

Places in Common: Exploring the Economic Geography of the Food System through the Case of Spain's Dairy Chain (1950s-Present)¹

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Abstract

How has the geography of the food system evolved as a result of the rise of a modern food processing industry? Have the geographies of farming and food processing conditioned each other strongly? Or, on the contrary, has there been a division of labour between farming regions and food processing regions? This article investigates this question through the case of Spain's dairy chain between the 1950s and the present. The Atlantic regions in the north of the country had a clear environmental advantage for the development of dairy farming and were leaders in both dairy farming and dairy processing. However, the evolution of economic policy, consumption patterns and the cost structure of processors also had an impact on the economic geography of the chain.

In the words of a leading food historian, 'Today, the food chain has lengthened beyond the imagination of people living in the preindustrial world'.² From the mid-nineteenth century onwards, and especially after 1945, farmers have been joined by large, increasingly influential companies involved

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² D. J. Oddy, 'The European food industries in perspective', in: D. J. Oddy and A. Drouard, *The food industries of Europe in the nineteenth and twentieth centuries* (Farnham 2011) 247-263, 263.

in food processing and retailing.³ What has this meant for the spatial configuration of the chain? For instance, have the geographies of farming and food processing conditioned each other strongly? Or, on the contrary, has the expansion of food processing followed a locational pattern of its own, so that a division of labour has emerged between farming areas and food processing areas?

This article seeks to contribute to answering the question through a case study of one country, Spain, and one of its food chains, the dairy chain. In terms of the questions posed, one of the attractive features of Spain as a study case is the presence of strong regional variations in climatology. Climatic areas in the country are very heterogeneous and range from a tiny strip of Atlantic-climate regions in the north to one of Europe's most arid regions in the south-east. This has favoured strong regional contrasts in agricultural specialisation, which provides a promising framework for exploring the interaction between the geographies of climate and farming (on the one hand) and food processing (on the other). The particular case of the dairy chain is relevant because it is among the most important chains in the Spanish food system (second only to the meat chain) and it is very representative of broader trends in the food system such as capitalization, innovation and internationalization.

The rest of the article is organised as follows. A review of historical and theoretical literature is offered first. A following section provides context by presenting an overview of Spain's dairy chain between the 1950s and today. On the basis of a newly constructed database, the main trends in the economic geography of the chain are identified next. The economic geography of three distinct periods (1952-1966, 1966-1986 and 1986-present) is discussed in the following section. A concluding section reflects on the factors involved in the coupling and decoupling of the geographies of farming and food processing, as well as on the relevance of cluster trajectories and internal differences within the food processing industry.

3 Y. Segers, J. Bieleman and E. Buyst, 'Preface', in: Y. Segers, J. Bieleman and E. Buyst (eds.), *Exploring the food chain: food production and food processing in Western Europe, 1850-1990* (Turnhout 2009) 13-16; P. Brassley, 'Food production and food processing in western Europe, 1850-1990: some conclusions', in: Segers, Bieleman and Buyst (eds.), *Exploring the food chain*, 281-287; L. Malassis, *Les trois âges de l'alimentaire: essai sur une histoire sociale de l'alimentation et de l'agriculture* (Paris 1997); A. Godley, 'The emergence of agribusiness in Europe and the development of the Western European broiler chicken industry, 1945 to 1973', *Agricultural History Review* 62:2 (2014) 315-336.

1 Literature review

In the last two or three decades, present-centred social sciences such as economics and geography have often emphasised that the food chain can be expected to become spatially disintegrated as it becomes longer. Agricultural economists, for instance, highlight that the location of food processing depends on many factors, the sourcing of agricultural inputs being only one of them. Many of those factors would be common to all manufacturing industries, among them the external economies stemming from access to specialised suppliers and workers and from the spread of relevant business information on technological innovation and market conditions. Even though proximity to agricultural inputs could remain crucial for the location of the simplest food processing industries, external economies would be expected to become more important for those food processing industries with a higher technological content.⁴

This basically reflects the contrast between the theoretical framework of Heckscher-Ohlin, on the one hand, and the so-called new economic geography, on the other. In a Heckscher-Ohlin world, factor endowments exert a powerful influence on the spatial division of labour.⁵ Farmers become specialised in those productions for which they hold some sort of (absolute or comparative) advantage in environmental terms. Those agricultural productions that are intensive in, say, sun exposure or rainfall tend to be located in regions where those environmental traits are present. In time, this creates favourable conditions for the emergence of food processing companies that make an intensive use of such agricultural productions. On the contrary, in the world of the new economic geographers, it is likely that a division of labour takes place between farming regions and food processing regions. Given that scale economies and external economies are more likely to be present in manufacturing than in farming, powerful forces lead to the concentration of manufacturing (or, more broadly, of increasing returns sectors) in a few places. Especially once

4 For empirical applications to the case of Spain, see: M. J. García Grande, 'La materia prima como factor de atracción locacional para la industria alimentaria', *Revista Española de Economía Agraria* 198 (1998) 53-88; J. Sanz, *Industria agroalimentaria y desarrollo regional* (Madrid 1993).

5 B. Ohlin, *Interregional and international trade* (Cambridge 1933). Although Heckscher and Ohlin modelled two-factor economies, their insights are easily extendable to three-factor economies in which labour and capital are joined by natural resources; see a mainstream basis for such extension in I. B. Kravis, "Availability" and other influences on the commodity composition of trade', *Journal of Political Economy* 64:2 (1956) 143-155.

transport costs have become low enough, a path-dependent process locks the rest of regions into agricultural specialisation.⁶

What agricultural economists are arguing is that the simplest branches of food processing develop in a Heckscher-Ohlin world, while the more complex ones develop in a new economic geography world. If we take the food processing industry as a whole, this would imply a historical evolution from spatial integration to spatial disintegration between farming and food processing. The message is surprisingly similar to the one coming from a radically different scholarly community: food geographers. Based on a postmodern, anti-structural epistemology, food geographers also argue that the modern food system is ever more characterised by delocalised production chains and an increasing distance between food producers and food consumers.⁷

In contrast to economists and geographers, historians have produced much evidence about the coupling of the geographies of farming and modern food processing. A large number of case studies of different sectors and regions provide evidence of linkages between agricultural progress and an emerging food processing industry. In these cases, the availability of some agricultural production stimulates the creation and flourishing of processing companies that transform agricultural inputs into food products. In other cases, the establishment of a food processing industry moves local farmers to reorient their production mix and become specialised in the production of those agricultural inputs demanded by that industry. Rather than disintegration, there would seem to be a powerful and recursive interaction between the geography of farming and the geography of food processing.⁸

The case of Spain is a good illustration. Many of the country's food processing industries have been found to be located close to those areas where the production of key agricultural inputs was more strongly developed. Flour production was located in the wheat-producing regions in the interior of the country, and the coupling of both geographies became stronger (rather than weaker) as the twentieth century progressed.⁹ Wine production was also located in regions with much vine cultivation, and in

6 P. Krugman, *Geography and trade* (Cambridge 1991).

7 For a recent review of the field, see B. Mandelblatt, 'Geography of food', in: J. M. Pilcher (ed.), *The Oxford handbook of food history* (New York 2012) 154-171.

8 This is the general impression that emerges from the case studies compiled in Segers, Bieleman and Buyst (eds.), *Exploring the food chain*, and Oddy and Drouard (eds.), *The food industries*.

9 L. Germán, 'La evolución de la industria harinera en España durante el siglo XX', *Investigaciones de Historia Económica* 4 (2006) 139-176.

most cases there was a high degree of interaction between vine farmers and wine processors.¹⁰ Andalusia, the region that was most specialised in the farming of olive trees, has also been the region with the strongest olive oil industry.¹¹ At least during the last half century, Catalonia has been home to both a powerful meat processing industry and an increasingly dense network of livestock farmers.¹² Other industries, such as sugar or tinned food, have also been found to follow a locational pattern that was coupled to that of the farming activities that supplied them with key inputs.¹³ It is not surprising then that an increasing number of historical studies on Spain's food processing industry rely on concepts such as clusters and industrial districts in order to account for the co-evolution of farming and food processing on local and regional scales.¹⁴

What about the dairy chain? Both in Spain and in other Western countries, the early stages of milk processing, between approximately 1850 and 1950, seem to have been located in areas where dairy farming was strong. In much of North-Western Europe, Denmark being the paradigmatic case, growth in butter production was based on the accumulation of a large number of small-scale, locally-embedded initiatives by dairy farmers' co-operatives.¹⁵ Cheese production also seems to have been closely tied to dairy farming, not only through countless farmers who produced their own homemade cheese but also through specialised processors who, as in

10 J. Pan-Montojo, *La bodega del mundo: la vid y el vino en España (1800-1936)* (Madrid 1994); J. M. Martínez Carrión and F. J. Medina Albaladejo, 'Revolución enológica en España? El empuje del sector vitivinícola a finales del siglo XX', in: L. Germán, J. Moreno and R. Hernández (eds.), *Economía alimentaria en España durante el siglo XX* (Madrid 2009) 211-245.

11 J. F. Zambrana, 'Continuidad y cambio en las industrias del aceite de oliva español, 1830-1996', in: C. Barciela and A. Di Vittorio (eds.), *Las industrias agroalimentarias en Italia y España durante los siglos XIX y XX* (Alicante 2003).

12 A. Langreo, 'Una visión territorial de la industria alimentaria', in: F. Molinero et al. (eds.), *Atlas de la España rural* (Madrid 2004) 348-353.

13 L. Germán, 'Características del desarrollo del complejo remolachero-azucarero en España, 1882-2000', in: Barciela and Di Vittorio (eds.), *Las industrias agroalimentarias*, 335-356; J. M. Martínez Carrión, 'Formación y desarrollo de la industria de conservas vegetales en España, 1850-1935', *Revista de Historia Económica* 7:3 (1989) 619-649; Langreo, 'Una visión territorial'.

14 R. Ramon, 'The growth of an agribusiness cluster in Catalonia, evidence from the olive oil industry', paper presented at the 'Rural History 2015' conference (Girona, 2015); J. Á. Aznar and A. Sánchez Picón, 'La conformación histórica de un cluster agroindustrial: el caso almeriense', in: Germán, Moreno and Hernández (eds.), *Economía alimentaria*, 247-280; R. Domínguez and L. de la Puente, 'Ganadería e industrialización láctea. El complejo ganadero-industrial en Cantabria en el siglo XX', in: Germán, Moreno and Hernández (eds.), *Economía alimentaria*, 143-179.

15 I. Henriksen, M. Lampe and P. Sharp, 'The strange birth of liberal Denmark: Danish trade protection and the growth of the dairy industry since the mid-nineteenth century', *Economic History Review* 65:2 (2012) 770-788.

France or in Switzerland, incorporated territorial elements into their reputation-making strategy.¹⁶

It is less clear, however, that further stages of dairy industrialisation were also based on a strong coupling of the geographies of farming and processing. Urban, large-scale production of pasteurised milk often required sourcing raw milk from very distant farmers. In the United States during the first half of the twentieth century, for instance, it has been found that the world of cheese remained highly integrated from a spatial point of view, while the world of liquid milk was prone to disintegration.¹⁷ These trends may have been common to other Western countries.¹⁸

The relative scarcity of studies dealing with the period since the Second World War, however, presents an obstacle to a more systematic understanding of these dynamics. It also raises the question of what the spatial implications of the late twentieth-century transition towards higher-value-added products (such as milk shakes, yoghurts and other refrigerated desserts) were. In the case of Spain, it has been suggested that this may have altered the geography of processing in favour of the main consumer market areas and against the main dairy farming areas, but we lack a systematic, long-run study on the matter.¹⁹

From a theoretical point of view, the account that follows will be influenced by economic theories of location, but also by the geography literature on cluster evolution and by neo-Schumpeterian economics. The traditional view on cluster evolution is that the latter can be explained according to the life cycle of the cluster's core products or industries. Clusters would then go through a succession of stages: take-off, peak entry, maturity and decline, and maybe (or maybe not) a new take-off. More recently, evolutionary economic geographers have proposed a modified version of this theory – an 'adaptive life cycle' theory that incorporates the possibility

16 S. Vabre, 'Rural capitalism: the *Société des Caves de Roquefort*, from c.1840 to 1914', in Oddy and Drouard (eds.), *The food industries*, 55-69; P. Moser and B. Brodbeck, *Du lait pour tous: portrait en images, documents et analyses de l'économie et de la politique laitières en Suisse au 20^e siècle* (Baden 2007).

17 E. M. DuPuis, *Nature's perfect food: how milk became America's drink* (New York 2002).

18 D. Taylor, 'Growth and structural change in the English dairy industry, c. 1860-1930', *Agricultural History Review* 35:1 (1987) 47-64; unpublished thesis I. Hernández Adell, *La difusión de un nuevo alimento: producción y consumo de leche en España, 1865-1936* (Universitat Autònoma de Barcelona).

19 R. Domínguez, 'La industria láctea en España, 1830-1985', in: Barciela and Di Vittorio (eds.), *Las industrias agroalimentarias*, 457-495.

of loops and feedbacks between different phases in the cycle.²⁰ This broader, open-ended view of cluster evolution could be further enriched with recourse to neo-Schumpeterian economics. According to the latter, business cycles are driven by a succession of phases of transformation, on the one hand, and rationalisation, on the other.²¹ While transformation phases are phases of innovation and expansion, rationalisation entails business restructuring and a concentration of resources in vanguard production units. The life cycles of clusters (adaptive or not) could then be seen, at least partially, as spatial manifestations of these broader sectoral dynamics.

2 Spain's dairy chain since the 1950s

Spain's dairy chain has gone through two distinct phases since the 1950s. The first of them unfolded between approximately 1952 and 1986 and was characterised by the industrialisation of the chain and the implementation of what might be called organised dairy capitalism. Around 1952 the dairy chain was composed mostly of farmers producing raw milk for human consumption, and it was not subject to any major State regulations. It is true that a few companies specialised in preserved milk were operating since the early twentieth century, and a few others were producing pasteurised milk since the 1920s.²² It is also true that since the early twentieth century local administrations had been paying increasing attention to the issue of milk quality and food security.²³ However, around 1952 processing companies did not absorb but a minor share of farmers' total milk production and the State had not implemented any policies that could exert a significant influence on resource allocation or on the coordination of production decisions along the chain.

Both things changed between 1952 and 1986. With a view to both fostering milk consumption and enhancing food security, in 1952 Francisco Franco's dictatorship implemented a set of innovative dairy policy measures. Arguably the two most important of them were the licensing of local monopolies for the production of pasteurised milk (the so-called 'milk

20 R. Martin and P. Sunley, 'Conceptualizing cluster evolution: beyond the life cycle model?', *Regional Studies* 45:10 (2011) 1299-1318.

21 L. Schön, *An economic history of modern Sweden* (Abingdon 2012).

22 Domínguez, 'La industria láctea'; Hernández Adell, 'La difusión'.

23 J. Pujol, R. Nicolau and I. Hernández Adell, 'El consumo de leche fresca en Cataluña entre mediados del siglo XIX y 1935: la difusión de un nuevo alimento', *Historia Agraria* 42 (2007) 303-325.

centrals') and the fixing of prices along the whole chain from farmer to consumer. This was basically a variety of the kind of organised dairy capitalism that dominated the political economy of Western Europe's dairy chain during the short twentieth century. It was under this policy regime that the industrialisation of the dairy chain took place. Especially after the mid-1960s, the production of processed liquid milk rocketed. This made it possible for milk consumption to become truly massive across all regions and social strata. Processing companies became the key node in the new dairy chain, and farmers' strategies came to depend ever more closely on their links with processing companies.²⁴

As the 1980s progressed, though, the dairy chain faced two major shocks. First, the greater part of organised dairy capitalism was dismantled.²⁵ Entry to the European Economic Community in 1986, in particular, forced Spain to discontinue the licensing of territorial monopolies. The subsequent transition to a more competitive business environment was joined by a crucial change in demand patterns. Around 1980 Spain had already completed its nutritional transition, so that consumer intakes were already well above biological needs. Consumers were therefore becoming massively exposed to the excess-related health risks of affluent societies. It was in this context that the high fat content of whole milk (that is, the product that had until then acted as the main engine of demand) became rapidly identified as a potential threat. The consumption of liquid milk stagnated and eventually declined.²⁶

These two shocks were the starting point for the making of a dairy chain that was very different to that in the period 1952-1986. Processing companies tried to re-stimulate demand by launching new products, among them a wide array of yoghurts and other refrigerated desserts.²⁷ This new source of expansion, however, coexisted with strong restructuring tendencies. Mergers and acquisitions, some of them involving foreign (French, in particular) business groups, became a common means to eliminate excess capacity, especially in the contracting niche of liquid

24 F. Collantes, 'Learning that milk comes from a cow: supply chain management and the character of neoliberalism in Spain's dairy chain', presented at the 'Rural History 2015' conference (Girona, 2015); id., 'Dairy products and shifts in Western models of food consumption since 1950: a Spanish perspective', *Rural History* 26:2 (2015) 249-268; A. Langreo, *Historia de la industria láctea en España: una aplicación a Asturias* (Madrid 1995).

25 Collantes, 'Learning'.

26 Collantes, 'Dairy products'.

27 A. Langreo, 'El sistema alimentario español desde la perspectiva de los sectores productivos (I)', *Distribución y Consumo* 81 (2005) 5-57.

milk. In the meantime, supermarkets were successful at marginalising small retailers or any other alternative networks. As a consequence, supermarkets have become increasingly influential on resource allocation and on the production decisions made by the other actors in the chain. By means of their price policies and supply management strategies, supermarkets have been crucial at shaping business restructuring in both dairy processing and dairy farming.²⁸

3 Trends in the economic geography of the dairy chain

3.1 Sources and database

A new database has been constructed in order to measure the degree of development of both dairy farming and dairy processing in relation to each region's population numbers. This is straightforward for dairy farming, but not for processing. The ideal indicator would be added value per capita, but this is not available even for the present. The only processing indicator that can be reconstructed consistently through time is employment. Reliable provincial data are available from the business censuses of 1970, 1980 and 1990 and the population censuses of 2001 and 2011. We also have the preliminary works of the 1958 industrial census, but this source is less reliable. Many dairy farmers (or dairy farm family members) who were marginally involved in the homemade preparation of cheese and other milk products were apparently classified as workers of a dairy processing industry, which leads to inconsistencies in relation to the rest of sources used here. As an imperfect solution to this problem, I have retained only the employment in business premises with five workers or more, which is a more reliable indicator of the presence of a true processing industry in each region. Even so, the results for 1958 must be taken as nothing more than a very broad approximation.

Employment figures are commonly used in studies of local economic geography, but they are not free from trouble. They do not capture inter-territorial differences in productivity and, therefore, they may contain a bias against those areas with higher productivity levels. In the case of Spain's food system, however, an analysis of the period 1959-2011 reveals that employment in food processing and added value in food processing were highly correlated at the province level (correlation coefficients

²⁸ F. Collantes, 'Food chains and the retailing revolution: supermarkets, dairy processors and consumers in Spain (1960 to the present)', *Business History* 58:7 (2016) 1055-1077.

range between 0.70 and 0.96). Employment in food processing showed a level of dispersion that was higher than that of productivity, and the geography of employment was broadly similar to the geography of added value.

Yet, an alternative indicator of dairy processing has been constructed for 1989, 2001 and 2011. This is sales per capita, which is available at a regional level for 2001 and 2011 and has been approximated for 1989 on the basis of a sample of large processing companies. The sample includes 114 companies that represented some 80 per cent of total employment in the sector. Because they do not incorporate inter-firm differences in operation costs, sales are not a perfect indicator either. It brings a bias against those companies operating with higher-than-average ratios of sales to costs (due to, for instance, specialization in high-added-value productions). There is also the problem that, in those cases in which a company has factories in more than one province, all sales are attributed to the main factory or to the company's general headquarters. This brings a bias against those regions in which there were factories belonging to companies from another region. Even though these objections must be taken into account when interpreting the results, the picture given by both of our indicators (employment and sales) is quite similar (the correlation coefficient between them is always above 0.80).

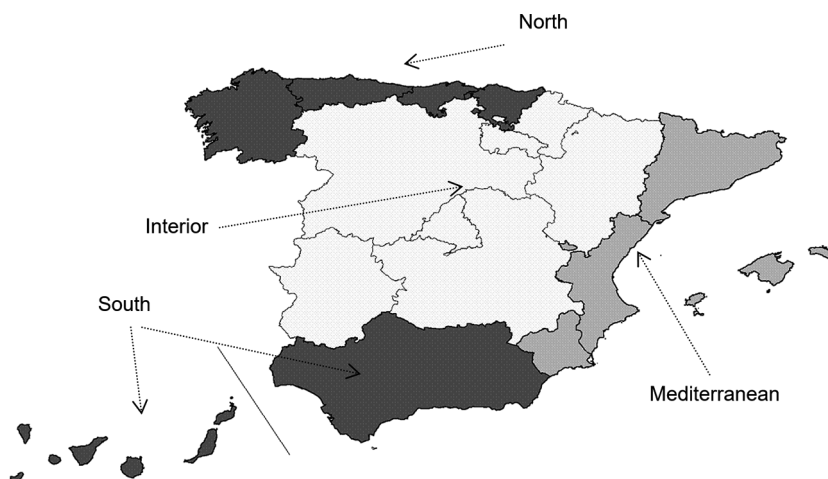
The database has been exploited at the level of Spain's current seventeen regions, which have also been grouped into the four macro-regions that are commonly considered in studies of Spain's agricultural history: North, Interior, Mediterranean and South (map 1).²⁹ This is a scale that captures the main geographical contrasts well and it is the one that will be used in much of the discussion in order not to produce an excessively fragmented narrative.

3.2 Evidence

The dairy chain has been persistently more concentrated in space than the average of the Spanish food system. Dairy farming has always been more concentrated than farming as a whole, and the same is true of dairy processing in relation to food processing as a whole (table 1). Both geographies reflect a clear leadership of the North over the other three macro-regions. The North's leadership is especially clear in the case of dairy farming (table 2).

Dairy processing has also shown higher levels of development in the

29 See for instance J. Simpson, *Spanish agriculture: the long siesta, 1765-1965* (Madrid 1995).



Map 1. Spain's four macro-regions

North than in the other macro-regions throughout the whole of the period (table 3), but some pattern of de-concentration and re-concentration can be discerned. At the start of the period, when the processing industry was rather small, it was highly concentrated in the North. However, its rapid growth in the 1960s and 1970s was based on an increasing presence in the other regions. By 1980 dairy processing was only slightly more developed in the North than in the Mediterranean or (after two decades of remarkable convergence) the Interior. Even the South's weak processing industry converged with the North during these years (and up until the turn of the millennium). A new era started in the 1980s. The industry tended to relocate in the North, while the Interior ceased to converge and the processing industry in the Mediterranean declined rapidly.

Table 1. Regional variation coefficients

	1958	1970	1980	1990	2001	2011
Dairy farming ^a	1.02	1.15 ^f	1.03	1.05	1.14	1.22
Dairy processing ^b	1.51	1.17	0.65	0.89	0.76	0.78
All farming ^c	0.37 ^e	0.47 ^g	0.45 ^h	0.52 ⁱ	0.71	0.71
All food processing ^d	0.43 ^e	0.44 ^g	0.44 ^h	0.45 ⁱ	0.49	0.56

Notes: ^a Raw milk production per capita; ^b Dairy processing employment per capita; ^c Gross added value per capita in the primary sector; ^d Employment in food processing per capita; ^e 1959; ^f 1972; ^g 1971; ^h 1981; ⁱ 1991.

Sources: dairy farming: INE [Instituto Nacional de Estadística], *Anuario estadístico de España 1960* (Madrid 1960); Ministerio de Agricultura, *Anuario de estadística agraria 1972* (Madrid 1972); id., *Anuario de estadística agraria 1980* (Madrid 1980); Ministerio de Agricultura, Pesca y Alimentación, *Anuario de estadística agraria 1990* (Madrid 1990); id., *Anuario de estadística agraria 2001* (Madrid 2002); dairy processing: INE, *Censo industrial de España 1958: enumeración previa de localización* (Madrid 1962); id., *Censo de los locales de España según la inscripción realizada el 31 de diciembre de 1970* (Madrid 1975-76); id., *Censo de locales 1980* (Madrid 1981-82); id., *Censo de locales 1990* (Madrid 1991-92); id., www.ine.es ('Censos de población', 2001 and 2011); all farming and all food processing: Fundación BBV, *Renta nacional de España y su distribución provincial. Serie homogénea. Años 1955 a 1993 y avances 1994 a 1997* (Bilbao 1999), until 1990; and INE, www.ine.es ('Censos de Población' and 'Encuesta Industrial de Empresas') and Ministerio de Agricultura, Alimentación y Medio Ambiente, www.magrama.gob.es ('Cuentas económicas de la agricultura'), for 2001 and 2011.

Table 2. Raw milk production per capita in four macro-regions, Spain=100

	North ^a	Interior ^b	Mediterranean ^c	South ^d
1958	293	72	44	54
1970	249	102	38	50
1980	259	107	33	51
1990	261	101	45	52
2001	293	93	38	59
2011	348	91	36	48

Notes: ^a Galicia, Asturias, Cantabria and Basque Country; ^b Castilla y León, La Rioja, Navarre, Aragon, Madrid, Castilla-La Mancha and Extremadura; ^c Catalonia, Balearic Islands, Valencian Community and Murcia; ^d Andalusia and Canary Islands. Sources: see table 1.

Table 3. Indicators of dairy processing intensity, Spain=100

	North	Interior	Mediterranean	South
Employment per capita				
1958	194	87	119	26
1970	156	100	122	25
1980	121	108	110	55
1990	165	98	89	70
2001	140	108	87	79
2011	181	112	72	57
Sales per capita				
1989	144	126	86	49
2001	202	107	77	50
2011	260	106	61	47

Sources: employment: see table 1; sales: Dun & Bradstreet, *Duns 15000. Principales empresas españolas 1989* (Madrid 1989); Mercasa, *Alimentación en España* (Madrid 2003); and id., *Alimentación en España* (Madrid 2013).

As a result, the geographies of dairy farming and processing show changing degrees of coupling through time (table 4). Until around 1970 there was much (and, perhaps, increasing) coupling between both geographies. After a clear hiatus around 1980, the coupling was restored in the later part of the period. This suggests that three distinct subperiods must be discussed next.

Table 4. Regional correlation coefficients between raw milk production per capita and dairy processing employment per capita

1958	1970	1980	1990	2001	2011
0.75	0.85	0.50	0.88	0.84	0.81

Sources: see table 1.

4 Places in common: a discussion

4.1 Environments and milksheds (before 1966)

Environmental conditions have impacted on the geography of dairy farming more powerfully than any other single group of factors. Before the 1960s, cattle feeding depended on a combination of grass coming from pasture lands and meadows, on the one hand, and the production of fodder crops by farmers, on the other. This made dairy farming (both in Spain and elsewhere in Europe) a rainfall-intensive activity. Therefore, the tiny strip of Atlantic-climate regions in the North of the country was in a better position than others to specialize in dairy farming. In much of the rest of the country, rainfall was so scarce and irregular that it was difficult for farmers to secure enough feed for the animals. The trajectory of technological change in dairy farming in the century prior to the 1960s reinforced, rather than weakened, this state of affairs. The substitution of multi-functional breeds with breeds specialised in high-yield milk production made the task of feeding animals ever more demanding. Even after the 1960s, when industrial feed was introduced, dairy farming remained more coupled to local land use practices than other areas of livestock farming such as pork or poultry.³⁰

As a result, the geography of dairy farming in Spain has remained to this

³⁰ R. Domínguez, 'Las transformaciones del sector ganadero en España (1940-1985)', *Ager* 1 (2001) 47-84; E. Clar, 'A world of entrepreneurs: the establishment of international agribusiness during the Spanish pork and poultry boom, 1950-2000', *Agricultural History* 84:2 (2010) 176-194.

day strongly conditioned by the geography of rainfall. Not only were bovine numbers initially higher in the North, but this region also led the way in the transition to specialised dairy farming through the incorporation of foreign, high-yield breeds. In contrast, in the rest of the country the agricultural sector was more oriented towards crops or, in the case of livestock raising, towards animals the feeding of which was not so demanding. It is true that some of these animals, such as ewes and goats, were used for dairy purposes in some parts of the country, but cow's milk was always dominant.³¹

For a long period between around 1900 and the 1960s, this was the basis of a stronger development of modern dairy processing in the North and, more broadly, a self-reinforcing interaction between the geographies of farming and processing. The Swiss company Nestlé, for instance, started in 1905 a factory in the northern region of Cantabria. Because the factory was oriented towards the production of preserved milk, and because the collection of raw milk absorbed a large share of the factory's costs, it is not surprising that Nestlé chose an area in which cattle raising had already reached some level of development and in which environmental conditions were suited to further dairy specialisation by farmers. In fact, the arrival of Nestlé rapidly stimulated the transition of many local farmers into high-yield breeds (Friesian, in particular) and more intensive systems of animal feeding.³²

It is true that not all of the major companies were located in the North. For instance, Danone, a Spanish firm that would later become a France-based multinational, was located in Catalonia. The company's strategy, which would make Danone become the leading producer of yoghurt for the Spanish market, was strongly based on innovation and marketing. With a cost structure not as dominated by raw milk as in most other companies, Danone was able to benefit from access to Catalonia's large regional market and, perhaps more crucially, to the external economies in

31 V. Calcedo, 'Crisis, evolución y cambio en la ganadería de vacuno de leche de la España húmeda (1950 al 2000)', in: R. Domínguez (ed.), *La vocación ganadera del norte de España: del modelo tradicional a los desafíos del mercado mundial* (Madrid 1997) 207-286; id., 'El ganado bovino en España', in: F. Molinero et al. (eds.), *Atlas*, 258-265; R. Domínguez and L. de la Puente, 'Dependencia de la trayectoria y cambio técnico en la ganadería de Cantabria, 1750-1930', in: S. López and J. M. Valdaliso (eds.), *Qué inventen ellos? Tecnología, empresa y cambio económico en la España contemporánea* (Madrid 1997) 121-155; D. Gallego, 'Sociedad, naturaleza y mercado: un análisis regional de los condicionantes de la producción agraria española (1800-1936)', *Historia Agraria* 24 (2001) 11-57; Hernández Adell, 'La difusión'.

32 Domínguez and de la Puente, 'Ganadería e industrialización láctea'.

Spain's most dynamic industrial district. The fact that Catalonia's environmental conditions were not particularly suitable for dairy farming was then a minor issue for the company.³³

In general terms, however, the world of dairy processing in Spain was more a Heckscher-Ohlin world than a new economic geography world. Processing companies, by now operating mostly in consumption niches such as preserved milk, tended to flourish in those regions with a stronger potential for dairy farming. In fact, such regions eventually generated their own external economies for dairy agribusiness. The degree of social interpenetration between farmers, traders and processors was high, and new local associations and farm cooperatives contributed to the spread of knowledge and business prospects. This, in turn, contributed to further dairy industrialisation. In Cantabria, for instance, the creation in 1932 of a large cooperative processor (SAM) that coordinated a wide-ranging collection network was underpinned by the previous experience of farmer interaction (and conflict) with Nestlé.³⁴

External economies may have even favoured that dairy industrialization in the early days of organised capitalism encountered less obstacles in the North than in other parts of the country. The State's plan of fostering the production of pasteurised milk through a network of locally monopolistic milk centrals was very unevenly successful before the mid-1960s.³⁵ Investment in dairy processing was discouraged by the low profit rates implied in the price levels fixed by the State, as well as by restrictions to machinery imports. Furthermore, in many places the top-down policies of the central State were made ineffective by the lack of a sufficient degree of social articulation among the potential leaders of local dairy processing. The State expected that many milk centrals would be built and run by dairy farmers' cooperatives, but in many regions these cooperatives did not exist or were very weak. In contrast, in the North the pre-existence of a network of dairy farmers and associations may have eased these difficulties.

4.2 Dairy industrialization under a policy shock (1966-1986)

The accelerated expansion that took place in the processing industry from the mid-1960s to the mid-1980s followed a territorial pattern that was not as concentrated as before. The North remained the area with the highest

33 Domínguez, 'La industria láctea'.

34 Domínguez and de la Puente, 'Ganadería e industrialización láctea'.

35 Langreo, *Historia de la industria láctea*.

level of dairy industrialisation, but the other areas converged. The Interior and the Mediterranean were actually close to reaching the industrialisation levels of the North.

This was so, in the first place, because the consolidation of organised dairy capitalism was a policy shock for the geography of the processing industry. The mediocre results achieved by the milk centrals policy between 1952 and 1966 led policymakers to revise it.³⁶ The State kept on fixing the price at which milk centrals bought raw milk from farmers and the price at which they sold pasteurised milk to retailers or consumers, but new price conditions were set. The fact that milk centrals and dairy farmers operated under widely different environmental conditions from region to region came to inform price policy more strongly. More generally, there was an upward revision of the processing profit rates that were implicit in the price policy. As a result, from the mid-1960s onwards new processing companies flourished all across Spain, and not just in the North.

Many of the new companies were milk centrals run by cooperatives the creation of which was closely tied to State policy and bureaucracy. Most of them did not have access to cheap milk in their surrounding hinterland. Nor were they managed by particularly experienced (or perhaps visionary) business people. In short, they did not hold any kind of distinctive competitive advantage. Their key strength was their being licensed local monopolies that, even if they were not completely free from some pro-efficiency pressure (given the price restrictions set by the State), did not have to worry much about competing with producers from other areas.

The dispersion of the processing industry during these years must also be put in relation to a second factor: the extraordinary expansion that took place in the consumer demand for liquid milk. In the terms alluded to above, growth in the processing industry was taking place during a Schumpeterian phase of transformation rather than during one of rationalisation. It is not that rationalisation pressures were completely absent. The production of sterilized liquid milk, for instance, was not subject to the kind of territorial licensing system that existed for the production of pasteurised milk, which meant that in this case there was a remarkable degree of inter-territorial competition.³⁷ Furthermore, a few leading milk centrals were trying to increase their scale by means of buying other centrals in their region. It was a strategy aimed not only at strengthening their competitive position in the battle over the expanding market for sterilised milk, but

³⁶ Langreo, *Historia de la industria láctea*.

³⁷ Langreo, *Historia de la industria láctea*.

also at reaching the highest possible point within the profit rate interval that was implicit in State price policy. Still, these pressures for rationalisation were more than offset by the extraordinary expansion that took place in consumer demand, which favoured the coexistence of very heterogeneous (in terms of efficiency) production units.

Interestingly, the de-concentration of the processing industry did not lead to a parallel de-concentration of dairy farming. There were some effects of this kind: areas, especially in the Interior, where the creation of one milk central (or an independent processor) stimulated the reorientation of some farmers towards dairy farming, either through the exploitation of some local, rainfall-abundant ecological niche or through a costly shift of land use towards intensive fodder cultivation. But, in general terms, linkages of this kind were not remarkable. Milk centrals outside the North made massive use of surplus production coming from Northern farms. Large cities in the Interior (such as Madrid) and the Mediterranean (Barcelona, Valencia) became major purchasers of raw milk coming from distant farmers.³⁸ By the end of this period, the geographies of dairy farming and processing were coupled only in a weak sense of the term. Dairy farming remained most powerful in the North, but dairy processing had expanded not only across the North but also (and more rapidly) in the other areas.

4.3 Resilient geographies, declining clusters (1986-present)

The elements that had favoured some spatial de-concentration of the processing industry vanished from the 1980s onwards: organised dairy capitalism was dismantled and the consumption of dairy products ceased to grow rapidly.³⁹ This led to the intensification of competitive pressures within both the farming and the processing nodes of the chain. In processing, rationalisation resulted in a re-location of the industry in areas of strong dairy farming. Many of the former milk centrals in the Interior, the Mediterranean and the South were not capable of sustaining competition in an open market. The end of the licensing system and the end of demand expansion led to a fatal decrease in their profitability. Only a few of the processing industries that had been created outside the North during the previous decades were able to become leading companies in the new era. As the cases of Pascual (in the Interior) and Puleva (in the South) show, the

38 J. Colino, 'El comercio interregional español de leche y la división internacional del trabajo en el sector lácteo comunitario', *Agricultura y Sociedad* 25 (1982) 111-140.

39 Collantes, 'Dairy products'.

making of a strong brand image was critical for a successful expansion in such context. Many former milk centrals, however, lacked the managerial skills to remain profitable in areas where access to raw milk was not particularly easy or cheap. In the meantime, some former centrals in the North, in particular Central Lechera Asturiana-Capsa, grew rapidly. This was also a time in which another major area of dairy farming, the neighbouring region of Galicia, strengthened its position in dairy processing. Put simply, these Northern companies used their access to cheaper raw milk in order to capture shares of the national market that had until then been reserved to higher-cost, politically protected competitors in other parts of Spain.

This suggests that the geography of the dairy chain was resilient to the policy shock embedded in organised dairy capitalism. It would be a mistake, though, to take this as a purely natural outcome of the transition to freer markets. The policies implemented by some regional governments were influential too. By the mid-1980s, the highly centralised State of the Franco regime had given way to a State in which a central administration co-existed with seventeen regional governments. Some of these governments, especially in the North, implemented policies set to minimise the impact of business restructuring upon their processing companies. The regional governments of the Basque Country and Navarre, for instance, supported the integration of all former milk centrals in their territory into one single, newly-created company (Iparlat) that could be expected to be more competitive than each of the centrals separately.⁴⁰

Regional governments also lobbied for a regional application of the European Union's milk quota system, which contributed to making the geography of dairy farming stand still. Regional governments opposed that the milk quotas made free by the exit of some of their farmers could end up in the hands of expanding farmers from other regions.⁴¹ Much of the quota assigned to Spain became then a set of seventeen regional quotas assigned in relation to the initial relevance of dairy farming in each region. This may have hindered some restructuring in the geography of dairy farming. There were many dairy farmers in the North, but many of them had very small farms located in remote areas and were not very productive. In other parts of the country, dairy farming was a marginal activity within the

40 A. Langreo, 'Cambios de fondo en el sistema lácteo español', *Distribución y Consumo* 67 (2003) 93-104.

41 V. Calcedo, 'El régimen de cuotas lecheras: análisis y balance de su aplicación en las comunidades autónomas de la España húmeda (1992-1996)', in: R. Domínguez (ed.), *La vocación ganadera*, 395-428.

agricultural economy, but dairy farms were larger and productivity levels were higher. Furthermore, the incorporation of industrial feed was making environmental conditions less relevant than in the past.⁴² Under a free market, or at least under a national (as opposed to regional) interpretation of quotas, farm restructuring could have had stronger spatial implications.

Whatever the combination of market dynamics and politics that allowed for the consolidation of dairy clusters in the North, the latter's degree of success should not be exaggerated. The North has actually shown little capacity to climb steps in the ladder of value creation. To start with, its leadership has always been stronger in farming than in processing. In other words, within the dairy chain the North has been relatively specialised in farming (table 5). In contrast, the Mediterranean, for instance, has always been relatively specialised in processing: even though its processing industry has always been smaller than that in the North, it has developed more than proportionately in relation to the local availability of raw milk.

Table 5. Processing (vs. farming) specialization within the dairy chain, Spain=100^a

	<i>North</i>	<i>Interior</i>	<i>Mediterranean</i>	<i>South</i>
1958	66	121	272	47
1970	63	98	332	48
1980	47	101	330	103
1990	64	96	205	138
2001 ^b	48-69	115-116	200-222	86-136
2011 ^b	53-75	118-124	168-195	93-97

Notes: ^a $[(P_i / P_S) / (F_i / F_S)] * 100$, where *P* (processing) is employment in dairy processing per capita, *F* (farming) is raw milk production per capita, *i* is each of the regions and *S* is Spain. A value higher than 100 means that the region is relatively specialised in processing, while a value lower than 100 means that the regions is relatively specialised in farming; ^b The intervals result from using employment in dairy processing and dairy sales as alternative measures of *P*.

Sources: see tables 1 and 3.

The shortcomings of the North can also be perceived in the poor performance of many of its processing companies when it comes to product innovation. In the last thirty years, there has been an extraordinary surge in product innovation, ranging from low-fat and enriched milks to all sorts of higher-added-value items, refrigerated desserts in particular. Northern

42 F. Sineiro and B. Valdés, 'Evolución del mercado y de la estructura productiva del sector lácteo español desde la integración en la CEE', *Economía Agraria y Recursos Naturales* 11 (2001) 125-148.

companies, however, have generally played a minor part in these developments.⁴³ The knowledge and social capital accumulated in the region during previous product life cycles may have contributed to some companies, such as Capsa or Kaiku, shifting successfully to output diversification, but in general terms the processing industry in the North is more oriented towards the (raw milk-intensive) production of liquid milk than that in the rest of the country. A comparison between the ten leading companies in milk and in yoghurt sales is striking: as many as six of the leading companies in milk production are located in the North, while this is true for only two of the leading companies in yoghurt production (map 2).

As the collection of raw milk (and the purchase of agricultural inputs more generally) has become less and less important in the cost structure of processing companies (table 6), the environmental advantages of the North have become less and less important as well. The case of Nestlé, a company that was never involved in producing liquid milk, is perhaps representative. Even though Nestlé opened up its first Spanish factory in the northern region of Cantabria as early as in 1905, much of its expansion in the last half century has taken place across the Barcelona and Madrid industrial districts. The Cantabria factory, in the meantime, has become largely marginal within the company's overall business strategy. The North has also been marginal for the geographical expansion of Spain's leading yoghurt producer, Danone, since the 1960s.⁴⁴ Finally, the latest major entrant to the yoghurt market, France-based Senoble, was remarkably uninterested in northern locations. A company specialised in the production of retailer-brand yoghurts for Spain's leading supermarket chain (Mercadona), Senoble opened up its only factory in 2002 in the Interior province of Toledo, close to Madrid.

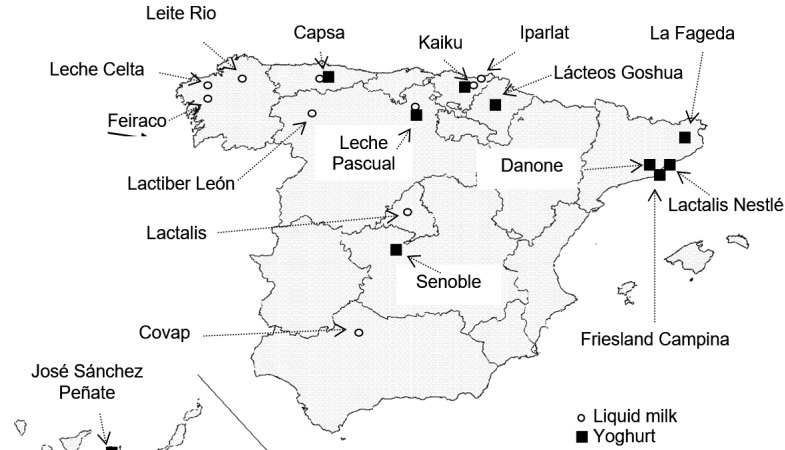
Table 6. Cost structure of dairy processing (%)

	1961 ^a	1970 ^a	1980	1991	2001	2007
Agricultural inputs	72	68	60	61	37	30
Industrial and service inputs	23	23	26	25	51	59
Labour	5	9	14	14	12	11

Notes: ^a Only companies that were processing more than one million litres of milk per year. Sources: INE, *Estadística industrial 1961* (Madrid 1963); id., *Estadística industrial 1970* (Madrid 1973); id., www.ine.es ('Tablas input-output').

43 Langreo, 'Cambios de fondo'.

44 Langreo, *Historia de la industria láctea*.



Map 2. Top ten companies in liquid milk and in yoghurt production, 2011

Source: Mercasa, *Alimentación en España 2013* (Madrid 2013).

In summary, even though the geography of the dairy chain was driven mostly by factor endowments (with the North, endowed with abundant rainfall, leading the way in both dairy farming and processing), those areas with a higher degree of territorial competitiveness and a stronger presence of external economies were able to develop a processing industry that was both larger than it could have been expected and more firmly oriented towards innovation and value creation. Dairy clusters in the North have thus become stabilised clusters, or perhaps even declining clusters. As has been made clear by thirty years of frantic business restructuring, these clusters are not in danger of breaking down rapidly and some of them may even show some capacity to diversify their output. However, they no longer possess the capacity to make the kind of major contribution to regional development that they made in earlier times. In fact, employment processing in the North has been declining clearly in absolute terms (table 7). Nor have cluster members, in spite of some selling of pasteurised milk through vending machines, devoted much effort to create their own alternative retailing structures as a way of challenging the dominance of supermarkets upon them.⁴⁵

45 On vending machines, see C. Marcos, 'Vender leche en máquinas expendedoras, un hecho', *Agricultura* 917 (2009) 270.

Table 7. Annual compound rate of change in dairy processing employment (%)

	Total	North	Interior	Mediterranean	South
1958-1990	4.2	3.5	4.3	3.9	7.5
1990-2011	-0.5	-0.8	0.1	-1.1	-0.5

Sources: see table 1.

5 Conclusion

How has the economic geography of the food system evolved as a result of the rise of processors? Has food industrialisation tended to locate in those regions where key agricultural inputs were abundant? Or have generic locational factors, such as external economies and territorial competitiveness, been more powerful? In our case, Spain's dairy processing has tended to be located in those regions where dairy farming was strong. In a country with much climatological heterogeneity, a rainfall-intensive activity like dairy farming has always been more present in the Atlantic regions in the northern part of the country, and the same is basically true for dairy processing. In these Atlantic regions, the availability of raw milk favoured the establishment of companies producing preserved milk, first, and liquid milk, later. Not even the major policy shock embedded in organised dairy capitalism in the decades prior to 1986 (which included a licensing system of local monopolies for the production of pasteurised milk) was able to fully destroy this geographical pattern. Said pattern, moreover, has been recomposed during the era of economic liberalisation and business restructuring that started in the mid-1980s. The case studied here, therefore, has been one of a powerful and persistent interaction between the geographies of farming and food processing, rather than one in which a division of labour emerges between farming areas and food processing areas.

Our case also suggests, however, that the conditions for successful agri-food clustering may be somewhat restrictive. The formation of dairy clusters in the North was linked to the fact that agricultural inputs were initially dominant within the cost structure of processors, which may be generalizable to other cases as well. But it was also linked to the fact that in Spain there were striking regional contrasts in environmental conditions and raw milk production potential, which is unlikely to be so generalizable to other products or countries. Furthermore, these clusters were successful

during the cycle of demand expansion that took place until around 1980, but more recently they have experienced difficulties in terms of output diversification and value creation. As the development of dairy processing entered this new era, generic territorial competitiveness seems to have been on the rise as a locational factor.

Illuminating the precise mechanisms through which territorial competitiveness becomes important for the location of the food industry is a task that future research may find worth pursuing. In this particular case, market access may not have been irrelevant, but external economies would seem to have played a more crucial part. The high degree of processing (vs. farming) specialization in Catalonia and the Mediterranean region more generally, where per capita dairy consumption was (and remains) relatively low, suggests so. A more systematic look at the issue is clearly needed, though. All in all, and irrespective of the precise mechanisms involved in changing spatial patterns, a new set of questions emerges: could it be that the great divide in the economic geography of the food system is not the industrialisation of food production *per se* but the transition (that took place later) towards a growth regime based on product innovation and sophistication? Perhaps the key is not the agricultural vs. manufacturing character of food chain activities but the larger or smaller share of agricultural inputs within the cost structure of both farmers and processors? Will then the economic geography of the food system go through more profound changes during the era that started in the late twentieth century than during the modernisation period of 1850-1970? Answering these questions on a larger geographical and sectoral scale than the one adopted in this article should be a priority for researchers interested in the making and unmaking of agro-food clusters in the modern era.

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