Revista Uruguaya de Historia Económica, diciembre 2017, Vol VII (12):30-57 ISSN: 1688-8561

# RAILROADS AND REGIONAL ECONOMIES IN URUGUAY, C. 1910 *

Emiliano Travieso**

**Abstract**

In the decades prior to the First World War Uruguayan incomes, fuelled by rising international prices for beef and wool, achieved levels similar to France's and Germany's, and vastly superior to those of Mediterranean Europe and all of the Southern Hemisphere, except the other three major 'settler economies' of Australia, Argentina, and New Zealand. These gains, however, were not evenly distributed within Uruguay. Railway transportation and domestic market integration reinforced narrow specialisation patterns and regional inequalities which persist to this day, with the southern coast of the country being significantly better-off than the north and north-east. This article traces the origins of these patterns back to the era of export-led growth under the First Globalization. Evidence is reconstructed from freight traffic from the 152 train stations in the country to identify spatial clustering of economic activities, moving the unit of analysis away from the 19 provinces (*departamentos*) which make up Uruguay's administrative divisions. This allows for a far more detailed benchmark of Uruguayan regional economies than previously available. Relying on geostatistical analysis and theoretical insights from the New Economic Geography, I propose a possible economic regionalization of Uruguay circa 1910.

**Resumen**

En las décadas previas a la Primera Guerra Mundial los ingresos medios en Uruguay, impulsados por los favorables precios internacionales de la carne y la lana, alcanzaron niveles semejantes a los de Francia y Alemania, y muy superiores a los de la Europa mediterránea y los del hemisferio sur en general, con la excepción de las otras economías de nuevo asentamiento (Argentina, Australia y Nueva Zelanda). Esta prosperidad, sin embargo, no se distribuyó equitativamente en el territorio. El transporte ferroviario y la integración del mercado doméstico reforzó estrechos patrones de especialización e inequidades regionales que persisten en el presente. Este artículo busca los orígenes de estos patrones en la era de crecimiento guiado por las exportaciones bajo la Primera Globalización. Se reconstruye evidencia a partir de la carga ferroviaria de las 152 estaciones del país para identificar la concentración espacial de la actividad económica, con independencia de la división administrativa en 19 departamentos, lo que permite un mayor nivel de desagregación. Utilizando técnicas de geoestadística y algunas categorías analíticas de la Nueva Geografía Económica se propone una posible regionalización de la economía uruguaya hacia 1910.

* I would like to thank the members of the Programa de Historia Económica y Social (Universidad de la República), particularly Reto Bertoni, for advice and comments. I would also like to thank the Cambridge Group for the History of Population and Social Structure for its research environment. Financial support from the Cambridge International Trust is gratefully acknowledged. Two anonymous referees made very helpful clarifications and suggestions. Any remaining errors are, of course, my own.

** King's College, University of Cambridge
et399@cam.ac.uk

## 1. INTRODUCTION

Today the mean per capita income in the province of Montevideo, home to Uruguay's capital and only city with over 150,000 inhabitants, is about 50% higher than the average of the rest of the country.[1] More widely, the southern provinces with shores on the Río de la Plata (Montevideo itself, plus Colonia, San José, Canelones, and Maldonado) form a club of prosperity, with average incomes nearly 50% higher than those of the north and north-eastern provinces (Artigas, Rivera, Tacuarembó, Cerro Largo, and Treinta y Tres), which lag behind the national averages in most indicators of productivity and competitiveness.[2] The magnitude of these regional inequalities is notorious in present-day Uruguay, and constitutes a major development challenge which stimulates both scholarly debate and policy making. Yet the economic history of regional inequalities in Uruguay is still little known, which prevents their structural causes from being fully understood. This paper aims to contribute to illuminating that history by reconstructing the spatial location of economic activity in Uruguay around 1910. It does so by relying on an underexploited source: the records of railroad freight cargo at the station level. Already explored by scholars of Uruguayan railway history, these records offer a new perspective on regional economies, as they allow us to construct 152 observations across the country, rather than being limited to the 19 previously allowed by the provinces (*departamentos*) which make up Uruguay's administrative divisions.

The rest of the paper is organised as follows: the next section briefly places the paper within the Uruguayan historiography on railroads and regional development in historical perspective; Section 3 discusses the dataset of train stations and their freight cargo for 1910 and considers its potential for understanding regional economies; Section 4 focuses on geostatistical analysis and offers an economic regionalization of Uruguay c. 1910; Section 5 concludes.

## 2. URUGUAYAN REGIONS, URUGUAYAN RAILROADS, AND EXPORT-LED GROWTH

This section attempts to place this paper within two strands of literature: the economic historiography on the Uruguayan railway network and the comparatively more recent scholarship on regional economies in Uruguayan economic history.

The study of the part played by railways in export-led growth in Latin America during the First Globalization has drawn scholarly debate for decades. For the economic historians of the *dependentista* tradition, railways served to modernize and consolidate a pattern of growth centred in primary commodities (minerals or foodstuffs), in the context of a political economy driven by foreign capital (usually British) in alliance with a class of local landowners and rentiers. According to these scholars, the dendritic design of the railway networks in the continent proved they were built primarily to connect export-producing areas (be they banana or coffee plantations, copper mines, or pastoral grasslands) with ports for overseas trade, and served to subordinate Latin American economies to foreign capital.[3] In Uruguayan economic historiography in particular, this influential narrative is associated with Barrán and Nahum's (1978) seminal work. The British-owned railways, subsidized by the Uruguayan state, were in their account absolutely necessary to the growth of the export economy, but their impact in terms of structural change was as a force for continuity rather than for change, since they helped consolidate traditional uses of the soil, livestock production techniques, and land tenure systems. In other words, in the *dependentista* tradition railways in Latin America (and elsewhere in the world periphery) were primarily about the integration of the national economy with the international markets rather than about domestic market integration (as was the case in the core Western economies).

Armed with new theoretical insights and new methodological tools, more recent generations of economic historians have offered a more nuanced take on the role of railways in Latin American economic history. Following the path opened by Fogel's (1964) landmark work on the economic impacts of the American railway, scholars have explored counterfactuals and constructed social saving rates for railway systems across the continent. In these new accounts, the Uruguayan railway system shows itself as one of the densest in Latin America, ranking third in per capita terms and

fourth in miles per square kilometre (Herranz-Loncán, 2011). And yet, in terms of its overall benefits to the economy (at least as captured through the social savings rate) its performance was amongst the worst in the continent, in stark contrast with its neighbours, Brazil and Argentina (Summerhill, 2005). Indeed, Uruguay was the one Latin American country with an extensive rail network which did not seem to benefit from it significantly (Herranz-Loncán, 2014). Extensive livestock production was not particularly suited to great traffic densities, and the gentle Uruguayan lowlands offered cheap alternatives to railroad transportations, which made under-usage (and its counterpart, over-investing) a problem for the productivity and profitability of Uruguayan railways (Díaz Steinberg, 2014; Herranz-Loncán, 2011).

While it relates to the issues raised by this literature, this paper is not primarily concerned with the direct contribution of railroads to export-led growth in 1900s Uruguay. Rather, it attempts to use new evidence on railway freight services to cast some light on the regional economic dynamics of the Uruguayan economy under the First Globalization boom. It will contribute a complementary perspective to that of growth accounting, by offering some insights into the geographical location of economic activities and the impact thereof on regional development. The results suggest the picture is more nuanced than the classic *dependentista* narrative suggests, whilst at the same time showing that the diverging economic paths of Uruguayan regions can be traced back to their place in the export economy prior to the First World War. Whether railways helped determine the contours these economic regions, or merely reveal or further entrench them is perhaps the major question arising from these results.

Long-term historical perspectives on regional development in Uruguay are, in comparison with the literature on railways, more recent. Despite the fact that the Uruguayan territory (c. 176,000 square kilometres) is significantly larger than England—to name one country where regional economic inequalities have long been a major subject of study—its small population (barely over 1 million by 1908, nearly 3.5 million a century later) and its location between two very large countries (Argentina and Brazil) have encouraged the misperception of the country as 'homogeneous', which is perhaps to blame for the general lack of regional perspectives in Uruguayan economic historiography. The former predominance of 'macrohistory' and *histoire totale* approaches is perhaps another factor behind this lack of 'regional sense' (Bértola, 1999: 82). As a result, efforts to reconstruct historical regional economies are in their infancy. In 2005 the government published the first official estimates of provincial output (1985-2003) (OPP, 2005), and economic historians have since tried to cast their net further back (García et al., 2015; Martínez-Galarraga et al., 2015). García et al. (2015) have reconstructed provincial GDPs for benchmark years (1908, 1936, 1955, and 1961), and Martínez Galarraga et al. (2015) have discussed provincial per-capita GDPs in the twentieth century. In terms of regional production, recent work by Araujo et al. (2015) has offered more a more detailed picture of provincial specialization patterns during the twentieth century.

These pioneering research results share a common trait imposed by the census data which they rely on as their main primary source: the units of analysis tend to be the 19 provinces which form Uruguay's administrative divisions. At the time of independence there were nine provinces; the other ten were created in the mid- to late-nineteenth century, often as the result of political calculations and coalition-building between political parties, and they generally had very little in the way of economic cohesion or viability.[4] The 1830 constitution, still in effect by 1910, established a 'political chief' (*jefe político*) in each provincial capital, who was appointed directly by the national executive branch and was closer to a police chief than to a government official. Additionally there was an elected 'council for finance and management' (*Junta Económico-Administrativa*) with very limited powers (Constitución de la República Oriental del Uruguay de 1830, Sección X, Capítulo 1, Artículos 118-121). This scarce organizational structure was complemented by a 1908 law which created *intendentes* (closer in lexical meaning and bureaucratic power to mayors than to governors) with a handful of municipal executive powers in each province, who were designated by the national executive branch with Senate approval. Therefore, the institutional framework prevailing in early-twentieth century Uruguay meant that local politics was to a large extent dependent on the balance of power in the national stage rather than the other way around (Pivel Devoto & Ranieri, 1956: 407-410). Furthermore, in terms of economic policy sub-national governments had very limited powers, and before the 1918 Constitution could not even

raise their own municipal taxes (Cagnoni, 2006). In the light of this institutional and political context, our understanding of regional economies in historical perspective stands to gain much from detaching itself from administrative divisions, which can often obscure rather than reveal diverging patterns of regional economic development.

The present paper tries to offer a complementary approach to the provincial-level historical estimates, offering a 'bottom-up' reconstruction of regional economies. Freight traffic data is used to identify 152 observations corresponding to all the train stations existing in 1910, when the Uruguayan railway already extended to almost all parts of the country, including all but three provincial capitals (Treinta y Tres, Trinidad and Rocha). Spatial analysis techniques are then used to construct economic areas beyond the administrative (and largely inconsequential from an economic standpoint) provincial divisions. The results uphold many of the conclusions of previous work, such as the greater spatial clustering of agriculture vis-à-vis livestock raising and the concentration of high-value activities in the western riverside and the metropolitan area surrounding Montevideo, while also providing the basis for a new economic regionalization for Uruguay on the eve of the First World War.

## 3. RECONSTRUCTING FREIGHT CARGO PER STATION

### 3.1. THE PRIMARY SOURCES AND THEIR LIMITATIONS

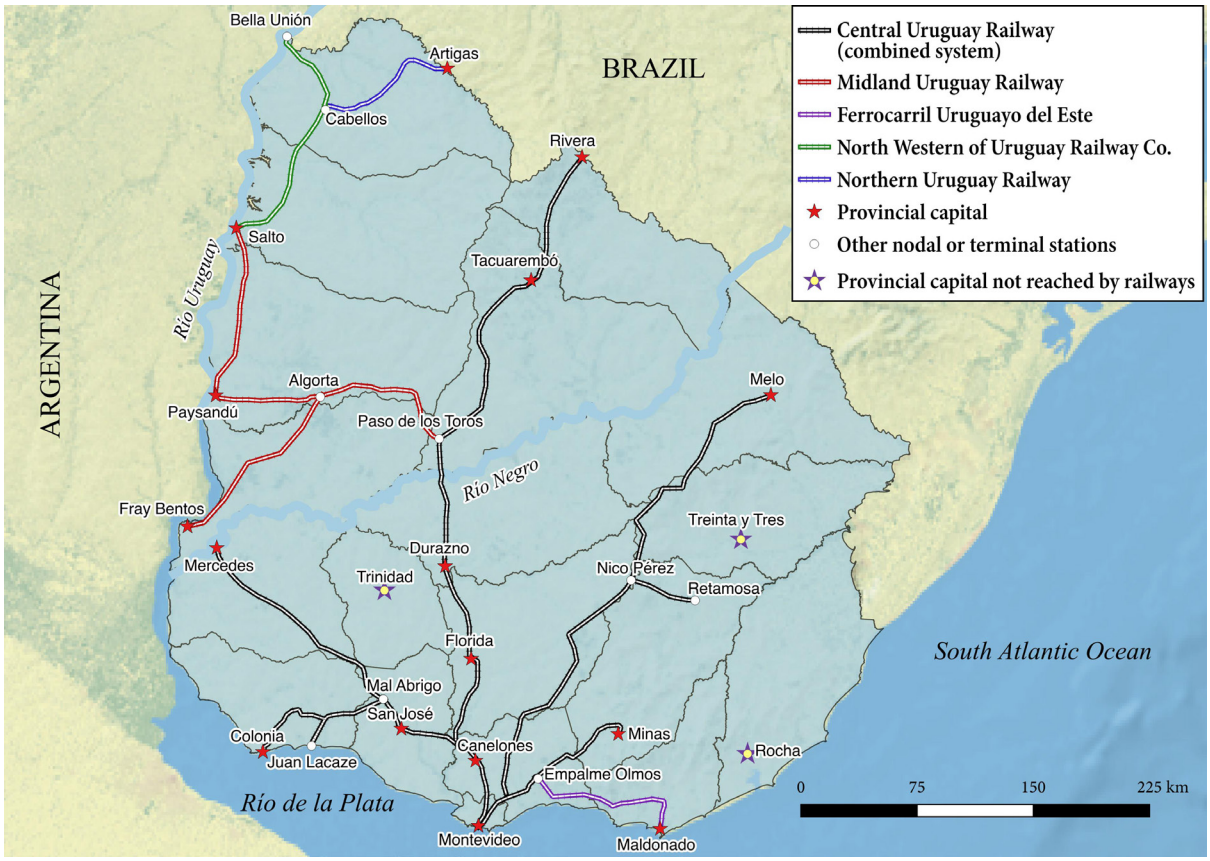
The main sources for reconstructing station-level data are the Uruguayan Statistical Yearbooks (*Anuarios Estadísticos*), complemented with the accounts and general manager's reports of the Central Uruguay Railway Company (CUR) and the Midland Uruguay Railway Company (henceforth Midland). The Statistical Yearbook for 1909-1910 provides official station-level cargo data by product or product groups for the 124 train stations managed by either CUR's combined system (102 stations, including the central line and the northern, eastern, and western extensions) or by other three smaller companies (22 stations in total between the Northeastern, Northern, and Eastern companies) in 1910-11 (*Anuario Estadístico 1909-1910*, Tomo I p. XXX ff.). For the lines operated by Midland (the second largest railway company) the Statistical Yearbooks for the years 1909-10, 1910-11, and 1911-12 can be used to gather information on the 28 stations the company owned on the western riverside (*Anuario Estadístico 1911-1912*, Montevideo, Libro XXIII, p. 692). In the case of Midland's stations data is aggregated by branch, and therefore it was necessary to disaggregate them to the spatial level of stations, relying on the company's reports to make informed estimates (Midland Uruguay Railway Company, *Report of the Directors to the Proprietors*, June 30th, 1911, p. 5 ff.). The estimation procedures are detailed in Appendix B, and the list of stations is presented in Appendix A. The data refers to volumes of cargo dispatched, measured in weight for all products except livestock, which are counted by unit of each species. When necessary for comparison with the rest of the cargo dispatched, livestock figures were converted to tons using average weights prevailing at the time.[5]

Three major biases and limitations are imposed by the sources. One major bias is of course their exclusive focus on internal transportation, which means we cannot capture export-oriented production which did not need internal railway transportation to the port. Perhaps the most important economic activity the sources fail to capture is Montevideo's meat-exporting industry, which in this period slaughtered almost half a million cattle per year in 15 *saladeros* (establishments producing beef jerky) (*Anuario Estadístico 1909-1910*, p. 296).

The second significant limitation is that the sources only reflect rail transport, which despite being by far the most important of the modes of internal transportation in Uruguay during the First Globalization was not the only one. In particular, fluvial transportation on the Uruguay River made flows of coastal trade possible, even if by 1910 water transport between Montevideo and the riverine ports had been to a very large extent substituted by railway cargo transportation (Martínez Montero, 1955: 401-403).[6] Further research on these dynamics will allow a more complete and accurate picture of the impact of Uruguay's transport infrastructure (as a local chapter of the global transportation revolution underway) in the country's era of export-led growth.

The third significant limitation imposed by the sources is that they record the cargo dispatched in each station but not the cargo received, which means we can use it as a proxy for the productive specialization of each station, but cannot identify flows of internal trade. In order to construct a picture of the regional dynamics we will make historically informed assumptions about those flows: for instance, we will assume that the wool and sheep dispatched in Durazno tend to travel south towards Montevideo rather than north towards Tacuarembó. Map 1 shows the extension of the Uruguayan railway network by 1910.[7]

**Map 1**
The Uruguayan Railway System, 1910




**Source:** own elaboration, on the basis of 'The Central Uruguay Railway of Monte Video and its Connections, 1911' Waterlow and Sons Limited, London. Cambridge University Library. Map Room. Maps.697.91.6, and Anuario Estadístico 1909-1910, Montevideo: DGE, 1912.

## 3.2. GEOREFERENCING AND CLASSIFICATION

After constructing the freight cargo database, the stations had to be located geographically in order to use geospatial analysis tools. A contemporary map drawn in 1911 by Waterlow and Sons for CUR of all the Uruguayan railway lines and stations was georeferenced to a present-day satellite map of Uruguay using the Quantum GIS software, and stations were located and assigned latitude and longitude values.[8]

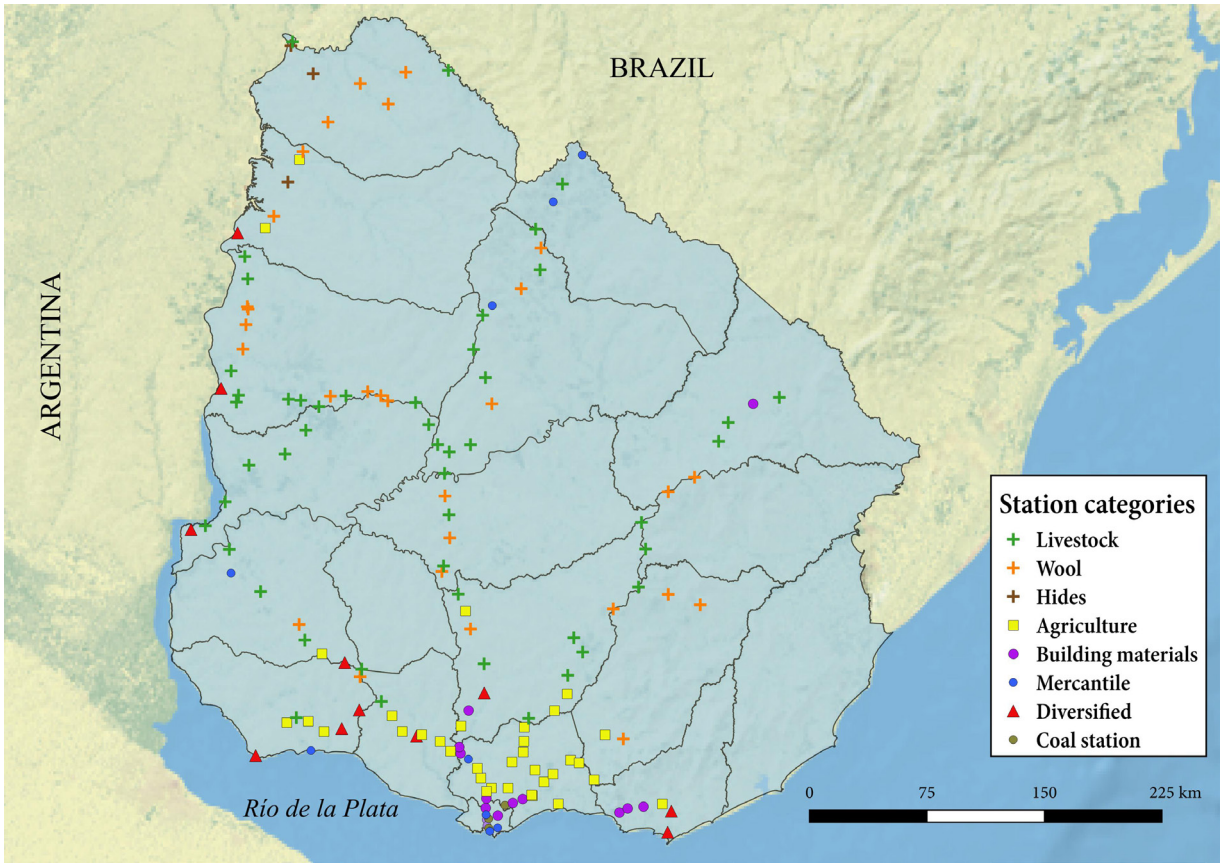
In order to provide a first back-of-the-envelope measure of the specialization pattern revealed by the freight traffic, I defined a simple set of mutually exclusive criteria resulting in a broad-brush classification of train stations (Table 1).

**Table 1**
Broad-brush classification of stations

| Station type | Threshold criteria |
|---|---|
| Livestock | Live animals (cattle, sheep, horses, and pigs) amount to more than 50% of total cargo. |
| Wool | Wool amounts to more than 50% of total cargo. |
| Hides and firewood | Cow hides and firewood amount to more than 50% of total cargo. |
| Agricultural | Wheat, corn, linseed, bran, and hay amount to more than 50% of total cargo. |
| Mercantile | "General merchandise" amounts to more than 50% of total cargo. |
| Building materials | Bricks, stone, building sand, wood, cement, and lime amount to more than 50% of total cargo. |
| Coal | More than 50% of total cargo is under the category of company traffic. |
| Passengers | Does not dispatch any livestock, wool, cereals, or building materials. |
| Diversified | Dispatches over 25% of its cargo in two different categories and does not fulfil any of the above criteria. |

**Source:** own elaboration.

**Map 2**
Train stations in Uruguay according to their specialisation pattern, 1910




**Source:** Table 1 and Map 1. NB: a larger version of this map is included in Appendix A.

The location of train stations specialized in different commodities reveals some interesting patterns in terms of spatial clustering. Stations specializing in pastoral commodities (livestock and wool) tend to be more evenly distributed across the territory, and generally increase in number as we move north and away from Montevideo. On the other hand, stations specializing in non-pastoral activities catering to the domestic market (agriculture and building materials) tend to be more clustered and generally located near the capital. Stations devoted almost exclusively to coal provisioning or passenger traffic (only five of them and all of them in or near Montevideo) unsurprisingly show the greatest degree of clustering. Stations categorized as "Diversified" or "Mercantile" are also amongst the least clustered, which can be explained as a result of the dynamics of the domestic market influenced by Montevideo's agglomeration shadow, which we will explore in the next section. Stations specializing in cow hides show a high degree of clustering whilst also being located far away from the capital, near the northern border. We will also discuss this further in the following Section.

Table 2 offers three very simple descriptive statistics to summarize the general trends shown in Map 2. Even if less sophisticated than the geostatistical analysis that follows, these simple indicators provide a first intuitive approximation to the spatial distribution of train stations and echo some of the previous findings in the literature. The nearest neighbour ratio (1) usefully compares the summation of the observed mean distance between each station and its nearest neighbour of the same kind () (2) with the expected mean distance which would result from a random distribution of stations of that kind in the territory () (3). When the ratio is closest to zero it suggests greater clustering, whereas if it is closest to 1 it suggests the observed distribution was closer to a random distribution. The expected mean distance arising from a random distribution is calculated in relation to the minimum enclosing area around all features (), which was set as the total land area of the Uruguayan territory. The table also provides mean distances to the Central Station in Montevideo measured in rail kilometres (i.e. not as the crow flies) and mean latitude figures. Uruguay is located between the latitudes 30ºS and 35ºS, which means that lower latitude scores correspond to more northern locations, and higher latitude scores to more southern locations.

(1) $$NNR = \frac{\acute{D}_O}{\acute{D}_E}$$

(2) $$\acute{D}_O = \frac{\sum_{i=1}^{n} d_i}{n}$$

(3) $$\acute{D}_E = \frac{0.5}{\sqrt{n/A}}$$

**Table 2**
Spatial clustering of train stations by specialization

| Station type | Nearest Neighbour Ratio | Mean latitude South (min=30, max=35) | Mean distance to Central Station (rail km.) |
|---|---|---|---|
| Livestock | 0.80 | 32.7 | 334.8 |
| Diversified | 0.77 | 33.8 | 251.0 |
| Wool | 0.70 | 32.4 | 407.7 |
| Mercantile | 0.70 | 33.4 | 229.0 |
| All stations | 0.66 | 33.3 | 269.5 |
| Building materials | 0.50 | 34.5 | 88.8 |
| Agriculture | 0.45 | 34.2 | 128.4 |
| Hides | 0.34 | 30.5 | 716.6 |
| Coal | 0.07 | 34.8 | 12.7 |
| Passengers | 0.02 | 34.8 | 6.0 |

**Source:** Map 2 and author's calculations.

These simple measures of spatial clustering support the findings by Araujo et al. (2015) who reconstructed agrarian output at the spatial level of provinces and found that livestock production (both of cattle and sheep) was much less geographically concentrated than agriculture between the 19 *departamentos*. This holds true as well for the 152 train stations taken as productive units. Furthermore, these results show that livestock and livestock by-products cargo travelled a greater distance on average than non-livestock cargo, a point already demonstrated by Díaz Steinberg (2014: 96-97) for CUR's main network as a whole. I have used similar evidence elsewhere to argue that most of the coal consumed by Uruguay's railroads was structurally part of the livestock commodity chain (Travieso, 2015: 43-44).

The next section makes full use of the freight cargo dataset, going beyond the broad-brush typology of stations discussed thus far and relying on geospatial interpolation techniques to produce maps of the predicted location of economic activities based on the location of each station and the volume of its cargo freights.

## 4. AN ECONOMIC REGIONALIZATION OF URUGUAY C. 1910

This section proposes an economic regionalization of Uruguay from the complementary perspectives of the more export-oriented livestock economy and the more inward-looking diversified economy. Every region in the country participated in and benefited from both, but as the geospatial analysis of the freight cargo database will show, most regions were more involved in one of those dimensions of the Uruguayan economy than in the other. Furthermore, there were very significant divergences within the livestock economy as well as within the inward-looking agriculture and manufacturing activities. The level of geographical and product disaggregation provided by the station-level data allows us to identify variations within the general themes. I will first discuss the livestock economy, which was the engine of growth for the Uruguayan economy under the First Globalization, and then the more diversified inward-looking economy, which increased its share of overall output throughout this period.

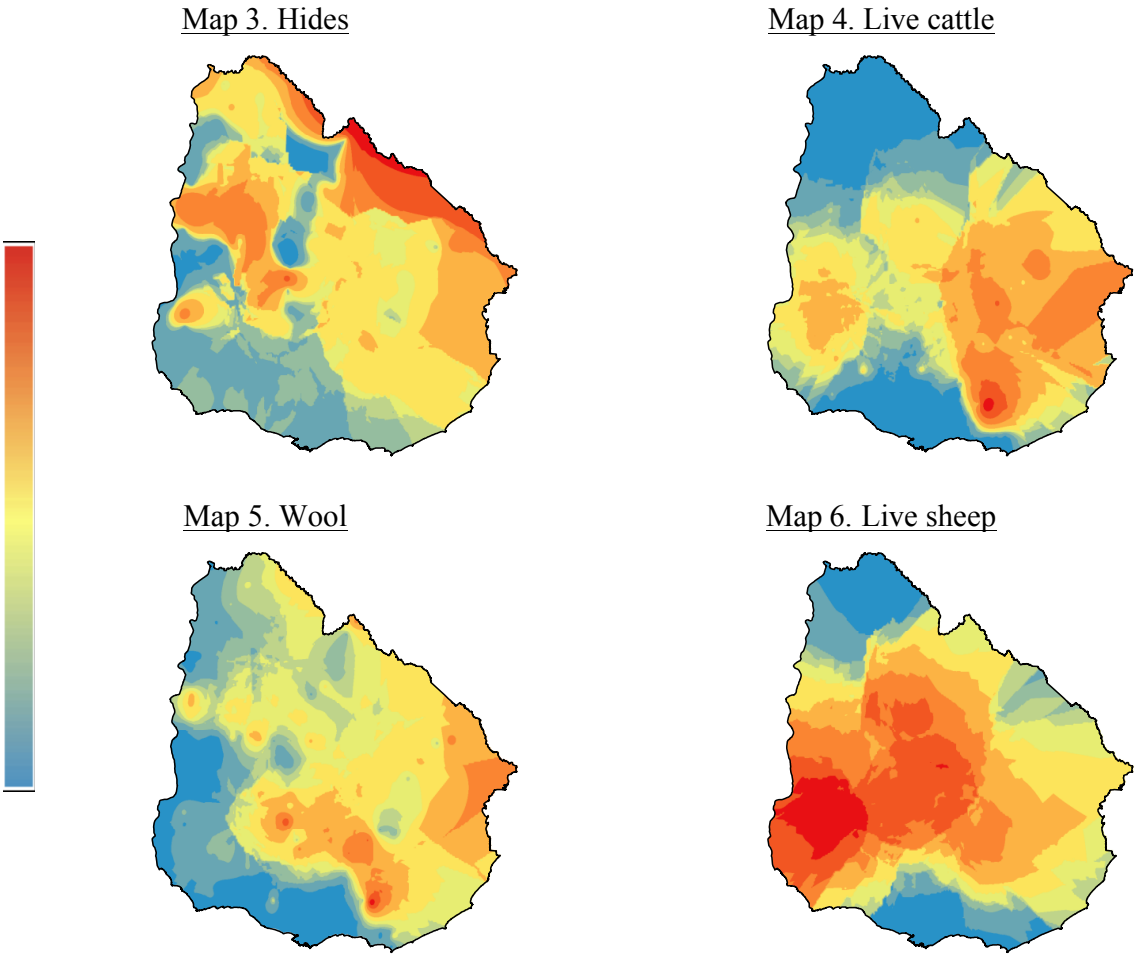
The maps presented in this section are the result of geospatial interpolation techniques allowing us to estimate the distribution of a variable over an area on the basis of the attributes observed in a limited number of points. Within the array of interpolation methods available Empirical Bayesian Kriging was chosen because it fits the quality and general distribution of the freight cargo dataset constructed.[9]

The method chosen requires some explanation. Firstly, kriging methods assume spatial autocorrelation, which is to say that points that are near each other tend to be more similar than points which are further away. This is true for most of the groups of products and train stations in our dataset, as shown intuitively by Map 2 and analytically by the semivariograms presented in Appendix C. Secondly, all distances are calculated using Euclidian (i.e. straight-line) distances and treating geographic coordinates as square coordinates, which is plausible for a relatively small study area such as the Uruguayan territory. Thirdly, and unlike the indicators presented in Table 2, the estimation procedure considers *absolute values* of cargo volume of each product group in each of the 152 stations weighed by their distance to the point being estimated, and not the *relative* participation of each product group in the cargo dispatched by each station. This means that if X is an equidistant point between Stations A and B, and Station A dispatches 20 tons of wool representing 10% of its total cargo dispatches whereas Station B dispatches 10 tons of wool representing 100% of its total cargo, when estimating the predicted specialization in wool production in X Station A will have a positive effect twice as large as Station B.

## 4.1. THE LIVESTOCK ECONOMY: SPATIAL VARIATIONS ON AN ECONOMIC THEME

Pastoral production was the most evenly distributed economic activity across the Uruguayan territory, but if the picture is examined more closely in the production of individual export staples the picture becomes much more nuanced. The economic history of livestock farming in Uruguay is many-layered, with cycles of export staples which moved historically from hides to wool and to beef, albeit in a slow fashion which never resulted in complete substitution (Barrán & Nahum, 1978: 182-186). This chronological variation in the economy-wide perspective was accompanied by territorial variation as well. Maps 3-6 show the very different spatial locations of hide production (the oldest and least sophisticated export staple of the country), wool production (which after the 1860s overtook hide exports), and cattle and sheep raising, as predicted from the cargo structure of train stations.

**Maps 3-6**
The livestock economy: predicted spatial distribution of pastoral production




**Source:** own elaboration.

NB: All maps group values into ten classes defined by geometrical intervals, ranging from blue (the lowest predicted production) to red (the highest predicted production). The interpolation technique used is empirical Bayesian kriging calculated on the basis of the attributes of the 152 observations presented in Appendix A.

Given the already discussed bias of the source towards internal transportation, the results underestimate live cattle exports from the northern regions towards Brazil, salted meat exports from Paysandú to Argentina via river shipping, as well as export-oriented wool and meat processing in Montevideo. Those limitations aside, these maps reveal different patterns of relative development in Uruguay's hinterlands, as well as degrees of variation within the generalized predominance of livestock farming as the leading industry. Four large regions can be identified from the kind of livestock raised and the main staples produced across the country:

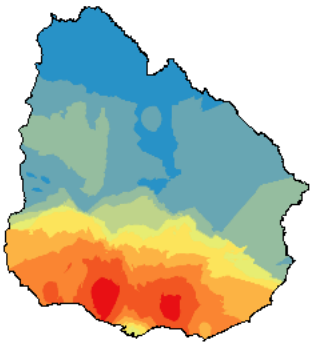
a) The northern cattle economy. In 1910 northern and north-eastern areas of the country still remained tied to the oldest Uruguayan export staples – cow hides and beef jerky – which were losing relative positions in favour of more sophisticated exports (wool, preserved meat, and eventually chilled and frozen beef). To this we can add the live cattle contraband exports destined for the *saladeros* of southern Brazil, which our sources fail to capture.[10] The focal points of this large regional economy were Salto and Rivera, important border trade hubs, San Eugenio (Artigas), a beef jerky production centre, and, in the north-east, Melo, a province capital near the Brazilian border surrounded by stations specialized in dispatching live cattle. It seems that the northern frontier was indeed 'an economic region' of its own, as Barrán and Nahum (1971: 126) termed it. Its specialization pattern likely had long-term consequences, as this region has been identified in the late twentieth and early twenty-first century as the least developed in the Uruguayan context (Rodríguez Miranda, 2010). Of course sub-regional economies were not homogenous within this broad area, and in particular we can identify a small belt of fruit agriculture centred around the stations of Arapey and San Antonio in the Salto province, as well as significant movement of manufactured goods from Salto city itself and from Rivera.
b) The riverside livestock economy. Organized around Fray Bentos which served as a trade hub and meat-packing centre, this hinterland benefited from the joint breeding of cattle and sheep.[11] It is the only region which ranks amongst the leaders in the categories of live cattle production, live sheep production, and processed meat production. The Fray Bentos harbour on the Uruguay River, which at the time could receive large transatlantic steamships, and Liebig's Extract of Meat Company, one of the largest beef extract and canned beef plants in the world, were key players not only in the Uruguayan export economy but also in terms of strategic imports, such as coal (Travieso, 2017). The city of Mercedes on the Río Negro was a secondary centre for this regional economy, particularly for wool production, providing direct rail links to Montevideo and river shipping services connecting even to Buenos Aires.
c) The eastern extensive livestock economy. Characterized by extensive sheep and cattle production bound for Montevideo's port, internal consumption, and meat factories, the eastern region of the country serves as a good example of the usefulness of looking beyond administrative boundaries. The single most important internal trade hub was Minas, one of the largest stations in the country in terms of traffic (just behind Montevideo's Central Station and Rivera), but the largest core areas of livestock production were not confined to any one province. In particular, the area serviced by the stations Nico Pérez, Valentines, and Cerro Chato (amongst the largest live cattle dispatch centres in the country) covers parts of five different provinces (Lavalleja, Florida, Durazno, Treinta y Tres, and Cerro Largo).
d) The centre-south sheep economy. With Durazno (a major wool dispatching centre, second only to Minas) and Paso de los Toros (an interchange station connecting CUR's network with Midland's) as its main hubs, the geographical centre of the country was the prime region for sheep raising, and the only one to rank highly in terms of both wool production and live sheep production. There is an element of path dependency in the trajectory of this region, as it was the first where sheep were introduced with great success in the 1860s (Barrán & Nahum, 1967: 142).

## 4.2. THE DIVERSIFIED ECONOMY: AGRICULTURE, MANUFACTURING, AND TRADE

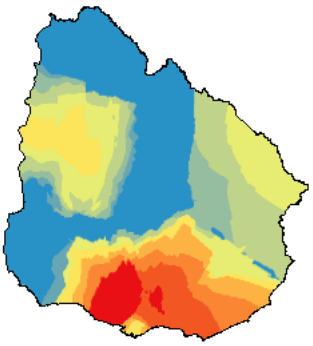
The spatial location of economic activities directed mostly towards the internal market shows a less uniform distribution throughout the territory, concentrating in the southern seaboard in general and in a semicircle around the capital in particular. Maps 7-12 show the predicted distribution of crop farming, production of building materials (sand, bricks, cement, lime), and trade in finished goods (*mercancías*) across the country.

**Maps 7-12.**
The diversified economy

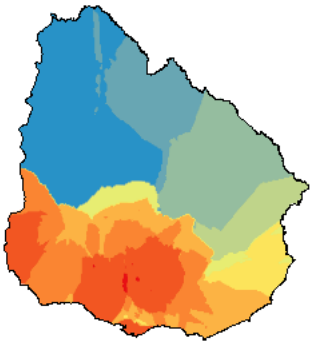
Map 7. Wheat



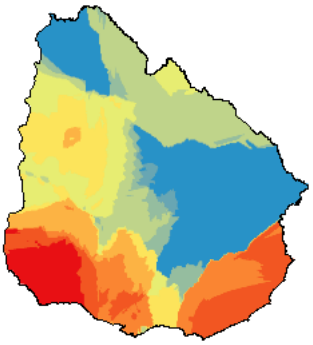
Map 8. Corn



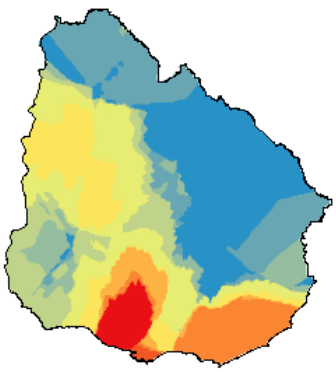
Map 9. Flour



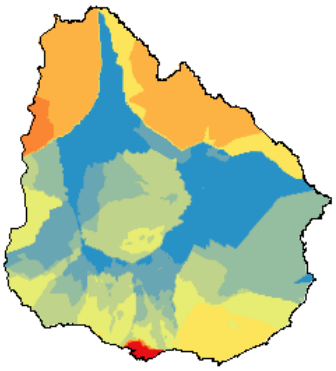
Map 10. Linseed



Map 11. Building materials



Map 12. Finished goods



**Source:** own elaboration.

NB: All maps group values into ten classes defined by geometrical intervals, ranging from blue (the lowest predicted production) to red (the highest predicted production). The interpolation technique used is empirical Bayesian kriging calculated on the basis of the attributes of the 152 observations presented in Appendix A.

These patterns of spatial distribution can be explained by the joint effect of von Thünen dynamics and by what economic geographers call 'agglomeration shadow' operating under the characteristic Uruguayan pattern of population concentration in Montevideo, which was the only city to exceed 100,000 inhabitants in the twentieth century (INE, *Series Históricas, Censos 1852-2011*). The von Thünen model of land use suggests that, assuming a closed economy with an isolated city, the spatial location of agricultural production is determined by the distance to the city.[12] The interaction of the yields of different crops and their transportation costs will determine a pattern of land use in concentric circles, from horticulture and dairying, to cereals, and finally cattle grazing. Taking Montevideo (which at the time was home to about a third of Uruguayan population) as the central city in von Thunen's model helps account for the spatial distribution of agriculture around 1910. These results offer further backing to Griffin's (1973) geographical analysis which found that von Thunen's model provided a useful framework for understanding the intensities of land use in Uruguay in the late 1960s.[13]

The concept of agglomeration shadow is a more recent theoretical contribution from New Economic Geography. According to Fujita et al. (1999: 147) the interplay of scale economies and transport costs causes a core-periphery dynamic between a major city and its neighbouring region, which may prevent new cities from emerging or existing ones from growing beyond a low threshold: they are under the core city's agglomeration shadow. Again, Montevideo would fit this role, and it further explains why the predicted production and trade of manufactured goods exhibits no other core south of the Río Negro (Map 12). These two theoretical insights can help us explain the Uruguayan 'cereal belt', Montevideo's dominance in terms of trade in manufactured goods, the concentrated pattern of production of building materials in the south and south-east, and an area of diversified agricultural in the south-west corner of the country.

a) The southern cereal belt. Covering most of the provinces of Canelones and San José, and also some of Florida and less of Colonia, Lavalleja, and Maldonado, an agricultural belt surrounds Montevideo in a semicircle skewed towards the west. It had Santa Lucía, Santa Rosa, San José de Mayo, and Fray Marcos as its major hubs. The cereal belt is particularly visible in the case of wheat, a product almost entirely destined for the domestic market. The differences in the predicted production zones for wheat and flour underlines the core-periphery dynamics between Montevideo and its cereal belt: almost none of the wheat was produced in the Montevideo province, but the major flour dispatcher was the capital's Central Station. Given the comparatively high labour absorption rate of agriculture as compared with livestock raising, it is unsurprising to find that about 15% of Uruguay's total population lived on this southern cereal belt by 1908.[14]
b) The capital's manufacturing and import economy. Montevideo's agglomeration shadow is revealed by the pattern of the internal trade in finished goods. South of the Río Negro no other region shows a significant revealed advantage in dispatching manufactured goods, and in the north of the country only the two border cities of Salto (on the River Uruguay bordering Argentina) and Rivera (the most populous area on the frontier belt with Brazil) seem to have their own small hinterlands for their trade in finished goods. The bias of our sources prevents us from disaggregating this cargo into imports and domestic production, but we can presume that Montevideo's dominance was exercised through both. Services related to both foreign and internal trade were also concentrated in the capital, which helps to account for the fact that 30% of total population lived there by 1908, a figure that would only increase throughout the twentieth century reaching 43% by 1996.
c) The south-western agricultural economy. Covering most of the province of Colonia and the southern area of Soriano, a diversified agricultural economy aimed at both domestic and export demand emerged around the mouth of the River Uruguay as it meets the estuary of the Plate. Stations in this area were the leaders in linseed, the major Uruguayan export crop in 1910, and performed well across several groups of processed products: flour, bricks, cement, and wool. The comparatively high quality of the soils and its locational advantage allowed it to benefit from the pull forces of both the metropolitan Montevideo economy and the riverside livestock export economy, as well as having access to its own foreign trade outlet to nearby Buenos

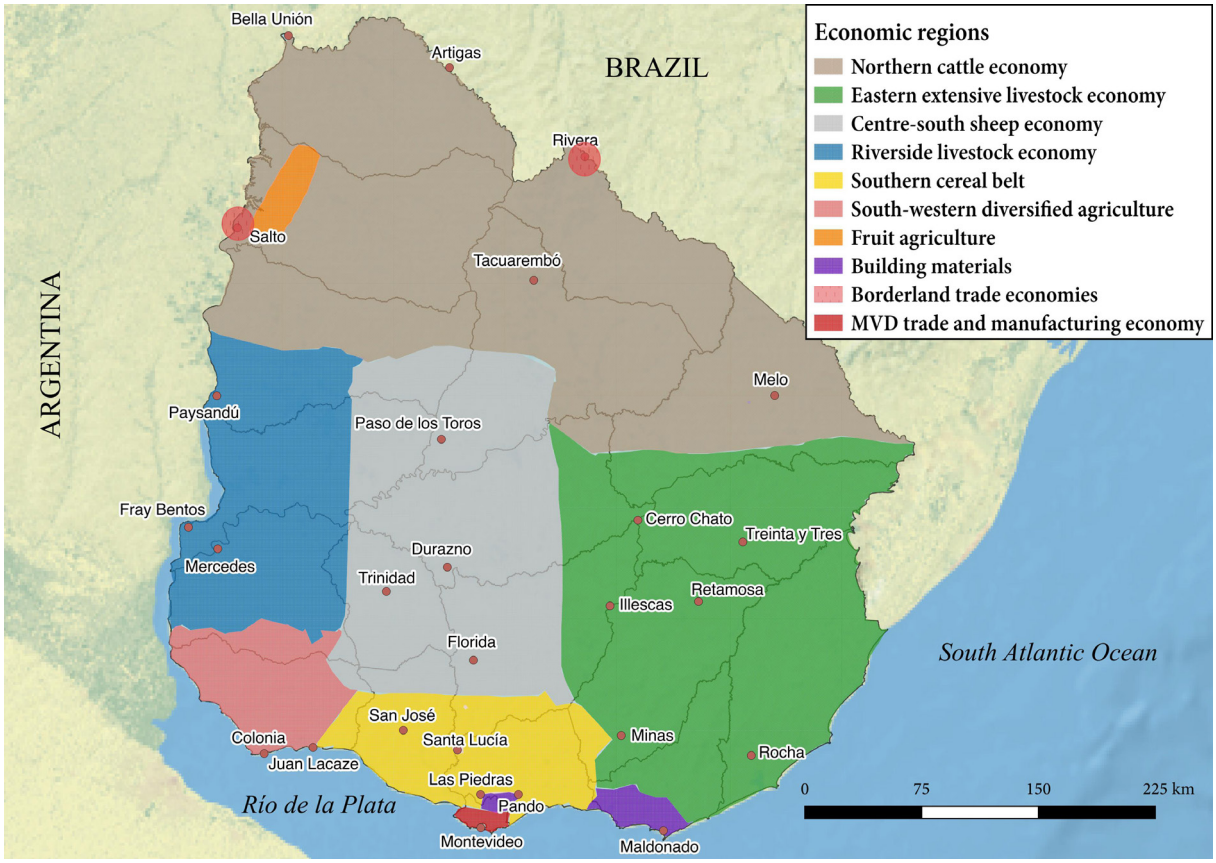
Aires in the form of the port of Colonia. The main station of this economic region was Juan Lacaze (Puerto del Sauce), which combined agricultural production with large dispatches of manufactured goods.

d) The metropolitan building materials production. A fast growing city such as Montevideo required building sand, bricks, and cement for its construction industry, and the cargo structure of the Uruguayan railroads reveals the existence of a metropolitan economy supplying that demand. If the cereal belt's semicircle was skewed towards the west, the building materials cluster extends towards the north and east of Montevideo with Pando and Las Piedras as two major providers nearer to the capital. Bañado Medina, in the north-eastern province of Cerro Largo, is the one exception to this pattern, but its production was almost entirely of building sand.

## 4.3. JOINING THE THREADS

Considering both the 'livestock economy' and the 'diversified economy' Map 13 offers one possible economic regionalization of Uruguay circa 1910, resulting from a visual inspection and ad hoc aggregation of the interpolation maps (Maps 3-12) and the discussion thereof. The approximate distribution of the Uruguayan territory between those economic areas is summarized on Table 3.

**Map 13**
An economic regionalization of Uruguay, c. 1910




**Source:** drawn by the author using QGIS 2.18 and ArcMap 10.22 on the basis of Maps 3-12.

NB: Provincial capitals and towns mentioned in the text are shown.

**Table 3**
Territory shares by economic region

| Economic region | Share of territory |
|---|---|
| North-eastern cattle economy | 35.6% |
| Eastern extensive livestock economy | 24.2% |
| Centre-south sheep economy | 17.6% |
| Riverside livestock economy | 10.5% |
| Southern cereal belt | 6.2% |
| South-western agricultural economy | 3.9% |
| Building materials | 0.9% |
| North-western fruit agriculture | 0.8% |
| Capital's manufacturing and import economy | 0.2% |
| Borderland trade economies | 0.1% |
| Total | 100.0% |

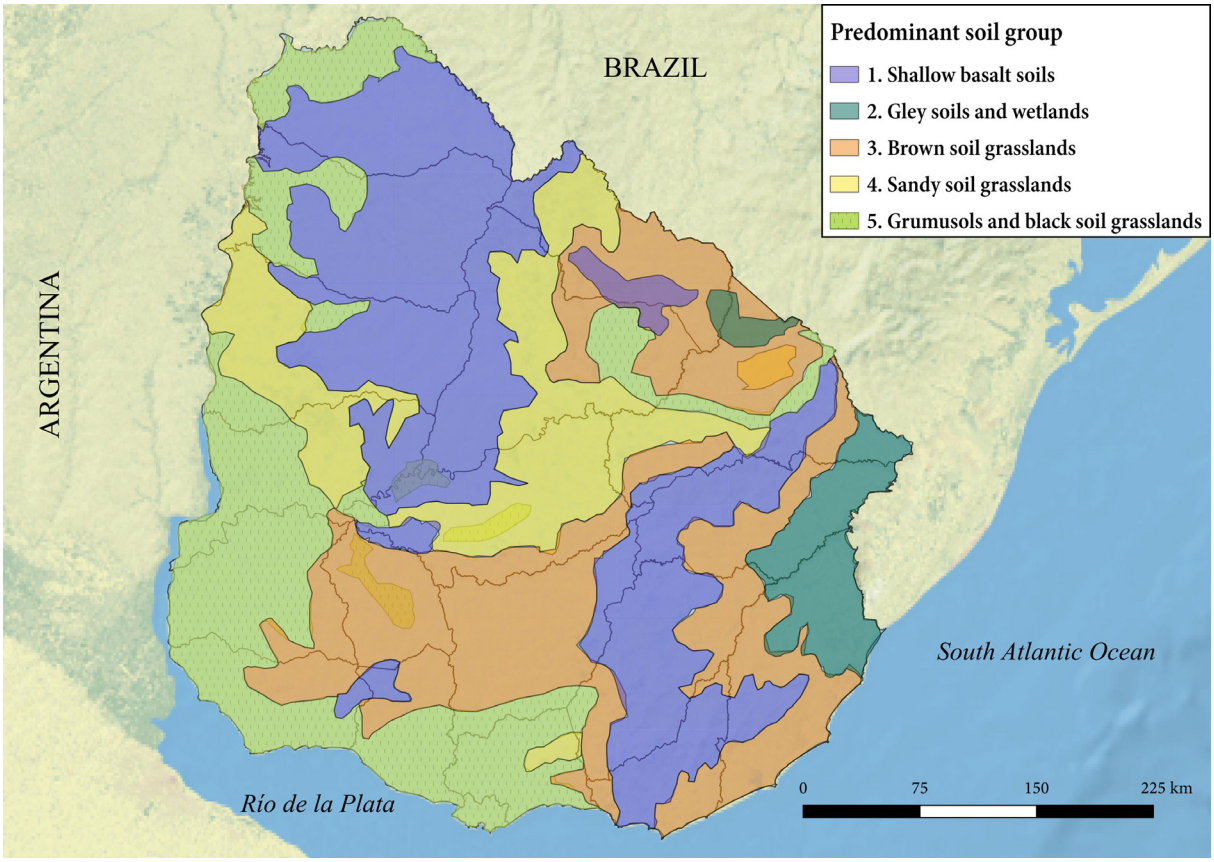
**Source:** Map 13.

This economic regionalization of Uruguay shows contrasting patterns from the geographic and demographic standpoints: four-fifths of the territory were predominantly under pastoral production, whilst more than half of the population lived in areas primarily devoted to trade, services, agriculture, and manufacturing.[15] This disparity is explained by the very low labour absorption rate characteristic of extensive livestock production and thus hardly comes as a surprise, but it does offer a measure of how dominant pastoral capitalism was from a territorial standpoint in Uruguay under the First Globalization. Furthermore, by dividing the country into economic regions we find that the comparatively extensive Uruguayan railway network had very relevant effects from a territorial standpoint, as it contributed to the creation of not one but several hinterlands. Despite their very modest economy-wide social savings, railroads made some regional dynamics possible, such as the western riverside livestock export economy and the development of trade and connected services in the border cities of Rivera and Salto. An internal transportation system without railways would have resulted in a different economic geography of production and consumption with, for example, a smaller Rivera and a larger Mercedes.[16]

## 4.4. LANDSCAPES, SOILS, AND SPECIALIZATION

This paper has so far described the spatial distribution of economic activities in Uruguay c. 1910 largely in terms of distances and core-periphery dynamics, two of the defining themes of New Economic Geography approaches (Krugman, 1998). However, geography's interplay with production goes beyond locational advantages and agglomeration effects. The different kinds of agrarian landscapes are also important to explain the economic regionalization suggested by railway cargo dispatches. Landscapes are the result of human intervention on the natural environment, and as such they can change over time faster than the eco-systems they are a part of (Tello, 1999). Extensive research by Moraes (2006, 2012, 2014) has provided a detailed discussion and a nuanced application of the concept of agrarian landscapes to the River Plate region, and to Uruguay in particular, in a long-term view. Without trying to offer a similarly deep analysis here, I would like to briefly consider one aspect of the different rural landscapes –soil quality and heterogeneity– that could help explain the spatial distribution of economic activities c. 1910 suggested by the inferences shown in Maps 3-12 and summarised in Map 13.

**Map 14**
Groups of Uruguayan soils according to Marchesi and Durán (1969)




**Source:** original map and classification from Marchesi and Durán (1969: 58), georeferenced and re-drawn by the author.

The classification of Uruguayan soils in five broad groups proposed by Marchesi and Durán (1969) and reproduced in Map 14 offers some interesting insights for our economic regions.[17] Firstly, the shallow basalt soils of Group 1, amongst the driest in the country and often not suitable for plough farming, are predominant in regions coinciding broadly with large areas of the northern and eastern extensive stock-raising economies. Secondly, at the other end of the soil classification, the leading agricultural regions all appear to be located in areas where Group 5 soils predominate. These are the deepest, most homogenous and fertile soils and occupy most of the regions defined here as the southern cereal belt, the south-western diversified agriculture zone, and the smaller area of fruit agriculture in the north-west, as well as the comparatively more diversified riverside livestock economy. Thirdly, the main area of brown soil grasslands (Group 3) coincides roughly with the sheep economy of the centre-south. Fourthly, in the sandy grasslands of Group 4 predominate soils of low fertility that are roughly located in areas of high predicted cattle hides production (in the north-centre and in the north-west, see Map 3) or sheep production (in the geographic centre of the country, see Map 6). Finally, the peculiarities of the gley soils and wetlands of Group 2 located in the easternmost part of the country (which would later become the main rice-producing region) are not captured by our railway cargo database as that area was not yet served by railways in 1910.

## 5. CONCLUSION

Economic historians argue (often when asked to justify their field) that the past, however 'outdated' it may seem, has useful economics not only because it provides us with a larger sample size of economic facts, but also –and more fundamentally– because it can help us trace how present developments came to be and inform the economic theory we rely on to understand them.[18] The long-term history of regional

inequalities in Uruguay is still to be written, and questions such as when the currently prevailing patterns emerged and became consolidated and in what ways they changed through time remain largely unanswered. This paper offered the results of an attempt to reconstruct some aspects of the economic geography of Uruguay during the period of export-led growth prior to the First World War moving the focus away from administrative boundaries and towards more disaggregated spatial data.

Regarding the debates on the impact of railways in the Uruguayan economy during the era of export-led growth before 1913, this paper points to a different avenue of research to that of the social savings scholarship. The problems identified by that literature – namely over-investment in the railway network and underuse due to the structural limitations of the Uruguayan geography – were real: indeed, when looking at the freight cargo structure by station there are many which dispatched low quantities of goods and animals. The point this paper makes is a complementary one: that railways were not region-neutral in their impact, and that from the perspective of the Uruguayan hinterlands the effect of railroads went beyond what can be measured through the nation-wide aggregate social savings rate, as some regional dynamics would likely not have emerged or developed without a railway connection.

If the evidence presented here is roughly accurate (or at least usefully inaccurate) then it will have served its purpose of helping stimulate discussion about Uruguayan regional development in historical perspective, and the part played by infrastructure therein. Hopefully it will also encourage further use of geostatistical analysis to escape the tyranny of administrative geography in our understanding of the spatial organization of the Uruguayan economy in historical perspective. In particular, further research could attempt to use existing price estimates to reconstruct the value of goods dispatched from each train station, thus capturing a significant part of regional output.[19] Moreover, since a benchmark necessarily offers a static image of the past, new estimates of productive specialization at a similar spatial level for more benchmark years would significantly improve the regionalization I have proposed, placing it in a richer historical and economic context.

## SOURCES

Dirección General de Estadística, Uruguay: *Anuario Estadístico de la República Oriental del Uruguay*, 1909-1910, 1910-1911, 1911-1912. Montevideo: DGE.

Instituto Nacional de Estadística, Series Históricas, Censos 1852-2011. http://www.ine.gub.uy/censos-1852-2011

'The Central Uruguay Railway of Monte Video and its Connections, 1911'. Map by Waterlow and Sons Limited, London. Cambridge University Library. Map Room. Maps.697.91.6.

The Midland Uruguay Railway Company. *Report of the directors to the shareholders with statement of accounts for the year ended 30th June 1911*. Montevideo.

## REFERENCES

ALONSO, William. (1964). *Location and land use: toward a general theory of land rent*. Cambridge, Mass: Harvard University Press.

ARAUJO, Micaela, CASTRO, Pablo, y WILLEBALD, Henry. (2015). Localización geográfica del valor agregado agropecuario en Uruguay en el largo plazo (1908-2000). Cuantificación y hechos estilizados. *Documentos de Trabajo del Instituto de Economía, DT 19/2015*.

BARRÁN, José Pedro, y NAHUM, Benjamín. (1967). *Historia rural del Uruguay moderno. Tomo I.* Montevideo: Ediciones de la Banda Oriental.

BARRÁN, José Pedro, y NAHUM, Benjamín. (1971). *Historia Rural del Uruguay Moderno. Tomo II: La crisis económica, 1886-1894*. Montevideo: Ediciones de la Banda Oriental.

BARRÁN, José Pedro, y NAHUM, Benjamín. (1978). *Agricultura, crédito y transporte bajo Batlle, 1905-1914*. Montevideo: Ediciones de la Banda Oriental.

BARRENECHEA, Pedro, y TRONCOSO, Carlos. (2008). *El índice de competitividad regional. ¿Qué cambios tuvo la competitividad por departamentos en una década?* Montevideo: UNDP.

BÉRTOLA, Luis. (1998). *El PBI de Uruguay 1870-1936 y otras estimaciones*. Montevideo: CSIC, Universidad de la República.

BÉRTOLA, Luis. (1999). La historia económica en Uruguay: desarrollo y perspectivas. *Revista de Historia Económica, 17*, 77-98. doi:doi:10.1017/S0212610900002275

BERTONI, Reto. (2011). *Energía y Desarrollo: la restricción energética en Uruguay como problema*. Montevideo: Universidad de la República.

CAGNONI, José. (2006). *El derecho constitucional uruguayo*. Montevideo: Grafinel.

CARDOSO, Ciro Flamarion, y PÉREZ BRIGNOLI, Héctor. (1979). *Historia económica de América Latina*. Barcelona: Crítica.

CHILES, Jean Paul, and DELFINER, Pierre. (2012). *Geostatistics: modeling spatial uncertainty*. New York: Wiley.

COSIO, Pedro. (1905). *Aduanas de Fronteras*. Montevideo: Ministerio de Hacienda.

DÍAZ STEINBERG, Gastón. (2014). *La inversión ferroviaria en el Uruguay antes de 1914: rentabilidad privada, subsidios e impacto económico.* (Unpublished MA Thesis), Universidad de la República, Montevideo.

FOGEL, Robert William. (1964). *Railroads and American Economic Growth: Essays in Econometric History*. Baltimore: John Hopkins University Press.

FUJITA, Masahisa, VENABLES, Anthony, and KRUGMAN, Paul R. (1999). *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA.: MIT.

GARCÍA, Mariana, MARTÍNEZ-GALARRAGA, Julio, y WILLEBALD, Henry. (2015). Crecimiento y estructura productiva regional en Uruguay en la primera mitad del siglo XX: primeras aproximaciones y algunas hipótesis. *XXIX Jornadas de Economía del Banco Central del Uruguay*.

GRIFFIN, Ernst. (1973). Testing the von Thunen theory in Uruguay. *Geographical Review*, 500-516.

HERRANZ-LONCÁN, Alfonso. (2011). The role of railways in export-led growth: The case of Uruguay, 1870–1913. *Economic History of Developing Regions, 26*(2), 1-32.

HERRANZ-LONCÁN, Alfonso. (2014). Transport technology and economic expansion: The growth contribution of railways in Latin America before 1914. *Revista de Historia Económica-Journal of Iberian and Latin American Economic History, 32*(1), 13-45.

ISAAKS, Edward H., and SRIVASTAVA, R. Mohan. (1989). *Applied Geostatistics*. Oxford: Oxford University Press.

KRUGMAN, Paul. (1998). What's New About the New Economic Geography? *Oxford review of economic policy, 14*(2), 7-17.

MARTÍNEZ MONTERO, Homero. (1955). *El río Uruguay: geografía, historia y geopolítica de sus aguas y sus islas*. Montevideo: Revista Histórica.

MARTÍNEZ-GALARRAGA, Julio, MIRANDA, Adrián Rodríguez, and WILLEBALD, Henry. (2015). Regional income inequality in Uruguay during a century (1908-2008). Did the productive public policy contribute to an equalizing process? *XXX Jornadas de Economía del Banco Central del Uruguay*.

MCCLOSKEY, Donald N. (1976). Does the Past Have Useful Economics? *Journal of Economic Literature, 14*(2), 434-461.

MCCLOSKEY, Donald N. (1987). *Econometric History*. Basingstoke: Macmillan Education.

MORAES, María Inés. (2006). La ocupación del espacio y la formación de paisajes agrarios en el Uruguay. *Ciência y Ambiente*(33), 57-79.

OFICINA DE PLANEAMIENTO Y PRESUPUESTO (OPP, Uruguay). (2005). *Departamentalización del Producto Bruto Interno de Uruguay. Período 1985 – 2003*. Montevideo: OPP - UDM.

PARUELO, José M, GUERSCHMAN, Juan P, PIÑEIRO, Gervasio, JOBBAGY, Esteban G, VERÓN, Santiago R, BALDI, Germán, y BAEZA, Santiago. (2006). Cambios en el uso de la tierra en Argentina y Uruguay: marcos conceptuales para su análisis. *agrociencia, 10*(2), 47-61.

PIVEL DEVOTO, Juan E., y RANIERI, Alcira. (1956). *Historia de la República Oriental del Uruguay (1830-1930)*. Montevideo: Editorial Medina.

PORCILE, Gabriel. (2004). Historia Económica y Teoría Económica: Encuentros y Desencuentros. *Análise Econômica, 22*(42).

RODRÍGUEZ MIRANDA, Adrián. (2006). Desarrollo económico territorial endógeno. Teoría y aplicación al caso uruguayo. *Documentos de Trabajo del Instituto de Economía*(2/06).

RODRÍGUEZ MIRANDA, Adrián. (2010). *Desarrollo económico en el noreste de Uruguay. Una explicación a partir de la articulación rural-urbana y la organización productiva.* (PhD), Universidad Autónoma de Madrid, Madrid.

SUMMERHILL, William R. (2005). Big social savings in a small laggard economy: railroad-led growth in Brazil. *The Journal*

*of Economic History, 65*(1), 72-102.

TELLO, Enric. (1999). La formación histórica de los paisajes agrarios mediterráneos: una aproximación coevolutiva. *Historia agraria: Revista de agricultura e historia rural*(19), 195-214.

THÜNEN, Johann Heinrich von, and HALL, Peter. (1966). *Von Thünen's Isolated state: an English edition*. Oxford: Pergamon Press.

TRAVIESO, Emiliano. (2015). *Cómo hacer una transición energética sin revolución industrial. Usos de la energía moderna en Uruguay, 1902-1954.* (Tesis de Maestría en Historia Económica), Universidad de la República, Montevideo.

TRAVIESO, Emiliano. (2017). *United by Grass, Separated by Coal. Energy prices and pastoral exports in New Zealand and Uruguay, 1870-1913*. Paper presented at the RIDGE Workshop on Economic History, Energy and Natural Resources, Montevideo.

VEIGA, Danilo. (2011). *Estructura social y ciudades en el Uruguay: tendencias recientes*. Montevideo: DS, FCS, UdelaR.

## APPENDIX A. URUGUAYAN TRAIN STATIONS, C. 1910

**Table A1**
Uruguayan train stations, c. 1910 (in alphabetical order)

| # | Station name | Rail distance to Central Station | Latitude | Longitude | Specialization | Province (Depto.) | Total cargo in tons |
|---|---|---|---|---|---|---|---|
| 1 | 25 de Agosto | 63 | -34.41157 | -56.4076 | Building materials | FL | 16029.6 |
| 2 | Abra Perdomo | 138 | -34.73979 | -54.98598 | Agriculture | MA | 91.408 |
| 3 | Achar | 339 | -32.40316 | -56.1798 | Wool | TA | 1992.682 |
| 4 | Algorta | 308 | -32.41965 | -57.39105 | Livestock | PA RN | 3792.333 |
| 5 | Arapey | 665 | -30.94585 | -57.52691 | Agriculture | SA | 761.3 |
| 6 | Arroyo Grande | 160 | -33.95991 | -57.09155 | Livestock | FS | 9916.587 |
| 7 | Bañado de Rocha | 468 | -31.60606 | -55.84193 | Livestock | TA | 1860.505 |
| 8 | Bañado Medina | 403 | -32.40302 | -54.35013 | Building materials | CL | 346.318 |
| 9 | Barker | 195 | -34.26245 | -57.46565 | Agriculture | CO | 173.689 |
| 10 | Bella Vista | 3 | -34.87876 | -56.20203 | Coal | MO | 43857.753 |
| 11 | Bellaco | 375 | -32.76545 | -57.88075 | Livestock | RN | 4491.353 |
| 12 | Bifurcacion (Juan Soler) | 106 | -34.321 | -56.80722 | Agriculture | SJ | 1416.68 |
| 13 | Bizcocho (Grito de Asencio) | 278 | -33.39934 | -58.00643 | Mercantile | SO | 499.257 |
| 14 | Cabellos | 702 | -30.71983 | -57.32728 | Wool | AR | 950.375 |
| 15 | Canelones | 42.617 | -34.53459 | -56.28119 | Agriculture | CA | 17450.085 |
| 16 | Capilla del Carmen | 360 | -32.35458 | -56.95724 | Wool | RN | 5144.5575 |
| 17 | Capurro | 69 | -34.43554 | -56.46919 | Agriculture | SJ | 2816.83 |
| 18 | Cardal | 79 | -34.2899 | -56.39641 | Agriculture | FL | 5817.557 |
| 19 | Cardoso | 301 | -32.64498 | -56.32928 | Livestock | TA | 4807.944 |
| 20 | Castellanos | 71 | -34.37847 | -55.95535 | Agriculture | CA | 3845.689 |
| 21 | Cazot | 63 | -34.4402 | -55.96 | Agriculture | CA | 6158.467 |
| 22 | Central | 0 | -34.89655 | -56.19411 | Mercantile | MO | 173731.88 |
| 23 | Cerro Chato | 280 | -33.10196 | -55.13205 | Livestock | DU TT FL | 13285.048 |
| 24 | Cerro Colorado | 153 | -33.86034 | -55.54413 | Livestock | FL | 10037.506 |
| 25 | Cerro de las Cuentas | 366 | -32.62503 | -54.59167 | Livestock | CL | 11622.414 |
| 26 | Chamberlain | 289 | -32.68693 | -56.47811 | Livestock | TA | 4509.392 |
| 27 | Chamizo | 89 | -34.2452 | -55.92193 | Livestock | FL | 5095.648 |
| 28 | Chapicuy | 557 | -31.66002 | -57.88927 | Livestock | PA | 3792.333 |
| 29 | Colon | 11 | -34.80234 | -56.22029 | Mercantile | MO | 849.533 |
| 30 | Colonia | 246 | -34.46071 | -57.8339 | Diversified | CO | 2044.125 |
| 31 | Colonia Suiza | 166 | -34.30428 | -57.23105 | Diversified | CO | 4000.737 |

| # | Station name | Rail distance to Central | Latitude | Longitude | Specialization | Province (Depto.) | Total cargo in tons |
|---|---|---|---|---|---|---|---|
| 32 | Cuareim | 768 | -30.23478 | -57.57574 | Livestock | AR | 6664.444 |
| 33 | Cuaro | 756 | -30.61195 | -56.90492 | Wool | AR | 1222.54 |
| 34 | Cufre | 149 | -34.1968 | -57.10836 | Diversified | CO | 1489.16 |
| 35 | Drabble (Rodo) | 220 | -33.69946 | -57.52921 | Wool | SO | 820.493 |
| 36 | Durazno | 205 | -33.39032 | -56.52978 | Wool | DU | 5287.158 |
| 37 | Esperanza | 467 | -32.35264 | -57.95391 | Livestock | PA | 3792.333 |
| 38 | Estanzuela | 225 | -34.64852 | -56.18254 | Agriculture | CA | 1809.91 |
| 39 | Florida | 109 | -34.0979 | -56.23321 | Diversified | FL | 3923.886 |
| 40 | Fraile Muerto | 382 | -32.51321 | -54.52454 | Livestock | CL | 9763.608 |
| 41 | Francia | 314 | -32.52658 | -56.62196 | Livestock | RN | 3792.333 |
| 42 | Fray Bentos | 448 | -33.14456 | -58.28653 | Diversified | RN | 6404.07 |
| 43 | Fray Marcos | 107 | -34.20041 | -55.74116 | Agriculture | FL | 9759.743 |
| 44 | Goni | 186 | -33.52238 | -56.41512 | Livestock | FL | 3578.553 |
| 45 | Gonzalez | 119 | -34.23029 | -56.8789 | Agriculture | SJ | 10671.287 |
| 46 | Guaviyu | 534 | -31.84044 | -57.88672 | Wool | PA | 5144.5575 |
| 47 | Guayabos | 391 | -32.35763 | -57.31035 | Wool | PA | 5144.5575 |
| 48 | Guaycuru | 145 | -34.00365 | -57.10206 | Wool | SJ | 175.976 |
| 49 | Guichon | 384 | -32.35557 | -57.20139 | Livestock | PA | 3792.333 |
| 50 | Haedo | 403 | -32.98095 | -58.047 | Livestock | RN | 4491.353 |
| 51 | Illescas | 204 | -33.6088 | -55.32955 | Wool | FL LA | 3977.88 |
| 52 | Independencia | 16 | -34.76326 | -56.223 | Building materials | CA | 15892.913 |
| 53 | Isla Mala | 91 | -34.20002 | -56.34255 | Building materials | FL | 21384.234 |
| 54 | Isla Sarandi | 731 | -30.48808 | -57.10131 | Wool | AR | 1034.69 |
| 55 | Itapebi | 622 | -31.28601 | -57.70643 | Wool | SA | 457.25 |
| 56 | Juan Jackson | 175 | -33.92114 | -57.20993 | Diversified | SO | 1174.122 |
| 57 | Juanico | 35 | -34.5907 | -56.2566 | Agriculture | CA | 1823.818 |
| 58 | La Cruz | 131 | -33.92884 | -56.23426 | Livestock | FL | 7411.092 |
| 59 | La Lata | 191 | -33.87073 | -57.36942 | Agriculture | SO | 2544.057 |
| 60 | Las Piedras | 20 | -34.70847 | -56.21838 | Building materials | CA | 5824.631 |
| 61 | Laureles | 498 | -31.36309 | -55.87323 | Livestock | TA | 3471.214 |
| 62 | Mal Abrigo | 132 | -34.14763 | -56.95345 | Livestock | SJ | 3003.847 |
| 63 | Maldonado | 158 | -34.9027 | -54.94875 | Diversified | MA | 740.125 |
| 64 | Manga | 16 | -34.80703 | -56.13799 | Building materials | MO | 992.294 |
| 65 | Mansavillagra | 182 | -33.77686 | -55.60592 | Livestock | FL | 6159.685 |
| 66 | Margat | 51 | -34.48145 | -56.34409 | Mercantile | CA | 900.991 |
| 67 | Melo | 421 | -32.36486 | -54.16655 | Livestock | CL | 6496.88 |
| 68 | Menafres | 326 | -32.55874 | -57.48252 | Livestock | RN | 4491.353 |
| 69 | Mercedes | 300 | -33.26044 | -58.01856 | Livestock | SO | 13035.859 |
| 70 | Merinos | 354 | -32.38483 | -56.90843 | Wool | PA | 5144.5575 |
| 71 | Migues | 78 | -34.48677 | -55.62872 | Agriculture | CA | 9001.216 |

| # | Station name | Rail distance to Central | Latitude | Longitude | Specialization | Province (Depto.) | Total cargo in tons |
|---|---|---|---|---|---|---|---|
| 72 | Minas | 125 | -34.36439 | -55.25907 | Wool | LA | 86785.618 |
| 73 | Molles | 245 | -33.05716 | -56.48002 | Livestock | DU | 9737.592 |
| 74 | Montes | 86 | -34.50315 | -55.56908 | Agriculture | CA | 7550.52 |
| 75 | Mosquitos | 73 | -34.54406 | -55.87768 | Agriculture | CA | 4238.135 |
| 76 | Nico Perez | 230 | -33.48073 | -55.15291 | Livestock | FL LA | 7968.412 |
| 77 | Olmos | 41 | -34.69307 | -55.89612 | Agriculture | CA | 2735.132 |
| 78 | Olmos Empalme (Ing. V. Sudriers) | 44 | -34.68786 | -55.90071 | Agriculture | CA | 2185.275 |
| 79 | Ortiz | 112 | -34.3408 | -55.38682 | Agriculture | LA | 5255.145 |
| 80 | Palmitas | 257 | -33.50729 | -57.79922 | Livestock | SO | 12768.273 |
| 81 | Palomas | 649 | -31.08074 | -57.60822 | Hides | SA | 1057.78 |
| 82 | Pampa | 359 | -32.24796 | -56.22465 | Livestock | TA | 5789.271 |
| 83 | Pan de Azucar | 113 | -34.76597 | -55.2287 | Building materials | MA | 3572.759 |
| 84 | Pando | 37 | -34.71177 | -55.9637 | Building materials | CA | 6771.511 |
| 85 | Parada Casupa | 121 | -34.10352 | -55.6523 | Agriculture | FL | 1882.682 |
| 86 | Parada Constancia | 493 | -32.2075 | -58.00577 | Livestock | PA | 3792.333 |
| 87 | Parada Daiman | 574 | -31.5272 | -57.90986 | Livestock | PA | 3792.333 |
| 88 | Parada Liebig | 434 | -33.12231 | -58.18599 | Livestock | RN | 12403.89 |
| 89 | Parada Menendez | 294 | -32.64429 | -56.55933 | Livestock | TA | 3792.333 |
| 90 | Parada Pandule | 416 | -32.38231 | -57.51829 | Livestock | PA | 3792.333 |
| 91 | Parada Pinera | 369 | -32.33038 | -57.04919 | Wool | PA | 5144.5575 |
| 92 | Parada Rivas | 534 | -31.82627 | -57.8922 | Wool | PA | 5144.5575 |
| 93 | Parish | 258 | -32.94712 | -56.50823 | Wool | DU | 319 |
| 94 | Paso de Ataques | 538 | -31.09325 | -55.68544 | Livestock | RV | 1508.846 |
| 95 | Paso de los Toros | 275 | -32.81364 | -56.51112 | Livestock | TA | 10861.224 |
| 96 | Paso del Cerro | 483 | -31.4762 | -55.83559 | Wool | TA | 694.848 |
| 97 | Paso Tranqueras | 523 | -31.2 | -55.75 | Mercantile | RV | 1327.127 |
| 98 | Paysandu | 479 | -32.31129 | -58.07577 | Diversified | PA | 6354.83 |
| 99 | Pedrera | 56 | -34.61203 | -55.81482 | Agriculture | CA | 4878.396 |
| 100 | Penarol | 10 | -34.8254 | -56.20211 | Coal | MO | 1489.387 |
| 101 | Piedra Sola | 386 | -32.08093 | -56.30761 | Livestock | PA TA | 12937.12 |
| 102 | Piedras Coloradas | 431 | -32.37572 | -57.60434 | Livestock | PA | 3792.333 |
| 103 | Porvenir | 457 | -32.39272 | -57.96881 | Livestock | PA | 3792.333 |
| 104 | Progreso | 26 | -34.66728 | -56.21707 | Agriculture | CA | 3402.11 |
| 105 | Puerto del Sauce | 201 | -34.43142 | -57.44652 | Mercantile | CO | 3280.739 |
| 106 | Puntas de Maciel | 172 | -33.62133 | -56.36441 | Agriculture | FL | 490.731 |
| 107 | Quebracho | 527 | -31.93265 | -57.90205 | Wool | PA | 5144.5575 |
| 108 | Queguay | 510 | -32.07852 | -57.92314 | Wool | PA | 5144.5575 |
| 109 | Raigon | 91 | -34.3399 | -56.67102 | Agriculture | SJ | 2948.797 |
| 110 | Reboledo | 133 | -33.99535 | -55.64814 | Livestock | FL | 4180.952 |

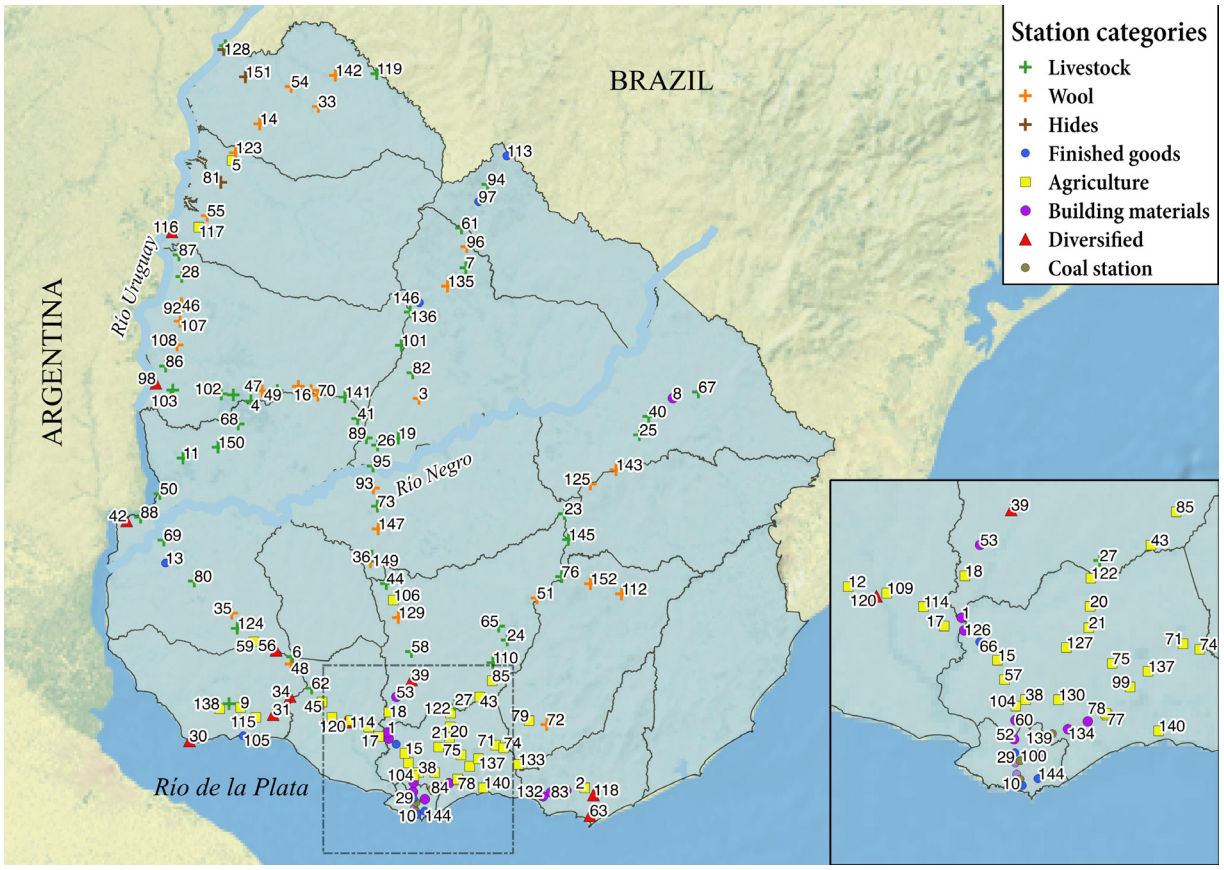
| # | Station name | Rail distance to Central | Latitude | Longitude | Specialization | Province (Depto.) | Total cargo in tons |
|---|---|---|---|---|---|---|---|
| 111 | Repecho | 124 | -34.75561 | -55.11777 | Building materials | MA | 4094.565 |
| 112 | Retamosa | 278 | -33.58483 | -54.72036 | Wool | LA | 1017.385 |
| 113 | Rivera | 567 | -30.91786 | -55.5469 | Mercantile | RV | 20972.989 |
| 114 | Rodriguez | 78 | -34.3792 | -56.54202 | Agriculture | SJ | 6895.74 |
| 115 | Rosario | 180 | -34.32159 | -57.35529 | Agriculture | CO | 3975.67 |
| 116 | Salto | 590 | -31.38549 | -57.96007 | Diversified | SA | 25000 |
| 117 | San Antonio | 611 | -31.35692 | -57.76669 | Agriculture | SA | 1272.959 |
| 118 | San Carlos | 145 | -34.78129 | -54.92305 | Diversified | MA | 4646.376 |
| 119 | San Eugenio | 816 | -30.40845 | -56.48435 | Livestock | AR | 11429.935 |
| 120 | San Jose | 96 | -34.3486 | -56.70751 | Diversified | SJ | 24860.977 |
| 121 | San Luis | 204 | -34.24093 | -57.54887 | Livestock | CO | 5281.479 |
| 122 | San Ramon | 82 | -34.29659 | -55.95256 | Agriculture | CA | 13669.312 |
| 123 | Santa Ana | 674 | -30.89803 | -57.5025 | Wool | SA | 358.985 |
| 124 | Santa Catalina | 207 | -33.79024 | -57.48959 | Livestock | SO | 11883.647 |
| 125 | Santa Clara (Aparicio Saravia) | 315 | -32.92247 | -54.94466 | Wool | TT | 946.593 |
| 126 | Santa Lucia | 59 | -34.44834 | -56.39889 | Building materials | CA | 182983.859 |
| 127 | Santa Rosa | 55 | -34.49798 | -56.03893 | Agriculture | CA | 14211.579 |
| 128 | Santa Rosa | 763 | -30.25915 | -57.58707 | Hides | AR | 1135.89 |
| 129 | Sarandi | 159 | -33.72564 | -56.32928 | Wool | FL | 4772.483 |
| 130 | Sauce | 37 | -34.64887 | -56.06681 | Agriculture | CA | 7337.595 |
| 131 | Sayago | 8 | -34.83169 | -56.21835 | Passenger | MO | 341.753 |
| 132 | Sierra | 94 | -34.78962 | -55.28657 | Building materials | MA | 34048.359 |
| 133 | Solis | 104 | -34.60117 | -55.46377 | Agriculture | LA | 7133.36 |
| 134 | Suarez | 30 | -34.73404 | -56.03317 | Building materials | CA | 2516.274 |
| 135 | Tacuarembo | 449 | -31.7192 | -55.97432 | Wool | TA | 2675.109 |
| 136 | Tambores | 412 | -31.87757 | -56.24403 | Livestock | PA TA | 3627.648 |
| 137 | Tapia | 64 | -34.56687 | -55.75158 | Agriculture | CA | 5940.575 |
| 138 | Tarariras | 212 | -34.26967 | -57.61557 | Agriculture | CO | 4843.331 |
| 139 | Toledo | 25 | -34.74706 | -56.08826 | Coal | CA | 339.608 |
| 140 | Toscas | 67 | -34.73892 | -55.71451 | Agriculture | CA | 6452.721 |
| 141 | Tres arboles | 334 | -32.39576 | -56.71434 | Livestock | PA RN | 3792.333 |
| 142 | Tres Cruces | 782 | -30.41907 | -56.78283 | Wool | AR | 1422.65 |
| 143 | Tupambae | 334 | -32.83618 | -54.76042 | Wool | CL | 663.017 |
| 144 | Union | 6 | -34.87718 | -56.13933 | Mercantile | MO | 746.379 |
| 145 | Valentines | 258 | -33.25815 | -55.1031 | Livestock | FL TT | 6800.325 |
| 146 | Valle Eden | 424 | -31.8197 | -56.17701 | Mercantile | TA | 273.687 |
| 147 | Villasboas | 229 | -33.1933 | -56.4747 | Wool | DU | 343.818 |
| 148 | Yatay | 4 | -34.86405 | -56.21388 | Passenger | MO | 0.83 |
| 149 | Yi | 209 | -33.3575 | -56.51824 | Livestock | DU | 11594 |

| | Station name | Rail distance to Central | Latitude | Longitude | Specialization | Province (Depto.) | Total cargo in tons |
|---|---|---|---|---|---|---|---|
| 150 | Young | 349 | -32.70009 | -57.62828 | Livestock | RN | 4491.353 |
| 151 | Zanja Honda | 738 | -30.42826 | -57.4311 | Hides | AR | 1134.015 |
| 152 | Zapican | 235 | -33.52337 | -54.94466 | Wool | LA | 163.418 |

**Source:** Dirección General de Estadística, Anuario Estadístico de la República Oriental del Uruguay, 1909-1910, 1910-1911, 1911-1912, Montevideo; Waterlow and Sons Limited, 'The Central Uruguay Railway of Monte Video and its Connections, 1911', London; and author's own calculations (see Appendix B).

NB: the cargo dataset by product group is too large to be conveniently displayed here, but is available in CSV format from the author upon request.

**Map A1**
Uruguayan train stations, 1910
(numbered in alphabetical order as per the list of stations in this Appendix)




**Source:** own elaboration on the basis of Table 1 and Map 1.

## APPENDIX B. ESTIMATION PROCEDURES

For the stations belonging to the Central Uruguay Railway's combined system or to the Northeastern, Northern, and Eastern railway companies the Statistical Yearbook offers station-level cargo data in kilograms disaggregated by product groups and in some cases by individual products (*Anuario Estadístico de la República Oriental del Uruguay 1909-1910, Tomo I con varios datos de 1911*, Montevideo, 1912, pp. XXX-XXXVIII). Livestock is the exception: cargo is measured in numbers per type of animal (cattle, sheep, pigs, horses, and riding horses). Average weights from contemporary sources and from Bertoni (2011) were used to arrive at the final figure for total cargo weight dispatched by each station. Weights used are as follows: 370kg for cattle, 48kg for sheep, 120kg for pigs, 350kg for horses and riding horses. The estimated weight of animals transported is only used to classify stations for the first broad-brush result (presented in Table 1 and Map 2); for the construction of interpolation maps and the economic regions the actual number of animals transported is used.

For the Midland Uruguay Railway Company the primary sources only provide us with aggregate data, which made it necessary to distribute the total between the stations of each section. In order to arrive at plausible estimates a three-step plan was followed:

a) The cargo data was divided between the main branch (Paso de los Toros – Paysandú – Salto) and the secondary branch (Algorta – Fray Bentos). This was done by comparing the figures from 1909-1910 (when the Algorta – Fray Bentos extension had not been built) to the figures from 1911-1912 (the first full year after that extension was opened), and imputing all new cargo to the new branch. Midland's 1911 report mentions that the increase in receipts for freight cargo, particularly livestock, was due to the Fray Bentos extension, which gives some support to this assumption (*The Midland Uruguay Railway Company, Limited. Report of the Directors to the Proprietors with Statement of Accounts, for the year ended 30th June 1911*, p. 5). This thus permits working separately with the cargo from the main branch and the new extension.

b) Main branch. The main stations in the other networks dispatching "merchandise" (i.e. manufactured goods) are near ports, such as Montevideo's Central Station or Salto, or border cities, such as Rivera. Since data was already available on cargo dispatched from Salto (as it was a CUR station), all cargo in the "merchandise" category of this branch was assigned to Paysandú, the only port on the main branch line. This is without doubt an exaggeration, but it seems fairly plausible that almost all of the manufactured goods on the Midland's main branch were dispatched from Paysandú. The rest of the cargo weight transported on the Midland's main branch was divided thus: 44% livestock, 29% wool, 12% building materials, 5% cereals, and 6% company traffic (coal and railway building materials). Since the stations are near each other the distribution of the cargo between them does not alter significantly the interpolation analysis, so each station is assigned the same share of cargo. A random specialization pattern would result in 60% of the stations being specialized in livestock and 40% in wool. The assumption can be made that the stations closer to Paysandú, where *saladeros* were in operation, specialized in livestock and that stations further away from Paysandú and toward the centre of the country (where most of CUR's stations specializing in wool are) specialized in wool. Of course this arbitrary imputing of specialization patterns offers much room for improvement, but the only results significantly affected by it are the broad-brush classification of stations and the nearest neighbour analysis.

c) Algorta – Fray Bentos extension. The increase in livestock traffic after the opening of the branch is assigned equally to each station between Algorta and Fray Bentos, except Algorta (which was already part of the main branch), Parada Liebig, and Fray Bentos. All the cargo classified as "frutos del país" is assigned to Parada Liebig, and all "merchandise" and building materials to Fray Bentos.

## APPENDIX C. SEMIVARIOGRAMS

Geostatistical analysis assumes spatial autocorrelation, that is, that points nearer to each other have more in common that points further away. This appendix explores to what extent that holds empirically for the distribution of cargo dispatches across the Uruguayan train stations and the groups of products analysed in Maps 3-12.

A semivariogram is a graph showing how the dissimilarity of each pair of observed points in the distribution (semivariance, shown in the y-axis) changes as the distance separating them (measured in the x-axis) increases. The line in the semivariogram is a model fitted to the averaged values of the pairs of observations in the distribution. The semivariogram of a variable showing strong spatial autocorrelation would show a rising curve (indicating that nearby points resemble each other more) that levels out as the distance between sample locations increases and flattens out at a point known as the *range*. If the model curve is entirely flat there is no spatial autocorrelation, and if it decreases rather than increases before attaining the range then there is negative spatial autocorrelation. All semivariograms shown here were specified as empirical transformations of K-Bessel type, with Euclidean distances calculated in standard circular neighbourhoods. The software used was ArcMap 10.3. For an introduction to the terminology used in spatial continuity analysis and the interpretation of variograms see Isaaks and Srivastava (1989: 143-149).

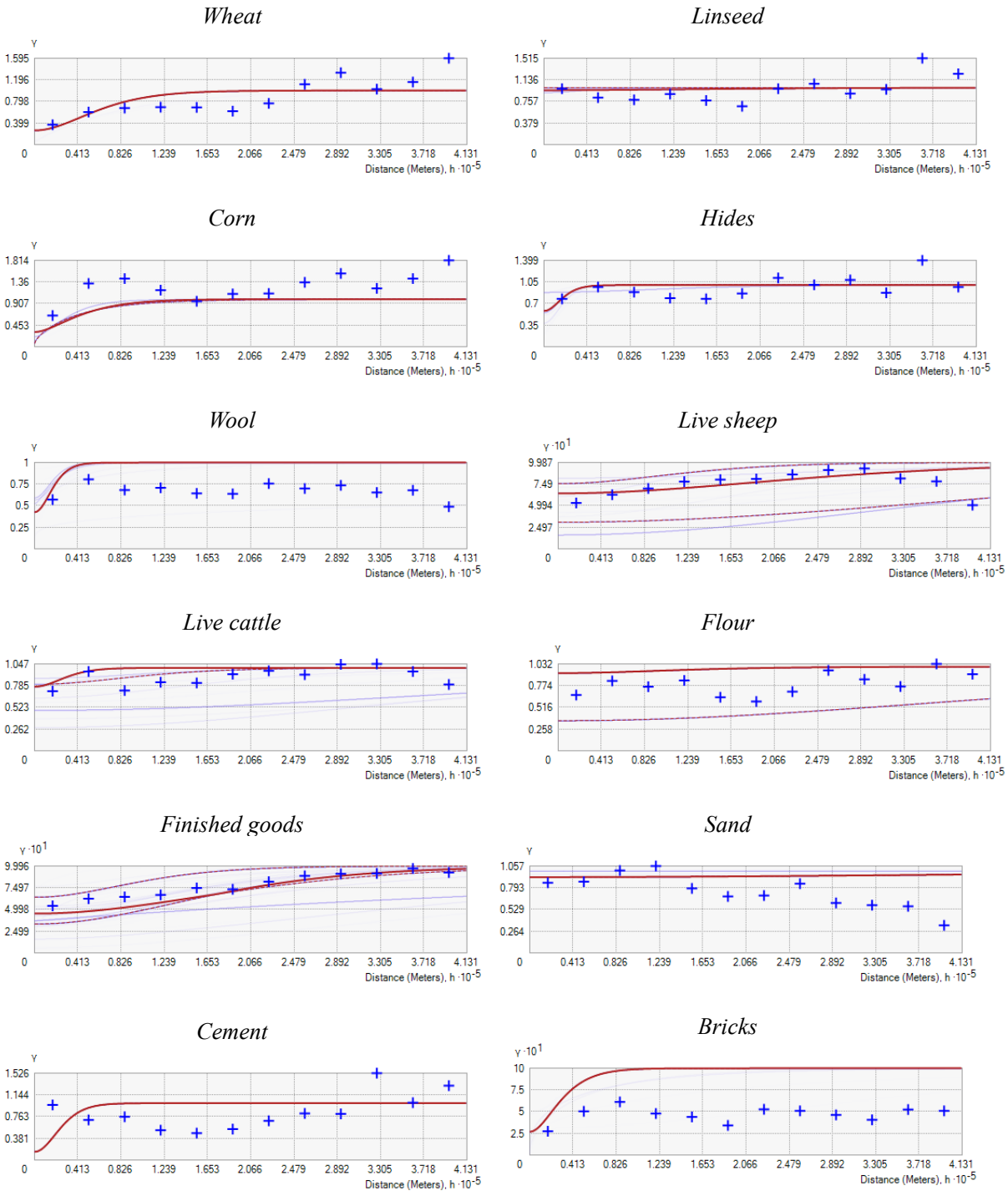
The semivariograms presented here consider sensitivity not only to separation distance but also to separation direction. The first series of semivariograms calculates the patterns of spatial continuity starting from the geographic centre of the country, whilst the second series calculates them from Montevideo outwards. Many other directions are of course possible and can be explored, but these two seem sufficient for the limited purposes of this appendix.

Spatial autocorrelation is generally strong for the main agricultural and pastoral products carried by railways (wheat, corn, wool and hides) in both estimates (from the geographic centre of the country and from Montevideo outwards). Linseed, a secondary crop important mainly as an export to Argentina, shows no distinguishable pattern of spatial autocorrelation, as its production was concentrated in the south-west and is the only agricultural commodity whose production does not show a clear north-south divide.

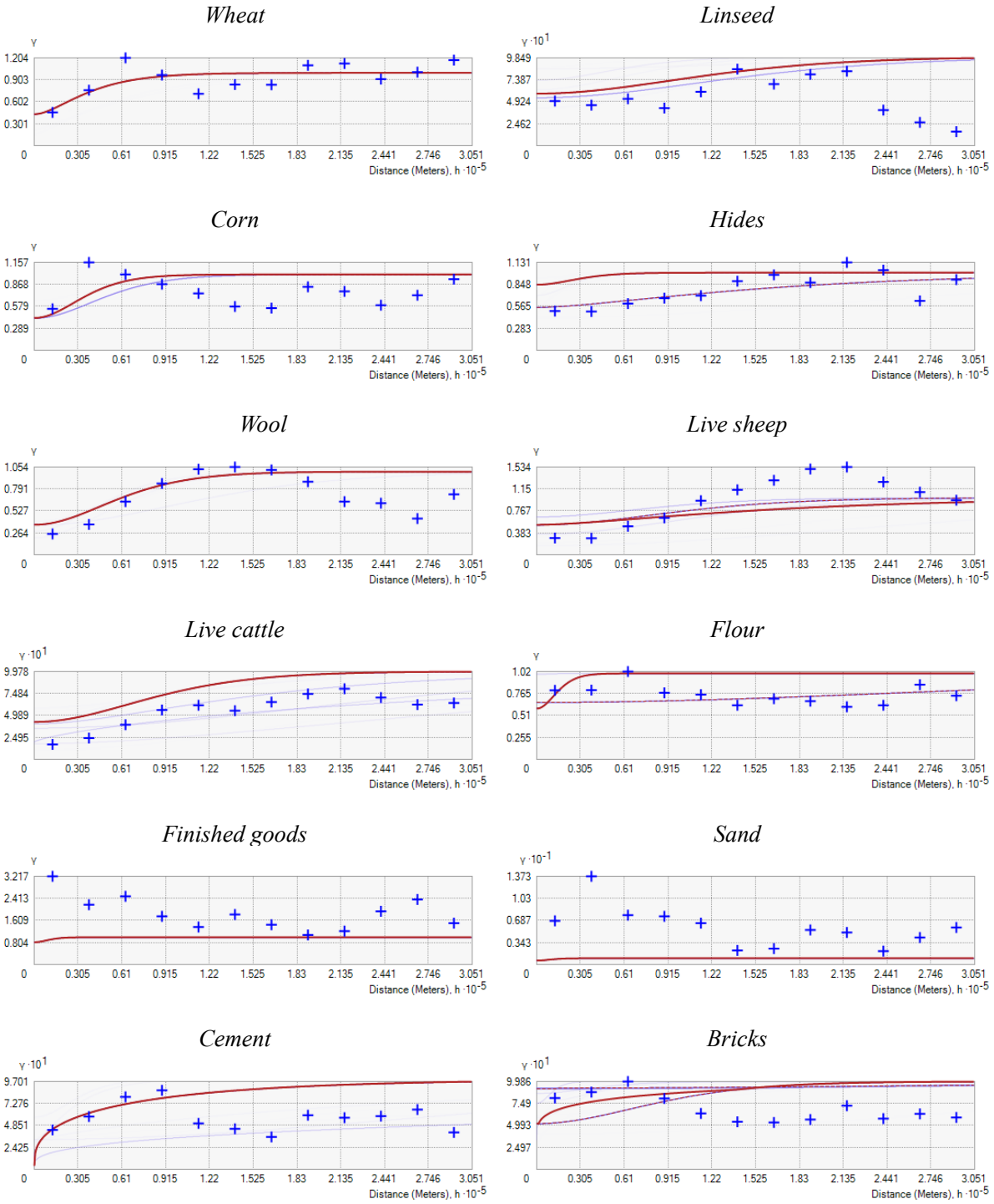
For live sheep and cattle (*en pie*) the spatial autocorrelation between stations dispatches appears if measured from Montevideo rather than from the centre of the country. This is consistent with the lack of stations in the far south and in the far north specialised in livestock cargo, which tended to be diffused in a wide central belt (see Maps 4 and 6). Within these geographically central area stations could be quite similar even if separated by many kilometres.

Regarding manufactures, the broad 'finished goods' category shows positive spatial autocorrelation when the semivariogram is calculated from the geographic centre of the country, owing to the gravity of Montevideo (Central Station), Rivera and Salto (the three most important dispatchers of merchandise), which are all similarly far away from the central coordinates. Dispatches of flour, diversified across the territory south of the Río Negro, do not conform to a clear semivariogram pattern. Within building materials, building sand shows no spatial autocorrelation, but cement and bricks do.

C1. Semivariograms calculated from the geographic centre of the country



C2. Semivariograms calculated from Montevideo outward



## NOTAS

1 Uruguay is divided in 19 *departamentos*, a term inspired by the French *départements* but unlike *départements*, *departamentos* constitute the first level of government below the national level rather than the second. Data from Instituto Nacional de Estadística, *Encuesta Continua de Hogares 2016*, Montevideo: INE.

2 These structural regional inequalities have been well documented and analysed by economists and sociologists, particularly over the last decade. Very good examples are Barrenechea and Troncoso (2008); Rodríguez Miranda (2006); Veiga (2011).

3 See, for example, Cardoso and Pérez Brignoli (1979: 69-72).

4 The last province to be created, Flores, is a good example: it was split from San José in 1885 by the then President Máximo Santos before leaving office in order to create a new Senate constituency, which he immediately stood for and won (Pivel Devoto & Ranieri, 1956: 356).

5 The average weights were obtained as follows: for cattle, sheep, and pigs it was taken from the *Anuario Estadístico 1913-1914*; for horses the mean of Bertoni's proposed range was used. (Bertoni, 2011: 99).

6 I would like to thank one of the anonymous reviewers for drawing my attention to this point and to Martínez Moreno's work.

7 All the maps in this paper were drawn by the author using Quantum GIS 2.18.9 Las Palmas and ArcMap Desktop 10.3. GIS shapefiles providing boundary and attribute data at the spatial level of provinces and of train stations are available from the author upon request.

8 I thank the staff at the Cambridge University Library Map Room for their help in finding and digitalizing CUR's original map.

9 A detailed explanation of the assumptions of EBK can be found in Chiles and Delfiner (2012: Chapter 3, and especially pp. 188-193).

10 Cosio (1905) estimated it at 150,000 per year in 1905.

11 The joint exploitation of both sheep and cattle was characteristic, according to Barrán and Nahum (1971: 27), of the higher-productivity *estancias*.

12 The model was originally put forth by J.H. von Thünen in the nineteenth century, and was rekindled by Alonso in the 1960s, who used it as the basis of a 'monocentric city model' (Alonso, 1964; Thünen & Hall, 1966).

13 I thank Henry Willebald for introducing me to Griffin's work.

14 According to the 1908 census about 15% of Uruguayan population lived in the provinces of Canelones and San José, which are almost entirely within the cereal belt (Dirección General de Estadística, *Censo General 1908*, Montevideo, 1912).

15 According to the 1908 census about 51% of inhabitants lived in the southern provinces which were mostly part of the regions described here as part of the "diversified economy": Montevideo's trade and manufacturing economy, the southern cereal belt, the south-western agricultural economy, and the metropolitan building materials economy. The census returns show that 30% of total inhabitants lived in Montevideo, 9% in Canelones, 5% in Colonia, 4% in San José, and 3% in Maldonado (Dirección General de Estadística, *Censo General 1908*, Montevideo, 1912).

16 In the same way that, according to Fogel's seminal work, an American economy without railroads would have resulted in a larger Denver and a smaller St Louis (Fogel, 1964; McCloskey, 1987: 66).

17 There are of course much more recent and detailed classifications of Uruguayan soils, including official surveys available in the digital library of the Ministerio de Ganadería, Agricultura y Pesca. However, given the significant changes that soils and particularly soil uses have experienced, particularly in the late twentieth and early twenty-first century (Paruelo et al., 2006), I have chosen to rely on Marchesi and Durán's earlier classification for the purpose of this brief section.

18 Two insightful reflections on economic history's relationship with economic theory can be found in McCloskey (1976) and Porcile (2004).

19 Using, for example, the product-specific estimates of prices from Bértola (1998).