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Reconstruction of the Regional GDP of Portugal, 1890 – 1980¹

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Abstract

This methodological study provides estimates of Portuguese regional GDP per capita between 1890 and 1980. These estimates were obtained either by following the Geary and Stark (2002) method for industry or directly from regional production data or proxies thereof where available.

Keywords: Regional GDP, Portugal, historical statistics

JEL CODE: N93, N94, R12

Resum

Aquest article metodològic ofereix estimacions del PIB per càpita regional de les regions portugueses, entre 1890 i 1980. Aquestes estimacions s'han obtingut seguint la metodologia proposada per (Geary and Stark, 2002) per a la indústria, i considerant estimacions de producció directa per la resta de sectors.

Paraules clau: PIB regional, Portugal, estadístiques històriques

Codi JEL: N93, N94, R12

Reconstruction of the Regional GDP of Portugal, 1890 – 1980

1 Introduction

This paper presents new estimates of Portuguese regional GDP from 1890 to 1950 and includes the official data for the *Historical Division* of districts from 1963 to 1980. From 1990 onwards, official data are provided at the NUTS-3 and NUTS-2 levels. These new data series help to characterize the regional process of growth and its pattern of geographical inequality, while this incorporation of a spatial component provides a better understanding of Portuguese development in the long run. Additionally, these new series, in conjunction with similar reconstructions undertaken in other European countries, facilitate the study of economic growth and industrialization from a regional perspective, that is, one that has often been “buried” within the national history and which may be able to reveal interesting new findings.

Regional estimates of GDP are calculated for Portugal’s 18 continental historical districts. This new series is then associated with the regions at the NUTS-2 level in accordance with the classification provided in Table 1. We have preferred to maintain the *historical division* because the regions at the NUTS-2 level are very heterogeneous in economic terms and relevant information might have been lost by aggregating the regional units.

This paper, the first step in a broader research programme, has two main objectives. First, it describes the method and sources used in reconstructing the historical data and, second, it provides regional GDP data from 1890 to 1980. Subsequent steps will undertake a study of regional growth, examining the increasing inequality between inland and coastal provinces and the impact on Portuguese districts of sharing a border with Spain’s poorest regions.

Table 1 - Administrative division equivalences

NUTS-1	NUTS-2	Historical Division
Portugal	Norte	Viana do Castelo Braga Porto Vila Real Bragança Viseu

	Guarda
Centro	Aveiro Coimbra Leiria Santarém Castel Branco
Lisboa	Lisboa Setúbal
Alentejo	Évora Portalegre Beja
Algarve	Faro

The rest of this paper is structured as follows. The next section outlines the methodology used to estimate Portuguese regional GDP. The sources used for reconstructing the dataset are described in section 3. Section 4 discusses the spatial unit of analysis. In section 5 we report the results of the robustness test run on these new series. Finally, section 6 provides new homogenised spatial data and associates them with official estimates for 1960 onwards.

2 Methodology

Two strategies are adopted in this reconstruction of Portuguese regional GDP. When regional production data are available, estimates are made directly. When they are not, we apply the Geary and Stark (2002) method used in calculating the regional GDP for the four countries of the United Kingdom before World War I.¹ For the Portuguese case, gross value added (GVA) figures are built for agriculture, industry and services from 1890 onwards. These are expanded to include the mining, construction and electricity sectors after 1920. From 1953 onwards official figures become available. Despite this, regional GDP for 1950 and 1960 is also estimated here to check the robustness of our approximation.

Regional GDP is constructed from the aggregation of the regional GDP of the sector estimates according to,

$$GDP_{it} = GVAA_{it} + GVAI_{it} + GVAS_{it} \quad t = 1890 \quad (1)$$

¹ This method has also been used for the historical reconstruction of regional GDP in a range of European countries. See, for example, Crafts (2005) for England, Buyst (2010) for Belgium, Rosés, Martínez-Galarraga and Tirado-Fabregat (2010) for Spain and Enflo, Henning and Schön (2010) for Sweden.

where GVA is the gross value added for each i region, and A, I and S are the Agricultural, Industrial and Services sectors and,

$$GDP_{it} = GVAA_{it} + GVAM_{it} + GVAI_{it} + GVAC_{it} + GVAE_{it} + GVAS_{it} \quad t \geq 1920 \quad (2)$$

where M, C and E are the Mining, Construction and Electricity sectors.

This strategy ensures the use of the best basic information available in each case. For the Portuguese case, regional mining production data (or a proxy thereof) are available after 1920 (paid regional taxes and production value). We also have data on Electricity and Gas production after 1930. In each case we assign the country GDP of these sectors to each region as a percentage of the country total for every variable or proxy used.

When no production data or other proxies are available, we follow the Geary and Stark (2002) method. In this case, National GDP (in current prices and at factor costs) is distributed between the different regions. National GDP is defined as:

$$GDP = \sum_i GDP_i \quad (3)$$

where GDP_i is the GDP of region i which is in turn defined as

$$GDP_i = \sum_j av_{ij} L_{ij} \quad (4)$$

where av_{ij} is the average value-added per worker in region i in sector j and L_{ij} is the corresponding number of workers. If we assume that the differences in regional GDP are related to the differences between the productivity of an

economic sector among the regions and, at the same time, that this is captured by the differences in nominal wages, we can transform (4) as:

$$GDP_i = \sum_j \left[gdp_j \beta_j \left(\frac{w_{ij}}{w_j} \right) \right] L_{ij} \quad (5)$$

where w_{ij} is the wage paid in region i in sector j and w_j is the national average wage in that sector and β is a scalar which preserves the relative regional differences but scales the absolute levels. As a result, the addition of GDP estimates for each sector at the regional level is equal to the sector estimates at the national level (from official sources).

3 Sources and Data

In this section we describe in detail the sources used to estimate Portuguese regional GDP. These sources varied over time and from one year to the next. The choice of data and methodology were determined by the best available option. This section is structured chronologically, beginning with the first GDP estimate for 1890 and concluding with that for 1960. For each year and sector we provide detailed information on both the method chosen to estimate regional GDP and on the sources used. The information needed to estimate the series consists in GDP for different sectors at the national level, economic active population and nominal wages for different sectors and regions, and production data at the regional level. The rest of this section describes the origin of this data.

The final outcome comprises an estimate of Portuguese regional GDP for the years 1890, 1920, 1930, 1940, 1950 and 1960. For 1890, GDP for each district is broken down into three economic sectors, and from 1920 onwards into 15 sectors.

3.1 Reconstruction of 1890

The Portuguese GDP is obtained from Lains (2003). The reconstruction of regional GDP data is obtained using the Geary-Stark method. Economic Active

Population (EAP) comes from Nunes (1989). This classifies Portuguese EAP into eight sectors. We take the EAP for the three main economic sectors: Agriculture, Industry and Services. Wages from Agriculture are for the year 1912 and come from *Salários dos trabalhadores rurais. Ano de 1935. Instituto Nacional de Estatística (INE)*. This source provides wages for each Portuguese district. Each district wage is the average of wages paid for a number of different farming tasks. We include only male wages. Industrial wages come from *Inquérito Industrial of 1890 (INE)*. The industrial wage for each district is the non weighted wage for all the industrial sectors provided by the source for the main city in that district.² In the absence of direct and reliable data on services, civil construction was taken as the reference.³ These wages are taken from the chapter entitled *Indústria* in the *Anuário Estatístico* of 1884.

3.2 Reconstruction of 1920

From this point on, estimations improve notably. The Portuguese GDP is obtained from Batista, Martins and Reis (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into eight economic sectors: *Agriculture and fishing; Mining; Manufacture; Construction; Electricity and gas; Transport and communications; Trade; Public services; and Other services*. The EAP of the manufacturing sector is split into eight sectors according to the distribution of Industrial EAP in 1930. These eight industrial sectors are: *Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment; and Other manufacturing*. In short, EAP is classified into 15 different sectors.

Wages from Agriculture are for the year 1921 and come from the chapter entitled *Indústria* in the *Anuário Estatístico (INE)* of 1921. This source provides wages for each Portuguese district. Each district wage is the average of wages

² For Lisbon and Porto we consider just one district in each city.

³ This proxy is also used by Rosés et al. (2010) in their reconstruction of the regional GDP for Spain. Geary and Stark (2002), however, consider a weighted average of the industry and agriculture wage series.

paid for a number of different farming tasks. We include only male wages. Wages for all the other sectors⁴ are for 1921 and come from the chapter entitled *Indústria* in the *Anuário Estatístico* of 1921. This source classifies workers into 28 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This was carried out using the non-weighted average of the different EAP sectors contained in each of Nunes' sectors.

3.3 Reconstruction of 1930

The Portuguese GDP is obtained from Batista et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment; and Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services; and Other services.*

Wages from agriculture come from the chapter entitled *Produção, consumo e custo da vida* in the *Anuário Estatístico (INE)* of 1930. This source provides wages for each Portuguese district. Each district wage is the average of wages paid for a number of different farming tasks. We include only male wages. For the other sectors⁵, wages used are from 1930 and come from the chapter entitled *Produção, consumo e custo da vida* in the *Anuário Estatístico* of 1930. This source classifies workers into 28 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This was carried out using the non-weighted average of the different EAP sectors contained in each of Nunes' sectors.

We completed these results by adopting the production strategy approach to Mining data. To do so, we use Mining Tax (*Imposto proporcional de minas*)

⁴ Except Mining

⁵ Except Mining and Electricity and Gas

statistics. This 2% proportional tax was charged on the extraction of minerals⁶ and the statistics provide this information at the district level. Thus, we proxy mining production through the taxes paid at the district level. Mining tax statistics are taken from the chapter entitled *Produção, consumo e custo da vida* in the *Anuário Estatístico (INE)* of 1930.

We also obtained production data for the *Electricity and Gas* sector. In the case of electricity we consider production in kW by district (the sum of thermoelectric and hydroelectric production) taken from the chapter entitled *Produção, consumo e custo da vida* in the *Anuário Estatístico (INE)* of 1930.

3.4 Reconstruction of 1940

The Portuguese GDP is obtained from Batista et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment; and Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services; and Other services.*

Wages from agriculture come from the chapter entitled *Produção e consumo* in the *Anuário Estatístico (INE)* of 1940. This source provides wages for each Portuguese district. Each district wage is the average of wages paid for a number of different farming tasks. We include only male wages. For the other sectors⁷, wages used are from 1943 and come from *Estatísticas da produção industrial* of 1943 (*INE*). This source classifies workers into 16 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This was carried out using the non-weighted average of the different EAP sectors contained in each of Nunes' sectors.

⁶ See Nunes (2002)

⁷ Except Mining and Electricity and Gas

We adopt the production approach to Mining data. The total mining production per district is taken from the chapter entitled *Produção e consumo* in the *Anuário Estatístico (INE)* of 1940. For the *Electricity and Gas* sector we consider electricity production (in kW) by district (the sum of thermoelectric and hydroelectric production) taken from the chapter entitled *Produção e consumo* in the *Anuário Estatístico (INE)* of 1940.

3.5 Reconstruction of 1950

The Portuguese GDP is obtained from Batista et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment; and Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services; and Other services.*

Wages for all sectors⁸ are from 1950 and come from *Estatística das Sociedades* of 1950 (*INE*). This source classifies workers into 29 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). However, in contrast with the previous ways of proceeding, we consider a weighted average based on the number of workers in each sector provided by *Estatística das Sociedades* to obtain the data for the GDP sectors.⁹

We adopt the production approach to Mining data. The total mining production per district is taken from the chapter entitled *Produção e consumo* in the *Anuário Estatístico (INE)* of 1950. For the *Electricity and Gas* sector we consider electricity production (in kW) by district (the sum of thermoelectric

⁸Except Mining and Electricity and Gas

⁹ For 1890, 1920, 1930 and 1940, wage data are only available for certain sectors and we do not have data regarding the number of workers for each sector. For this reason, we had to consider non-weighted wages in the earlier estimations.

and hydroelectric production) taken from the chapter entitled *Produção e consumo* in the *Anuário Estatístico* (INE) of 1950.

3.6 Reconstruction of 1960

The Portuguese GDP is obtained from Pinheiro et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment; and Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services; and Other services.*

Wages for all sectors¹⁰ come from *Estatística das Sociedades* of 1960 (INE). This source classifies workers into 39 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This is carried out using a weighted average based on the number of workers in each sector provided by *Estatística das Sociedades*.

We adopt the production approach to Mining data. The total mining production per district is taken from the chapter entitled *Produção e consumo* in the *Anuário Estatístico* (INE) of 1960. For the *Electricity and Gas* sector we consider electricity production (in kW) by district (the sum of thermoelectric and hydroelectric production) taken from the chapter entitled *Produção e consumo* in the *Anuário Estatístico* (INE) of 1960.

3.7 Official sources from 1950 to 1980

Official efforts to obtain regional GDP estimations in Portugal began at a very early date. Abreu (1969), an official INE publication, provides data for the historical districts for 1953 and 1963 in three sectors (agriculture, industry and services). For 1970, da Conceição (1975), likewise an INE publication, provides data for eight sectors in the historical districts. For 1980 and 1990 we use the

¹⁰ Except Mining and Electricity and Gas

data at the NUTS-2 level provided by INE (1991a, 1991b). Both publications offer disaggregated data for 38 sectors. For 1995 onwards, EUROSTAT provides regional data based at the NUTS-2 and NUTS-3 levels.

3.8 Official sources from 1990 onwards

To obtain homogenised data for estimates of Portuguese regional GDP between 1890 and 2000, we have to aggregate the data for the historical districts at the NUTS-2 level. As mentioned, EUROSTAT only provides data at the level of the NUTS regions. The problem arises when it is not possible to transform the data from the *Historical Division* to the equivalent NUTS-3 division, and the only possible solution is to aggregate regional data at a larger scale (NUTS-2).

4 Unit of analysis

Our analysis of the evolution of regional GDP levels in Portugal could be biased as a result of the unit of analysis we select. Certainly, the reconstruction of the historical data must be comparable to those undertaken in other countries, but we also have to consider the economic sense of the selected spatial unit in each case study. EUROSTAT defines various levels of spatial analysis - NUTS-1, NUTS-2 and NUTS-3 - for all the regions of Europe. These divisions follow administrative, geographic and theoretical economic criteria and allow the realization of comparable studies.¹¹ However, in Portugal, administrative divisions have changed over time. The administrative division that we refer to here as the *Historical Division* was superseded by the NUTS division, but the correspondence between the two is not exact. This means that the reconstruction we attempt here is not as straightforward as those conducted in other states (Spain, France and the United Kingdom, for example) that present relatively stable administrative divisions in the long run

In Portugal, according to EUROSTAT, NUTS-1 corresponds to the whole of the country, while there are there are five NUTS-2 continental divisions. However, the latter make little economic sense as they are the sum of sub-regions with very different characteristics. Typically, large transversals regions fail to differentiate rich, developed regions from their poorer neighbours and, as such,

¹¹ For more information see: http://ec.europa.eu/eurostat/ramon/nuts/home_regions_en.html

ignore essential economic differences (which became more marked during the twentieth century). These disparities are particularly evident among coastal regions with an orientation towards the international market, and inland regions that are usually less developed and more dependent on the agrarian sector. NUTS-3 regions, on the other hand, are smaller, more recent, administrative divisions without any historical counterparts. The NUTS-3 units are smaller than the units in the historical division and, therefore, it is impossible to rebuild historical units from the sum of regions at the NUTS-3 level. For this reason, here, we have chosen the historical division for reconstructing the regional GDP (given that they make greater economic and political sense). At the same time, the historical division allows us to build aggregated data to the NUTS-2 level for the purpose of making international comparisons (see Table 1).

It should be stressed that that we do not provide regional estimations for non continental regions because GDP data before 1953 only included continental Portugal. Given that the methodology used to estimate regional GDP requires an aggregate GDP figure, it has not been possible to provide estimates for the non continental regions.

5 Robustness

To check the robustness of our figures we compare our estimates for 1950 with the official data for 1953. In order to do this, we consider the weight of each region in the GDP of the whole country. Despite the small number of observations, a simple, non-parametric rank correlation test between the two columns shows a high degree of similarity (ρ - Spearman = 0.92). This test, therefore, points to the reliability of the new series described here. On the other hand, the result of the rank correlation test between our 1960 estimates and the official data for 1963 is weaker (ρ - Spearman = 0.87). This may well reflect the problems encountered when applying the method of estimation to more recent periods. Indeed, Geary and Stark (2002) point out that the poorest estimations are obtained for current data because the link between regional differences in wages and in productivity became weak as the service sector increased its participation in the economy.

Table 2 – Robustness test

	1950	1953	1960	1963
Aveiro	5.40%	5.40%	4.3%	6.2%
Beja	3.27%	3.39%	0.6%	2.4%
Braga	4.86%	4.89%	2.9%	4.9%
Bragança	1.89%	1.80%	0.6%	1.6%
Castel Branco	2.96%	3.18%	1.2%	2.6%
Coimbra	3.44%	4.18%	3.8%	3.9%
Évora	2.75%	3.01%	0.9%	2.4%
Faro	3.85%	3.01%	2.0%	2.6%
Guarda	2.51%	1.99%	2.0%	1.8%
Leiria	4.04%	4.14%	9.2%	3.8%
Lisboa	28.84%	27.68%	37.9%	31.0%
Portalegre	2.84%	2.61%	0.6%	1.9%
Porto	14.27%	15.03%	16.2%	16.3%
Santarém	5.44%	5.72%	5.5%	4.4%
Setúbal	4.56%	5.75%	5.9%	7.1%
Viana do Castelo	3.03%	2.04%	0.8%	1.7%
Vila Real	1.76%	2.50%	2.2%	2.2%
Viseu	4.30%	3.69%	3.2%	3.1%

6 Results

The results of the estimations performed in this paper and the official data from the 1960s onwards are shown in the Appendix. More specifically, Table A1 shows the regional per capita GDP for the historical administrative divisions until 1980. In addition, so as to have a continuous series until the end of the twentieth century, Table A2 provides the same information at the NUTS-2 level.

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8 Data Appendix

Table A.1 – Per capita GDP ranking of the Portuguese regions (1890-1980). Portugal=100

1890		1920		1930		1940		1953		1963		1970		1980	
Lisboa	158	Lisboa	190	Lisboa	163	Lisboa	190	Lisboa	175	Lisboa	177	Lisboa	180	Lisboa	147
Porto	117	Setúbal	146	Setúbal	131	Porto	118	Setúbal	135	Setúbal	145	Setúbal	157	Setúbal	121
Setúbal	113	Porto	135	Porto	122	Setúbal	100	Porto	110	Porto	109	Porto	101	Porto	102
Évora	108	Coimbra	86	Coimbra	93	Portalegre	86	Évora	109	Aveiro	96	Aveiro	87	Aveiro	96
Vila Real	106	Santarém	82	VC	91	Évora	86	Portalegre	106	Évora	96	Santarém	79	Évora	94
Bragança	106	Bragança	82	Santarém	88	Santarém	85	Santarém	100	Portalegre	92	Évora	77	Faro	91
Santarém	94	Aveiro	81	Aveiro	87	VC	84	Beja	95	Santarém	80	Leiria	77	Santarém	89
Portalegre	93	Braga	80	Évora	86	Coimbra	83	Aveiro	87	Leiria	79	Portalegre	74	Portalegre	86
Braga	90	Évora	80	Bragança	86	Aveiro	80	Leiria	83	Beja	78	Beja	72	Coimbra	86
VC	90	Portalegre	79	Leiria	85	Braga	78	CB	79	Coimbra	75	Coimbra	70	Leiria	85
Beja	89	Leiria	78	Portalegre	84	Beja	77	Coimbra	77	Faro	71	Braga	70	Braga	78
Guarda	89	Vila Real	76	Vila Real	81	Leiria	77	Faro	75	CB	71	CB	70	Beja	73
Aveiro	88	VC	74	Guarda	79	Faro	74	Braga	70	Braga	67	Faro	64	CB	68
Leiria	88	Guarda	72	Braga	79	Vila Real	72	Bragança	63	Bragança	63	Bragança	63	Viseu	57
Coimbra	87	Faro	70	Faro	74	CB	72	Vila Real	63	Vila Real	59	Guarda	53	Guarda	56
Viseu	78	CB	70	Beja	73	Viseu	72	Viseu	60	Guarda	58	Viseu	45	VC	55
CB	76	Beja	66	CB	72	Bragança	69	VC	59	Viseu	56	Vila Real	44	Bragança	55
Faro	71	Viseu	57	Viseu	66	Guarda	65	Guarda	53	VC	52	VC	43	Vila Real	53

Source: See text.

Note: VC is Viana do Castelo and CB Castelo Branco

Table A.2 – Per capita GDP ranking of the Portuguese NUTS-2 regions (1890-2000). Portugal=100

	1890	1920	1930	1940	1950	1963	1970	1980	1990	2000
Norte	98	91	92	88	83	78	74	82	88	81
Centro	87	80	86	80	85	82	78	57	70	84
Lisboa e Vale Tejo	149	181	157	172	158	170	175	166	137	142
Alentejo	96	74	80	82	99	88	75	74	59	90
Algarve	71	70	74	74	98	71	64	77	85	104

Source: See text.