Industrial Location, Market Access and Economic Development: Regional Patterns in Post-Unification Italy

by

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Declaration

I certify that the thesis I have presented for examination for the MPhil/PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

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Abstract

What accounts for the differences in the economic performance across Italian regions in the post-Unification period? This thesis seeks to explain the regional patterns of economic development and industrialization in Italy in the period 1871-1911 by applying various Economic Geography models. The first part follows Overman and Puga (2002) and studies the distribution of industrial employment across regions. The aim is to test the effect of regional borders on the distribution of industrial employment. The existence of this border effect, tested through the use of provincial data, suggests that the Italian regions in this period represented meaningful economic entities. By testing the effect of pre-1861 borders we link this result to the persistence of pre-Unification institutional arrangements. The second part follows the methodology by Head and Mayer (2011) and investigates the relationship between economic performance and market access. Here market access is captured through market potential, a measure of the centrality of a region based on GDP and transport costs. The main result is that domestic market potential is a strong determinant of GDP per capita while all the formulations of market potential that include trading partners give more mixed results. The last part seeks to explain the location of industries in Italy in the period 1871–1911. The analytical framework takes into account both the Heckscher-Ohlin (H-O) theory on factor endowment and the New Economic Geography (NEG) theory on access to markets. The methodology used here is based on Midelfart-Knarvik et al. (2000). The location of industries, measured through employment per region per sector, is explained with interactions between characteristics of the regions and characteristics of the sectors, of both H-O and NEG-type. The main findings of this chapter are that endowments, and in particular human capital, were the driving force behind the first Italian industrialization while access to markets had a more limited effect.

Keywords: historical economic geography, regional disparities, market potential, industrial location, Italy

JEL classification: N93, O18, R12, R30

"*Il formare l'Italia, fondere insieme gli elementi che la compongono, armonizzare il Nord con il Sud, presenta altrettanti difficoltà di una guerra contro l'Austria o una lotta con Roma.*"

— Letter from Camillo Benso, Conte di Cavour to William de la Rive (1860).[1]

[1] Zanichelli (1949).

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Preface

To those interested in regional divergence, Italy is probably one of the most compelling examples that present times and contemporary history can provide. The different parts of Italy were economically and socially heterogeneous before 1861 and remained so for more than 150 years following its unification. Although the South managed to catch up with the North in several respects, such as life expectancy, literacy, and other developmental measures, it did so only with heavy State intervention (Felice and Vasta, 2012). This is why the advancement of the South can be seen in development measures that are boosted by the public provision of services such as health and schooling but not in the (relative) GDP per capita, where we see the diverging paths of North and South. The central government of Italy has played a large part in the economy of the southern regions, which started in the Fascist period and still continues, transferring substantial resources from North to South. Whenever regions take such diverging paths, above all in economic performance, a harsh public debate arises about the responsibilities and consequences, in Italy as elsewhere. The last two decades have seen the flourishing of several movements calling for more decentralization of public spending or even the independence of part of the country. What is perhaps unusual is that movements calling for independence have developed both in the South and in the North. In both cases, the claims for independence have economic motives: in the South the so-called "neo borbonici" blame the Unification and the Italian governments for depriving the South of its wealth, transferred to the North. Correspondingly, several movements in the North, most notably the Lega Nord, have been invoking the wealth transfers from most of the North to the South in order to gain public support for independence.

In this battle, both sides have attempted to use History. On the northern front, we find arguments which are very similar to that used by Putnam et al. (1994), claiming that the South's lack of social capital is to blame for its poor performance; on the southern front, we find arguments that go back to the intellectual school of the Meridionalisti and claim that the South has been economically damaged by the unifi-

cation. This is how economic historian became increasingly involved in the debate on the origin and the extent of the North-South gap. To respond to this demand from outside the academic world, some scholars have engaged in a sort of "popular science" explanation to the general public showing which claims about the past are historically grounded and which are not. Among these, some of the main works published in the last three decades or so are Cafagna (1989), Toniolo (1990), Zamagni (1990), Fenoaltea (2006), Ciocca (2007), Daniele and Malanima (2007) and the recently published Felice (2013b). All these works rely on quantitative evidence for support and dismiss any theory not based on it.

This thesis aims at contributing to the production and discussion of quantitative evidence on the North-South gap by bringing Economic Geography into the picture. When an economic phenomenon is characterized by spatial relations, these should be taken into account. Economic Geography is a subfield of Economics which is concerned with the study of these spatial relations. Our decision to rely on geographic theory is of course not isolated within Economic History. The last couple of decades have seen the development of what we call Historical Economic Geography, which is now a recognized subfield of Economic History closely related to Economic Geography. Ironically, a country that is one of the most markedly characterized by geographic patterns is quite underrepresented in this line of research compared to other areas of the world. This thesis aims at only partially filling this gap by looking at GDP per capita and industrial employment patterns in the period between Unification and the First World War.

My decision to undertake a PhD in Economic History is the result of my education and the people who have inspired and encouraged me along the way. I thank Ann Casper for making the study of history so pleasant during my time at Alameda High School, as well as all the teachers in my tough courses in Economic History at the University of Trieste, Bocconi University and the London School of Economics. In particular I want to thank Tommy Murphy for his priceless guidance and encouragement in giving substance to my aspirations and Luca Fantacci for his thoughtful supervision of my first master 's thesis in Economic History at Bocconi University in 2008. I also thank Maristella Botticini for hosting me at IGIER Bocconi in 2011 and Franco Amatori for giving me an opportunity to spend fruitful time at the Department of Institutional Analysis and Public Management.

I also thank my thesis supervisors, Max-Stephan Schulze and Steve Gibbons for their support, encouragement and constructive criticism. Their experience in Economic

History and Economic Geography respectively has opened my mind to both these fields. Special thanks to my co-author, Carlo Ciccarelli, who has had the patience to work with me on two other projects, one of which provides the essential quantitative basis for Chapter 3 of this thesis and from whom I learnt immensely. During my PhD I had the chance to meet several scholars working on Italian Economic History. Without their guidance and encouragement this thesis would have not been possible. I want to thank in particular Guido Alfani, Stefano Battilossi, Andrea Colli, Emanuele Felice, Stefano Fenoaltea, Alessandro Nuvolari, Gianni Toniolo, Michelangelo Vasta, Giovanni Vecchi and Vera Zamagni for the time they spent introducing me to the economic history of Italy.

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London, September 2014

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Lund, January 2014

Chapter 1

Introduction

Since its unification in 1861, Italy has been characterized by profound regional disparities. At the time, regions differed in terms of both social and economic indicators, suggesting that these disparities originated well before. Southern regions lagged behind in terms of literacy rates, school enrolment, GDP per capita, land productivity and levels of industrialization. In the first decades after Unification, some of these indicators, such as literacy, improved in the South more quickly than in the North. However, the main economic indicators in the two regions, GDP per capita, drifted further apart. In the decades following Unification, Italy experienced its first industrialization in a modern sense and by the First World War all the major industrial sectors were represented (Zamagni, 1990). During this period, we see a consolidation of the North-South gap not only in terms of GDP level but also in terms of industrial output. It is in this period that industrialization in the three regions of the Northwest of the country — Piedmont, Lombardy and Liguria — begins to forge ahead, giving them the name of the Industrial Triangle. While the rates of growth of the economy and of the industrial sector in particular in this period are still below the astonishing levels reached in the 1960s during the Economic Miracle. This period is considered very important in the formation of regional disparities. In particular, the industrial performance between Unification and the First World War has received a good deal of attention in the Economic History literature.[1] This is because industrial output, among the economic indicators, shows the strongest polarization, suggesting that an important part of the story of regional disparities has to do with a regionally imbalanced process of industrialization. The present thesis embraces this view and devotes most of its efforts to the study of the regional patterns in the industrial sector.

[1] See Zamagni (1978), Federico and Toniolo (1991), A'Hearn (1998), Fenoaltea (2006), Felice and Vasta (2012) and Ciccarelli and Fenoaltea (2013b).

Since the seminal work of Gerschenkron (1962), which focused on the industrialization of Italy as a whole, several scholars have engaged in quantitative research on the topic, with a special focus on the regional disparities. In particular, the regional reconstruction of the industrial series started with the work by Zamagni (1978) on industrial value added and employment in 1911 and continued with the regional and provincial estimates of industrial value added by Fenoaltea and Ciccarelli.[2] On GDP reconstructions, in recent years Felice has produced regional estimates (Felice, 2011a). Both the authors of these reconstructions and several others that relied on them have proposed different approaches, quantitative and also qualitative, to account for regional differentials across the Italian regions. The factors which are thought to have contributed to the formation and most importantly to the consolidation of the North-South gap are numerous: genetic differences among Italians; exploitation of the South by the North; differences in culture and institutions and differences in physical geography and in agriculture. Scholars have approached these theories of regional disparities in Italy in various ways: some have used anecdotal and qualitative evidence, some have relied on quantitative evidence but without a formal model and others have done the same but with quantitative evidence within a regression analysis.

This thesis aims at contributing to the latter of research by investigating regional differentials in the late 19^{th} and early 20^{th} centuries, in terms of both GDP and industrial employment. What in fact accounts for the different GDP per capita and industrial activity levels in the Italian regions between Unification and the First World War? Although each of the three main chapters of this thesis addresses a distinct research question, they all contribute towards answering this main question.

These three chapters of the thesis all apply methodologies introduced within the field of Economic Geography. Economic Geography as a discipline provides "theoretical and empirical work on the spatial aspects of the economy, that is, where economic activity occurs and why" (Fujita et al., 2001). We believe that the study of where economic activity occurred in Italy and why it did can greatly benefit from the use of formal modelling from Economic Geography.

After reviewing the relevant historiographical and methodological literature in Chapter 2, we first describe regional patterns. In Chapter 3, we measure regional specialization and the geographical concentration of industries, drawing on industrial

[2]The first of these studies on the Italian regions is Fenoaltea (2003b), while for the provinces see Ciccarelli and Fenoaltea (2013b).

employment data.[3] This is done through the standard indices used in the Economic Geography literature. First, we propose various measures of spatial concentration of the industrial sectors, such as the G index and the Ellison and Glaeser index. We then move to regional specialization, showing the Krugman index. In a second step, we evaluate how a region's industrial activity is spatially correlated to that of its neighbours. To do this, we use the notion of spatial autocorrelation which is measured through the Moran's I. This is useful to check whether the type of industrial activity in a region tends to be influenced by the type of industrial activity of neighbouring regions. The results of the concentration and specialization indices suggest that Italian regions experience both processes in this period. The spatial autocorrelation analysis finds that the distribution of industrial sectors was not particularly interdependent at the regional level. The second part of this chapter aims at answering the following question: are changes in the distribution of industries in the Italian regions affected by the presence of regional borders? In practice, we want to test whether borders matter in deciding a location. To this end, we use the model proposed by Overman and Puga (2002). Relying on provincial level industrial employment for 15 sectors, we study whether the change in employment in the provinces is affected differently by employment in physically neighbouring provinces that are in the same region rather than in another. We find that provinces belonging to the same region of a given province positively affect the region's industrial employment whereas if they belong to another region the opposite occurs. This result is consistent with the findings from the various indices proposed and suggests that regional borders did matter in the evolution of industrial location. Since regional borders often correspond to pre-unitary borders, the same exercise is repeated with counter-factual pre-1861 borders applied to post-1861 employment and the results are similar, indicating that the border effect observed originated before the Unification.

Chapter 4 is devoted to estimating regional market potential, which is a measure of the access to markets for any given region. A growing branch of Economic Geography called New Economic Geography considers market forces as the main candidate for explaining how economic activity locates. Both this chapter and Chapter 5 use market potentials as explanatory variable for economic activity. Market potentials as in Harris (1954) depend on regional GDP and distances between region. We then move to the

[3]Throughout the thesis, we use industrial employment to measure industrial location. The use of employment figures, rather than production figures, is standard practice in Economic Geography to account for the location of industrial activity in a way that avoids bias from productivity differentials.

regression analysis where our main purpose is to study the causal link between GDP per capita and market potential and also between industrial value added and market potential following Head and Mayer (2011). The main result of this chapter is domestic market potentials, which only take into account Italian regions, show a more "traditional" picture of Italy. The North is ahead of the South, in particular at the beginning of the period; the gap between North and South narrows in time. This is due to the relative decline in the cost of shipping compared to that of railways, which benefited the southern regions because they had easier access to the sea than the North did. We also calculate other formulations of market potential that gradually include foreign trading partners, finding that the more these enter into the calculation, the more the picture changes in favour of the South. Regression analysis shows that the domestic market potential is a stronger determinant of GDP per capita of the regions only in its domestic formulation, confirming the intuition that the home market in this period mattered more for growth than did the international markets.

Chapter 5 of the thesis studies the determinants of industrial location following the methodology introduced by Midelfart et al. (2000) for the case of the European industries from the 1970s. This work integrates both the Heckscher-Ohlin (H-O) view which points to factor endowment as the determinant of the location of industrial activity and the New Economic Geography (NEG) view that points to market access. The research question is "What are the factors, among those proposed by both the H-O view and the NEG view, that determine the location of Italian industries in the Italian regions between 1871 and 1911?" This methodology has found fruitful historical applications, as in Crafts and Mulatu (2006), Wolf (2007), Martinez-Galarraga (2012) and Klein and Crafts (2012) and has the advantage of testing both views in a single model. The model seeks to explain the regional share of each industry in terms of employment, with the interaction between industry characteristics and regions that is characteristic of both the H-O and the NEG type. The idea is to test, for various regional characteristics, whether they attract the location of industrial sectors that use characteristic more intensively. For instance, if we want to test whether human capital drives the location of industries, we take a measure of human capital availability in the regions (in this case, we take regional literacy rates) and we interact it with a measure of intensity in the use of human capital by the industrial sectors (in this case we take the share of white collar workers. If human capital matters, the interaction between these two matching characteristics will be significant. The same is done for

the other endowment interactions related to energy, financial capital and agriculture and for three interactions that capture the role of market access. The main finding of this chapter is that industrial location is mostly driven by endowment forces, most notably human capital, although domestic market access has a positive effect through backward linkages between industrial sectors. Other market interactions, such as the one capturing increasing returns to scale, do not drive industrial location in this period.

A major task has been to construct the extensive dataset on industries, regions and provinces on which the thesis is based. The population censuses of 1871, 1881, 1901 and 1911 are the building blocks of the dataset, providing all the employment data at both provincial and regional level. Although reclassified figures from the censuses for all industrial sectors at regional level were available from the work by Fenoaltea (2001), provincial level figures were published by the present author and Carlo Ciccarelli in 2013 (Ciccarelli and Missiaia, 2013). Population censuses were also the source for literacy rates, the strength of the agricultural labour force and population figures, all collected at both regional and provincial levels.[4] The other primary source that is heavily used in this thesis is the 1911 industrial census, from which a large proportion of the characteristics for industrial censuses were taken. Other primary sources were the Italian statistical yearbooks (Annuario Statistico Italiano), yearbooks from specific ministries such as the MAIC (Ministero dell'Agricoltura, Industria e Commercio) and publications on railway rates from Ferrovie dello Stato. The data set is also largely based on reconstructions by other scholars. In particular, GDP estimates are from Felice (2009a) for 1881 and 1901 and Brunetti et al. (2011) for 1871, 1891, 1901 and 1911. Industrial value added estimates for the regions are from Fenoaltea (2003b) and the input-output tables are from Vitali (2003).

The motivations for this thesis are several. First, the debate among economic historians on the origins of the Italian North-South divide is a very open one. The explanations proposed by scholars go from colonial exploitation of the South by the North, differences in agricultural structure, in the institutional framework and cultural differences. No consensus has been reached on which of these hypothesis can explain the Italian experience and new studies continuously revive one or the other view. However, formal testing of this hypothesis through an econometric model to identify causal relationships has been until recently a more infrequent approach than the qualitative one. The primary cause of this delay, compared to other countries and periods, is most

[4]The regional figures were also available from A'Hearn et al. (2011).

probably due to the shortage of suitable data at the regional, not to mention provincial, level. In the last decade or so, new quantitative evidence has been published on GDP, literacy, industrial output and employment: this evidence made it possible for the first time to apply the methodologies presented here to the Italian case. In doing so, we can consider hypotheses that have often been brought forward but rarely tested. Two examples are the role of human capital and that of market access in the shaping of regional disparities. Moreover, this work systematically tackles the issue of the localization of industries using data covering all industrial sectors and all regions and making possible general conclusions which go beyond those of single case studies.

The motivation for choosing this specific period (1871–1911) of Italian history is two-fold. First, these years correspond to the first industrialization of the country during which Italy evolved from a predominantly agricultural country to a country experiencing modern industrial growth for the first time. As noted, this period saw much smaller growth rates than those in the industrial boom of the 1960s and 1970s. However, it is in this period that many location choices were made and the path dependency originating from these choices is likely to have persisted to later periods. Studying the origins of these choices can also be useful for interpreting later periods. The second reason to restrict the analysis to the years between 1871 and 1911 is more practical. Attempting the same analysis before Italy's unification would have required an amount of quantitative evidence on pre-unitary states that is simply not available at present. Moreover, achieving comparability among such data, produced by different statistical offices, would have been very hard. Therefore we considered 1871 the first year in which the volume of quantitative data could support our study. For similar reasons, ending the analysis before the First World War leaves out the troubled period of the war itself, the twenty subsequent years of Fascist rule and the Second World War.

This thesis speaks not only to those interested in the economic history of Italy. Scholars are engaging more and more in investigating the determinants of development and the location of economic activity in the early stages of industrialization in a number of countries.[5] This line of research contributes to explaining why some regions became industrialized and not others. This is interesting both in regard to past location decisions and also long term trends whenever path dependence made these decisions persist over time. It has been observed that different countries and periods do not necessarily

[5]See Crafts and Mulatu (2006) on Britain, Wolf (2007) on Poland, Martinez-Galarraga (2012) on Spain and Klein and Crafts (2012) on the US.

share the same determinants: both market access and endowment can impact on development and industrial location. Studying the case of Italy brings more insights into this literature, providing a further case study to scholars interested in regional patterns of industrialization.

Another motivation goes beyond the boundaries of Economic History. The process of economic divergence proceeded almost continuously throughout the whole history of modern Italy, excepting only the years of the Economic Miracle. Italy is now living in a time of regional divergence in terms of GDP per capita and most of the other indicators of economic development. Studies aimed at explaining this regional divergence today are more and more frequently brought to the attention of the general public. As a consequence, the debate on the origins and causes of the country's regional disparities has also gained increasing attention beyond the academic world. We believe that proposing new interpretative hypotheses which are firmly grounded on quantitative evidence, as the present thesis aspires to do, is essential to transmitting a true and fair view of the historical evolution of Italy since Unification.

Chapter 2

The Italian economy: historical context, debates and theory

2.1 Introduction

The economic history of unified Italy is characterized by two main lines of research. The first is interested in the economic development of Italy as a whole, in particular its spectacular industrialization in the late 1950s and 1960s. This experience is often compared to the postwar industrialization of Germany, Japan and the Asian Tigers, with which Italy shared unprecedented catch up-growth and improvements in virtually all areas of economic development. In this respect, the Italian experience is often studied in comparison to other late industrializers. One of the first studies analysing the Italian industrialization is Gerschenkron's "Economic backwardness in historical perspective"[1] which focuses on the period 1861–1914. After Gerschenkron, the next scholar to adopt a quantitative approach to the matter of Italian economic growth was Fenoaltea, who started a decade of work to reconstruct the Italian national accounts in the 1960s.[2] Since then, several scholars have undertaken extensive qualitative and quantitative research on the economic trajectory on Italy as a unified country.[3]

The second line of research is focused on the regional differentials that arose during this process, and more precisely the increasing gap between northern and southern regions in terms not only of economic performance but also of virtually all indices of devel-

[1] Gerschenkron (1962).

[2] A summary of the PhD dissertation discussed by the author is contained in Fenoaltea (1969); the work of reconstructing of industrial series carried on by Fenoaltea is in its main results reviewed in Fenoaltea (2006). After 2006, the main focus of his research (along with Carlo Ciccarelli) has been to produce provincial series (Ciccarelli and Fenoaltea, 2013b) and second generation regional series that estimate the production for each region directly rather than through the allocation of the national production according to regional employment (see Fenoaltea (2005)).

[3] Again, it is beyond the scope of this chapter to touch upon this immense literature; a partial list would include Romani (1976), Toniolo (1973), Cafagna (1989), Toniolo (1990), Sylla and Toniolo (1991), Federico (1994a), Bevilacqua et al. (1999), Cohen and Federico (2001), Zamagni (1990) and Ciocca (2007).

opment. In this second line of research we find a very large body of literature that will be reviewed in this chapter.[4] This thesis aims at contributing to the latter line of research, by introducing the perspective of Economic Geography to the study of regional differentials across Italy. In this chapter we therefore focus more closely on this second line of research, providing an overview of the existing empirical evidence and literature on the determinants of Italy's economic dualism. In this chapter, we also illustrate the theoretical context provided by Economic Geography for the study of regional differentials.

The chapter is organized as follows. Section 2.2 provides a review of the economic history of Italy at the time of its Unification and in the following 50 years until the First World War; Section 2.3 illustrates the debate on regional disparities relying on the existing empirical evidence and discussing the main literature seeking to account for the North-South gap. Section 2.4 explains how theory within Economic Geography tackles the issue of regional differentials and shows how this theory has been applied in historical Economic Geography to other cases. Section 2.5 concludes.

2.2 The Italian economy: historical context

In order to have a complete picture of regional economies in unified Italy we need to look backwards to the economic condition of the pre-unitary states. In this section we look at the main indicators of economic performance and development on the eve of Unification. We then move to describing the economy of Italy as a unified state after 1861.

2.2.1 The mosaic of pre-unitary states

The 19th century has been characterized by the explosion of several nationalist movements all across Europe. Riots took place in almost all regions of continental Europe, including France, Spain, Greece, the Hapsburg Empire and the German and Italian states. This period sees the formation of two nation-states: Italy in 1861 and Germany in 1871. Alike German territories, the Italian peninsula before 1861 was divided into several small states. Figure 2.1 shows a map of Italy on the eve of Unification.

Before Unification, some of these states, such as the Kingdom of Sardinia and the Kingdom of the Two Sicilies, were independent. Others, such as Lombardy and Veneto, were part of the Hapsburg Empire. Others again were independent but under the protection of a foreign power, as in the case of the Papal States, protected by

[4]Notable works belonging to this line of research are, among others, Cafagna (1989), Zamagni (1990), Fenoaltea (2006), Felice (2007a), Daniele and Malanima (2007), Vecchi (2011).

Figure 2.1: Italian states on the eve of Unification, 1860.

France and the Hapsburg Empire.[5] The economic condition of the pre-unitary states was very far from uniform. Table 2.1 shows a summary of the main economic and social indicators for the Italian regions at the time of Unification. Most of these measures show large differentials that seem to mirror those between North and South after the country was unified.

The Kingdom of Sardinia included the regions of Piedmont, Liguria and Sardinia. The first two were the most economically advanced of the whole peninsula, with a fairly modern agricultural sector boosted by investments in irrigation and the introduction of composts in farming. Some industry based on wool and cotton production had been established and the two regions on the eve of Unification had 40% of the railways of the peninsula (Cafagna, 1989, p. 287). Sardinia was much less developed than the rest of the kingdom, with latifundia based agriculture and livestock holdings as its main activities.

Lombardy and Venetia, the northeastern regions, were both under Hapsburg administration. In spite of this, their economic development had been profoundly different. Lombardy had a very intensive agriculture, with large production of silk. It was also one of the first Italian regions to develop a mechanic sector, notably steel production, and had a commercial sector that was developed enough to connect its production to other markets. The transportation network in 1861 was almost as good as that in

[5]Smith (1968, p. 410).

Table 2.1: Main economic and social indicators at the time of Unification.

	Pop. 1861 (million)	Agric. Output Output Total (million lire)	Railways 1859 (km) Per hectare (lire)	Roads in 1963 (km)	Letters p.c. 1862	Literacy rate 1862	Primary school enrol.	Import p.c. p.c. 1858 (lire)	Export p.c. p.c. 1858 (lire)	Cotton spindles 1857	
Piedmont	2.8	516	169	850	16500	6.1	45.80%	93%	84.16	60.28	197,000
Liguria	0.8										
Sardinia	0.6	48	23	—	986	—	10.30%	29%	10.8	33.33	—
Lombardy	3.3	435	238	522	20901	5.3	46.30%	90%	26.06	38.48	123,046
Veneto	2.3	270	128			—	25%	—	39.13	26.09	30,000
Parma-Modena	0.9	197	174	—	25766	2.7	22%	36%	48.89	36.67	—
Papal State	3.2	264	68	101	—	20%	25–35%	22.5	19.69	30,000	
Tuscany	1.9	242	117	257	12381	3.1	26%	32%	79	23.68	3,000
Kingdom of the Two Sicilies	9.2	870	81	99	13787	1.6	13%	18%	41.58	15.11	70,000
Italy	25		104	1829	—	—	25%	43%	32.8	28.12	453,000

Source: Zamagni (2007, pp. 42–43).

Piedmont, with a good road system and almost 30% of the rail roads of the peninsula (see Table 2.1). Venetia was less economically advanced than Lombardy. Its economic decline had started in the 18th century with the end of the Republic of Venice. Its commercial sector was not as strong as in Lombardy's and its agricultural sector was less productive.

Moving to central Italy, Tuscany on the eve of Unification was ruled by members of the Habsburg dynasty. The commercial policy implemented in Tuscany had greatly favoured a free market and therefore did not provide incentives for the creation of an industrial sector. Most of the exports consisted in raw materials such as iron and marble. The Papal states had a quite heterogeneous agriculture with more intensive agriculture in the northern parts, such as Emila, and latifundia in Latium and Umbria. There was almost no manufacturing in any of the Papal states, while a large part of the population of Rome lived on activities connected with pilgrimages to the Vatican.[6]

The South was united in one state, the Kingdom of the Two Sicilies. Its economy was based mostly on agriculture. The ownership of land was very much concentrated in the hands of the aristocratic class. Most of the land was farmed as latifundium and produced wheat,together with some high value added agricultural products.[7] Since wheat requires manpower only for short periods over the year, a large part of the workforce was often unemployed. Land productivity was roughly 1/3 of that of Lombardy. This was due to the low level of technological innovation in farming and to the inefficient use of the labour force. These conditions made it impossible for the southern regions to create a larger internal market for either agricultural goods or consumer goods since the labour force was too poor to consume above the level of subsistence (Zamagni, 1990, p. 38). The infrastructure built in the Kingdom of the Two Sicilies before 1861 was weak, with only 99 km of railways, mostly built with foreign capital. Moreover, nearly all manufacturing had been established by foreign entrepreneurs, with almost no participation by the local upper or ruling class (Zamagni, 1990, p. 40).

Thus, the economic condition of the Italian regions on the eve of Unification varied greatly from region to region. The northern regions had a different agricultural system, both in terms of the types of crops produced and in terms of organization. The northern regions, Lombardy in particular, had an intensive agriculture based on the production of cotton and silk, while southern regions had large parts of their territories employed

[6] Zamagni (1990, p. 35).
[7] Felice (2013b, p. 38).

in wheat production, with a low level of productivity both per hectare and per worker.[8] The productivity per hectare in 1857 was strikingly varied, with Piedmont at 169 lire, Lombardy at 238 and the Kingdom of the two Sicilies at 81 (Table 1). On the eve of Unification, the other main difference between the northwestern regions and southern regions lay in the presence of textile industries in Piedmont and Lombardy. The two combined had 320,000 spindles while the Kingdom of the two Sicilies had only 70,000 in total (Table 2.1). Moreover, the northwestern regions had a stronger commercial net and a system of transportation, with 70% of the railways built before 1861 located in Piedmont and Lombardy. On the eve of Unification, the pace of industrial growth was generally slow compared to the European frontrunners of industrialization (King, 1985, p. 32). A modern textile industry had been established over the 19$^{\text{th}}$ century in the northwestern regions. According to Cafagna (1989, p. 285), its creation in the North made possible by the favourable natural conditions for producing silk, by the availability of hydroelectric power, the availability of a workforce and the tariffs established after the Napoleonic period. It is in this part of Italy, between Piedmont, Lombardy and Liguria, that the modern industrial sectors would later flourish. The next section analyses the developments of the Italian economy after the Unification of 1861.

2.2.2 Unified Italy: challenges, achievements and failures

The process of Italian Unification embraces more than a decade in the middle of the 19$^{\text{th}}$ century. Among the pre-Unification states, the Kingdom of Sardinia had a leading role in the process of forming of the Italian national state. Popular revolts broke out in Naples in 1820–21 against the Bourbon king but we ended with the help of the Habsburg troops. In 1830–31, revolts broke out in Emilia but were soon ended by the intervention again of the Hapsburg troops. In 1848, the Kingdom of Sardinia declared war against the Habsburg Empire in order to take Lombardy and Venetia, but without success again. After the failed riots of 1820–21 and 1830–31 and the defeat of a coalition of Italian states against the Austrians in 1848, the first victory came in 1859. The Kingdom of Sardinia was then allied with France and the Prime Minister Camillo Benso di Cavour, one of the political fathers of Italian unification, managed to provoke a second conflict against Austria following that of 1848.[9] The result of this was the annexation of Lombardy to the Kingdom of Sardinia. Shortly after, France

[8] See Cafagna (1989, p. 31) for a comprehensive overview of the development of agriculture in Lombardy.

[9] Smith (1997, p. 19).

Figure 2.2: Italian regions, 1870–1918.

did not object to Tuscany and Emilia to hold a referendum on annexation and the two regions also became part of the Kingdom of Sardinia. Italy was officially declared a kingdom in 1861 after a military campaign, known as the Expedition of the Thousand, in the course of which most of the southern and some of the central regions belonging to the Papal States were taken. The King of Sardinia, Victor Emmanuel II, became the first King of Italy. A third war against the Habsburg Empire was necessary to take Venetia in 1866. Finally, Rome was taken in 1870 when the French troops who were protecting the Pope were relocated on the Franco-Prussian border, leaving the future capital vulnerable.[10] Therefore, after 1870, the Italian state presented borders which persisted until the end of the First World War. The administrative regions of unified Italy between 1870 and the First World War are shown in Figure 2.2.

The political unification of the country had been achieved in 1861 but the way to economic unification was still very long. The Risorgimento, the intellectual and political movement that had sponsored the unification of the country, was driven mostly by nationalistic ideals. The ruling elite of the time, of which Prime Minister Cavour was a notable member, had established some economic priorities. Railways had to be built to favour Italy's industrial development and a free trade regime had to be established.

[10]Other territorial changes occurred after the First World War when Trento, Trieste and the South Tyrol joined Italy and finally after the Second World War when part of the Venezia-Giulia was given to Jugoslavia. These two changes in borders do not fall into the time range of this thesis.

The economic policies of the first Italian governments mostly followed these two main lines. Both targets were set with the British experience of industrialization in mind and also the British economic literature of the time.[11]

The pace of railway construction increased in this period: from an average of 176 km of new rail lines built per year in the decade 1851–1861, the rate increased to 376 km per year between 1861 and 1876 and later remained around 300 km per year until 1905 (King, 1985, p. 40). Before 1861, most of the rail lines had been built along a line connecting Venice, Milan and Turin. After 1861, two new lines along the East and West coasts were built. By the end of the century, the southern regions went from a sharing of 6% of Italian railways to around 40%, proportional to their population.[12] However, according to Cafagna (1989, p. 289) the construction of railways did not have the spill over effect that had been expected. Most of the companies building the lines were foreign owned and had contacts with other foreign companies to buy both building and mechanical materials. Therefore, the demand for building materials and rolling stock was mostly directed abroad. Moreover, the Italian engineering sector was still very small and could not compete with foreign companies. Fenoaltea (1971, p. 343) and Fenoaltea (2006, p. 215) quantitatively confirm the intuition of Cafagna (1989) on the limited effect of railways, both directly through the inter-connection of Italian regions and indirectly through the stimulus of the industrial sector.

The other element on which the first Italian governments focused was the opening of the country to free trade. Before 1861, most of the pre-unitary states had adopted measures to protect their economies; the two exceptions to this were the Kingdom of Sardinia and Tuscany. In the case of the first, Cavour believed that free trade was always one of the most important policies to pursue.[13] Cavour had taken Britain as his model for the Piedmontese trade policy, for a variety of reasons: the attempt to introduce Italy into the international system of investments and technological transfers; the reciprocity of treatment by commercial partners that could allow Italian industrial goods to enter foreign markets; and, last, the need to pay Britain and France for their political and financial aid during the process of unification (Zamagni, 1990, p. 147). As the new territories were annexed, the tariffs and commercial treaties of the previous Kindgom of Sardinia were extended to the whole Kingdom of Italy. Free trade policies

[11] Zamagni (1990, p. 147).

[12] Romani (1976, p.420) provides an full description of the development of railways in Italy in this period.

[13] Ciocca (2007, p. 78) provides an overview of the political and intellectual heritage of Cavour, who died only three months after Unification but whose influence lasted well beyond his demise.

were favourably seen by land owners, who were very well represented in the first Italian Parliament, because they were thought to boost the export of agricultural goods and the importing of industrial goods. There had been some debate on what trade policy to adopt after 1861 among the economic and intellectual elites, whose members called for more protection. However, protectionism did not have many supporters outside of these elites until the mid-1870s, when American grains started to be competitive on the Italian market (Cafagna, 1989, p. 290). In 1874, an industrial enquiry by the Italian parliament was released; it had been directed by Luigi Luzzatti and Vittorio Ellena, two prominent intellectuals of the time, and their conclusions favoured more tariff protection for the Italian industrial sector. The debate involved economists and intellectuals until another parliamentary commission was established in 1883. This time the goal of the commission was more specific: the revision of the tariffs of the Kingdom. In 1887, a new customs duty was introduced. It strongly protected the textile industry and the agricultural sector, while offering less protection to other sectors such as engineering and chemical sectors. This arrangement was, according to Zamagni (1990, p. 152), the result of international negotiations where the high protection to textiles and agriculture came at the expense of less protection elsewhere.

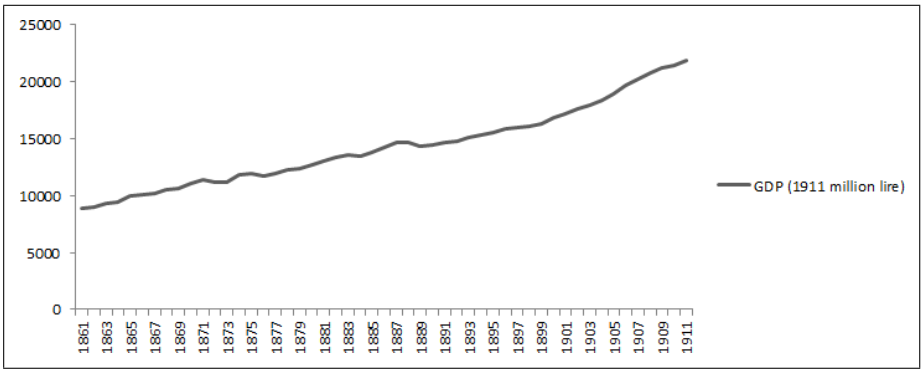
In the next sections we continue the discussion on the Italian economy as a whole looking at the evolution of its GDP. We then move to describing the industrial sector, which is the one on which we focus more closely, and the agricultural and service sectors of the Italian economy over the period 1871–1911.

Trends in the Italian GDP. We turn next in this review of the Italian economy to GDP, both in total and per capita, as the main indicator of economic performance. GDP estimates for the period between Unification and the First World War were produced for the first time by the Italian Statistical Office (ISTAT) in the 1950s.[14] Shortly after, a group coordinated by Giorgio Fuà produced revised estimates (Fuà (1965, 1969)). It is widely recognized by scholars that the first efforts spent on GDP estimates for pre-1914 Italy did not produce reliable series.[15] The starting point for a new estimation of the Italian national accounts came from Gerschenkron (1962) for industry while the work on agriculture was started by Federico (1979, 1982). Meanwhile, Angus Maddison attempted a revision of the ISTAT-Fuà series, highlighting the systematic overestimation of the Italian GDP in both ISTAT (1957) and Fuà (1965,

[14] ISTAT (1957).

[15] Fenoaltea (2010) explains that the estimates produced by the Fuà group came with very little detail on how they were compiled and therefore the exact cause of their shortcomings cannot be identified.

Figure 2.3: Italian GDP, 1861–1911 (1911 million lire).



Source: Baffigi (2011).

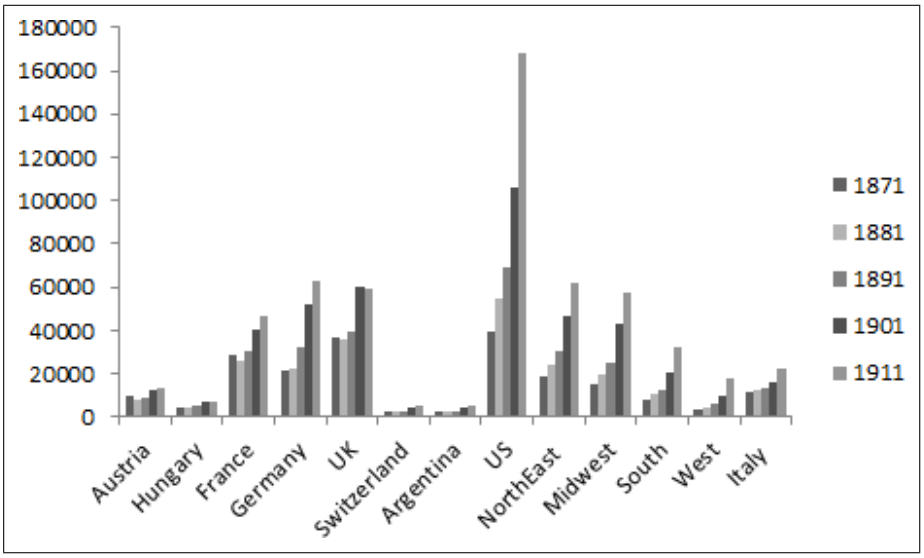
1969).[16] Maddison produced several versions of his estimates of GDP, covering most existing countries including Italy, all in the very long-run. The latest version is Maddison (2007). The latest available estimates for agriculture are from Federico (2003) and from Fenoaltea (2003a) while for services the reference is Zamagni and Battilani (2000). These estimates are still today the building blocks of any existing series of the Italian GDP for the years 1871–1911. Daniele and Malanima (2007) also used these figures for the sub-period 1871–1911 of their long-run estimate of Italian GDP. In 2011, the year that marked the 150$^{\text{th}}$ anniversary of Italian Unification, the Bank of Italy promoted the research project "Italy and the world economy, 1861–2011". Part of this project was devoted to the rationalization and revision of the historical statistical data covering the entire 150 years after Unification. Baffigi (2011) contains GDP estimates in constant and current prices, which are the most up-to-date series available.[17] Figure 2.3 shows the GDP series provided by Baffigi (2011) for the period 1861–1911 and Figure 2.4 shows the Italian GDP in census years in comparison with other countries.

Two considerations emerge from these figures. The first is that Italy's GDP had a steady growth in this period, with an average growth rate just below 2%. As noted by Baffigi (2011, p. 12) these series conclusively dismiss the hypothesis of a Gerschenkronian take-off at the turn of the century, which was suggested by Gerschenkron (1962) himself and later by Maddison (2007), but which had already been challenged by Fenoaltea's reconstructions (Fenoaltea (2003a, 2006)). The second is that the size of the Italian economy compared to those of its main trading partners was in this period still quite small. Both these characteristics of the Italian economy would change dramatically after the Second World War, when the exceptional economic performance

[16] See Maddison (1991).

[17] These series are the ones used in this thesis when our methodology requires national GDP estimates.

Figure 2.4: GDP of Italy and its main trading partners, 1871–1911 (1911 million lire).



Source:Prados de la Escosura (2000) and Crafts (2005a).

of the 1950s and 1950s would "break the centuries old trend" and mark what is often referred to as the "Economic Miracle".[18]

The last point to touch on before moving to the description of the three sectors is the evolution of the GDP per capita. Felice and Vecchi (2013) take a very long term perspective and discuss the evolution of GDP per capita in the last 150 years. The Italian GDP per capita in the period between Unification and the Second World War doubled while it has increased seven-fold since 1951.[19] Therefore, the period that we focus on in this thesis is not a period of high growth in GDP per capita, although it has an upward trend, with the growth rate doubling in the period 1901–1913 (the so-called Giolitti age) compared that of the previous decades after Unification.[20] Again, the hypothesis of the take-off in this period is not confirmed, since most of the twelve-fold increase experienced by Italy's GDP per capita would actually take place in the postwar period, giving Italy a place among the richest countries of the world.

The first Italian industrialization. Before the 1880s, the progress of the Italian industry was rather slow, especially if compared to the progress of the post Second World War period. Scholars and institutions have been engaged in the estimation of the industrial indices for Italy since the 1950s. Gerschenkron published in 1955 his

[18] Felice and Vecchi (2013) provide a complete discussion of the growth and recent decline of GDP from Unification to the present. This work relies on the reconstruction of national accounts made available for the 150th anniversary.

[19] Felice and Vecchi (2013, p. 6).

[20] Felice and Vecchi (2013, p. 8).

work on the industrial growth of Italy from 1881 to 1913; the Italian statistical institute (ISTAT) published its estimates in 1957 and Vitali his in 1965.[21] Gerschenkron (1955) noted a slow pace of growth in 1881–1888 (4.6% per year), stagnation in 1888–1896 (0.3% per year), rapid growth in 1896–1908 (6.7% per year) and slow growth in 1908–1913 (2.4% per year) (Fenoaltea, 2006, p.15). The period 1896–1908 is considered by Gerschenkron as the period of the big spurt of Italian industrialization; however, the rate of growth seems to be slower that it was expected to be for a backward country such as Italy (the anticipated rate would have been between 8% and 12% per year). Gerschenkron attributes this low level of industrial growth to the delayed intervention by the Italian state since high tariffs had been imposed only after substantial delay. The industrial sector started to be protected by a specific tariff only in 1877 and this tariff was imposed only on the textile industry, leaving out other more innovative sectors (Gerschenkron, 1955, p. 367).

Later on, both ISTAT and Vitali produced new estimates which were used by Romeo (1969) for his analysis. According to Romeo, the first 20 years after Unification corresponded to the Rostwian phase of capital accumulation that ended in the 1880s when Italian agriculture started to decline. In the 1960s, Fenoaltea started to revise and extend of the Gerschenkron index. These new indices show that the 1880s had a steeper growth than shown by Gerschenkron but also cast some doubt on the size of the rate of growth in 1896–1908, as below 8% (Fenoaltea, 2006, p. 34). The latest estimates by Fenoaltea are the most complete and reliable. His results show that the 1880s were a much more prosperous decade than had emerged from the estimates by Gerschenkron and Vitali (Fenoaltea, 2003a, p. 696).[22]

In spite of the debate on the rate of growth of the industrial sector over the 1880s, there is a general agreement on the main trends of industrialization from Unification to the First World War. The progress of industries was quite modest in the two decades after Unification. Most of the advances took place in the textile industry, with silk production being mostly concentrated in Lombardy and cotton production in Piedmont. The other sectors were all less dynamic. The iron and steel industry and the engineering industries were still far behind compared to their foreign counterparts and most of

[21] The estimates by both Gerschenkron (1955) and Vitali (1965) are illustrated in comparative terms in Fenoaltea (2006, pp. 16–19).

[22] Since the publication of his work "Peeking backward: regional aspects of industrial growth in post-Unification Italy" in 2003, where the first even regional series of value added figures are published, the work of reconstruction by Fenoaltea has had a much stronger regional focus. Therefore, in this work we refer to the series in Fenoaltea (2003a) and Fenoaltea (2006) for the national industrial sector. For the regional series we use Fenoaltea (2003b) and for the provincial series Ciccarelli and Fenoaltea (2013b).

the industrial supplies for these sectors were still imported. Before 1880, some small steps forward were taken in the food and chemical industry also. According to Cafagna (1989), the Italian economy in the two decades after Unification remained predominantly agricultural, with some initial industrial activity in the northwestern regions which had more contacts with the most industrialized European countries. This allowed Piedmont, Liguria and Lombardy to import technologies and to build a financial and commercial network to support their industries (Cafagna, 1989, p. 292).

At the beginning of the 1880s the first signs are seen of a change in the pace of industrial growth. In this period there was a change in several elements that favoured industrialization (Cafagna, 1989, p. 293). As we know, in this period the tariff regime changed to improved protection for domestic industries. The engineering and iron and steel sectors benefited from the orders placed by the Italian government for both building and machinery for railways and ships for the navy.[23] Another important change was a fall in freight rates that led to the fall in the costs of imported raw materials, in particular, coal.[24] In the late 1870s, Italian agriculture entered a crisis because of the competition from North American grains. This crisis discouraged investment in the agricultural sector and redirected resources to the rising industrial sector. As explained earlier, this was when both the industrial and the agricultural elites started asking for more protectionism, leading to the tariff regime of 1887. The first investments after Unification affected the urban economy, with the construction of urban infrastructure (in transport, electricity and construction). However, the positive effects of these investments were limited by the international economic crisis of the late 1870s and early 1880s (Cafagna, 1989, p. 294). At first, the industry benefiting most from the increased investments and the protectionist regime was the textiles. Urban development along with with higher tariffs expanded the internal market and benefited this sector. Moreover, textile companies tended to be small and self-financing was very often the preferred way to find capital (Cafagna, 1989, p. 296). For this reason, the textile industry was less hurt by the severe banking crisis that led to the failure of all issuing banks and some large commercial banks in 1893. Another sector that greatly devel-

[23] The Beccarini law giving quotas to the Italian engineering sector for the construction of railways was passed in 1882. In 1885 direct assistance was given to the shipyards in Genoa, Livorno and Naples; iron and steel for shipbuilding were provided mostly by the iron and steel works based in Terni, which also received support.

[24] According to Cafagna (1989, p. 294) the price of imported coal fell from an average of 370 Italian lire in the 1870s to 260 in the 1880s; Bardini (1997, p. 363) finds similar decrease from 29.28 shillings in 1870 to 20.70 in 1886. In the same period the volume of imports of coal increased from 1,300,000 to 4,000,000 Tons.

oped in this period was the engineering sector because of the orders connected with the building of railways and ships; iron and steel were also starting to be produced in Terni (Umbria) which later became one of the most important centres in the country for iron and steel production.

What Gerschenkron considered the big spurt of Italian industrialization did not occur until the end of the world crisis of 1896. This expansion corresponded to a positive phase of the world economy which lasted until the outbreak of the First World War. From 1897 to 1913, the rate of industrial growth touched levels that Italy had never experienced before. In spite of the differing results by various scholars, all agree on that the pace of growth increased dramatically after the crisis. According to Fenoaltea (2003a), the rate of industrial growth was 1.2% in the period 1888–1896, 7.6% in the period 1896–1908 and 2.3% in 1908–1913. According to Toniolo (1990, p. 163), the conditions that allowed this expansion were several. The reorganization of the banking system after the crisis provided reliable capital for investment; the new Giolitti government appeared more focused on the industrial development of the country; the recovery of the world economy provided more capital from abroad and reopened foreign markets to Italian industrial goods.

The sectors which are mostly fostered in this period are those which produced intermediate and durable goods. Specifically, electrical, engineering, chemical and steel and iron industries were the most active in this period. The goods produced in these sectors, electricity above all, would eventually be widely applied in other sectors, creating intersectoral linkages and innovating the productive process in many sectors. Of course, the role of traditional industries such as textiles and food industries was still very large, but alongside these, new industries were now developing. The first Italian electrical company, Edison, was founded in 1882 but electricity production boomed only at the turn of the century, when lakes and rivers in the Alpine regions started being employed in hydroelectric production. The production of electricity in Italy increased by a factor of 16 between 1900 and 1914, reaching 73% of the British production at the time (Toniolo, 1990, p. 171). The electricity was fruitfully employed both in industry and in private consumption. The engineering sector grew to the point that Italian railways could rely completely on home production. Breda and Ansaldo are two of the first companies to have developed in this framework. The automobile industry was also born in this period: FIAT was founded in 1899 and Alfa Romeo in 1910. In the chemical industry, rubber stood out, with Pirelli acquiring a international role in the sector.

Agriculture and services. At the time of Unification, agriculture accounted for roughly half the Italian GDP.[25] In terms of share of the labour force in agriculture, in all the years considered the share stayed above 50%. For the whole period between Unification and the First World War, agriculture was the sector with the largest relative share. The dramatic decrease of labour force in agriculture that characterizes sustained economic growth took place only after the Second World War (Toniolo, 1990).

For a long time the general assessment of Italian agriculture has been that it was backward in its technology and production performance compared to that of the Northern industrialized countries of Europe. O'Brian and Toniolo (1991, p. 403) compare the value added per agricultural worker in Italy and in the United Kingdom in the period 1909–1914 and find that Italian workers produced roughly 60% of their British counterparts. Zamagni (1990, pp. 83–90) points out that during the first 50 years after Unification, Italian agriculture did not perform very differently from the previous period, discarting the thesis by Romeo (1969) who claimed that this period was one of the most rewarding for Italian agriculture. Zamagni (1990) also discusses the role of the grain invasion, whose effects were perceived by the Italian agricultural sector although these were delayed by the introduction of duty on wheat imports in 1887.[26] The rather grim view of Italian agriculture has been largely revised by Federico (1994b), both in terms of data analysis and in terms of critical analysis.[27] The assessment of the Italian agricultural system by Federico (1994b, pp. 105–107) is cautiously positive: it managed to feed the increasing population during the first Italian industrialization and it provided a labour force to the growing industries.

As for the service sector, its share with respect to the total GDP remained roughly constant, between 15% and 20%.[28] The stability of the share in this sector derives from the structure of the demand for services, which tends to follow the trajectory of the rest of the economy (Toniolo, 1990, p. 9).[29] The public sector, which was mostly localized in large urban centres, tended to behave similarly and had a slow growth rate over the entire period that we focus on. The forging ahead would take place only in the 1930s, boosted by the Fascist policies and the war in Ethiopia (Toniolo (1990, p. 11)). Services are important in the process of industrializing nation because of the role

[25] Federico (1996).

[26] On the effects of the grain invasion on the agricultural sector in Europe see O'Rourke (1997) and for a discussion specifically on the southern European countries see Morilla et al. (1999).

[27] The latest estimates of the Italian agricultural production are from Federico (2003).

[28] Felice (2007b).

[29] The latest published estimates available for the service sector are from Zamagni and Battilani (2000) although Baffigi (2011) uses unpublished estimates from the authors cited by Emanuele Felice.

of the financial system behind them. According to Gerschenkron (1962), Italian banks did participate in the great spurt of the Italian industrialization by providing capital and entrepreneurship (and therefore offsetting the lack of classical prerequisites for industrialization), as happened in Germany. The Italian banking system at the time of Unification was modelled on the example of French banks, with the issue function performed by six commercial banks rather than one single central bank and some deposit banks. In the 1890s, the Italian banking system experienced a severe banking crisis, with the failure of all six banks of issue and two major deposit banks, Credito Mobiliare and Banca Generale. In the mid-1890s, German and Swiss bankers established Banca Commerciale and Credito Italiano on the model of the mixed German banks.[30] The positive role of mixed banks in post-Unification Italy has been questioned. In his seminal work, Confalonieri (1974, 1982) depriciates the role of mixed banks versus strictly commercial banks. The claim is that French style commercial banks played an important role in both constructing the first railways in the 1870s and in promoting the first industries in the 1880s. Federico and Toniolo (1991, p. 205) present an overview of the quantitative evidence on the role of banks but are unable to conclude how far the role of mixed banks in Italian industrialization extended.

So far, we have outlined the general trends of the Italian economy, with a special focus on industry, in the period that goes from Unification in 1861 to the First World War. From 1871 to 1911, all the Italian regions experienced some degree of industrial growth. The industries that were most active in this process were the classic textile industry, the engineering industry, the iron and steel industry, the electrical industry and last the chemical industry. As set out in the introduction, the regional dimension of the first Italian industrialization has been paramount. The next section discusses the regional differences in growth rates and levels of industrialization among the Italian regions.

2.3 Regional disparities: an historiographical overview

In this section we illustrate the state of the art of quantitative research on the North-South divide among Italian regions and provide a critical discussion of the main explanations proposed in the literature.

[30] Mixed banks are banks that combine commercial banking with industrial finance, often sharing the capital of the new companies.

2.3.1 The debate in numbers: GDP, industrialization and development

When discussing the economic condition of the Italian economy, the regional differences are the most striking feature in both the present and historical perspectives. Italy still experiences today a persistent gap in terms of economic indicators from the northern and southern regions.[31] It is in the 1880s that the Italian regions start to polarize in terms of GDP per capita and even more sharply in the level of industrial production. As we will see, during the first decades after Unification, most of the economic gap was between the Northwestern regions (Piedmont, Lombardy and Liguria) versus the rest of the country. This tendency has mostly been increasing for 150 years and more of Italy as a unified country, except during the period of very high economic growth between the late 1950s and the early 1970s.

As for the case of national reconstruction, regional and provincial reconstructions of national accounts, production and development indicators have been for a long time at the centre of the debate among scholars. The first quantitative study on regional disparities in 1911 comes from Zamagni (1978). The choice of 1911 depends on data availability: 1911 is the year of the first industrial census and the work by Zamagni is mostly concerned with regional industrialization. Industrial value added is here estimated for the first time, relying on employment figures provided in the census.[32] The value added in agriculture and services is also estimated here at regional level using direct production figures for the former and fiscal data for the latter. The main result of this study is a very pronounced North-South divergence. However, although these estimates were the only regional ones available for over 20 years, their reliability is undermined by data issues (Felice, 2013a, p. 29). The next scholar to estimate regional series is Stefano Fenoaltea, who focuses on the industrial sector for the same period as is considered in this thesis.[33] Felice (2013a, p. 30) provides a detailed discussion of

[31] The use of the terms North and South in this context aims at giving a stylized picture of the economic disparities; it is well known that both the North and the South of Italy were quite heterogeneous. For instance, Felice (2007a) discusses how the regional divide in terms of GDP per capita was also an East-West one at the time of Unification.

[32] The use of these figures rather than the figures from the 1911 population census is the object of a decades long debate among economic historians; Ciccarelli and Missiaia (2013) discuss the matter in detail; a summary of the arguments brought by the two sides is also contained in Chapter 3 of this thesis.

[33] The first article published in this direction is "Peeking Backward" (Fenoaltea, 2003b) but several other works, most of them co-authored with Carlo Ciccarelli, were later published: Fenoaltea (2004), Fenoaltea and Ciccarelli (2006), Ciccarelli and Fenoaltea (2008a), Ciccarelli and Fenoaltea (2008c), Ciccarelli and Fenoaltea (2008b), Ciccarelli and Fenoaltea (2009a), Ciccarelli and Fenoaltea (2009b), Ciccarelli and Fenoaltea (2010) and Ciccarelli and Fenoaltea (2013a).

the differences between the method used by Zamagni and that used by Fenoaltea. The fundamental points are that Fenoaltea uses employment data from the population census to allocate regional shares of production while Zamagni uses industrial censuses;[34] and that Fenoaltea does not correct for productivity differences using wages, while Zamagni does.

The first scholar to propose GDP estimates for the Italian regions for our period is Esposto (1997). Esposto largely relies on the method from Crafts (1983) which basically implies using proxies such as letters per capita, coal consumption and infant mortality to estimate GDP. This work opened the way to the estimation of regional GDP but the methodology and the results are far from convincing.[35] Emanuele Felice also proposes GDP estimates for the Italian regions starting from 1871.[36] These estimates do not use proxies but they are grounded on production and employment figures and they take "the best parts of the work [by Zamagni and Fenoaltea]" (Felice, 2013b, p. 30) and using the method of Geary and Stark (2002) they provide estimates for 10-year-benchmarks.[37] Daniele and Malanima (2007) also use the same sectoral reconstructions as Felice to produce their regional GDP estimates. These estimates have been widely discussed among scholars because of their surprising results: they find that there was no gap between the North and South of Italy at the time of Unification, leading to a new interpretation of the divergence that can be attributed to post-Unification policies. However, the methodology used in Daniele and Malanima (2007) has been criticized because of its procedure in attributing the regional quotas of national production.[38] We decided in this thesis to use the estimates by Felice for two main reasons. First, they apply the estimation method proposed by Geary and Stark (2002), which is the most frequently encountered in the existing literature on historical Economic Geography for estimating regional GDP.[39] The second reason is that the estimates by Felice are the most recent and make wide use of the work done within the research project "Italy and the world economy, 1861–2011".

[34] The procedures are illustrated in detail in Chapter 3.

[35] The results by Esposto (1997) point at a very wide GDP gap between North and South as early as 1861, which we now know was not present at the time of Unification.

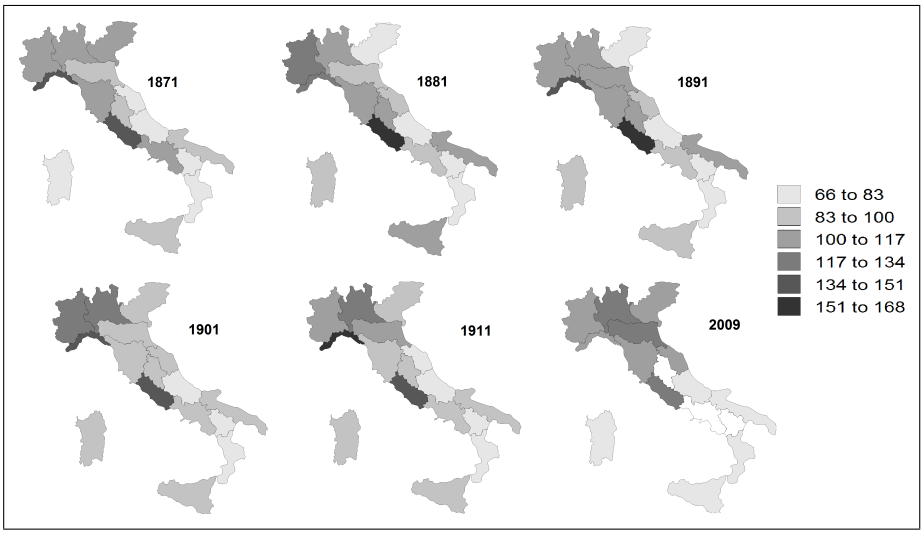
[36] The reconstructions by Felice are Felice (2005), Felice (2007a), Felice (2007b), Felice (2009a), Felice (2009b), Felice (2011b), Felice (2011a) and Felice (2013b).

[37] The sources for the period 1871–1911 are: Federico (2003) for agriculture, Fenoaltea (2003b) (and later revisions) for the industries and Zamagni and Battilani (2000) for services.

[38] (Felice, 2013a, p. 33) explains his critique in detail. For a reply to the critique see Daniele and Malanima (2014).

[39] See among others Crafts (2005b) and Schulze (2007).

Figure 2.5: GDP per capita of the Italian regions, 1871–1911 (constant 1911 prices, Italy=100).



Source: Felice (2009a) for 1881 and 1901 and Brunetti et al. (2011) for 1871, 1891, 1901, 1911 and 2009.

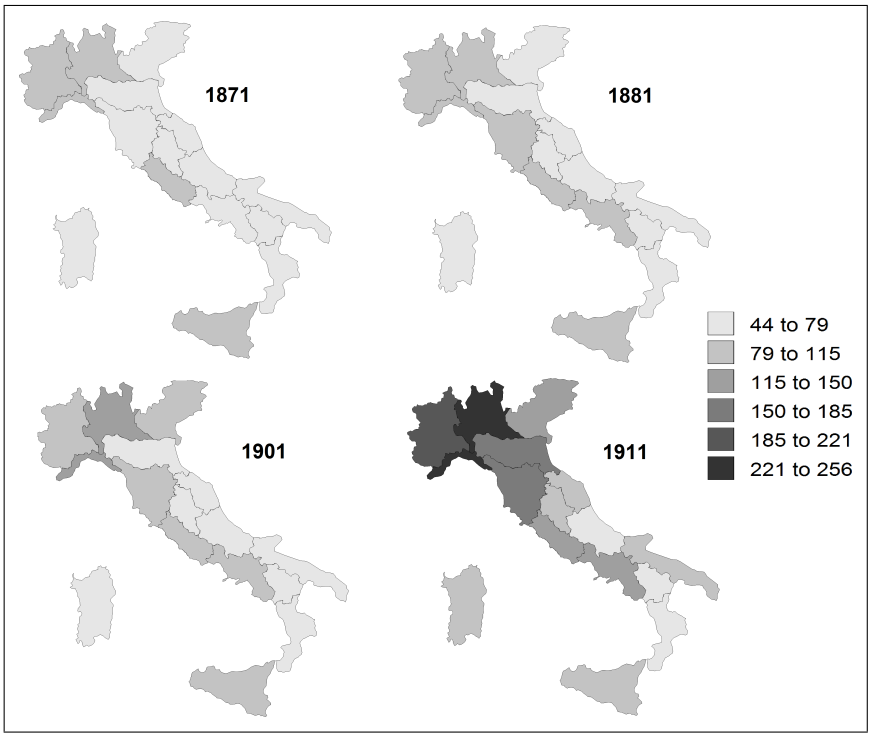
We therefore start this review of the quantitative evidence on the regional disparities by discussing GDP per capita. Figure 2.5 gives a sense of this divergence process in terms of GDP per capita for the period between Unification and the First World War. In this graph we also include a map of regional GDP per capita in 2009 from the same author to show how economic dualism remained a strong feature of the Italian economy.

The period 1871–1911 covers the rise in industrial growth described in the previous section and shows the formation of the gap between northwestern regions and the rest of Italy. Therefore, Figure 2.6 shows for four benchmark years the regional disparities in the industrial value added per capita, meaning the part of the GDP per capita originated by the industrial sector.[40]

The picture here is even more eloquent in terms of divergence. We see that in 1871, when Italy was still predominantly agricultural and there was only some industry based on silk in Lombardy, a clear pattern was not recognizable. On the eve of the First World War, the Northwestern area formed by Lombardy, Liguria and Piedmont stands out from all other regions. This area is often referred to as the "Industrial Triangle" and it is here that most of the Italian modern industrial sectors had come into existence. Looking at the two maps, it can be noted that the main change is not in the magnitude of the divergence but the fact that in 1871 there is almost no North-

[40] We do not attempt to include similar estimates for later periods because the same author does not provide comparable series as in the case of GDP per capita.

Figure 2.6: Industrial value added per capita of the Italian regions, 1871–1911 (constant 1911 prices, Italy 1871=100).



Source: Fenoaltea (2003b) and Fenoaltea (2003b) and MAIC (1874, 1883, 1902, 1914).

South gap. Most of the gap in 1871 was West-East, with the Eastern regions falling behind in terms of industrialization. According to Fenoaltea (2006, p. 231), most of the regional divergence in industrialization starts after 1881. To understand how the North-South gap developed it is useful to discuss the distribution of the industrial sectors in the various regions. In 1871, the industrial structures of the regions are very similar. Each region has almost all the sectors; this could be due to the political divisions before 1861 and to the high transport cost that impeded the specialization of the regions. The sector that has the highest concentration is mining: most of it is based in Sardinia (10.5% in 1871, 14.1% in 1911), Sicily (43.5% in 1871, 32.4% in 1911) and Tuscany (13.8% in 1871, 18.1 in 1911). The electrical industry had 20% of its national production in Latium in 1871 but the figures becomes 8.6% in 1911 because of the construction of hydroelectric plants in the North (Lombardy goes from 11.2% to 24.4% in the same period while Piedmont goes from 13.5% to 17.9%).[41] In the broader manufacturing sector, only the textile production in 1871 is already concentrated in the Northwest, as already discussed in the previous sections (only in Lombardy, Piedmont and Liguria combined was there more than 60% of the total production). Within the

[41] Fenoaltea (2006, p. 252).

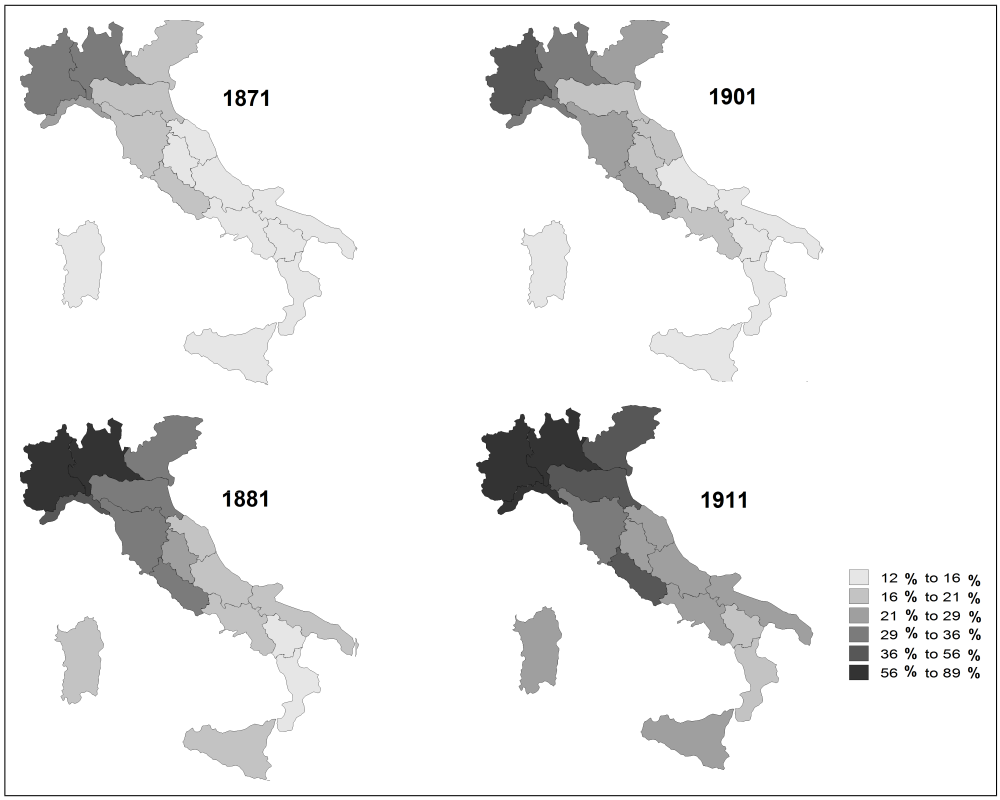
Industrial Triangle, the industrial structure of the three regions is not the same. Liguria specialized quite early in engineering and iron and steel production thank to its ports where coal could be easily imported. Piedmont and Lombardy were more specialized in manufacturing, with almost all types their manufacturing being over the national average by 1911. Tuscany and Campania were in this period around the average in manufacturing but as we go further and further south, the relative quotas decrease and we often see only one type of manufacturing significantly represented.[42]

To conclude this section, we discuss the regional distribution of human capital. Human capital is often used as explanatory variable for the level of development at both national and subnational levels.[43] In the case of pre-First World War Italy, human capital is very often measured in terms of literacy rates. Several authors have conducted research on literacy and in general on the formation of human capital in Italy. The first to touch this topic for Italy is Zamagni (1973) where she provides both literacy rates at regional level and also estimates of the public expenditure on education. Zamagni (1996) deals with technical education and its regional diffusion over Italy. In recent years, human capital has been included among the possible elements that caused the South to fall behind. A'Hearn et al. (2011) provide an overview of the education performance of Italy over its 150 history. The study provides literacy rates from population censuses at regional level for the population of 15 years of age and older. These are the estimates that we use in this thesis. Figure 2.7 shows the literacy rates for the usual benchmark years.

These figures clearly confirm the picture that arises from the previous indicators: the southern regions at the beginning of the period lagged behind the northern regions, and in particular the regions forming the Industrial Triangle. Felice and Vasta (2012) study what determined the modernization of the Italian economy from 1871 to 2007. The paper presents estimates of the Human Development Index (HDI), which is an index created by the UN to compare the levels of development across countries and that found fruitful applications in Economic History (Crafts (1997) and Prados de la Escosura (2014)). Felice and Vasta (2012, p. 22) includes a specific discussion on the role of education, which is one of the three ingredients of HDI, along with income and life expectancy. They note that literacy is a measure that is useful in explaining disparities in earlier stages of industrialization, when literacy rates are quite widely

[42] Fenoaltea (2006, pp. 252–262).
[43] A'Hearn et al. (2009a), Prados de la Escosura and Roses (2010) and Go and Lindert (2010).

Figure 2.7: Literacy rates in the Italian regions, 1871–1911 (Italy=100).



Source: A'Hearn et al. (2011).

dispersed. As the literacy rates converge, other measures of human capital need to be used.[44] For the period 1871–1911, the dispersion of literacy rates across Italy suggest that literacy rates are a meaningful indicator of human capital.

In the next section, we discuss the several theories and explanations that the literature provides regarding the formation and the persistence of the north-south gap.

2.3.2 Main explanations for the North-South divide

The historiography has brought forward several explanations for what is often referred to as the "Questione Meridionale", the Southern Question. The recent book by Felice (2013b) contains an excellent critical review of all the existing schools of thought on why the South of Italy fell behind the North. Felice basically states that all explanations tend to either attribute the full responsibility of the failure to the South or to absolve the South completely, seeking external and exogenous factors to explain its poor performance. Felice (2013b) finally proposes his own explanation, which is far from absolving the South but that attributes the responsibility for its troubles to its elites

[44] Felice and Vasta (2012, p. 23) propose as an alternative the geometric average between years of schooling and expected years of schooling.

rather than to the population as a whole. In this section we discuss each of these views, following, when possible, the chronological order in which the appeared in the debate.

The "colonial view". Immediately after Unification, both politicians and intellectuals began debating over the differentials in the economic conditions of the Italian regions. The "Questione Meridionale" appeared immediately as one of the most compelling problems in post-Unification Italy. Some of main representatives of the group of intellectuals called "Meridionalisti" were Villari and Sonnino, who were engaged in research and enquiries into the economic and social conditions of the South.[45] At the turn of the century, the idea that the negative economic conditions of the South were a national issue that affected the development of all Italian regions was developed by intellectuals such as Nitti, Salvemini, De Viti De Marco and Gramsci. Nitti (1900) claimed that the first Italian tax system redistributed wealth from South to North; De Viti de Marco (1930) was the first to claim that the South was transformed in a colonial market for northern industrial goods; Salvemini (1955) believed that the delay of the South was due to inequalities in the ownership of land which ought to have led a land reform; Gramsci (1950), one of the founders of the Italian Communist party, believed that that the solution would have been to establish a socialist economy that would have cancelled differences among regions.[46] Felice (2013b, pp. 206–217) discusses the quantitative basis of these claims. In particular, he dismisses Nitti's reconstructions of the tax accounts by citing the harsh critique by Gini (1914) whose re-estimation is considered by Felice as the most reliable to date.

The first works that focused on the issue from an historical rather than political perspective started to be published after the black-out effect of Fascism and the Second World War had worn away. The literature in this period was still influenced by Marxism and also by the works of the Meridionalisti. Sereni (1947) was one of the first scholars to propose the colonial explanation for the failure of the southern regions to keep pace. Sereni claimed that the industrialization of the North had occurred through the exploitation of the South. In this view, the tariffs passed in 1887 subsidized the industrial sector of the North while lowering the surplus of the consumers in the South. Moreover, investments in infrastructure were targeted to boost the factories of the Industrial Triangle, allowing the North to exploit the market of the South (Fenoaltea, 2006, p. 219). Another scholar to be mentioned is Romeo (1969). In response to the

[45] Villari (1979), Sonnino (1877).

[46] An exhaustive overview of Meridionalismo can be found in Felice (2007a, p. 18).

analysis of Gerschenkron of Italian industrialization, Romeo supported a thesis very similar to that of Sereni on the exploitation of the southern markets.[47] For Romeo, the high inequality among southern farmers slowed down their consumption. The use of taxation to build infrastructure in the Northwest redistributed the surplus from south to north. Romeo disagreed with Gerschenkron on the effects of the policies adopted by the Italian Governments after 1861: he believed that Government intervention enhanced industrialization in the North. However, this intervention caused the gap between northern and southern regions to take shape.

In recent years there has been a revival of these positions. The book "Terroni" by the journalist Pino Aprile has gained large public attention. Aprile (2010) relies on the estimates of regional GDP by Daniele and Malanima (2007) to claim that the South of Italy was as rich as the North at the time of Unification and that the extractive policies by the Italian State, which at the time were controlled by the Northern elites, damaged the South. Felice (2013b) responds to the work of Aprile by bringing forward the large body of quantitative evidence which we have summarized in the previous sections.

This "colonial" view has been strongly opposed by many scholars, starting in the 1980s. According to Cafagna (1989), there is no evidence of the South providing raw materials, labour force or capital to the northern industrial sector nor being able to serve as internal market for industrial goods (Cafagna, 1989, pp. 194–213). Moreover, the two economies, at the time of the first industrialization appeared not to be complementary. This rules out the explanation of the gap in terms of exploitation of the South. (Federico and Tena, 1998, p. 90) also understate the actual effect of protection on the Italian economy. If this is true, the claims of the trade policy being unbalanced towards the protection of the northern industries appear to have no verification.[48] Part of the colonial view focuses on the role of public intervention by the Italian State. The idea is that state intervention was implemented to help Northern regions, neglecting the South. This view does not appear very convincing: various scholars have studied the provisions implemented by the Governments before the First World War and the general assessment is that they did not have much effect on the patterns of economic growth. The protectionist tariff of 1887 has often been pointed out as an element which boosted

[47] Romeo was engaged in an academic debate over the thesis of Gerschenkron (1955). Gerschenkron had criticized the first Italian governments for not supporting the northern industrial sector enough after Unification; in this context Romeo pointed out that it was exactly that policy of support of northern industries that had created the gap.

[48] See Felice (2007a, p. 37) in his volume on public intervention and regional divergence; the point is reiterated even more strongly in Felice (2013b, p. 214) where the author claims that the 1887 tariff on wheat was actually detrimental for the northern industries.

the northern industrialization while trapping the South in its subsistence agriculture. This hypothesis is dismissed by Federico and Tena (1998) in their paper on protectionist policies in Italy. In general, public policies before the First World War and the Fascist period have been quite limited. Public expenditure never exceeded 20% of GDP and did not increase much in the 1861–1914 period (it took up 16.8% of GPD in 1866 and 17.7% in 1913) (Zamagni, 1990, p. 210). Another study on state intervention is Felice (2007a). The author finds that before the end on the Second World War the role of the State was quite limited and ineffective and it cannot be blamed for the formation of the North-South gap (Felice, 2007a, p. 65). The building of infrastructure in the 1861–1914 period absorbed much of the initial effort of the new Kingdom. However, it was concentrated where more economic activity was already taking place. Therefore, the building of railways in the Northwest more than in the South, should be seen as a consequence rather than a cause of economic development.

The "agricultural" view. Cafagna and Zamagni provide an alternative explanation for the formation of the economic gap. These two authors focus on the agricultural roots of the North-South divide. Cafagna challenges the assumption of the Meridionalisti, according to which northern and southern regions had similar economic conditions before Unification. It is true that all Italian regions were still agricultural before 1861, but their agricultural structures were very different. Agriculture was organized in a very different way in the North and the South: in Lombardy and Piedmont, the size of farms was smaller that in the Kingdom of the Two Sicilies. The productivity per hectare in 1857 was strikingly different, with Piedmont at 169 lire, Lombardy at 238 and the Kingdom of the two Sicilies at 81 (Zamagni, 2007, p. 42). This confirms that the North had an intensive type of farming. The South had mostly latifundia, with extensive farming not organized by landlords, who would leave peasants free to farm the land but would appropriate any production exceeding what was needed for subsistence. After Unification, some coastal areas of the South specialized in fruit and vegetable production, which was highly productive but did not the spill-over effect of cotton and silk (Zamagni, 1990, p. 100). Using data by Eckaus (1959), Cafagna (1989, p. 189) shows that agricultural production and capital stock were much higher in the northern regions before Unification. Intensive agriculture in the North was more productive and was supported by a network of infrastructures, a high level of trade and the availability of credit. Moreover, the North had a larger market in terms of

purchasing power, a more specialized labour force, higher level of capital accumulation and more resourceful entrepreneurship (Zamagni, 1990, p. 99). These differences were reflected in the unbalanced development of textile industry employing silk and cotton. At the time of Unification, 75% of spindles were based in the North. The two areas were not different in size alone, but in organization as well: the southern mills were quite large but isolated within the economic context; in the north, mills were much smaller but constituted a system that had spill-over effects on the entire economy. This pattern in the North corresponds to the classical dynamics of the textile industry boosting industrialization, as the British Industrial Revolution.

This view that identifies the cause of the North-South gap in the agriculture of the South has been challenged by various authors.[49] The main points of discussion are the role of the traditional agrarian institutions, the aversion of land owners to competing in international markets and their ability to manage land efficiently. Federico (1996) admits that northern regions have coped better with these challenges but does not give a negative assessment of southern agriculture. One of the most recent works on the role of agriculture in regional disparities is an article by Federico (2007). Here Federico reviews the existing quantitative literature, starting from the estimates of total factor productivity (TFP) by Orlando (1969), and provides new improved estimates of TFP for the Italian regions. The estimates are more in line with the traditional view of a more efficient agricultural sector in the northern regions. However, Federico continues to reject the hypothesis that the gap in productivity was caused by institutional arrangements but points to the lower investment in innovation and the lower level of human capital (Federico, 2007, p. 336).

The "geographical" view. This view basically takes the physical geography of Italy as the primary cause of the backwardness of the South. For instance, Fenoaltea (2006, p. 261) gives a possible explanation for the regional patterns of industrialization in Italy before the First World War based on the comparative advantages of the North, in particular in terms of energy endowment from water, but he does not translate it into a formal model. Daniele and Malanima (2007, p. 181) discuss the role of the physical distance of the southern regions to the centre of Europe and they claim that the position of the South constituted a natural disadvantage for its industrialization. This explanation is strongly rejected by Felice (2013b, p. 201) who uses several other his-

[49] See Bevilacqua (1990) for a non quantitative approach to the issue and Federico (1994b, 1996) for a more technical critique.

torical examples, i.e. California, Japan and Southeast Asia, to demonstrate that mere physical distance from the core does not necessary imply a disadvantage. One other existing piece of research that links Economic Geography to the regional disparities in Italy is a working paper by A'Hearn and Venables (2011). The paper explores the relationship between economic disparities, internal geography and external trade for the 150 years of the unitary history of Italy. The authors propose different explanations for what drove economic activity across Italian regions in different periods: in the period 1861–1890 the main driver was natural advantage; in the period 1890–1950 it was access to the domestic market; and finally in the post-war period it was the access to foreign markets.

The purpose of this thesis is to contribute to the existing debate on geography and the way in which it relates to the North-South gap, by providing new estimates of the market access of the Italian regions and the use of them to explain both GDP per capita and industrial employment.

The "genetic" and "cultural" views. The so called "genetic" view is probably the one that has most often been dismissed by economic historians. Starting from the 19^{th} century some criminal anthropologists, Lombroso (1878) above all, started an inquiry into a genetic explanation of criminal behaviour. Niceforo (1901) was the first to apply these theories to the study of regional disparities in Italy. He claimed that southern regions were poorer because the local populations were genetically disadvantaged. In more recent times, Lynn (2010) has claimed that IQs can explain differentials in income, literacy and other indicators between the North and South of Italy. Felice and Giugliano (2011) dismiss Lynn's hypothesis, pointing out its logical inconsistencies: it is in fact well known that IQ scores and literacy rates are affected by school quality, which in turn is affected by (and could also affect) income. Lynn reverses the causality and in doing so he introduces heavy bias to his results.

Another view is the one that attributes the origin of the Italian economic dualism to the culture of the South. The idea that the differences among regions were a consequence of the different traditions among the pre-Unification states was widespread among the Meridionalisti. The main feature of what was perceived as a cultural deficit of the southern regions lay in the level of literacy. The Northwestern regions of the Industrial Triangle had a share of Italy's literate population of 54.7% in 1871 while the southern regions had 15.9% in the same year; the Northeast and Centre were around 30.02% (Felice, 2007a, p. 147). In this view, low literacy contributes to the persistence

of pre-modern institutions. The persistence of these institutions was considered one of the reasons for the delay of the South. In the 1950s, Banfield (1958) created the term "amoral familism" to describe the inability of southern Italians to cooperate beyond the boundaries of their family[50] This feature was typical of southern Italian society and made it not conducive to economic development. The argument has been developed in a more systematic fashion by social scientists starting from the 1980s. The concept of social capital is central to this point. It can be defined as the norms and beliefs that engage a group of individuals in collective actions with the goal of producing the public goods necessary for development (Felice, 2007a, p. 55). The deficit of social capital as an explanation for the Italian case was first proposed by Putnam et al. (1994). The authors go back to the early Middle Ages, when northern Italy was organized into city-states while the South was a feudal monarchy. This led the former to develop horizontal and egalitarian relations within its society and the latter to develop vertical and hierarchic relations. This made northern Italians feel more involved in public management and consider social welfare as part of their own welfare. In contrast, southern Italians developed a form of mistrust towards the authority and its actions.

More recent works by economic historians have tried to test the hypothesis that cultural differences explain the North-South divergence. A'Hearn (2000, 2005) focuses on the functioning of cooperative banks in the North and South of Italy. The aim of his work on banche popolari, a type of cooperative bank widespread in all Italian regions after Unification, is to test Putnam and his coauthors' hypothesis of cooperation failure in the South. In the 1880s, the number of banche popolari rose sharply. Given that this type of bank was based on cooperation, this finding could apparently be in contrast with Putnam et al. (1994). However, a great number of these banks failed in the 1890s. A'Hearn studies all the elements that led to the formation of the banche popolari, such as their mission and their business model, and finds no difference between South and North. What is different is the types of activity undertaken, their level of risk and their liquidity. This was due, according to A'Hearn, to a lower level of trust in the southern banks; they needed to reassure the mistrustful public by providing more liquid assets and higher returns (A'Hearn, 2000, p. 91).

A quantitative work on social capital in southern Italy was proposed by Galassi (2000). The explanation that the South was disadvantaged for having been misgov-

[50] Banfield conducted his research in Basilicata, where he spent a few months in 1954 studying the farmers of the village of Chiaromonte.

erned for many centuries is rejected: many regions in the world have been equally misgovernment but not all have have ended up falling behind their neighbours. Galassi explores the social capital explanation. Social capital is defined as the tendency not to defect from cooperative engagements. But this is a circularity problem with stating that where social capital is low then economic development is low. Social capital may well be a consequence of the low economic development. Galassi tries to overcome this problem. He analyses, in the North and South, a situation where the ex-ante condition for farmers to join a cooperative bank with unlimited liability was welfare improving but exposed them to the risk of neighbours' defections. If the improvement in welfare was the same for everyone who joined the membership, differences in the proportion of rural cooperative banks between regions could reflect different level of mistrust towards neighbours. This is what the quantitative analysis by Galassi finds and in spite of the differences between southern regions, it seems to support the cultural explanation for the economic gap (Galassi, 2000, p. 50). The most recent study on social capital in the Italian regions is Felice (2012), in which the author tests the role of both social and human capital as an explanatory variable for long-term regional inequality among Italian regions; The result is that, in contrast to the findings by Putnam et al. (1994), human capital has more explanatory power than social capital except in recent decades, suggesting that the backwardness of southern regions can hardly be explained by a single variable.

The "institutional" view and passive modernization. The institutional view is often seen as very closely connected to the cultural view. Both Galassi (2000) and A'Hearn (2000) discuss the way in which culture shapes institutions in southern Italy. Felice (2013b) separates what he calls the "socio-institutional" explanation from the cultural ones proposed by other authors.[51] Felice follows the large body of literature started with by the work of Acemoglu et al. (2001) who explain the difference in economic performance between North and South America with the different types of institutions established by their colonizers. In particular, in North America, where the climatic conditions were more favourable to permanent settlements, non-extractive institutions were developed; quite differently, in South America extractive institutions undermined the chances of developing a more equal and prosperous society. The key lies in the path dependency that characterizes these institutions. Felice claims that

[51] Felice (2013b, p. 218).

the key to understanding the Italian economic dualism is this path dependency. Political and economic elites have the chance to break this vicious cycle; those of southern Italy did not act to do so and can be blamed for the failures of the South. Felice and Vasta (2012) distinguish two types of modernization: active and passive. Active modernization takes place when the entire society is involved in the creation of a national market, the building of infrastructure and the development of the human capital of its population; passive modernization takes place without an organic strategy but it is imposed from the outside through, for example, State intervention. In this case the ruling elites establish extractive institutions such as the one described by Acemoglu et al. (2001).[52] The claim is that the North has been able to undertake an active modernization similar to that of other industrialized countries while the South remained trapped in passive modernization. The responsibility for this does not lie in the behaviour of the entire Southern population, as a cultural approach would suggest, but in that of its ruling elites.

The idea that the South of Italy lagged, and still lags behind, because of the culture and institutions that it developed throughout history is fascinating to many. However, virtually all theories on culture and institutions share a fundamental shortcoming because of the endogeneity between economic performance and the proposed explanations for it. Are bad institutions established where economic conditions are poorer or, conversely, are those institutions the cause of economic backwardness? Moreover, what is the role of culture in shaping institutions? As we have seen, scholars such as Galassi (2000) and A'Hearn (2000) have engaged in testing the efficiency of institutions in southern Italy. Their results confirm that the level of trust among southern farmers is lower in the case of cooperative banks. However, it is not necessarily the case that this is the direct cause of economic backwardness nor that causal relationships can necessarily be read in only one direction. A similar objection is often moved in the literature inspired by the work of Acemoglu et al. (2001). Although the reasoning appears sensible and intellectually appealing, proving their theories empirically has been found quite difficult. The case of Italy is no exception.

The debate on the regional gap between the North and South of Italy, from the theories proposed by the Meridionalisti to the very recent ones inspired by the institutional approach, is still open. No consensus has been reached on the origins of the economic dualism and its persistence throughout the 19^{th} and 20^{th} centuries. The hypothesis

[52] Felice and Vasta (2012, p. 7).

presented here has involved public policies, agriculture, culture and institutions. Other possible causes are linked to entrepreneurship, property rights, climate, demography, education and capital markets (A'Hearn, 1998, p. 735). The literature on the Italian economic performance of the last two decades has taken a much stronger regional and quantitative approach. This has fuelled research on regional divergence aiming at assessing quantitatively the size and scope of the gap. Comprehensive explanations based on descriptive data such as Cafagna (1989), Zamagni (1978, 1990), Ciocca (2007), Felice (2007a) and Daniele and Malanima (2007) are complemented by other studies intended to test the various hypothesis econometrically. Examples of the quantitative testing of an hypothesis for the gap are those proposed by A'Hearn and Galasso, although they restrict the analysis to case studies and their results are not necessarily general. Further recent examples are Ciccarelli et al. (2010) on regional business cycles, Felice (2012) on the effect of human and social capital on growth, Cappelli (2013) on schooling provision and Federico and Tena (1998) on regional market integration before Unification. The present thesis aims at contributing to this line of research by introducing three models taken from Economic Geography and applying them to the study of regional growth in Italy before the First World War. The next sections explain in detail which part of this literature is used for this purpose.

2.4 Economic Geography: theory and historical applications

Since the 1990s there has been an increasing interest in economic research in the "on the spatial aspects of the economy, that is, where economic activity occurs and why" (Fujita et al., 2001). This interest boosted the creation of Economic Geography as a sub-field of Economics. Paul Krugman, one of the best known scholars in the field, informally defines Economic Geography as "the branch of economics that worries about where things happen in relation to one another" (Krugman, 1991, p. 1). Given these definitions of the discipline, it is not surprising to find more and more articles in Economic History journals that are theoretically grounded in Economic Geography as well as empirical works in Economic Geography that employ historical data. In the last decade, these two fields have become more and more interested in sharing their respective expertise. Mentioning here all the authors and works in both fields would go far beyond the scope

of this chapter.[53] Therefore, in this section we restrict our focus to the literature that we find most relevant to the focus of the present thesis. We discuss in the next section how economic phenomena across space are normally measured in the literature, in particular, we look at concentration and specialization measures and we discuss the concept of spatial autocorrelation; we then move on to the modelling of market access through the concept of market potential and the way in which this is used to explain GDP per capita; we then show how the location of economic activity is normally modelled in Economic Geography; we conclude with a review of the existing literature in Economic History that relies on the tools provided by this discipline.

2.4.1 Measuring economic phenomena across space

Economic Geography is primarily concerned with the spatial implication of any given economic phenomenon. Before accounting for these spatial implications, the first step is to measure their extent. Two of the main chapters of this thesis focus on industrial employment across regions and provinces: Chapter 3 seeks to explain how the change in industrial employment in any given province is influenced by the change in neighbouring provinces; Chapter 5 seeks to identify the determinants of industrial employment. The two chapters basically study the same economic phenomenon, industrial employment, using two different methodologies and with two different aims.

Chapter 3 is based on the methodology used by Overman and Puga (2002) to describe unemployment clusters across the European Union. It basically involves comparing the change in time in the unemployment rate of a European region with the initial level of the employment in the region plus some basic controls such as the share of industrial and agricultural employment, school enrolment rates and region fixed effects.[54] The variable of interest for them is the change in the employment rate of the neighbouring regions. In particular, they define as the neighbouring regions of a given region A all the regions that share a border with A. They also sort the neighbouring regions according to whether they belonging to the same European state in region A or to another state. The aim is to test two different formulations of neighbours and identify a difference of impact. In this case a border effect in the distribution of un-

[53] For an extensive theoretical discussion of Economic Geography see Clark et al. (2003), Fujita et al. (2001), Combes et al. (2008) and Fotheringham et al. (2000); for a reference on the use of Economic Geography in Economic History see Crafts and Venables (2002). We cross-refer the reader to Section 2.4.3 for further discussion on the use of geographical tools in Economic History.

[54] Overman and Puga (2002) use unemployment while our study uses employment rates; in terms of methodology it either makes no conceptual difference, therefore we were able to use Overman and Puga (2002) as a theoretical reference.

employment would be present. The result for Overman and Puga (2002) is that both neighbour effects matter, suggesting that in the European Union unemployment clusters are transnational.[55] In Chapter 3 we also describe patterns of industrial employment, using several of the tools provided by Economic Geography. The intuition is that we need to measure, consistently through regions and sectors, whether the geographical distribution of employment presents geographical patterns and how far it differs from a random one. If the distribution is not random, it presents some degree of specialization of the regions and concentration of the industrial sectors. The term "concentration" is often used in the field of industrial organization to refer to "a characterization of the size, distribution and quantity of competing firms within a specific market or industry" (Carranza, 2008). Here we use the term with a geographical connotation because we refer to the concentration of industrial plants of a given sector across regions.

The literature provides several indices to measure both specialization and concentration at various levels of refinement.[56] In this thesis we propose three measures of concentration (the Krugman index of concentration, G index and E-G index) and one measure of specialization (the Krugman index of specialization). We do not take the reader into the technical details of these indices here as they are discussed one by one in Chapter 3.[57]

The last concept that we employ in our descriptive analysis is that of spatial autocorrelation, which can be defined as spatial dependence among the observations (De Dominicis et al., 2007, p. 9). The development of this concept goes back to the seminal work by Anselin (1988), who was one of the first to discuss the violation of the neoclassical model due to spatial dependence among observations. In fact, spatial data "typically are positively spatial autocorrelated, that is high values cluster near other high values and low values cluster near other low values"(Fotheringham et al., 2000, p. 12). This leads to correlated errors in the regression and possible bias in the result

[55] In Chapter 3 we see that for the case of industrial employment in Italy the results are quite different.

[56] See for instance Ellison and Glaeser (1997), Ellison and Glaeser (1999), Midelfart et al. (2000), Marcon and Puech (2003), Combes and Overman (2004) and Duranton and Overman (2005).

[57] Combes and Overman (2004, pp. 2857–2873) discuss the standard methodology and provide some baseline criteria for the choice of the most appropriate index. The authors state that an index should be comparable across activities; comparable across spatial scales; provide a rage of values to evaluate the null hypothesis of "no systematic component to the location of the activity"; provide levels of significance; unbiased with respect to the shape of spatial units; unbiased with respect to the industrial classification; and finally the researcher should always think about both the null and the alternative hypothesis when she is making any statement about theory based on the index. By of the authors' admission, "no measure currently meets all of these criteria". (Combes and Overman, 2004, p. 2860) The two authors then move to discuss some of these indices, among which there is the Krugman index for both concentration and specialization.

when the spatial relationships are not properly included in the model. For this thesis, we are interested in the measurement of spatial autocorrelation among Italian regions. The index we use is the Moran's I index, which Anselin (1995) includes among the "Local Indicators of Spatial Association".

We also use employment data in Chapter 5 of this thesis. Chapter 3 looks at industrial employment but aims only at unveiling the spatial relationships that characterize its location. Chapter 3 is merely descriptive with respect to the phenomenon we are studying. However, Chapter 5 tests some hypotheses on the determinants of industrial employment, using a methodology that has been applied to other case studies, from both present and historical perspectives. Section 2.4.2 will discuss them in detail. Before touching upon the literature on industrial location, the next section discusses how previous authors have measured the access to markets, which is a fundamental explanatory variable for the industrial location of countries and regions, and shows how this has been applied to other studies, in particular on the regional disparities in GDP per capita.

2.4.2 New Economic Geography, market potential and industrial location

The idea that the location of economic activity depends on proximity to markets goes far back in time to "The Isolated State" by Von Thünen, written in 1826.[58] In 1920, Marshall (1920) published his volume "Industry and Trade" in which he studied the positive effect of market size on the development of industries. These theories became part of an "integrated and micro-founded approach to spatial economics" known as New Economic Geography (Venables, 2008). In the New Economic Geography approach, measuring market access taking transport costs into account is paramount: one of the main assumptions of this framework is in fact that economic activity tends to cluster in areas where economies of scale and better access to markets can be exploited. For this reason, it is necessary to quantify the access to markets of different regions to test the hypothesis that better access to market leads to a concentration of economic activity. The notion of market potential, which is a measure of market access, has been used by several scholars for this purpose. Over the 20^{th} century, market potential has seen several developments and extensions. The formulation we refer to in this thesis goes back to the seminal work by Harris (1954) on the location of the US manufacturing sector.

[58] This volume has seen several re-prints; for reference see Von Thünen (1910) and Von Thünen (1966) for the first English version.

In this formulation, the market potential of region A is defined as the sum of the GDP of all the adjacent regions, each weighted by their distance from region A, plus the own GDP of region A adjusted by some measure of its size. The idea here is that the more the GDP of a region itself and that of its neighbours is high and physically close, the more its access to markets will increase. This formulation of market potential has been refined by several scholars by replacing distances with transport costs and by taking tariffs into account when neighbours are located in different countries which protected their home markets. In recent times, this methodology has been used by Midelfart et al. (2000) to obtain market potential estimates and also in several historical application when data limitations are usually more severe.

Market potential has seen alternative empirical strategies for its calculation. In other works, it has been calculated using trade volumes. For instance, Redding and Venables (2004) use a gravity model to estimate the functional form of market potential. A gravity model explains the volumes of trade between regions using the size of and distance between each pair of regions as controls, jointly with some dummy variables such as the adjacency or presence of a border. Market potential in this case is calculated through the parameters estimated with the gravity model. Other examples of works using market potential to calculate through gravity models are Head and Mayer (2004) on Japanese firms' investment in the European Union; Hanson (2005) on employment in the United States; Head and Mayer (2006) on regional wages; and Head and Mayer (2011) on market potential and GDP per capita worldwide. The calculation of market potentials using trade data is not possible in the case of Italian regions since data on volumes of trade within Italian borders are not available for this period. Therefore, in this thesis we follow the methodology used by Midelfart et al. (2000). Apart from the methodology employed, most of these studies share similar results regarding the role of market potential in the location of economic activity, the level of GDP per capita or other economic variables that are thought to be determined to some extent by market access.

We are here particularly interested in the part of the literature that uses market potential to explain GDP per capita, which is what we present in Chapter 4 for the Italian regions. Redding and Venables (2004) explaining GDP per capita with market potential cross-country from the mid-1880s to 1995 and find that market access is statistically significant and quantitatively important in explaining income. Head and Mayer (2011) use a similar methodology, explaining GDP per capita with market po-

tential and several country-specific controls. The geographical focus is still the world but here the authors extend the dataset in time, starting from the 1960s. The result is again a positive effect of market on GDP per capita.

Within Economic Geography, we are also in this thesis interested in the studies that use market potential to explain industrial location. The tendency of industries to locate close to each other has attracted the attention of scholars since the beginning of the 20^{th} century. Marshall (1890) was the first to carry on a formal economic analysis of the phenomenon of industrial location. In his model, industries concentrate to create a market for specialized skills, to benefit from a larger supply of inputs and to exploit technological spill overs. In recent times, Midelfart et al. (2000), focusing on the industrial location across European regions, have provided a theoretical framework for modelling industrial location across regions that has found fruitful applications on historical cases. This methodology takes into account the two competing views on how industries locate: the Heckscher-Ohlin theory (H-O) that predicts that economic activity locates according to the endowment of factors of a given location. Most commonly, this endowment consists in natural resources (raw material or energy sources) or human capital. The other is the New Economic Geography (NEG) theory that focuses on market access and this we have already discussed at length. The methodology tests both theories as explanations for industrial employment through the inclusion of interactions between industry characteristics and region characteristics of both the H-O- and the NEG- type. Their regional characteristics considered include market potential, energy access, labour abundance and skilled labour availability. Industry characteristics include measures of energy-, labour- and skill intensity, intermediate input use, mean plant size and sales to industry. Other controls are size controls for regional population and sector employment. The main results of this study is that both market access and R&D investment are strong determinants of industrial location in the EU.

To sum up, the previous sections have provided an overview of the Economic Geography literature that we apply in this thesis. We have touched upon specialization and concentration measures, spatial autocorrelation, market potentials and industrial location. We now move to the next section for a review of the historical application of these models and a discussion of their results.

2.4.3 Economic Geography in historical perspective

Market potential, growth and industrial location in Economic History. Economic Geography and Economic History have often benefited from one another. In this section we review some of the main historical applications to the models described in previous sections.[59] The first group of relevant works are the reconstructions of regional GDP. Most of the existing regional series have been estimated following Geary and Stark (2002).[60] The main works that use this method are Crafts (2005b) on Britain (1871–1911), Roses et al. (2010) on Spain (1860–1930), Enflo et al. (2010) on Sweden (1855–2000), Combes et al. (2011) on France (1860–2000) and Schulze (2007) on Austria–Hungary (1870–1910).[61]

On market potential calculations for historical periods, Crafts (2005a) was the first to provide estimates for the British regions in the period 1871–1931 following the methodology by Harris (1954). Another paper presenting exclusively market potential estimates is Schulze (2007). More frequently, market potential estimates are included in works on industrial location, as in the case of Wolf (2007), Martinez-Galarraga (2012) and Klein and Crafts (2012).

The estimates of market potentials in Economic History have been often used to account for industrial location in different periods and areas of the world. This body of research is the one upon which we build Chapter 5 on this thesis and which is largely inspired by the work of Midelfart et al. (2000). The first application of this model is Crafts and Mulatu (2006) on British regions before the First World War. The main result of this work is that endowment forces were more important than market forces in determining the location of industries in this period. Only at the end of the sample there is some effect through the economies of scale but in general coal abundance, education of the labour force and agricultural inputs show a much more consistent result. The following paper applying the Midelfart et al. (2000) model is Wolf (2007) on interwar Poland. Here market potentials are calculated using a gravity model and the assumption is that only internal trade was taking place. The bottom line result is that both market and endowment forces mattered, and in particular skilled

[59] The literature on Historical Economic Geography is extremely vast and touches upon topics such as market integration, trade, income inequality and migrations and several others; in this review we discuss only the works relevant to this thesis.

[60] The procedure basically implies breaking down the national figures according to regional employment in the three sectors of the economy, and adjusting for productivity using wage data.

[61] Klein (2009) does not use the Geary and Stark (2002) method because he relies on existing estimates of GDP for the US states (1880–1910) and builds up from them.

labour had an important role in attracting industries. More recently, similar works have been published on the US between 1880 and 1920 by Klein and Crafts (2012) and Spain between 1856 and 1929 by Martinez-Galarraga (2012). Both works follow the methodology by Harris (1954) for market potentials, either with straight line distances like Klein and Crafts (2012) or with transport costs like Martinez-Galarraga (2012). For the US, market potentials are calculated only using the US states because the authors consider that to be the relevant market of the US industry. The result is that marker forces result more determinant than endowment. Finally, for the case of Spain, the result is that both market and endowment forces mattered.[62] Summing up, the historical application of the Midelfart et al. (2000) model are far from showing homogeneous results. Although in most cases some endowment forces are present, the role of markets changes across historical periods and areas of the world. Chapter 5 of this thesis aims at providing one further case study.

Economic Geography and the Italian case. In this concluding section we focus on the existing studies that take an Economic Geography to the Italian case in historical perspective.[63] Among the first to attempt the exercise there are Clough and Livi (1956) and then by Faini (1983), and more recently by A'Hearn (1998). The work by Clough and Livi (1956) attributes the determinants of industrial location to the linkages among sectors that led to the expansion of the Industrial Triangle. Faini (1983), on the other hand, attributes the larger industrial development of the Northwest to the larger capability of exploiting economies of scale. Both these hypothesis, which are not formally tested using census data covering all regions of Italy, are tested in Chapter 5. A'Hearn (1998) was the first to test the propositions on local externalities to explain the failure of the South to industrialize. The case-study used is the one on cotton textile production. Step by step, A'Hearn rejects most of the classical explanations provided by Economic Geography: spill overs of technology, complementarity of human capital, education, interactions at different levels of the production chain (with suppliers, customers and competitors), possibility of scale economies, market forces and

[62] Industrial location in Historical Economic Geography has been of course studied using other empirical frameworks. Roses (2003) explains regional specialization in Spain in 1797–1910 using production figures by estimating an idiosyncratic demand function for each Spanish province. This function allows to identify comparative advantages of the provinces and to test their effect on specialization. Crafts and Wolf (2013) model the location of cotton textiles industry in the UK by focusing merely on region characteristics, especially energy endowment, and defining the optimal choice location as the location that maximizes profit. These are quite different approaches to the one chosen in the previous works.

[63] On contemporary Italy see for example Iezzi (2006) and De Dominicis et al. (2007).

cheap labour supply (A'Hearn, 1998, pp. 737–742). The analysis consist in regressing manning levels (which represent productivity) on explanatory variables such as the age and gender composition of the labour force (which are proxies for experience), its literacy and its density. The author also calculates the relative labour costs, weighting them by relative wages and relative manning. The result is that the higher productivity of workers was offset by their higher wages, leading to quite similar values in and out of the Industrial Triangle. The regression results do not support the hypothesis that external effects had a big role in the Italian cotton industry. To prove this, examples of flourishing cotton industries in the North, outside the Industrial Triangle, are brought as examples (A'Hearn, 1998, p. 749). In spite of cotton mills surviving outside the Industrial Triangle, the production in the South was still very limited. The argumentation used to explain this uneven distribution of the cotton industry is that the southern regions had less pooling of small savings that could support industrial investment. This is attributed to the lower level of trust among small entrepreneurs in the South and in general to the anti-entrepreneurial mind-set in the South.[64] According to the author, the limits of externalities driven models apply to other industrial sectors. Institutional analysis of this view is essential for the correct understanding of the localization of industries in Italy.

The more recent A'Hearn and Venables (2011) explores the relationship between economic disparities, internal geography and external trade for the 150 years of the unitary history of Italy. It proposes different explanations for what drove economic activity across Italian regions in different periods: in the period 1861–1890 the main driver was natural advantage; in the period 1890–1950 it was domestic market access; and finally in the post-war period it was the access to foreign markets. Although the aim of the paper is very similar to that of Chapter 5 of this thesis, its methodology is quite different. The paper presents a narrative based on estimates of market potentials, employment shares of the regions/sectors and exports which is not grounded on a formal model that can be econometrically tested.

Another recent paper that studies the spatial patterns of industrial value added is Ciccarelli and Proietti (2011). These authors use a multivariate graphical technique named dynamic specialisation biplot to evaluate the degree of specialization of provinces from Unification until the First World War. The result is that provinces were

[64] A'Hearn (1998, p. 759); this argument is later developed by the same author, linking it to the literature on the cultural and institutional hypothesis that we have already mentioned in previous sections (A'Hearn, 2000).

not particularly specialized at the beginning of the period but they increased their degree of specialization as their industrialization process went on. The methodology used by Ciccarelli and Proietti (2011) is quite new to economic historians and represents an alternative methodology to the standard one used in the present thesis to measure specialization. The main difference, however, is in the geographical focus of the two studies: in this thesis specialization is measured for regions and it is simply a descriptive exercise to introduce a regression analysis. For Ciccarelli and Proietti (2011) the description of the specialization patterns of provinces is the main goal.

2.5 Conclusions

Summing up, in this chapter we have provided the historical, historiographical and theoretical background of this thesis. We have surveyed the economic condition of the Italian regions before the Unification of 1861, the position of Italy at the time of Unification and also the economic conditions of its regions. We have then outlined the main explanations that have been proposed by scholars to explain the North-South gap that has characterized the Italian economy since 1861 (and in many respects earlier then this).

The second part of the chapter was dedicated to the presentation of the theories and the empirical studies from Economic Geography that are most relevant to this thesis. In particular, we discussed the estimation and use of market potentials and the empirical strategies used to account for industrial location. To conclude, we touched upon other studies in Economic History that made use of empirical tools taken from Economic Geography.

The next three chapters of this thesis aim at contributing to the growing literature on Italian regional divergence and unbalanced industrialization. Our goal is first to describe the location of industrial employment across regions and provinces, measuring specialization, concentration and spatial autocorrelation and then identifying regional border effects (Chapter 3); study the effect of market potentials on GDP per capita (Chapter 4) and explain what drove the location of industries at the beginning of Italy's industrialization (Chapter 5).

Chapter 3

The Industrial Geography of Italy: Provinces, Regions and Border Effects (1871–1911)

3.1 Introduction

The previous chapter gave an overview of the economic conditions of Italy as a whole and of its regions during its first 50 years of unified history. The country, throughout the period of its first industrialization, witnessed the rise of large regional differentials. Understanding this experience is crucial to appreciating the causes of the regional disparities still to be observed in contemporary Italy. One of the main purposes of this thesis is to account for the "industrial" part of this divergence. This chapter contains a preliminary analysis of the patterns of industrialization across Italian regions and provinces in the period 1871–1911. The goal is first to describe the location patterns using some synthetic indices and then to assess how the evolution of the employment in the industrial sectors relates to the presence of regional borders.

Following a well established practice in both Economic Geography and Economic History, we use the Krugman index, the G index and the Ellison and Glaeser (E-G) index to assess the specialization of the regions and the concentration of the industrial sectors. Our results will be compared to other countries and discussed as applying to the Italian case. Spatial autocorrelation, which is the degree of spatial interdependence of the observations, will also be analysed through a calculation of the Moran's I for each industrial sector. This measure introduces in this analysis a spatial dimension, which is not considered when measuring the specialization and concentration with the standard Krugman index, G index and E-G index.

The second part of the chapter is devoted to a study of the determinants of change in industrial employment over the census years. The chapter addresses the question whether (and to what extent) the change over time in industrial employment at the

provincial level depended on the change in the neighbouring provinces. Neighbouring provinces, meaning provinces that share a border with a given province, will be divided into two groups: "same region" and "other region" neighbours. The working assumption is that, if industrial employment presented regional border effects, the role of these two groups of neighbours will be different. The methodology used in this chapter is the one proposed by Overman and Puga (2002) to test the existence of transnational clusters of unemployment across the EU. To adapt this model to the Italian case we consider the Italian provinces instead of European regions and the Italian regions instead of European countries.[1] The chapter tests for both border effects corresponding to regional borders in the period 1871–1911 and for pre-unitary borders which might have had a long term impact perceived even after Unification. This analysis will exploit a newly published provincial level dataset from Ciccarelli and Missiaia (2013). The present study provides for the first time information on employment at the provincial level for all 15 industrial sectors, separating males and females; it also allows us to look at sub-regional units.

The main results of the descriptive analysis of this chapter are that regions in this period presented a fairly high level of specialization, mirrored by a concentration of the industrial sectors. Moreover, the spatial autocorrelation among regions was not particularly high, suggesting that regions were fairly independent from each other in terms of employment patterns. These findings are coherent with the results of the regression analysis, where we find that regional borders did matter. In fact, we find that, for a given region, the change in employment of the two types of neighbour had different signs, leading to different effects on employment.

The motivation for this chapter is two fold. From a methodological perspective, Italian regions are the standard unit of analysis for most existing works on disparities across the country, including the two remaining chapters of this thesis. Studying the geographical patterns across regions can shed light on whether or not this unit of analysis is economically meaningful. From an historical perspective, this research can be informative on the persistence of pre-unitary borders in the distribution of industries.

The chapter is organized as follows. Section 3.2 provides an historical account of the Italian local administrations; Section 3.3 illustrates the empirical framework for

[1] The methodology requires us to use two separate levels of geographical aggregation, one for which the employment is measured and a larger one that imposes borders across the smaller units. Therefore, as a work on the European Union would measure the change in the regions and test the national border effects, our work on Italy measures change in employment in the provinces and tests for regional border effects.

Figure 3.1: Italian Regions under Augustus, 7 A.D.

both the descriptive indices and the regression model; Section 3.4 presents the data set used in this work and discusses it in detail; Section 3.5 provides the empirical results and Section 3.6 concludes.

3.2 Pre-unitary states and Italian local administrations: an historical overview

The first attempt to organize the Italian territory into regions dates back to 7 A.D.. Emperor Augustus divided Italy into eleven regions, most named after the ancient populations that had occupied them (Galinsky, 2005, p. 80). These regions were not administrative units but served only as a way to organize population censuses. Figure 3.1 shows the eleven regions. Since the Barbaric invasions of the 6^{th} century, the different parts of the Italian peninsula did not belong to a single political entity until the unification of 1861. With the political fragmentation of the Middle Ages, the ancient names ceased to be used until approximately the 15^{th} century, when geographers started reviving these terms.[2] As we note, several of these regions, such as Venetia, Aemilia (Emilia), Liguria, Umbria, Etruria (Tuscany), Latium, Sardinia, Apulia, Calabria and Sicily preserve the names and often the borders of modern Italian regions.

[2] Almagià (1935).

After Unification, the pre-unitary states have been the basis for the formation of the Italian regions, in the north and centre of the country in particular.[3] Figure 3.2 shows the map of Italy before 1861. Figure 3.3 shows the regions after the annexation of Rome in 1871. The model of administration adopted by the newly established country was, not surprisingly, taken largely from that of Piedmont. However, even though the transition of model was mostly based on the structure of Piedmont, the other pre-unitary states also presented a structure with intermediate elements. For instance, the Kingdom of the Two Sicilies was divided into 22 provinces and 76 districts (Spagnoletti, 1997, p. 162); the Kingdom of Lombardy Venetia was organized in 17 provinces and 218 districts (Meriggi, 1987, p. 34). After the Unification, most of these provinces kept the same name and shape.

At the time of Unification, the two options of centralization and decentralization divided intellectuals and politicians. The former originated from the French model and was basically the one that Piedmont had adopted. It was supported by Cavour, Rattazzi, Mazzini, Garibaldi and others. The latter implied a federalist approach and was supported by Gioberti and especially Cattaneo. The centralized view, which implied a milder transition and fewer risks for political stability, prevailed.[4] The territory of Unified Italy was divided in 15 regions and 69 provinces. Smaller geographical units, "circondari" and "mandamenti", also existed with limited powers.[5] The smaller unit was the "comune", which represented the "natural delimitation [of the territory]" and had deep historical roots.[6]

Local units in this period had far less autonomy than those created after the Second World War. In the period we are looking at, the province was the main intermediate body between the "comune" and the central state. Regions were mere collections of provinces without powers and without a structure. In spite of some attempts by Crispi in the 1890s to create larger and more independent administrative units, regions would remain so until the new provisions of the Constitution of 1948.[7] However, in this chapter we will claim that regions, in spite of the lack of formal powers, still represented meaningful economic units because of their historical connections to pre-unitary states and regions. The next section moves on to the empirical strategy pursued in this chapter.

[3]The political and economic framework of pre-unitary states is surveyed in Chapter 2. This paragraph discusses the only administrative arrangements before and after 1861.

[4]Pavone (1964, p. 195).

[5]See Antonelli and Palombelli (1995) for a survey of the legislative history of local administrations since 1861.

[6]Antonelli and Palombelli (1995, p. 71).

[7]Bonini (1997).

Figure 3.2: Italian states on the eve of Unification, 1860.

3.3 Spatial distribution of employment: empirical framework

In this section will describe our methodological approach to studying the patterns of spatial distribution of employment. In section 3.3.1 we propose some measures of concentration of the industrial sectors and specialization of the regions and in section 3.3.2 we illustrate the calculation of the Moran's I, a measure that takes into account the proximity of the regions and measures the spatial autocorrelation among data points.

In section 3.3.3 we turn our attention to the the determinants of the distribution of industrial employment. In particular, we adapt a model proposed by Overman and Puga (2002) to describe the changes in the unemployment rate across the EU and use this in relation to the changes in the location of industrial employment in Italy.

3.3.1 Measuring geographic concentration and regional specialization: the Krugman index, the G index and the E-G index

The first step in the study of the location patterns of Italian industries is to measure the phenomenon of specialization of regions and concentration of industrial sectors within the regions. The location of industries in a given area, divided into subunits such as regions, can be studied looking at both the concentration of industries in the sub-units and the specialization of each subunit in certain industries. These phenomena are different but closely related. It is easy to predict that when industrial concentration is

Figure 3.3: Italian regions, 1870–1918.

high, regions will be specialized. However, the two measures are not necessarily equal when industries and regions differ in size (Wolf, 2007, p. 25).

The concentration of a given industry k is measured as the ratio of the employment of industry k in region i on the total employment of k, following Wolf (2007):

$$L_{k,i}(t) = \frac{x_{k,i}(t)}{\sum_i x_{k,i}(t)}\,. \tag{3.1}$$

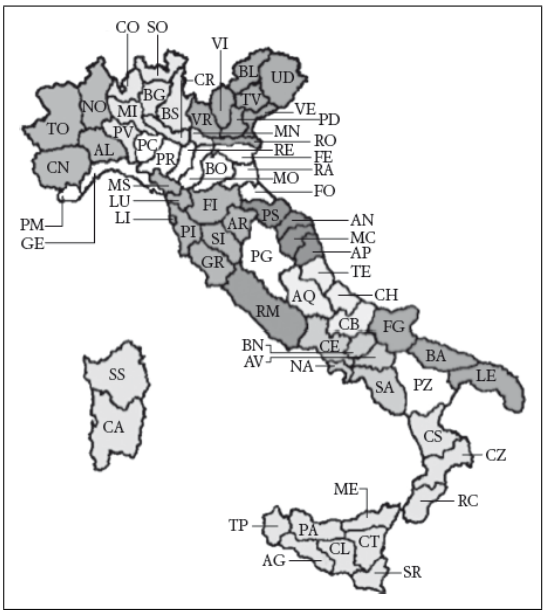
This measure is not an index and therefore it is not bounded by any two values.

Another index used by Wolf (2007) to overcome this problem is the Krugman index of concentration. It is calculated as follows:

$$K_k(t) = \sum_i |L_{k,i}(t) - \overset{*}{L}_{k,i}(t)| \tag{3.2}$$

where $\overset{*}{L}_{k,i}(t)$ is equivalent to $L_{k,i}(t)$ except that it excludes industry k. The Krugman index is bounded between 0 and 2. These are very basic measures of concentration that take into account only employment figures by industrial sector by region. Further developments in Economic Geography lead to more complex and refined measures. In the literature, three standard requirements are required for an index to be suitable for measuring the concentration of industries: the measure must be comparable across industries; it must control for the tendency of manufacturing to agglomerate and it must control for the degree of industrial concentration (Duranton and Overman, 2005, p. 1078). The first requirement is met by both the G index and the Krugman index, but

Figure 3.4: Italian provinces, 1871–1911.



The different shades of grey are used in the map only to indicate regional borders.

the second and third are not. We can therefore introduce another index that controls for the size of plants and the level of geographic aggregation.

$L_{k,i}(t)$ is used to compute another index, the G index, which is the sum of the absolute difference between $L_{k,i}(t)$ and the share of the area of i in the total area:

$$G_k(t) = \sum_i \left| L_{k,i}(t) - \text{area}_i \right| . \tag{3.3}$$

The third option for measuring concentration comes from Ellison and Glaeser (1997). They propose the following index:

$$\begin{aligned} \gamma_{E,G}(t) &= \frac{G(t) - (1 - \sum_i x_i(t)^2)H(t)}{1 - \sum_i (x_i(t)^2)(1 - H(t))} \\ &= \frac{\sum_k (s_k(t) - x_i(t)^2) - (1 - \sum_i x_i(t)^2)(\sum_j z_j^2)}{(1 - \sum_i x_i(t)^2)(1 - (\sum_j z_j^2)} \end{aligned} \tag{3.4}$$

where $s_i(t)$ is the share of industry k employment in area i; $x_i(t)$ is the share of i in the total manufacturing employment; and z_j is the squared plant employment share indexed by j. Ellison and Glaeser (1997, p. 902) classify their index according to these values: a sector is not very concentrated if the E-G index is smaller than 0.02; it is relatively concentrated if the E-G index is between 0.02 and 0.05 and it is highly concentrated over 0.05. The advantage of using an E-G index is that the size of plants is taken into account as well as the size of the regions throughout the industrial employment. The index calculated for each industry is then compared to a benchmark random

distribution of industries. This allows the index not to take value zero if employment is uniformly spread across space but only if the distribution is comparable to a random one (De Dominicis et al., 2007, p. 4). This index requires in theory to know the share of employment of each single plant. These data is not available for any year of our period. The only information available on plants comes from the 1911 industrial census. For each industrial sector and region, the number of plants and workers is recorded. From this, we can work out the mean plant size by region by industry and the corresponding share. This is used in place of the plant employment share. The calculation of the E-G index is possible here for 1911 alone because of data limitations.

Regarding the specialization of regions, the simplest measure is the ratio of the employment of industry k in region i to the total employment of region i:

$$s_{k,i}(t) = \frac{x_{k,i}(t)}{\sum_k x_{k,i}(t)} \,. \tag{3.5}$$

The Krugman index of specialization can be calculated as follows:

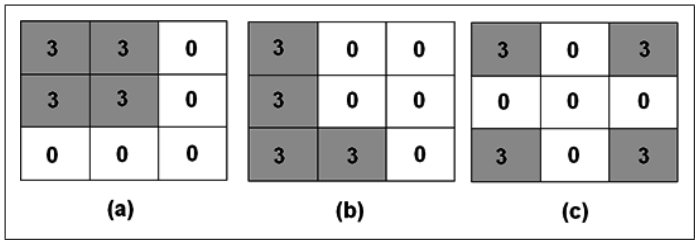
$$K_i(t) = \sum_k |S_{k,i}(t) - \overset{*}{S}_{k,i}(t)| \tag{3.6}$$

where $s_{k,i}(t)$ is the ratio of employment in industry k in region i over the total employment of all regions except i.

3.3.2 Moran's I and spatial autocorrelation

The last tool taken from the Economic Geography literature and employed in this chapter to describe the localization of Italian industries is the Moran's I. This tool is used to detect whether adjacent regions tend to have closer values in the variable of interest. What differentiates the Moran's I from the previous indices is that it considers each region not as an isolated entity but in relation to the others. This is done through the information provided by a proximity matrix. The Moran's I measures the degree of spatial autocorrelation of the phenomenon studied. Spatial autocorrelation predicts that adjacent observations of the same variable will be more closely correlated than those further away. The notion is similar to standard autocorrelation in econometrics, but it develops across space instead of time. Previous indices are "a-spatial" in the sense that every spatial unit is treated as isolated from the others. To better explain this point, we propose the example of De Dominicis et al. (2007, p. 16). We consider three possible location scenarios of twelve plants located across nine sub-regions, as shown in Figure 3.5.

Figure 3.5: Three cases of agglomeration.



The three scenarios would show the same level of spatial agglomeration when using a-spatial tools such as the Krugman index of concentration, the G index or the E-G index. The Moran's I unlike these can detect that Figure 3.5a has a higher agglomeration than 3.5b that has an higher agglomeration than that shown in Figure 3.5c. Spatial autocorrelation introduces the spatial dimension across regions, considering every region in its position relative to the others through a spatial weight matrix. The elements of the matrix take value one if the two regions are adjacent and zero otherwise. There are two types of Moran's I: the Global Moran's I and the Local Moran's I. The Global Moran's I yields to one index that summarizes the whole study area (in this case, Italy), assuming every region to be internally homogeneous. The Local Moran's I is in contrast calculated for every spatial unit in order to detect clustering within each unit. According to Anselin (1995, p.94), Local Indicators of Spatial Association, such as the Local Moran's I, are proportional to the global indicator of spatial association (the Global Moran's I). In our case, we calculate the global Moran's I. This is because we have no information on the distribution of firms within each region.

The Moran's I is defined in Fotheringham et al. (2000, p. 201) as:

$$I = \frac{\left(\frac{N}{\sum_k \sum_j w_{k,j}}\right)\left(\sum_k \sum_j w_k, j(x_k - x_a ve)(x_j - x_a)\right)}{\sum_k (x_k - x_a)^2} \tag{3.7}$$

where N is the number of regions, $w_{k,j}$ is a discrete variable which takes value 1 if regions i and j are adjacent and 0 otherwise, x_k is the characteristic being analysed, in our case employment for each industrial sector and x_a is the average value of the characteristic. For statistical hypothesis testing, Moran's I values can be transformed into Z-scores in which values greater than 1.96 or smaller than -1.96 indicate spatial autocorrelation which is significant at the 5% level. The significance of the spatial autocorrelation of the Moran's I can be tested through a simple z-test.

3.3.3 Testing for border effects in industrial employment

We now move to the regression analysis on the determinants of change in industrial employment. The methodology is taken from Overman and Puga (2002), who look at the change in unemployment rates across European countries. The empirical strategy is described by the Equation (3.8):

$$\begin{aligned}\Delta \text{ Employment}_{r,k,t-(t+1)} = \alpha \text{ Initial Employment}_{r,k,t} \\ + \beta \sum_n \Delta \text{ Employment (same region)}_{n,k,t-(t+1)} \\ + \chi \sum_m \Delta \text{ Employment (other region)}_{m,k,t-(t+1)} \\ + \gamma \text{ \%Literacy}_{r,t} + \delta \text{ \%Agric. Employment}_{r,t} \\ + \eta \text{ \%Ind. Employment}_{r,t} + \psi \text{ Region} \\ + \phi \text{ Industry} + \epsilon\end{aligned} \tag{3.8}$$

The dependent variable is the change in employment rate of province r in sector k between census years t and t+1. The employment rate in each sector is calculated as share of the provincial labour force working in that specific sector. Provinces are defined as neighbouring with respect to province r when they share a border with r. The explanatory variables are the initial industrial employment rate in province r in sector k, the change in the neighbouring provinces employment (indexed by n for "same region" neighbours and m for "other region" neighbours) and three provincial controls at time t: the skill levels (proxied by literacy rate) in province r and share of labour force in agriculture, and industry. Province and industry fixed effects are always included. The two neighbour effects are the weighted averages of the changes in industrial employment rates of neighbouring provinces with provincial labour force as weight.[8] The coefficient of the change in the neighbouring provinces employment represents what is called "neighbouring effect", meaning that if the coefficient of the employment of neighbours is positive and significant, the evolution in the industrial employment of a region tends to be close to that of nearby regions. If industrial clusters locate within regions, this coefficient will be non significant or negative, proving the existence of a border effect. This strategy is also applied by imposing the pre-unitary borders on the post-1861 data. It is done by simply defining as neighbour "other state"

[8] A matrix where cells take value 1 when two provinces share a border and 0 otherwise was used to work out which provinces to include in the neighbour effect computation.

the provinces that belonged to a different state and neighbours "same state" provinces that belonged to the same state before unification.[9]

3.4 Provincial industrial employment: new insights from the population censuses

The main primary sources upon which this and the following chapters rely to quantify industrial employment are the population censuses of 1871, 1881, 1901 and 1911 and the industrial census of 1911.[10] The industrial census of 1911 is the only complete one in this period that recorded the number of plants along with other basic information at firm level.[11] The population census of 1891 was not conducted because of budget cuts, leaving us with a twenty-year gap in the data instead of the standard ten-year gap.

Although the data on industrial employment at worker level comes entirely from population censuses, these are not readily usable in their original format. Before being able to pool the different years, long and thoughtful reclassification for the four benchmark years is required to create homogeneous industrial sectors. This work was started over forty years ago by Vitali (1970). The resulting dataset started from 1881 and connected each of the professional categories of the censuses to fifteen industrial classes, homogeneous across years and broken down by region. Later on, this work at regional level was extended to 1871 by Fenoaltea (2001), with some adaptation of the industrial sectors to calculate regional value added.[12] In 2013, Ciccarelli and Fenoaltea presented industrial value added estimates for the 69 Italian provinces for the four census years, broken down by industrial sector.[13] This work introduced for the first time a provincial dimension in the study of the Italian industrial sectors. Ciccarelli and Fenoaltea based their estimates on the reclassified employment figures from the censuses but did not provide the underlying numbers. Following this work, Ciccarelli and Missiaia (2013) provided the full dataset of provincial industrial employment broken down by indus-

[9] A similar matrix to those of regions mentioned above was computed to calculate the pre-1861 neighbouring effects.

[10] MAIC (1871, 1881, 1901, 1911a, 1911b). The population census has also been used to obtain the size of each unit. Italy at the time was divided into 16 regions. The population of Italy was about 36,180,000 and its extent was 279,542 km^2. Therefore the average extent of a region was 16,443 sq^2 with 2,128,235 residents on average.

[11] The E-G index is calculated using the first industrial census in Italian history conducted in 1911. The census includes information of the number of firms in each administrative unit and their size in terms of employment. This census, and in particular the information at firm level that it contains, are exploited in detail in Chapter 5. We therefore delay the discussion on this source to the relevant chapter.

[12] 1871 is one the most problematic censuses when it comes to standardization of the industrial sectors. On this point see Vitali (1970, p. 3) and Zamagni (1987, p. 37).

[13] Ciccarelli and Fenoaltea (2013b).

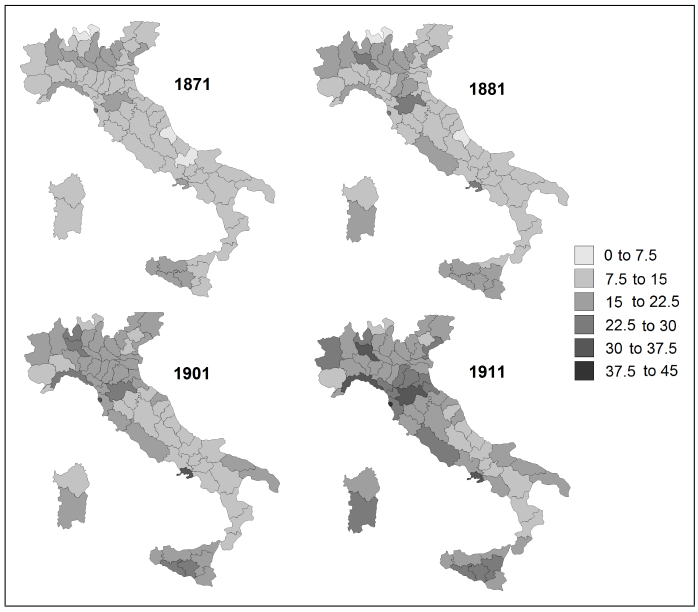
trial sector and for the first time showing males and females separately.[14] The main contributions of this work, other than making the numbers available, is to provide an extensive discussion on the state of the art in the reconstructions and their shortcomings. In particular, the availability of both female and male workers allows us to assess what the authors call the "textile-bias-of-the-early-censuses". As previous authors have observed, the female labour force in the early censuses (most notably 1871 and 1881) is severely over represented. According to Vitali (1970), Zamagni (1987), Fenoaltea (2001) and Ciccarelli and Missiaia (2013), the over representation can be entirely imputed to the textile sector. To see this graphically, compare Figures 3.6 and 3.7. The former shows the share of industrial labour force in each province, net of textiles. The latter introduces textile workers. It is clear that when textile workers are included, the picture changes dramatically in 1871, 1881 and somewhat less markedly in 1901. According to Ciccarelli and Missiaia (2013, p. 148) the bias arises from the anomalous classification of the occupational activities of female workers. This bias is particularly severe in the Southern regions, such as Calabria, Apulia and Basilicata, where women in textiles reached as much as 80% of the industrial workforce of the region. Moreover, textile employment in the South included many more part-time and seasonal workers than in the North. Figure 3.8 shows the employment of female workers in textiles as a share of the total industrial employment in the different provinces. Their over representation in the South appears quite extreme, leading us to conclude that females in textiles bring in more bias than can be than can be used in our analysis.

Scholars agree that the picture that arises from the employment figures in the census is so distorted that no analysis can proceed without a correction. In the literature two main corrections have been proposed. The first is the one by Zamagni (1987, p. 37–43); it is based on comparing the information contained in the population censuses with corresponding information in the industrial census of 1911 and other sources at firm level for 1876–1881 and 1901–1903.[15] It should be noted that industrial censuses (or official publications on industries, as for 1876–1881 and 1901–1903) report much lower figures than the population censuses do; therefore the assumption here is that the "true" number of workers lies somewhere between the lower bound of the industrial censuses

[14] Although they were unpublished, the underlying figures for the industrial value added estimates were already completed, for the total industrial labour force, by Ciccarelli and Fenoaltea (2013b). Ciccarelli and Missiaia (2013) extends the data further by including males and females separately.

[15] The two sources used are Ellena (1880) which contains information on some industries for 1876 and MAIC(1906) which provides a summary of the "industrial conditions" in the country.

Figure 3.6: Share of provincial industrial employment, 1871–1911 (net of employment in textiles).



Source: our calculations using employment data from Ciccarelli and Missiaia (2013) and MAIC (1874, 1883, 1902, 1914).

and the upper bound of the population censuses.[16] The methodology also relies on the fact that the relationship between industrial censuses and population censuses becomes from the 1930s onward somewhat stable: around 110% of the figure in the population census equals 100% of the figure from the industrial census. Therefore, Zamagni applies a 110% coefficient to the industrial census data nearest in time and takes these as the value for textile workers whenever they do not exceed the population census figures.

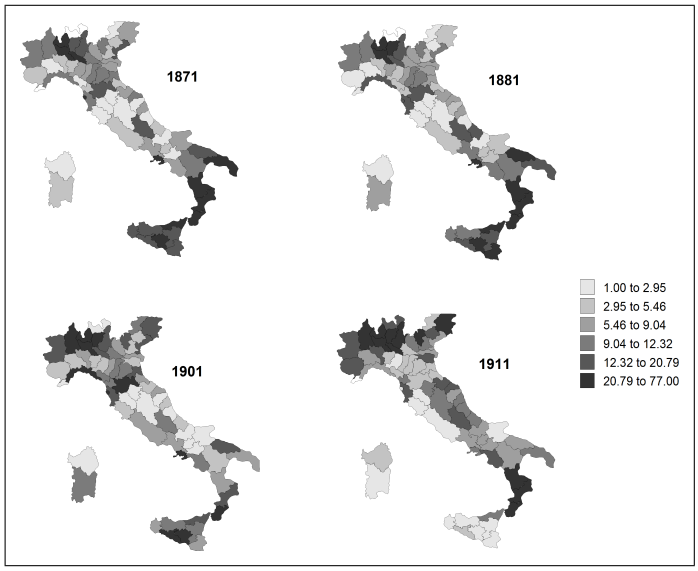
On the other front, Fenoaltea (2003b, p. 1083) corrects the textile figures calculating the number of workers in each region as the sum of males plus females capped at four females for each male. The 4:1 ratio is approximately the proportion of males to females in industrial employment in other sectors at the end of this period.[17] In this thesis we decided to follow the method by Fenoaltea for two main reasons. First of all, because we start our analysis in 1871, the first year of the dataset would not have been covered by an alternative industrial source.[18] Second, we are interested in quantifying the location of workers, which is simply a measure of where people physically are.

[16] To give a sense of the difference, in the textile sector Ellena (1880) reports for 1876/1881 295,700 workers and the population census of 1881 reports 1,337,108; for 1901/1903 MAIC (1906) reports 408,404 and the 1901 population census reports 783,253; for 1911 the difference between the two censuses is 508,076 vs. 673,968.

[17] To give a sense of the difference between the two methods, following Zamagni we get for 1881 325,270 textile workers while following Fenoaltea we get 555,684; for 1901 the numbers are 449,244 vs. 514,285. For 1911, 558,883 vs. 502,920.

[18] Ellena (1880) starts in 1876, which being closer to 1881 than 1871 is used as a source for 1881.

Figure 3.7: Share of provincial industrial employment, 1871–1911 (without correction).



Source: our calculations using employment data from Ciccarelli and Missiaia (2013) and MAIC (1874, 1883, 1902, 1914).

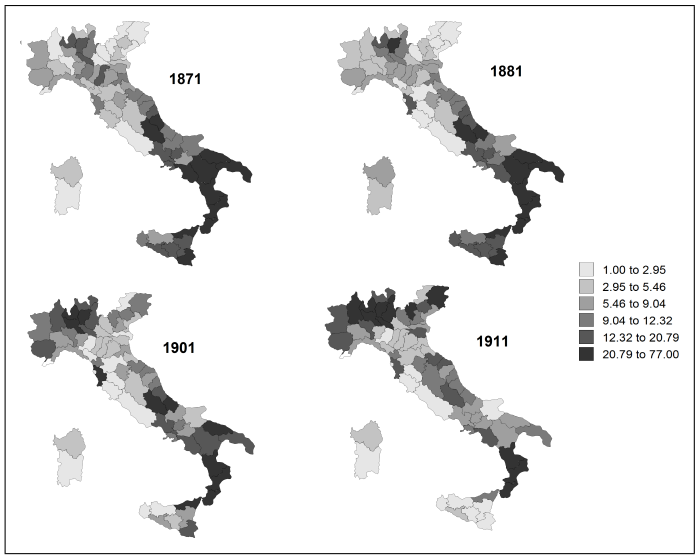
This is a very different exercise from using employment data to produce, say, a value added estimate or number of hours worked.[19] These two measures, and in general any measure affected by hours per worker or labour productivity, are very sensitive to the inclusion of workers who might be seasonal, part-time or simply less productive. In our case, the inclusion of non-full time and low-productivity workers is expected, as long as they are actually working in a particular sector. Finally, other than Fenoaltea, the correction capping the number of females to four times the number of males has also been adopted by A'Hearn and Venables (2011) in their work on internal geography and external trade in the long run, which is probably the most similar work to ours in the literature on Italian Economic History literature. The resulting employment rates, with the correction for textiles, which will used from now on in this thesis, are shown in Figure 3.9.

Other than industrial employment figures, this work uses two other variables that are unpublished at provincial level. The first one is literacy rates by province, which has been computed following the same methodology of A'Hearn et al. (2011) for the regions.[20] Figure 3.10 shows a map of the literacy rates at provincial level.

[19]For examples of census data used to assess the former, see the works by Fenoaltea and Ciccarelli (Fenoaltea (2001), Fenoaltea (2003b), Fenoaltea (2003a) and Ciccarelli and Fenoaltea (2013b)) and the estimates of regional GDP by Felice and Brunetti (Felice (2009a) and Brunetti et al. (2011)); for an example of estimation of total hours worked based on censuses see Giordano and Giugliano (2012).

[20]The literacy rates are computed on a population of at least 13 years of age for 1871 and 15 years for 1881, 1901 and 1911. The age group is not the same throughout the sample because of limitations in the sources; for a full discussion see A'Hearn et al. (2011, p. 205).

Figure 3.8: Female employment in textiles as a share of total industrial employment, 1871–1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013) and MAIC (1874, 1883, 1902, 1914).

The last variable computed using population censuses is the share of the labour force in agriculture. The reference for this the classification by Vitali (1970, p. 298) for the years 1881–1911. For 1871 we included the the entire category of agriculture (categoria I), which appeared similar enough to the corresponding category of the other censuses. The results are shown in Figure 3.11.

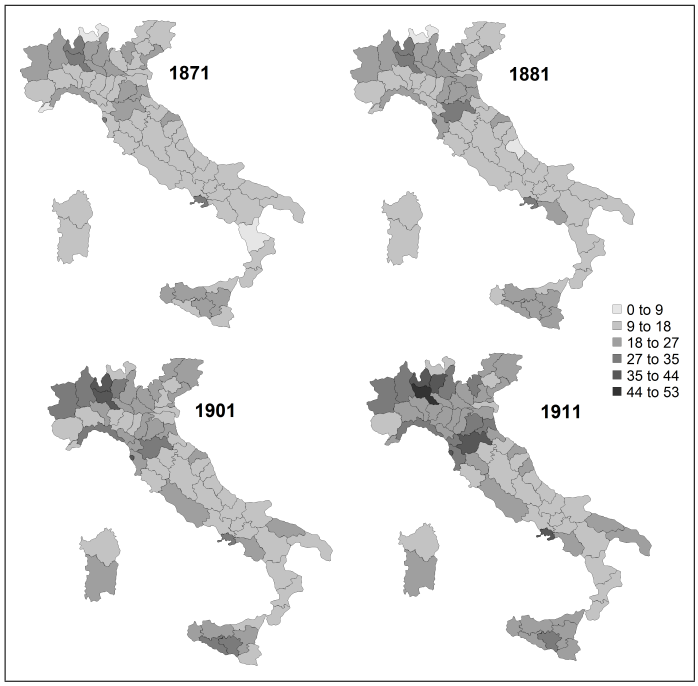
3.5 Pattern of industrial employment and border effects: empirical results

This section illustrates the empirical results of both the descriptive indices and the model of the determinants of change in industrial employment.

3.5.1 Concentration

We start the analysis by looking at the concentration measures. Table 3.1 and Figure 3.12 show the Krugman concentration index for all benchmark years and all 15 industrial sectors. The Krugman concentration index indicates for each industrial sector, where it stands between two bounds: it takes value 2 when the sector is concentrated in one region and value 0 when it is equally distributed in all regions. In all benchmark years the values have a minimum value of about 0.70 and a maximum value of 1 for metalmaking. These numbers show a relevant degree of concentration throughout the period, with quite similar values across sectors.

Figure 3.9: Share of provincial industrial employment, 1871–1911 (with correction).

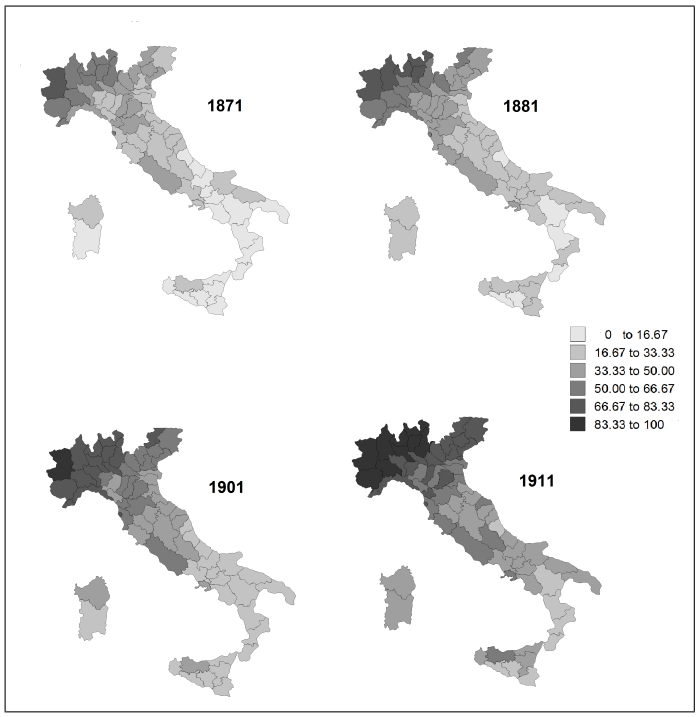


Source: our calculations using employment data from Ciccarelli and Missiaia (2013) and MAIC (1874, 1883, 1902, 1914).

A second index of concentration is the G index. The values are presented in Table 3.2 and Figure 3.13.

Unlike the Krugman index, the G index controls for the size of region, avoiding bias from size differences which would bias the results (Wolf, 2007, p. 31). The G index shows much more heterogeneity than the Krugman index. This difference is probably driven by the fact that the G index controls for the area of the regions when the Krugman controls only for the share of employment of a sector out of the total. All sectors present some concentration, with values going from a minimum of about 0.30 to a maximum of about 1. Sectors such as construction or foodstuff show lower concentration, since as expected, we see them present to some extent in all regions. Other sectors, more closely linked to local resources, such as mining, show a persistently higher value. There is on average an upward trend in the index, showing a mild increase of concentration through time. In some cases there is a much sharper increase in the concentration. This is, for example, the case of metalmaking. The reason for this is that at the beginning of the period this sector was quite small, composed of small and dispersed plants. Only in 1884 did a large steelworks company based in Terni (Umbria) start its activity, boosted by public funding Zamagni (1990, p. 128). An inverse path is followed by utilities, among which we find electric power production. In this case, Italy

Figure 3.10: Literacy rates in the Italian provinces, 1871–1911.

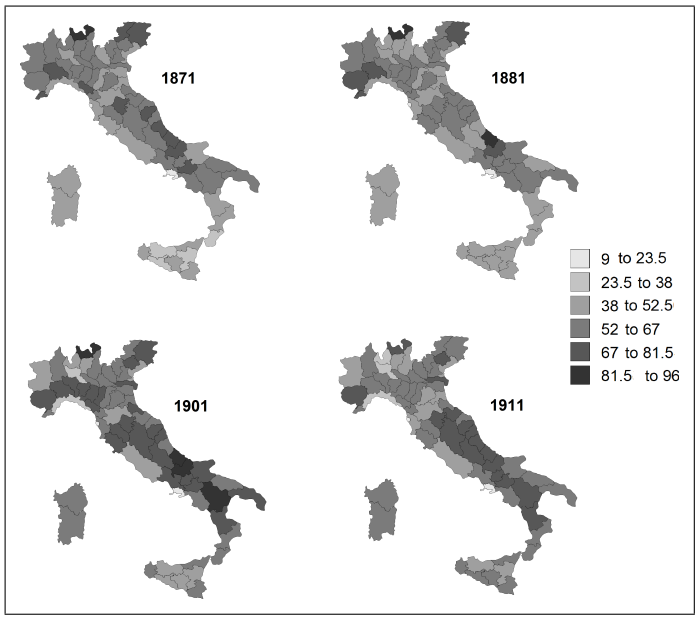


Source: MAIC (1874, 1883, 1902, 1914).

experiences an increase of the power installed from 86,175 to 1,286,883 kW Zamagni (1978, p. 89). The greater part of this power came from hydroelectric plants. The development of this sector was made possible through the opening of new plants rather than enlargement of the existing ones, explaining the reduced concentration in the period. Summing up, both indices show a fair amount of concentration, in the mining industry in particular (which is quite predictable, given the characteristics of point resource extraction). The Krugman index shows less heterogeneity while the G index shows more differences across sectors.

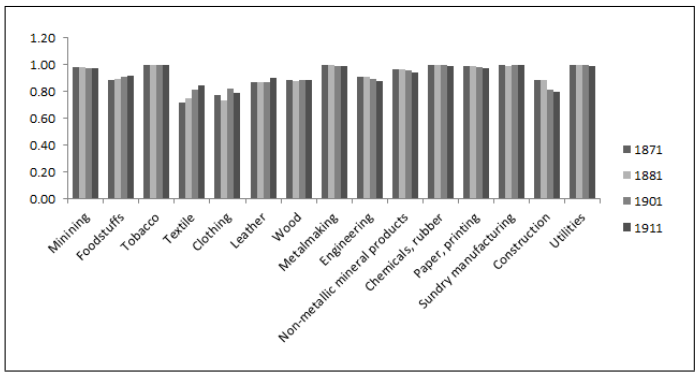
As noted in Section 3.3.1, the two indices presented so far do not meet two of the three standard requirements prescribed by Duranton and Overman (2005, p. 1078) for an index to be suitable for measuring the concentration of industries. They are comparable across industries but they do not control for the tendency of manufacturing to agglomerate and for the degree of industrial concentration. This means that different localization schemes may be represented by the same concentration measure. The Economic Geography literature provides another index that controls for the size of plants and the level of geographic aggregation. The third option for measuring concentration comes from Ellison and Glaeser (1997). Their index can be calculated only for 1911,

Figure 3.11: Share of provincial labour force in agriculture, 1871–1911.



Source: MAIC (1874, 1883, 1902, 1914).

Figure 3.12: Krugman concentration index, 1871–1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

since data on the number of plants are taken from the 1911 industrial census.[21] This tool is useful in taking into account the size of the plants as well as the size of the regions (in terms of their total industrial employment). It allows us to distinguish between the industrial concentration caused by market concentration (a few large plants) from concentration from agglomerative forces (many small plants co-located). According to Ellison and Glaeser (1997, p. 890), the former phenomenon cannot be regarded as proper concentration. These authors provide the example of the vacuum cleaner industry in the US, where 75% of the employees work in one of the four largest plants:

[21] To calculate E-G indices, ideally we should know the size of each plant. Here we replace plant size with the mean size of the observations for each region. This is because we do not have firm-level data. This procedure is not optimal but still it is an improvement over indices that do not take into account the size of plants at all.

Table 3.1: Krugman concentration index, 1871–1911.

	1871	1881	1901	1911
Mining	0.98	0.98	0.97	0.97
Foodstuffs	0.88	0.89	0.91	0.92
Tobacco	1.00	1.00	1.00	0.99
Textile	0.72	0.75	0.81	0.85
Clothing	0.78	0.73	0.82	0.79
Leather	0.87	0.87	0.87	0.90
Wood	0.88	0.88	0.89	0.88
Metalmaking	1.00	1.00	0.99	0.99
Engineering	0.91	0.91	0.89	0.87
Non-metallic mineral products	0.96	0.96	0.96	0.94
Chemicals, rubber	1.00	0.99	0.99	0.99
Paper, printing	0.99	0.99	0.98	0.98
Sundry manufacturing	0.99	0.99	0.99	0.99
Construction	0.88	0.88	0.81	0.80
Utilities	1.00	1.00	1.00	0.99

Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

according to the authors, this does not mean that the industry is concentrated. This is because they read the phenomenon of concentration as firms locating close to each other and claim that having few big plants may simply be related to economies of scale.

Table 3.3 and Figure 3.14 show the values of the index for the 15 industrial sectors.

Ellison and Glaeser (1997, p. 902) classify their index as follows: a sector is not very concentrated if the E-G index is smaller than 0.02; it is relatively concentrated if the E-G index is between 0.02 and 0.05 and it is highly concentrated over 0.05. The index here indicates a fairly high level of concentration. The index takes value zero if it deviates from what would be expected given a random distribution across space.

The results support the idea that Italy had a high concentration of industries at least in the final year of our period. All sectors are well above the 0.05 threshold of concentration. Mining, as expected, is the most concentrated industry. This is because mining is not necessarily organized in large plants but it tends to locate, in the case of Italy, in the few regions to benefit from natural resources endowment. Metalmaking, looks much less concentrated than the previous indices. This is due to the correction for the plant size proposed by Ellison and Glaeser (1997). Metalmaking was mostly

Table 3.2: G index of concentration, 1871–1911.

	1871	1881	1901	1911
Mining	0.89	0.95	1.07	0.78
Foodstuffs	0.40	0.44	0.45	0.46
Tobacco	0.66	0.69	0.68	0.62
Textile	0.70	0.73	0.90	0.99
Clothing	0.48	0.43	0.51	0.52
Leather	0.32	0.32	0.35	0.37
Wood	0.42	0.42	0.41	0.42
Metalmaking	0.60	0.84	0.98	1.04
Engineering	0.53	0.53	0.58	0.51
Non-metallic mineral products	0.36	0.44	0.49	0.61
Chemicals, rubber	0.50	0.53	0.68	0.53
Paper, printing	0.73	0.72	0.71	0.74
Sundry manufacturing	0.73	1.10	1.01	0.92
Construction	0.36	0.39	0.38	0.41
Utilities	0.89	1.04	0.87	0.63

Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

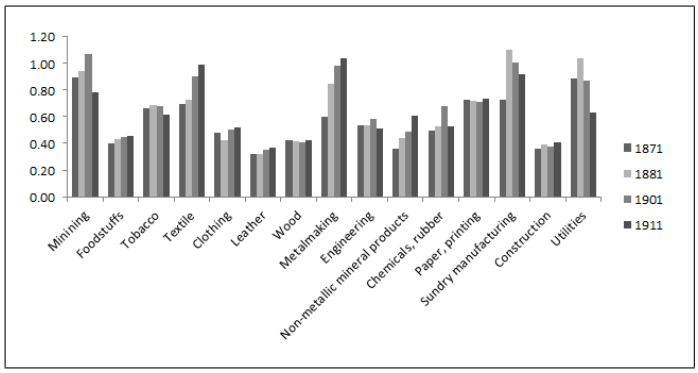
carried on by a few large firms and the index eliminates the "few-large-plants" effect already described. We can now move to the specialization measures.

3.5.2 Specialization

The index used for specialization is a simple Krugman index as described in the previous section. For the specialization of regions we do not need to correct for plant size, so this task is somewhat simpler. Table 3.4 and Figure 3.15 show the values of the index.

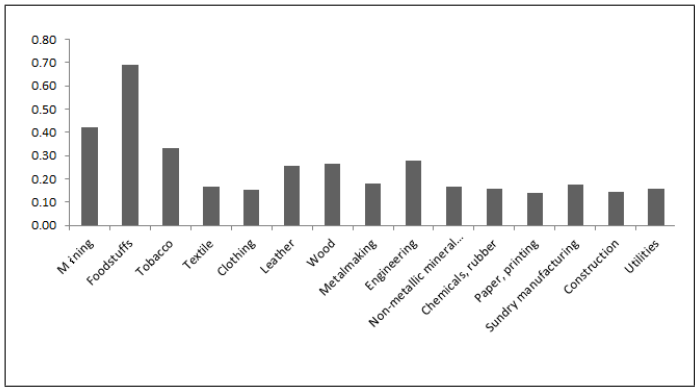
The Krugman index of specialization is bounded by 0 (no specialization) and 2 (complete specialization). This index has been employed in Wolf (2007) to show patterns of specialization in interwar Poland. The index indicates for each region the degree of specialization with respect to the rest of the country. For the case of interwar Poland, the values range from a minimum of about 0.7 to a maximum of slightly less than 1. Italy shows similar values and all regions seen to some extent specialized in all the benchmark years. Values are between 0.84 and 1 in all years and the great majority of regions has values between 0.90 and 1. This index shows the picture of fairly high and constant levels of specialization by Italian regions over time. This index there-

Figure 3.13: G index of concentration, 1871–1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

Figure 3.14: Ellison-Glaeser index, 1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

fore confirms that the distribution of industrial activity in Italy in the post unification period was fairly far from being homogeneous.

3.5.3 Moran's I

The tools provided so far look only at concentration in regions that we define as part of a broader area but with no any relationship with one another. However, these tools do not take into account the position of the regions with respect to each other. As discussed in Section 3.3.1, the Moran's I is an index of spatial autocorrelation that introduces a spatial dimension across regions. Table 3.5 and Figure 3.16 below show the Moran's Is for all industrial sectors and benchmark years. The Moran's I shows positive spatial autocorrelation when the values are higher than the expected value. The expected value of the Moran's I is $E(I) = \frac{-1}{N-1}$ with N number of regions (Arbia et al. (2006, p. 17).). The Moran's I is bounded between E(I)-1 (perfect negative correlation with the neighbours) and E(I)+1 (perfect positive correlation with the neighbours). The statistical significance of the Moran's I is tested with a standard Z test at a 5% level.

Table 3.3: Ellison-Glaeser index, 1911.

	Ellison-Glaeser Index, 1911.
Mining	0.42
Foodstuffs	0.69
Tobacco	0.33
Textile	0.16
Clothing	0.15
Leather	0.26
Wood	0.26
Metalmaking	0.18
Engineering	0.28
Non-metallic mineral products	0.17
Chemicals, rubber	0.16
Paper, printing	0.14
Sundry manufacturing	0.18
Construction	0.14
Utilities	0.16

Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

The numbers in Table 3.5 and Figure 3.16 are standardized so that E(I)=0. The results above show predominantly positive spatial autocorrelation.

All the values are significant to the Z test at a 5% level. The expected value in this case is 0.0625; therefore the maximum value that the Moran's I could have is 1.0625. Looking at Table 3.5, the values are almost all below 0.20. Although all the Moran's I values are significant, these values are not particularly high compared to other cases in which there is a high spatial autocorrelation.[22] The level of spatial autocorrelation is also different in the various industrial sectors. Some sectors have quite low values, around 0.05. This is for example the case with mining, which is a sector that is very concentrated in a few regions (notably in Sardinia, which has all zeros in the spatial weight matrix since it is an island). Other sectors with lower levels of autocorrelation are leather and sundry manufacturing. In the latter case, this could be explained by the fact that employment in the sector is generally low and not widespread enough to create transregional clusters. The Moran's I is higher in

[22]See Arbia et al. (2006, p. 27), the Moran's I they obtain for manufacturing and services in the 1990s in Italy are higher, mostly between 0.10 and 0.30.

Table 3.4: Krugman specialization index, 1871–1911.

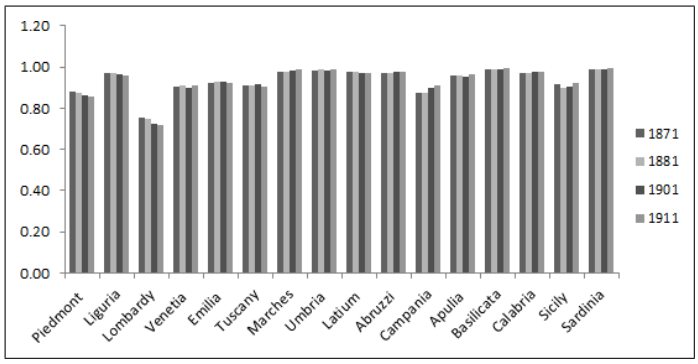
	1871	1881	1901	1911
Piedmont	0.88	0.88	0.86	0.86
Liguria	0.97	0.97	0.96	0.96
Lombardy	0.75	0.75	0.73	0.72
Venetia	0.90	0.91	0.90	0.91
Emilia	0.92	0.93	0.93	0.92
Tuscany	0.91	0.91	0.92	0.90
Marches	0.98	0.98	0.98	0.99
Umbria	0.99	0.99	0.99	0.99
Latium	0.98	0.98	0.97	0.97
Abruzzi	0.97	0.97	0.97	0.98
Campania	0.88	0.87	0.90	0.91
Apulia	0.96	0.96	0.95	0.96
Basilicata	0.99	0.99	0.99	0.99
Calabria	0.97	0.97	0.97	0.98
Sicily	0.91	0.90	0.90	0.92
Sardinia	0.99	0.99	0.99	0.99

Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

sectors such as metalmaking and engineering, which were probably developed enough to cross regional borders. Utilities has higher values as well, probably because of the production of hydroelectric power across the Alpine regions. There are some cases of sectors having relatively large differences in different years. Given the generally low level of spatial autocorrelation and in some cases the low level of employment (as for the sundry manufacturing), small changes in absolute terms can cause relatively large swings in the Moran's I.

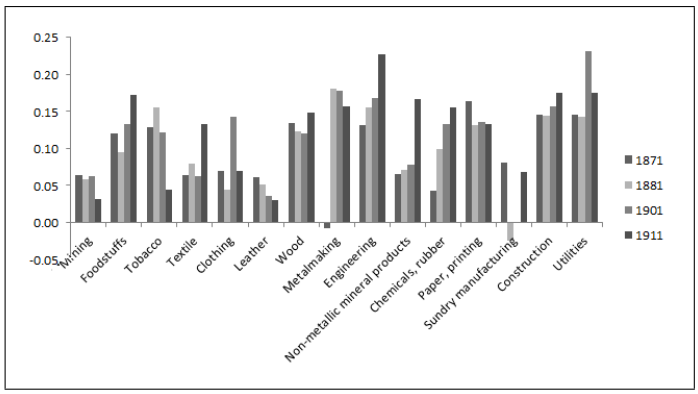
The last point to make is on the relationship between concentration, specialization and spatial autocorrelation. The previous measures show a generally higher concentration and specialization and generally lower autocorrelation. These two results are compatible with a scenario of the high concentration of industries within the boundaries of the traditional regions. In general, it looks as though industries tended to concentrate at regional level and regions tended to specialize within their borders. This result is in line with the working hypothesis of the next section in which we test the regional border effects in the change of industrial employment.

Figure 3.15: Krugman specialization index, 1871–1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

Figure 3.16: Moran's I index, 1871–1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

3.5.4 The determinants of changes in industrial employment, 1871–1911

In this section we finally move to the regression model. Table 3.6 starts with a simple cross sectional OLS. The three periods are presented first with robust standard errors and no clustering and then in the second column with clustering at provincial level. All coefficients are in logs. All provinces and all sectors are pooled. All specifications include province and sector fixed effects. First, we notice that quite predictably the change in industrial employment in a province is largely explained by the starting employment rate in that province. The R^2 of all specifications and years is well above 60%, proving that we do indeed capture much of the variation. The second insight is that the two types of neighbour effects have different signs in all years. This confirms our working hypothesis of there being different effects of the change in employment in neighbouring provinces, defined as the provinces sharing a border with a given province, depending on whether they belong to the same region or not. In terms of changes in time, we see that the neighbour effects are stronger in earlier periods in terms of the

Table 3.5: Moran's I index, 1871–1911.

	1871	1881	1901	1911
Mining	0.06	0.06	0.06	0.03
Foodstuffs	0.12	0.10	0.13	0.17
Tobacco	0.13	0.16	0.12	0.04
Textile	0.06	0.08	0.06	0.13
Clothing	0.07	0.04	0.14	0.07
Leather	0.06	0.05	0.04	0.03
Wood	0.13	0.12	0.12	0.15
Metalmaking	-0.01	0.18	0.18	0.16
Engineering	0.13	0.16	0.17	0.23
Non-metallic mineral products	0.07	0.07	0.08	0.17
Chemicals, rubber	0.04	0.10	0.13	0.16
Paper, printing	0.16	0.13	0.14	0.13
Sundry manufacturing	0.08	-0.02	0.00	0.07
Construction	0.15	0.14	0.16	0.18
Utilities	0.15	0.14	0.23	0.17

Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

size of the coefficient and also in terms of significance. If we believe that regions matter not because of the post-unitary arrangements but because of their historical meaning, the fact that earlier years show a stronger neighbour effect is predictable. In the next table, we show the same exercise pooling the sample and with panel regression. The reason why we are interested in pooling all the years when running the model is that, in spite of a fairly large overall sample (over 500 province-industry pairs), the number of cases of neighbouring provinces is a great deal more limited. It should be noted that the variables of interest for us are the neighbour effects rather than the controls. Therefore, pooling the three periods allows us to increase the number of cases under scrutiny.

Table 3.7 shows the pooled and panel specification with no clustering in the first column and region, province and industry clustering in the following sequence of columns in turn. The first thing that we notice is that the coefficients increase for the neighbour effects, in particular for the "same region" ones. The level of significance also increases to 1% for all specifications. Comparing the pooled regressions with the panel regression, we notice that the results on neighbour effects are very similar whereas the controls change. In particular, the share of the labour force in industry is negative and

Table 3.6: The determinants of changes in industrial employment, 1871–1911 (cross sectional OLS).

Log Change ind. employ.	1871–1881		1881–1901		1901–1911	
Log employment rate	0.803$^{(***)}$	0.803$^{(***)}$	0.678$^{(***)}$	0.678$^{(***)}$	0.525$^{(***)}$	0.525$^{(***)}$
	(0.0688)	(0.0831)	(0.0650)	(0.0708)	(0.0624)	(0.0597)
Log neighbour effect (same region)	0.0645$^{(*)}$	0.0645$^{(**)}$	0.102$^{(***)}$	0.102$^{(***)}$	0.0399	0.0399
	(0.0370)	(0.0314)	(0.0383)	(0.0350)	(0.0333)	(0.0280)
Log neighbour effect (other region)	-0.110$^{(***)}$	-0.110$^{(**)}$	-0.0516	-0.0516	-0.0416	-0.0416
	(0.0402)	(0.0432)	(0.0424)	(0.0371)	(0.0281)	(0.0287)
Log literacy	0.0887	0.0887	0.0476	0.0476	0.106	0.106
	(0.320)	(0.178)	(0.347)	(0.127)	(0.308)	(0.0978)
Log ind. LF	0.862$^{(*)}$	0.862$^{(***)}$	0.168	0.168	0.330	0.330$^{(***)}$
	(0.520)	(0.0657)	(0.409)	(0.135)	(0.345)	(0.0602)
Constant	-4.727$^{(***)}$	-4.727$^{(***)}$	-0.939	-0.939	-2.622$^{(*)}$	-2.622$^{(**)}$
	(1.469)	(1.147)	(1.210)	(0.719)	(1.370)	(1.090)
Clustering	no	province	no	province	no	province
Observations	534	534	576	576	536	536
R^2	0.678	0.678	0.687	0.687	0.624	0.624

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$ $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the difference in the logs of the employment rates by industry by province. All explanatory variables are in logs. Neighbour effects are defined as the weighted sum of changes in employment in the regions (with weights equal to the relative size of the industry/province labour force). Two provinces are neighbours if they share a border. Neighbours belonging to the same region are separate from those belonging to another region. Literacy, the agricultural labour force and industrial labour force are expressed as rates.

significant in the pooled regressions while the same result arises for the share of labour force in agriculture but not in industry in the panel. Also, in the panel, the literacy rate is positive and significant. These differences may be due to some collinearity issue between the share of industry and agriculture in the labour force in the different sectors, but they may also be due to issues between these and literacy.[23]

To summarize our findings so far, what we observed is that the change in industrial employment of a province is mainly explained by the initial industrial employment level in the province plus some controls, such as the share of labour force in each sector, literacy rates and province and industry fixed effects. We also included the change in the employment of the neighbouring provinces, defined as provinces that share a border with the given province, and, following Overman and Puga (2002), we

[23]We decided to keep both the share of the labour force in industry and that in agriculture in the regression to follow the example of Overman and Puga (2002) who also include a measure of human capital. As these are not necessarily the variables of interest but simple controls, whichever of these is actually included does not affect the analysis.

Table 3.7: The determinants of changes in industrial employment, 1871–1911 (pooled and panel OLS).

Log Change ind. employ.	Pooled				Panel			
Log employment rate	0.667$^{(***)}$	0.667$^{(***)}$	0.667$^{(***)}$	0.667$^{(***)}$	0.394$^{(***)}$	0.394$^{(***)}$	0.394$^{(***)}$	0.394$^{(***)}$
	(0.0368)	(0.0334)	(0.0265)	(0.0456)	(0.0661)	(0.0794)	(0.0810)	(0.126)
Log neighbour effect (same region)	0.0852$^{(***)}$	0.0852$^{(***)}$	0.0852$^{(***)}$	0.0852$^{(***)}$	0.0948$^{(***)}$	0.0948$^{(***)}$	0.0948$^{(***)}$	0.0948$^{(***)}$
	(0.0186)	(0.0191)	(0.0214)	(0.0221)	(0.0249)	(0.0239)	(0.0256)	(0.0279)
Log neighbour effect (other region)	-0.0799$^{(***)}$	-0.0799$^{(***)}$	-0.0799$^{(***)}$	-0.0799$^{(***)}$	-0.101$^{(***)}$	-0.101$^{(***)}$	-0.101$^{(***)}$	-0.101$^{(***)}$
	(0.0198)	(0.0176)	(0.0250)	(0.0208)	(0.0250)	(0.0240)	(0.0300)	(0.0208)
Log literacy	0.425	0.425	0.425	0.425	1.971$^{(***)}$	1.971$^{(***)}$	1.971$^{(***)}$	1.971$^{(***)}$
	(0.671)	(0.716)	(0.572)	(0.546)	(0.303)	(0.251)	(0.246)	(0.620)
Log agric. LF	-0.110	-0.110	-0.110	-0.110	-0.867$^{(**)}$	-0.867$^{(**)}$	-0.867$^{(*)}$	-0.867
	(0.469)	(0.358)	(0.433)	(0.625)	(0.423)	(0.328)	(0.437)	(0.726)
Log ind. LF	-1.062$^{(**)}$	-1.062$^{(**)}$	-1.062$^{(***)}$	-1.062$^{(*)}$	-0.357	-0.357	-0.357$^{(*)}$	-0.357
	(0.465)	(0.408)	(0.217)	(0.600)	(0.437)	(0.415)	(0.196)	(0.579)
Constant	0.622	0.622	0.622	0.622	-4.573$^{(**)}$	-4.573$^{(***)}$	-4.573$^{(**)}$	-4.573
	(3.210)	(3.107)	(2.477)	(3.063)	(1.781)	(1.691)	(1.770)	(3.246)
Clustering	no	region	province	industry	no	region	province	industry
Observations	1646	1646	1646	1646	1646	1646	1646	1646
R^2	0.599	0.599	0.599	0.599	0.164	0.164	0.164	0.164

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$ $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the difference in the logs of the employment rates by industry by province. All explanatory variables are in logs. Neighbour effects are defined as the weighted sum of changes in employment in the regions (with weights equal to the relative size of the industry/province labour force). Two provinces are neighbours if they share a border. Neighbours belonging to the same region are separate from those belonging to another region. Literacy, the agricultural labour force and industrial labour force are expressed as rates.

separated the neighbours belonging to the same region from the neighbours belonging to another region. We found that these have different signs. The interpretation for this result goes back to the specialization of the regions, which we found was quite high in the case of Italy. When a region tends to specialize, all its provinces will tend to have similar trends in the change of industrial employment, whereas provinces belonging to other regions will tend to have opposite trends to those of their competing neighbours. In the next tables we split the sample by macro area and then by industrial sector in order to go into depth about the relationship between industrial employment and border effects.

Table 3.8 shows the model run separately for the three macro areas.[24] The result of these three separate regressions is that most of the effect we observe when we pool all provinces comes from the North-East-Centre, where the coefficient is larger for the neighbour effect(in the same region) than in the other areas (over 0.1 when the North-West has coefficients below 0.05 and the South below 0.07) and is highly significant. The South presents a less pronounced neighbour effect but one still significant in the pooled regression. However, which basically represents the Industrial Triangle of Italy, does not show any significant neighbour effect. The explanation for this is two fold. First of all, Liguria and Piedmont were part of the same pre-unitary state; therefore it is expected that they would preserve their ties after Italy's Unification. However, Lombardy is also part of the North-West but this does not seem to drive any neighbour effect. The phenomenon can be explained through the similar economic trajectory that all three regions of the Industrial Triangle followed during the first Italian industrialization. Regarding the South, although the regions in this macro area were all part of the Kingdom of the Two Sicilies, it appears that the economic heterogeneity they experienced allowed for some neighbouring effect, albeit not as strong as in the North-East-Centre, where most of the variation is nested.[25]

In Tables 3.9 and 3.10 we repeat the same exercise for the industrial sectors showing the pooled OLS specification only. Here, disentangling the effect by splitting the sample in 15 sub-samples appears too demanding for our data. Most of the sectors do not

[24]The three areas are North-West, North-East-Centre and South, as in Felice (see Felice (2007a) and subsequent works on the regional development of Italy.

[25]It should also be noted that because of the way that the three macro areas are designed, the variation among them is not evenly distributed. Therefore, the North-East-Centre embraces far more provinces and, most importantly, far more borders. The stronger results here are therefore expected not only for historical reasons but also because of the way that the three sub-samples are constructed.

Table 3.8: The determinants of changes in industrial employment, 1871–1911, by macro area (pooled and panel OLS).

Log Change ind. employ.	North–West		North–East–Centre		South	
	Pooled	Panel	Pooled	Panel	Pooled	Panel
Log employment rate	0.648$^{(***)}$	0.446$^{(***)}$	0.665$^{(***)}$	0.337$^{(***)}$	0.629$^{(***)}$	0.384
	(0.0591)	(0.0832)	(0.0419)	(0.109)	(0.109)	(0.251)
Log neighbour effect (same region)	0.0265	0.0424	0.113$^{(***)}$	0.125$^{(***)}$	0.0694$^{(*)}$	0.0601
	(0.0773)	(0.0858)	(0.0242)	(0.0281)	(0.0357)	(0.0414)
Log neighbour effect (other region)	-0.0814	-0.0696	-0.0645$^{(**)}$	-0.0821$^{(**)}$	-0.0858$^{(**)}$	-0.103$^{(*)}$
	(0.0650)	(0.0605)	(0.0269)	(0.0334)	(0.0368)	(0.0509)
Log literacy	-1.256	2.649$^{(***)}$	1.152	1.897$^{(***)}$	4.053$^{(*)}$	1.509$^{(***)}$
	(1.370)	(0.603)	(1.126)	(0.562)	(2.212)	(0.408)
Log agric. LF	0.120	-0.547	0.847	-0.0725	-0.179	-0.780
	(0.827)	(1.251)	(1.048)	(0.749)	(0.869)	(0.445)
Log ind. LF	-1.599$^{(*)}$	-0.531	-0.857	-0.330	-0.613	-0.752
	(0.847)	(0.723)	(0.813)	(0.929)	(0.824)	(0.731)
Constant	7.440	-9.205	-5.806	-6.879$^{(*)}$	-11.94	-2.351
	(5.002)	(5.585)	(7.161)	(3.282)	(7.934)	(1.743)
Clustering	province	province	province	province	province	province
Observations	486	486	722	722	438	438
R^2	0.635	0.210	0.585	0.201	0.625	0.090

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$ $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the difference in the logs of the employment rates by industry by province. All explanatory variables are in logs. Neighbour effects are defined as the weighted sum of changes in employment in the regions (with weights equal to the relative size of the industry/province labour force). Two provinces are neighbours if they share a border. Neighbours belonging to the same region are separate from those belonging to another region. Literacy, the agricultural labour force and industrial labour force are expressed as rates.

show a neighbouring effect, and a quite a few do not show a significant level of starting employment. This suggests that there is not enough variation in these specifications.

The last variation on the model that we show is the one with pre-unification borders. Here the pre-1861 borders are applied to the post-1861 provinces. Therefore, two provinces are neighbours (in the same state) if they shared a border in 1871 and if they belonged to the same pre-unitary state before 1861. But, if they shared a border in 1871 but did not belong to the same pre-unitary state, they would fall under the heading of neighbours (in another state).[26] The regressions here are ran as pooled

[26]To illustrate with an example: the provinces of Alessandria and Genova do share a border but they belong to two different post-1861 regions (Alessandria is in Piedmont and Genova in Liguria). Therefore, in all the previous tables, their neighbour effects fall under neighbours (in another region). With pre-unitary borders they on the contrary fall under neighbours (in the same state), since both provinces belonged to the Kingdom of Sardinia before 1861. The same applies to all cases. To work out the matrix we used information on borders variations from ISTAT (2001).

Table 3.9: The determinants of changes in industrial employment, 1871–1911, by sector (pooled OLS).

Log Change ind. employ.	Mining	Foodst.	Tobac.	Text.	Cloth.	Leath.	Wood
Log employment rate	0.218	4.868$^{(***)}$	0.0424	1.697$^{(***)}$	-1.863$^{(**)}$	-3.696$^{(*)}$	-5.728$^{(***)}$
	(0.148)	(1.769)	(1.136)	(0.596)	(0.920)	(1.865)	(2.027)
Log neighbour effect (same region)	-0.0690	0.0562	0.175	0.193	-0.0559	0.255	-0.00470
	(0.150)	(0.0864)	(0.496)	(0.124)	(0.0806)	(0.189)	(0.119)
Log neighbour effect (other region)	-0.0476	-0.0992	0.135	0.0314	0.0635	-0.103	-0.00821
	(0.123)	(0.0917)	(0.266)	(0.130)	(0.0864)	(0.151)	(0.146)
Log literacy	2.097	2.104	0.215	0.822	-0.190	5.424$^{(***)}$	2.013
	(1.748)	(1.415)	(8.548)	(1.814)	(0.930)	(1.286)	(1.522)
Log agric. LF	-2.172	0.372	-0.863	2.167	0.338	-4.241$^{(***)}$	-1.292
	(2.211)	(1.551)	(4.440)	(1.757)	(1.241)	(1.420)	(2.075)
Log ind. LF	0.869	-2.849	2.894	0.671	-0.614	-2.958	2.978
	(2.264)	(2.163)	(8.498)	(2.003)	(1.660)	(1.924)	(2.588)
Constant	-4.958	-7.782	-9.016	-13.51	2.814	4.955	-9.773
	(8.740)	(6.442)	(26.08)	(8.158)	(5.334)	(7.110)	(9.331)
Observations	121	126	44	126	126	126	99
R^2	0.693	0.519	0.808	0.576	0.701	0.546	0.575

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$ $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the difference in the logs of the employment rates by industry by province. All explanatory variables are in logs. Neighbour effects are defined as the weighted sum of changes in employment in the regions (with weights equal to the relative size of the industry/province labour force). Two provinces are neighbours if they share a border. Neighbours belonging to the same region are separate from those belonging to another region. Literacy, the agricultural labour force and industrial labour force are expressed as rates.

Table 3.10: The determinants of changes in industrial employment, 1871–1911, by sector (pooled OLS).

Log Change ind. employ.	Metalm.	Engineer.	Nonmetallic	Chemic.	Paper	Sundry	Constr.	Util.
Log employment rate	1.194$^{(***)}$	-3.014	-1.976$^{(**)}$	0.0333	-1.782	0.453$^{(**)}$	-2.418$^{(**)}$	-0.204
	(0.248)	(1.824)	(0.841)	(0.188)	(1.090)	(0.223)	(1.123)	(0.256)
Log neighbour effect (same region)	-0.0669	0.0984$^{(*)}$	0.309$^{(**)}$	0.0901	0.0965	0.206	0.116	0.103
	(0.175)	(0.0538)	(0.127)	(0.103)	(0.106)	(0.155)	(0.123)	(0.262)
Log neighbour effect (other region)	-0.226$^{(**)}$	-0.106$^{(*)}$	0.183	-0.111	-0.0670	-0.152	0.154	-0.0430
	(0.105)	(0.0579)	(0.142)	(0.189)	(0.0850)	(0.100)	(0.120)	(0.204)
Log literacy	1.964$^{(*)}$	3.161$^{(*)}$	6.858$^{(***)}$	2.549$^{(**)}$	3.974$^{(**)}$	-1.452	4.822$^{(***)}$	8.016$^{(**)}$
	(1.070)	(1.687)	(0.788)	(1.028)	(1.515)	(2.932)	(1.370)	(3.176)
Log agric. LF	3.399$^{(**)}$	-1.613	-1.410	0.749	-0.251	0.655	-5.690$^{(**)}$	-2.678
	(1.489)	(0.983)	(1.089)	(1.212)	(1.165)	(2.638)	(2.675)	(3.323)
Log ind. LF	1.979	1.736	-0.927	1.198	1.652	2.024	2.028	1.580
	(2.244)	(1.200)	(1.169)	(1.480)	(1.544)	(2.597)	(2.565)	(3.257)
Constant	-31.95$^{(***)}$	-11.26$^{(*)}$	-17.67$^{(**)}$	-19.91$^{(***)}$	-27.39$^{(***)}$	-3.461	2.901	-29.97
	(10.20)	(6.111)	(7.533)	(5.937)	(9.298)	(9.672)	(12.21)	(18.05)
Observations	101	101	126	126	126	104	112	82
R^2	0.792	0.757	0.767	0.641	0.712	0.740	0.580	0.789

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$ $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the difference in the logs of the employment rates by industry by province. All explanatory variables are in logs. Neighbour effects are defined as the weighted sum of changes in employment in the regions (with weights equal to the relative size of the industry/province labour force). Two provinces are neighbours if they share a border. Neighbours belonging to the same region are separate from those belonging to another region. Literacy, the agricultural labour force and industrial labour force are expressed as rates.

and panel OLS. Again the first column is with no clustering and the following three with three different types of clustering. The main result here is that the neighbour effect (same state) is positive and significant, while the neighbour effect (other state) is non significant. In terms of the other controls, we get similar results compared to the specification with post-1861 neighbour effects (share of industrial employment negative and significant for for the pooled and literacy positive and significant for the panel). Table 3.11 basically confirms the results obtained using post-unitary borders, although the neighbours in other states in this case seem to behave independently rather than in the opposite direction.

To conclude, this section has shown that the change in industrial employment is mainly explained by the initial industrial employment level in the province plus some controls (share of labour force in each sector; literacy rates; and province and industry fixed effects). Once we have controlled for all these factors, we can include in the model the change in the employment of the neighbouring provinces. Neighbours are defined as provinces that share a border with the given province. We took into account two types of neighbour: those belonging to the same region and those belonging to another region and we included them separately in the regression. We found that these two have different signs, suggesting that regional borders do matter in attempts to explain the patterns of regional specialization. By splitting the sample into three macro areas we have shown that most of the strength of these border effects comes first from the North-East-Centre and second from the South. The Industrial Triangle seems to be acting as a unique "economic" region in terms of the evolution of its industrial sectors.

We believe that the post-unitary administrative arrangements alone cannot explain this border effect. The first Italian state, unlike today's, was quite centralized and if intermediate bodies had power, they were the "comune" in the first place and then the province. Regions did not have specific administrative powers and were mere collections of provinces for census purposes. Therefore, to test whether the effect we observe originates from the years before unification, we created some "counterfactual" border effects, imposing the definition of neighbour according to pre-1861 borders on the post-1861. The result is similar to the one with post-1861 borders, with a positive and significant effect of neighbours in the same state but no effect of neighbours in other states.

Table 3.11: The determinants of changes in industrial employment in Italy, 1871–1911, pre-unification neighbour effect (pooled and panel OLS).

Log Change ind. employ.	Pooled				Panel			
Log employment rate	0.672$^{(***)}$	0.672$^{(***)}$	0.672$^{(***)}$	0.672$^{(***)}$	0.362$^{(***)}$	0.362$^{(***)}$	0.362$^{(***)}$	0.362$^{(**)}$
	(0.0426)	(0.0396)	(0.0287)	(0.0530)	(0.0745)	(0.0872)	(0.0889)	(0.125)
Log neighbour effect (same state)	0.0585$^{(**)}$	0.0585$^{(**)}$	0.0585$^{(*)}$	0.0585$^{(**)}$	0.0747$^{(**)}$	0.0747$^{(**)}$	0.0747$^{(**)}$	0.0747$^{(**)}$
	(0.0238)	(0.0270)	(0.0306)	(0.0271)	(0.0290)	(0.0286)	(0.0253)	(0.0323)
Log neighbour effect (other state)	-0.0189	-0.0189	-0.0189	-0.0189	-0.0385	-0.0385	-0.0385	-0.0385
	(0.0226)	(0.0247)	(0.0274)	(0.0264)	(0.0280)	(0.0318)	(0.0294)	(0.0313)
Log literacy	0.614	0.614	0.614	0.614	2.061$^{(***)}$	2.061$^{(***)}$	2.061$^{(***)}$	2.061$^{(**)}$
	(0.822)	(0.697)	(0.707)	(0.660)	(0.363)	(0.340)	(0.303)	(0.724)
Log agric. LF	0.254	0.254	0.254	0.254	-0.569	-0.569	-0.569	-0.569
	(0.563)	(0.451)	(0.573)	(0.633)	(0.486)	(0.399)	(0.537)	(0.762)
Log ind. LF	-1.156$^{(**)}$	-1.156$^{(**)}$	-1.156$^{(***)}$	-1.156	-0.309	-0.309	-0.309	-0.309
	(0.588)	(0.559)	(0.354)	(0.833)	(0.546)	(0.590)	(0.390)	(0.752)
Constant	-0.968	-0.968	-0.968	-0.968	-5.753$^{(***)}$	-5.753$^{(**)}$	-5.753$^{(***)}$	-5.753
	(3.971)	(3.128)	(1.707)	(3.962)	(2.144)	(2.192)	(1.679)	(3.650)
Clustering	no	region	province	industry	no	region	province	industry
Observations	1201	1201	1201	1201	1201	1201	1201	1201
R^2	0.588	0.588	0.588	0.588	0.186	0.186	0.186	0.186

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$ $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the difference in the logs of the employment rates by industry by province. All explanatory variables are in logs. Neighbour effects are defined as the weighted sum of changes in employment in the regions (with weights equal to the relative size of the industry/province labour force). Two provinces are neighbours if they share a border. Neighbours belonging to the same region are separate from those belonging to another region. Literacy, the agricultural labour force and industrial labour force are expressed as rates.

3.6 Conclusions

In the previous sections, we followed two main steps in order to study the geographical patterns of industries in the Italian regions in the period between the Unification and First World War.

We first presented different indices (Krugman, G and E-G indices) to measure the concentration of industries, the specialization of regions and spatial autocorrelation. The general results are that Italy experienced both a concentration of industries and specialization of its regions. These phenomena are, to some extent, present in all industrial sectors and all regions. The purpose of the exercise is first of all to establish whether there are some location patterns in the way that the different industrial sectors located themselves. Looking at standard measures of concentration and specialization, this appears to be the case. It is also useful to measure concentration and specialization at regional level in order to assess the role of regional borders. High levels of concentration and specialization suggest that borders do matter in the location patterns. The results for the third measure, the Moran's I, show a relatively low level of spatial autocorrelation among industries. Spatial autocorrelation has been introduced in the analysis to relate the dynamics of industrial location within the regions with the same dynamics in neighbouring regions. Spatial autocorrelation tells us whether regions tend to have more similar industrial sectors when they are closer to each other. The result of low spatial autocorrelation suggests that Italian industrial sectors tend to cluster more within regions than across regions.

The second step was to run a regression model to test whether the change in employment in a given province depended, all else being equal, on the change in neighbouring provinces. We sorted neighbouring provinces according to whether they belonged to the same region or not and found that provinces belonging to the same region had a positive and significant effect on employment while provinces belonging to different regions had a negative and significant effect. The interpretation of these results is connected with the results on specialization and concentration, for both steps of our methodology confirm that regions did matter in the location patterns for industrial sectors. We have claimed, in Section 3.2 that the role of post unification regions was minor compared to other smaller geographical units. This suggests that the importance of regional borders stems from pre-unitary arrangements. To test this, we imposed the pre-unitary borders

on the post-unitary provincial industrial employment and repeated the exercise. The results were basically confirmed.

The findings presented in this paper are important for three reasons. First, they bring some insights onto the location patterns of industries using newly published provincial level data. The availability of these data allows us for the first time to look into a lower geographical unit and opens the door to further research in this direction. Second, it brings some historical insights into the impact of pre-unitary institutions on the post-1861 industrial patterns. And last, it assures us that the use of regions as unit of analysis for the following two chapters has an economic rationale and is not merely a technical choice in the empirical analysis. This result is important for the analysis in the next chapter on the driving factors of industrial location. The Midelfart et al. (2000) model takes regions as unit of analysis.

Chapter 4

Where Do We Go From Here? Market Access and Regional Development in Italy (1871–1911)

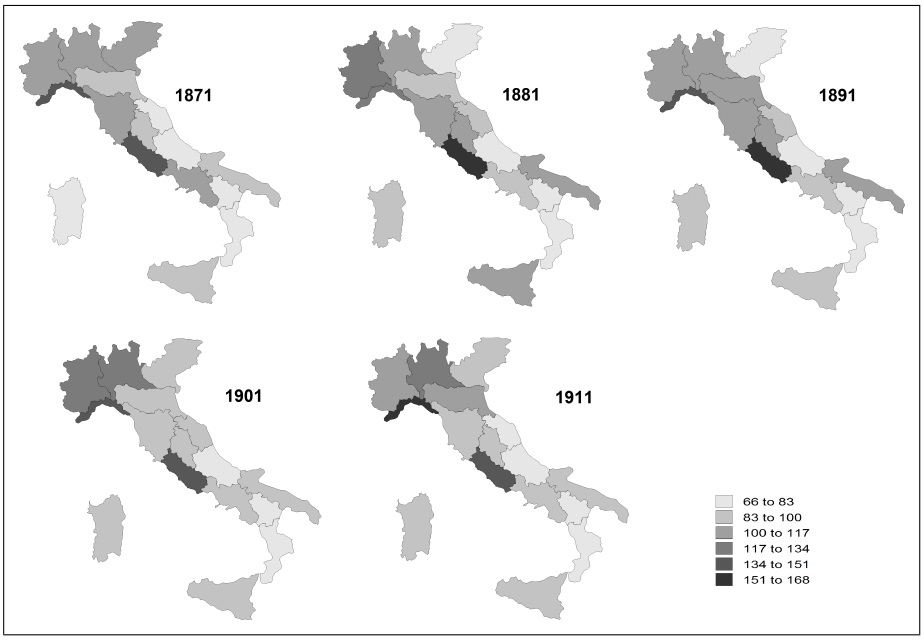
4.1 Introduction

Chapter 2 gave a complete overview of the economic conditions of the Italian regions at the time of Unification. The message is that the regions were not at all homogeneous in terms of their economic structure and performance. Although they did not show as large a North-South divide in terms of GDP per capita as today's, it is in this period that the gap starts widening (see Figure 4.1).

If we look at the indicators of economic development, such as the literacy rate, the level of regional inequality appears evident at the time of Unification. Figure 4.2 shows the literacy rates for each region in the benchmark years 1871, 1881, 1901 and 1911. Finally, looking at the industrial value added per capita (which corresponds specifically to the part of GDP produced by industry) in Figure 4.3, the formation of the gap during this period is much more evident, due to the process of industrialization which was largely concentrated in the Northwestern regions of Piedmont, Lombardy and Liguria.

The Italian regions showed increasing differences in this period in terms of economic development. Some working hypotheses on the causes of this rising gap can be put forward. In Economic Geography, we know that there are two competing views on why certain regions attract economic activity more than others. The traditional Heckscher-Ohlin (H-O) view focuses on factor endowment to explain the location of economic activity, meaning that regions with a higher endowment of natural, financial or human resources attract economic activity. Opposite to this, the New Economic Geography

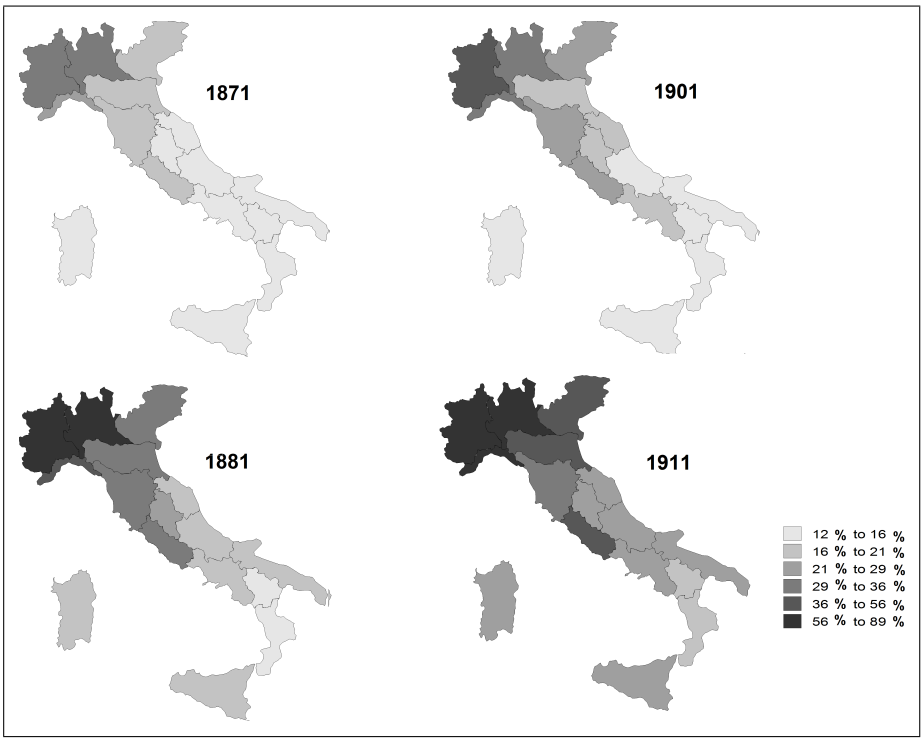
Figure 4.1: GDP per capita of the Italian regions, 1871–1911 (constant 1911 prices, Italy=100).



Source: Felice (2009a) for 1881 and 1901 and Brunetti et al. (2011) for 1871, 1891, 1901 and 1911.

(NEG) view considers market access as the main force. While measuring endowments is a fairly straightforward procedure, if not in terms of data collection at least in terms of methodology, measuring market access is far more complicated. Reliable measures of market access are an essential starting point in order to evaluate NEG forces. Chapter 2 provided a detailed description of the use of market access measures in both the Economic Geography literature and that of Economic History. This chapter looks at the role of market access in the regional divergence of Italian regions, using the concept of market potential. This is a measure of the centrality of a region in terms of its access to markets. Given the lack of trade volumes data for the Italian regions, this measure will be based on the GDP of each region and the GDP of the adjacent regions, weighted by their distance. The formulation used here dates back to the seminal work by Harris (1954), adjusted by the several developments and extensions since then. This chapter will estimate the market potentials of all Italian regions for a series of ten year benchmarks, from 1871 to 1911, following the methodology by Crafts (2005a) and Schulze (2007). These estimates will allow us to look at the market access of different regions both before the process of industrialization gained ground and during its evolution. The estimation of market access through market potentials has fruitful applications beyond the mere quantification of the relative position of the regions. In particular, market

Figure 4.2: Literacy rates in the Italian regions, 1871–1911.



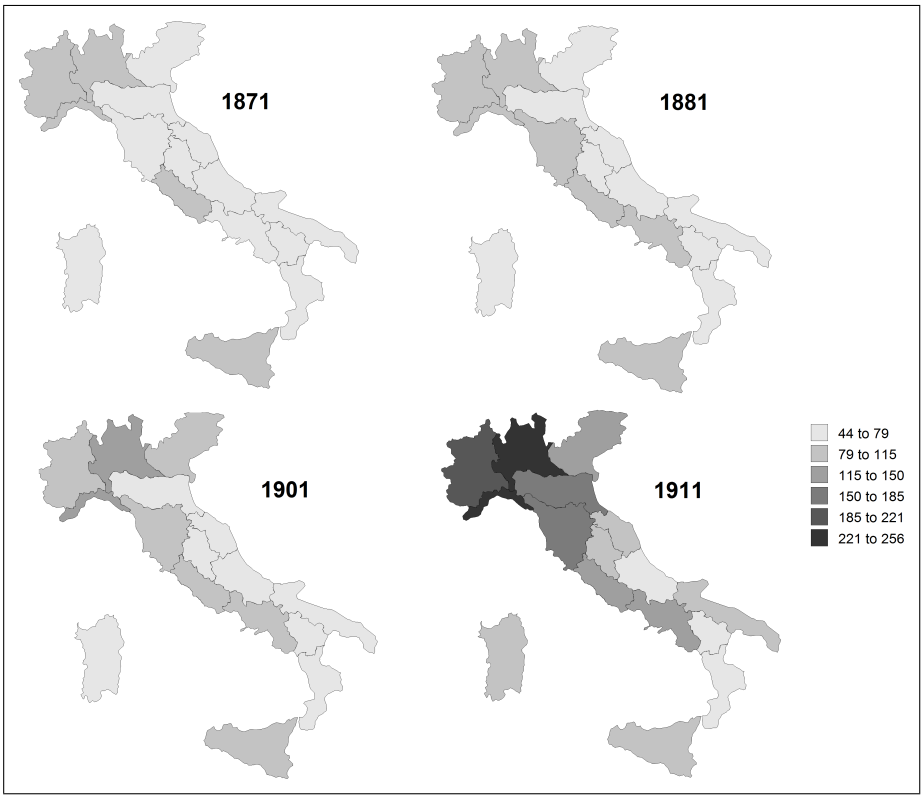
Source: A'Hearn et al. (2011).

potential is often a strong candidate in accounting for regional disparities in terms of economic development. In this chapter we use various formulations of market potential in order to explain regional GDP per capita and regional industrial value added per capita. The main result is that the formulations that we use show that regional GDP per capita in this period was affected by domestic market potential more strongly than other formulations which include trading partners, in particular when the model is run in first differences, which corresponds to looking at growth rates. The second economic indicator that we try to explain is industrial value added per capita, which in terms of growth rates seems to be much less affected by any type of market potential. This measure is included in the analysis to help us focus on the part of GDP generated by the secondary sector, which appears to be more geographically polarized.

The motivations for these chapter are the following. First, the chapter provides several formulations of the market potential estimates for the Italian regions. The methodology for these estimates is discussed in detail, as the estimates themselves are. It is useful to mention here that in recent works market potential has been used as an explanatory variable for modelling the location pattern of industries across regions.[1]

[1]See Midelfart et al. (2000), Crafts and Mulatu (2006), Wolf (2007), Martinez-Galarraga (2012) and Klein and Crafts (2012). This literature is discussed extensively in Chapter 2.

Figure 4.3: Industrial value added per capita in the Italian regions, 1871–1911 (constant 1911 prices, Italy=100).



Source: Fenoaltea (2003b) and MAIC (1874, 1883, 1902, 1914).

To this end, the estimates proposed in this chapter are applied to the case of Italy to model the location of industries across regions. Second, beyond providing estimates for Chapter 5, this chapter proposes a model for studying the relationship between the development of the Italian regions and their market potential. This exercise is quite different from modelling the location of industries. GDP per capita is in fact an output measure of development, which is affected by factors that could be different from those affecting location (above all, labour productivity). Therefore, Chapters 4 and 5 do address different, although connected, questions.

This chapter is organized as follows. Section 4.2 discusses the methodology used to calculate market potentials for the Italian regions; section 4.3 illustrates the sources used; section 4.4 shows the estimates and provides a commentary on the results; section 4.5 applies these estimates to explain GDP per capita and industrial value added per capita; section 4.6 concludes.

4.2 Market access in regional analysis: empirical framework

In the literature, market potential has been calculated following several methodologies. The most basic one goes back to Harris (1954) and uses retail sales weighted by distances to evaluate the market access of US regions. This type of formulation has been used in more recent works such as Midelfart et al. (2000) on the European Union, Crafts (2005a) on Britain (1870–1910), Schulze (2007) on Austria-Hungary (1870–1910), Martinez-Galarraga (2012) on Spain (1856–1929) and Klein and Crafts (2012) on the US (1880–1920). All these works the use the total GDP of the regions weighted by distance.[2] The alternative approach to calculating market potentials is to use a gravity model to estimate the functional form of market potential. A gravity model explains the volumes of trade among regions using mainly the size of the regions and the distance between each region, jointly with some dummy variables and controls such as adjacency or the presence of a border. Market potential in this case is calculated through the parameters estimated by means of the gravity model. Examples of works using this methodology are Redding and Venables (2004) at world level, Head and Mayer (2004) on Japanese firms in the European Union, Hanson (2005) on the United States, and in historical perspective, Wolf (2007) on Poland (1925–1937) . This exercise is not possible in the case of Italian regions because data on volumes of trade within the Italian borders are not available for this period. The next section illustrates the methodology adopted here, which largely follows Crafts (2005a) and Schulze (2007).

4.2.1 Modelling market potential

In its original formulation, the market potential of region A was defined as the sum of the GDP of all the adjacent regions, each weighted by their distance from region C, plus the GDP of region C adjusted by a coefficient that takes account of its size. The calculation of market potential, following Harris (1954), is shown in Equation (4.1):

$$\mathrm{MP}_c = \sum_w \mathrm{GDP}_w \times D_{c,w}^{\gamma} \tag{4.1}$$

[2] All the works actually use transport cost adjusted distances; the only exception is Klein and Crafts (2012), which uses straight line distances. The appropriateness and difference between these approaches is discussed in the chapter.

with $D_{c,w}^{\gamma}$ the distance between region c and w. The parameter γ is set as -1 and is defined as in Equation (4.2):

$$D_{c,c} = 0.333 \times \sqrt{\frac{\text{Area}_c}{\pi}}\,. \tag{4.2}$$

The idea behind market potential is quite straightforward. First, for each region C, we take the main node. The second step is to calculate the distances between the node of region C and the nodes of each other adjacent region.[3] For a given region C, the larger the GDP of the other regions, the better the access of the regions to markets; the larger the distance between region C and the other regions and the lower the weight of the GDP of each of these regions in the market access of the region concerned. Finally, Equation (4.1) shows how to deal with the own GDP of the region, which represents the contribution of the home GDP to the overall market access: Harris (1954) proposes a formula for own distance that takes into account the size of the region, so that the larger the region, the lower the weight of its own GDP. The rationale here is that for a given level of GDP, the larger the region the more spread out, and therefore harder to access, is its own GDP.

Although a gravity model cannot be used because of the lack of internal volumes of trade data, several refinements are still possible. First of all, distance in our case is weighted by transport costs as normally done in the literature on market integration and market potential when volumes of trade are not available. In this case, we decided to take into account both ground distances, which are assumed to be covered by railway and sea distances which are assumed to be covered by ship. For each pair of nodes, we calculate the cheapest combination of railway and shipping. To do so, we apply to all distances both a variable component (cost per km) and a terminal component (a lump sum cost when using each given mean of transportation). Whenever a part of the distance is assumed to be covered with a different mean of transportation, the corresponding terminal cost is applied. Finally, the last cost to take into account is the existence of trade barriers between nodes. It is not the case for Italian nodes, but whenever one of the two nodes is a foreign city, a correction is needed. Following Crafts (2005a) and Schulze (2007), tariffs are converted into distance equivalents. This procedure is based on the coefficients of the gravity model by Estevadeordal et al. (2002). The elasticities of the model are used to convert ad valorem tariffs into a distance equivalent measure to be added to the regular terminal component of the transport

[3] In this case all the Italian regions plus the main trading partners of Italy.

cost. The tariff between Italy and each trading partner is computed as the ratio of the total custom revenues of the trading partner over its total imports. This gives an average tariff level for each country.

4.2.2 Testing the effect of market potential on economic development

The goal of this chapter is to study the relationship between economic development and market access in the Italian regions in the period 1871–1911. The empirical framework we use is taken from the work by Head and Mayer (2011) on market potential and economic development in the period 1965–2003. This work focuses on the calculation of market potentials for all countries in the world, relating them to GDP per capita. The main methodological difference between our work and that by Head and Mayer (2011) is the calculation of market potentials: here the calculation of market potentials follows Harris (1954) using GDP figures and transport costs; Head and Mayer (2011) use a gravity model based on trade data.

After obtaining market potential estimates following Harris (1954), we implement the model using regression analysis; our goal is to cast light on the relationship between economic development and market access. We rely on the following base line specification:

$$\begin{aligned} \ln(GDPpc_i)_t = \beta_t \text{ Market Potential}_\text{i} \\ + \alpha_t \text{ Region Controls}_\text{i} \\ + \sum_t \theta_t \text{ Year} + \epsilon_t \,. \end{aligned} \tag{4.3}$$

The model described in Equation 4.3 aims at explaining the GDP per capita of region i through market potential as the main explanatory variable. The region controls are as follows: South, which is equal to 1 if the region is in the South (we also show a version of this model with region fixed effects and with latitude as a control); literacy, which is the literacy rate in a given region and the share of arable land. This latter is used in 1871 level to explain all years as a method to avoid endogeneity.

Equation 4.3 can thus be expanded in the following estimating equation:

$$\begin{aligned} \ln(\text{GDPpc}_i)_t = \beta_t \text{ Market Potential}_\text{i} \\ + \gamma_{1t} \text{ Latitude}_\text{i} + \alpha_{1t} \text{ Literacy}_\text{i} \\ + \alpha_{2t} \text{ Share Arable Land}_\text{i} \\ + \sum_t \theta_t \text{ Year} + \epsilon_t \,. \end{aligned} \tag{4.4}$$

Figure 4.4: Italian regions, 1870–1918.

In Section 4.5 various specifications of this model are shown. We also split the sample in North and South and we show the same regression with industrial value added per capita as a dependent variable. All the models are also run in first differences to address collinearity concerns. Before we show the results, the next section illustrates in detail the sources used.

4.3 Sources

In this section we describe the sources used for testing the model of Equation 4.4. All monetary measures are taken in constant 1911 lire.[4] The regions considered in this work are the sixteen regions created in 1870 after the annexation of Rome. Figure 4.4 shows the boundaries of the Italian regions which did not change over the period.[5]

Starting the analysis on market potentials in 1871 and ending it in 1911 is both historically and practically useful. From a pragmatic point of view, the 1871–1911 period is convenient because borders did not have any variation and because 1871 was the year of the first census after the main annexations. In fact, Italy was formally unified in 1861 but its borders changed twice, in 1866 and in 1870, when Veneto and

[4] We chose to use constant 1911 prices following Head and Mayer (2011). On the other hand, when we study the determinants of industrial location in Chapter 5 we use current prices following the methodology by Klein and Crafts (2012). This choice is discusses in Chapter 5.

[5] These regions are quite similar to present regions, with the exception of Venezia Giulia and Trentino Alto Adige which were not yet Italian and Valle Aosta and Molise which were at the time parts of Piedmont and Abruzzi, respectively.

Latium were annexed. All the main regions of Italy (except Trentino Alto Adige and Venezia Giulia) were part of Italy in 1871. From an historical point of view, ending the analysis in 1911 allows us to isolate this period of the early industrialization from the effects of the First World War and Fascism.

4.3.1 Market potentials

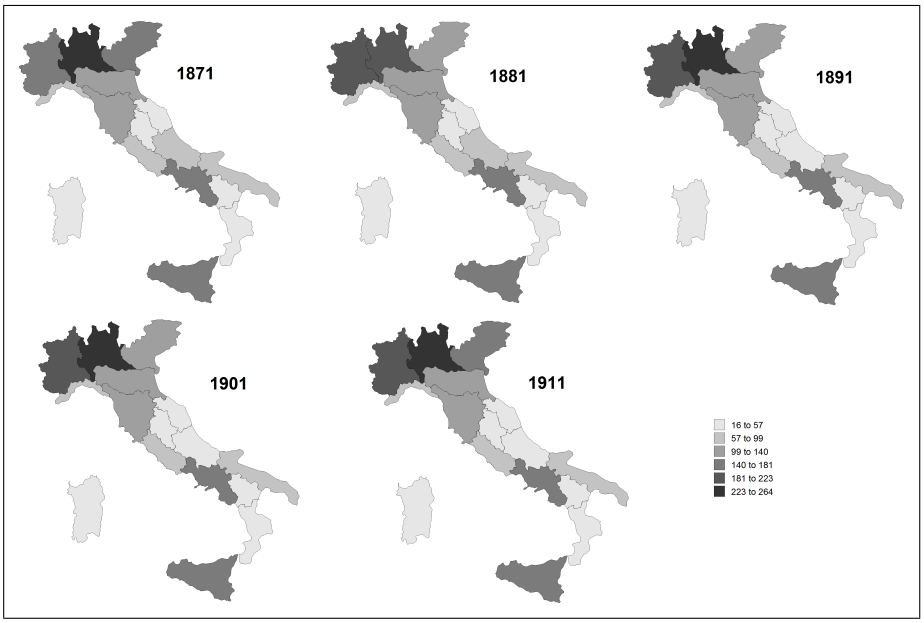
The variable at the core of this model is market potential. Market potential is calculated using regional the GDP, the GDP of trading partners, transport cost adjusted distances and tariffs. The next sections illustrates the sources and how they are used for each of the components of market potential.

Regional and Foreign GDP Estimates. The first and main ingredient of market potential is GDP. The estimation of regional disparities for Italy in the period 1871–1911 has been a matter for discussion among scholars for a long time.[6] For the GDP estimates for the Italian regions the latest available series are those from the work of Emanuele Felice. The estimates of regional GDP used here come from Felice (2009a) for 1881 and 1901 and Brunetti et al. (2011), of which Felice is a coauthor, for 1871, 1891 and 1911. The data provided here on the regional disparities of GDP per capita are the starting point for deriving GDP estimates in levels for this period. The next step in the procedure is to apply these per capita disparities to the national GDP per capita. We decided to use for this step the GDP estimates published by Baffigi (2011) within the broader project of the Bank of Italy for the 150th anniversary of the Unification. These are the latest estimates for the Italian national income and are published both in constant and current prices. In this chapter we give the GDP figures in 1911 constant lire. Starting from the national GDP estimates by Baffigi (2011), we calculate the national GDP per capita estimates by dividing them by the present Italian population. This figure is then multiplied by the coefficients of regional disparities provided by Felice (2009a) and Brunetti et al. (2011) to work out all the level of the regional GDP per capita. Finally, the per capita figures are multiplied by the regional population figures to obtain the total GDP of each region in levels at constant 1911 prices.[7] The regional GDP disparities from Felice (2009a) and Brunetti et al. (2011) are shown in Figure 4.5.

[6] See Fenoaltea (2003b), Zamagni (1978), Felice (2007a), Felice (2009a) and Brunetti et al. (2011). Also see Chapter 2 for an extensive discussion.

[7] To illustrate, assume that the national GDP per capita in a given year is 100 lire. If the GDP per capita coefficient for a region A is 1.20, the GDP per capita is 120. If the present population of the region in 1871 is 1,000,000 than the total GDP of region A in 1871 is derived by multiplying these three figures, returning 1,200,000,000 lire.

Figure 4.5: Total GDP of the Italian regions, 1871–1911 (constant 1911 prices, Italy=100).



Source: Felice (2009a) for 1881 and 1901 and Brunetti et al. (2011) for 1871, 1891 and 1911.

With regard to the GDP of foreign trading partners, the procedure is the following. Using data on exports from the Annuario Statistico Italiano, for each benchmark year, we take all the countries that cover 80% of Italian foreign trade. The trading partners included are: Austria-Hungary, France, Germany, the United Kingdom, Switzerland, Argentina and the United States.[8] Figure 4.6 shows the Italian exports to these countries as the share of total exports for each benchmark year.

The main source for the GDP of foreign partners is Crafts (2005a), who relies primarily on the work of Prados de la Escosura (2000). Argentina and Switzerland come directly from Prados de la Escosura (2000) for the years 1881–1911.[9] We also consider Austria and Hungary separately. In order to do so, we split the estimate by Crafts (2005a).[10]

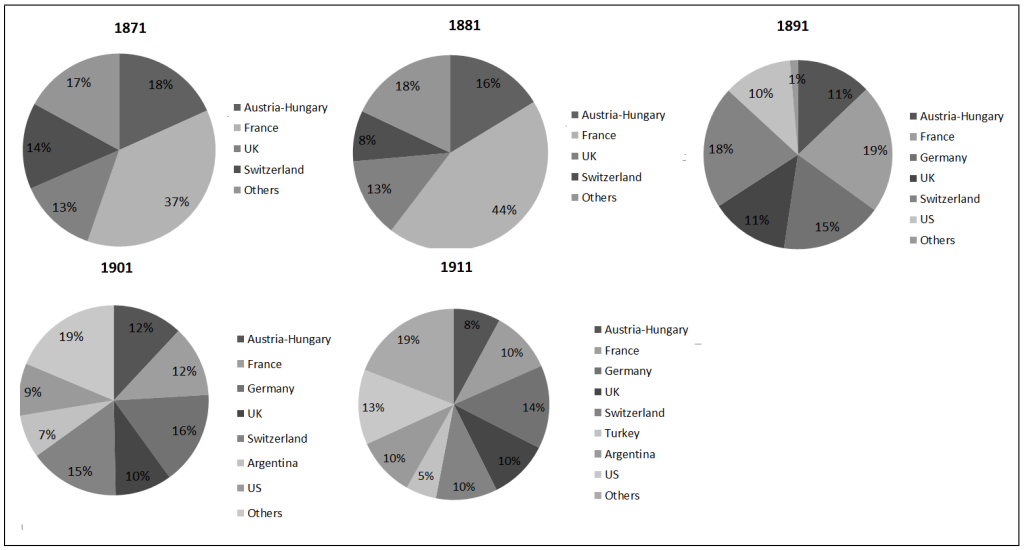
Figure 4.7 shows the magnitude of the Italian GDP compared to foreign GDP. Looking at Figure 4.7, the different magnitude of the US, for 1911 in particular, stands out. Including such a large GDP compared to that of the Italian regions could be problematic in the sense that most of the market access could be driven by the US.

[8]The only exception to the 80% criterion is Turkey, for which GDP estimates for this period in current prices are not easily available from either source.

[9]For 1871, estimates were not available; therefore we used the relative disparity among countries of 1881 and applied it to 1871.

[10]The two GDP are worked out by looking at the relative size in each year from Schulze (2007).

Figure 4.6: Italian export shares, 1871–1911.



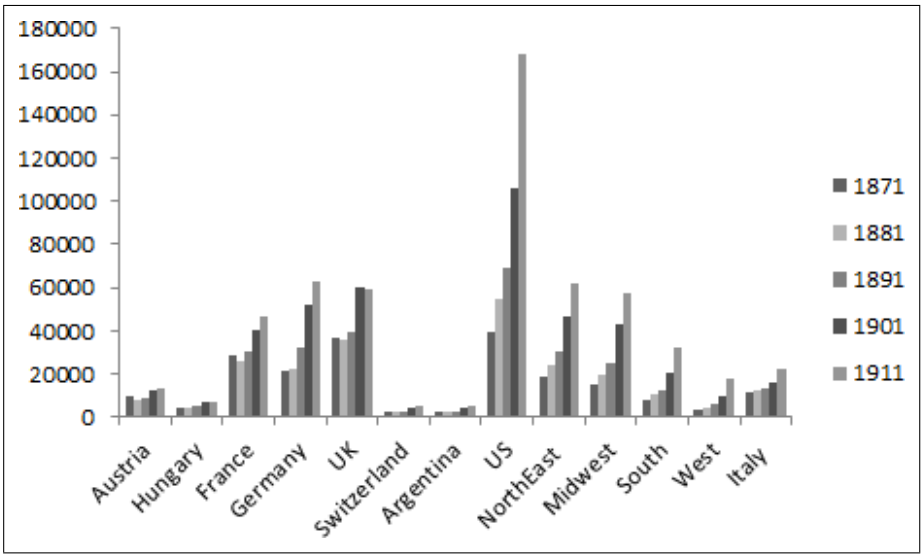
Source: Annuario Statistico Italiano 1877, 1881, 1892, 1911.

To underplay the role of the US, we split it in four macro-regions, Northeast, Midwest, West and South. The implication of this choice is discussed in more detail in the next section. The regional disparities for the US are worked out from Klein (2009). These are the same estimates as those on which the market potentials of Klein and Crafts (2012) are based for 1881–1911. To work out 1871, we use the same disparities as for 1881.

Distances. In order to weight the sum of GDP, a distance measure is required. As in previous works by Crafts (2005a) and Schulze (2007), geographical distance is replaced by transport costs. This is suitable because straight line distances per se do not take into account differences of costs for alternative means of transportation nor of the existence of railway lines and ports. The first step is to choose a node for each region and foreign trading partner. Then the distance in terms of railway line or sea route (or the two together) between each pair of nodes is computed. The administrative regions considered are shown in Figure 4.4.

The general rule in selecting the nodes is to take the most populous centre which often corresponds to the administrative centre. Exceptions are Terni and Pescara for Italy. The reason for this choice is that the actual administrative centres, Perugia and L'Aquila, were not the economic centres of the regions and were not very well integrated in its transport network. Using them would have created too high a penalty for Umbria and Abruzzi in terms of market access. For the US, none of the nodes is

Figure 4.7: GDP of Italy and its main trading partners, 1871–1911 (constant 1911 million lire).



Source: Prados de la Escosura (2000) and Crafts (2005a).

the administrative centre since in the US the largest cities almost never correspond to the capital. The two means of transportation considered in this period are railways and shipping. For railways, the length of lines has been worked out from the following sources: Bradshaw's Continental Guide of 1914 and the publication on the all lines opened by Ferrovie dello Stato (1927). Relying on sources that cover the whole period is very important, because this takes into account the construction of new lines. For shipping, distances were easily computed from the website www.dataloy.com, which provides the length of maritime routes between all the main ports worldwide.

Transport Costs. Once a matrix of distances is computed, the next step is to quantify the rate per tonne per kilometre. The rate taken into account is the average rate between coal and wheat, which are considered here the two representative goods.[11] For Italian railways, the source is a publication on railway rates by Ferrovie dello Stato (1912). This publication is quite detailed, providing terminal and variable components of the rate of transportation for a variety of goods. For the rates of foreign countries, we rely on the work by Schulze (2007) which uses on the information from the US Bureau for Railway Economics (1915) and Noyes (1905) to compute terminal and variable components. The first source provides an overview of 1914 rates for different countries and

[11] We would of course like to take into account the transportation cost of all industrial goods. However, collecting information on transport rate for all goods would be extremely data and time consuming. Moreover, it would not be clear how to use this information in a synthetic measure. Therefore, we follow the existing literature such as Crafts (2005a) and Schulze (2007) and adopt the standard solution.

Table 4.1: Regions, trading partners and nodes.

	Region/Country	**Node**
Nodes with sea access	Liguria	Genoa
	Venetia	Venice
	Marches	Ancona
	Campania	Naples
	Apulia	Bari
	Calabria	Reggio Calabria
	Sicily	Palermo
	Sardinia	Cagliari
	United Kingdom	London
	Turkey	Istanbul
	Argentina	Buenos Aires
	Unites States	New York
	Northeast	New York
	South	New Orleans
	West	San Francisco
Nodes without access to the sea	Piedmont	Turin
	Lombardy	Milan
	Emilia	Bologna
	Tuscany	Florence
	Umbria	Terni
	Latium	Rome
	Abruzzi	Pescara
	Basilicata	Potenza
	Austria-Hungary	Vienna
	France	Paris
	Germany	Berlin
	Switzerland	Zurich

for both coal and wheat, separating the cost in terminal and variable component for different city pairs in each country. From this, the terminal and variable components for various countries are worked out. The next step is to project these estimates back in time. Noyes (1905) provides average rates starting from 1870. This information is converted into an index and used jointly with the 1914 baseline to extrapolate terminal and variable components for the whole period. For the US, which is not covered by Schulze (2007), we rely on the information from Noyes (1905) and assume that the US rate is 50% of the general European rate. For shipping, there are no sources specific to Italy. The estimates for international ocean shipping from Kaukiainen (2003) are

used for all routes. This is a widely used source for this type of research, including works on Italy.[12] The transport costs used are set out in Tables 4.2, 4.3 and 4.4.

Table 4.2: Shipping rate per tonne per km, in constant 1911 lire, 1871-1911.

	Terminal Component	Cost per km
1871	19.67	0.00307
1881	14.71	0.00180
1891	11.14	0.00116
1901	9.06	0.00111
1911	7.29	0.0011

Source: Kaukiainen (2003)

Table 4.3: Italian railway rates per tonne per km, in constant 1911 lire, 1871-1911.

	Terminal Component	Cost per km
1871	1.93	0.05688
1881	1.83	0.05386
1891	1.51	0.04456
1901	1.56	0.04588
1911	1.26	0.03731

Source: Ferrovie dello Stato (1912), Schulze (2007), Noyes (1905)

Table 4.4: Railway and Shipping rates per tonne per km, in constant 1911 lire 1871-1911.

	Austria Railway Rates		France Railway Rates		Germany Railway Rates	
	Terminal	Variable	Terminal	Variable	Terminal	Variable
1871	5.44	0.08342	7.67	0.01937	6.56	0.03344
1881	4.35	0.06633	8.69	0.02195	6.69	0.03379
1891	3.11	0.04860	7.61	0.01924	6.21	0.03149
1901	2.98	0.04618	7.00	0.01753	5.96	0.03057
1911	2.60	0.04013	5.73	0.01450	4.90	0.02505
	Europe Railway Rates		UK Railway Rates		US Railway Rates	
	Terminal	Variable	Terminal	Variable	Terminal	Variable
1871	7.55	0.034289	2.35	0.052741	7.99	0.03614
1881	7.58	0.034409	2.34	0.05054	4.88	0.022046
1891	6.32	0.028692	2.04	0.045535	3.63	0.016437
1901	6.19	0.028006	2.29	0.0491	3.10	0.014003
1911	5.10	0.023171	1.87	0.041229	2.55	0.011585

Source: Ferrovie dello Stato (1912), Schulze (2007), Noyes (1905) and US Bureau for Railway Economics (1915)

Tariffs. The last cost to be taken into account is the one originated by trade barriers between nodes. It is not the case for Italian nodes, but whenever one of the two nodes is a foreign city, a correction is needed. Following Crafts (2005a) and Schulze (2007),

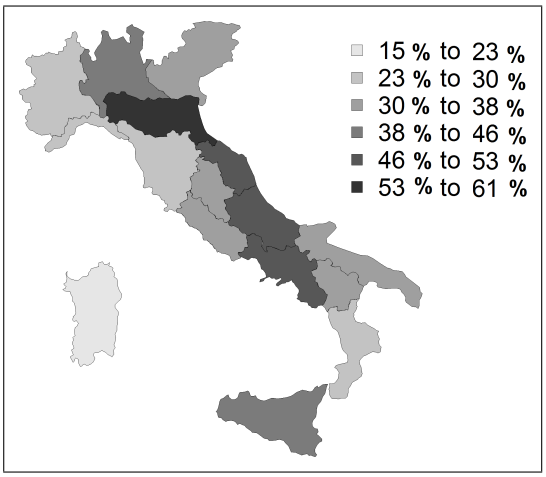
[12] Federico (2007) uses the same source to study the market integration of Italy in the 19th century.

Table 4.5: Ad valorem tariffs, 1871–1911.

	Austria-Hungary	France	Germany	UK	Switzerland	Argentina	US
1871	2%	3%	8%	6%	2%	22%	29%
1881	0%	6%	6%	5%	2%	27%	24%
1891	3%	8%	9%	5%	3%	20%	20%
1901	6%	9%	9%	9%	4%	29%	20%
1911	6%	10%	8%	12%	4%	2%	15%

Source: Mitchell (2003) for Austria-Hungary, France and Germany, Mitchell (1988) for the United Kingdom, Capie (1994) for 1870 Germany and Ferreres (2005) for Argentina.

Figure 4.8: Share of arable land by province, 1870.



Source: MAIC (1976).

tariffs are converted into distance equivalents. The source used is Mitchell (2003) except for the United Kingdom, where Mitchell (1988) is used: Capie (1994) gives data for 1870 Germany and Ferreres (2005) for Argentina. Whenever a year is missing, either the closest available year is used or the gap is filled by interpolation. Table 4.5 shows the level of tariffs used.

4.3.2 Region controls

In section 4.5, GDP per capita and industrial value added per capita are explained using market potentials, geographical controls (such as dummies for macro areas, region fixed effects and latitude) and two other controls; literacy rates and share of arable land. The share of arable land is shown in Figure 4.8 while literacy rates (Figure 4.2) are derived from the population censuses.

A last remark is on the year 1891. In spite of having GDP estimates for 1891, we decided to leave the year out because the 1891 population census has not been carried

out owing to budget restrictions. For this reason, explanatory variables such as literacy rates for this chapter but also other variables used in the following chapter (such as the share of labour force in agriculture or industry) are not available. In order to avoid relying heavily on interpolations, we decided to leave 1891 out of the regression analysis, although we still show the market potential estimates for this year. The next section shows the results of the market potential calculations.

4.4 Market potential of Italian regions, 1871–1911: empirical results

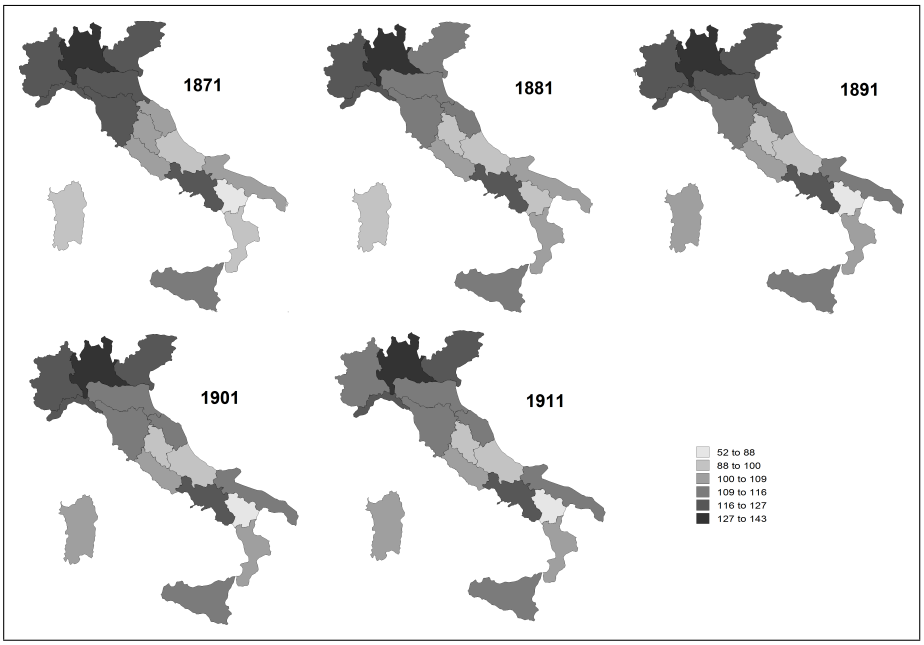
This section shows and compares the different versions of market potential for the Italian regions that will be used in the next section as explanatory variable for GDP per capita and industrial value added per capita. The first one proposed is a domestic market potential, exclusively taking into account the Italian regions. The second one is a repetition of the domestic market potential using straight distances and shows how different results can emerge in the case of Italy without controlling for transport costs. The third is total market potential, which comprises all the main trading partners of Italy along with the Italian regions. The fourth is total market potential with the US split into four macro-regions (Northeast, Midwest, South and West). The fifth is European market potential, which excludes all non-European trading partners and the sixth is what we call AH-F market potential, which is a market potential taking into account only Austria-Hungary and France. The last is foreign market potential, which includes only trading partners, leaving Italian regions out.

Let us start with the first version. Figure 4.9 provides the estimates of domestic market potential for the Italian regions between 1871 and 1911.[13]

The domestic market potential shows two main results. The first is that at the beginning of the period the picture is quite in line with the classic North-South divide, with the North showing a higher level of market access and the South lagging behind. The exceptions in the South are Campania and Sicily. The reason why these two regions have levels comparable to the Northern regions is that their total GDPs at the beginning of the period were comparable to those of the regions in the North and that these two regions have sea-ports as their economic centre. This makes them able to exploit shipping, which is cheaper than railways in this period. The second result is

[13] All the numbers underlying the maps are provided in the appendix both in absolute values and setting the average for Italy as equal to 100.

Figure 4.9: Domestic market potential in Italian regions, 1871–1911 (constant 1911 prices, Italy=100).

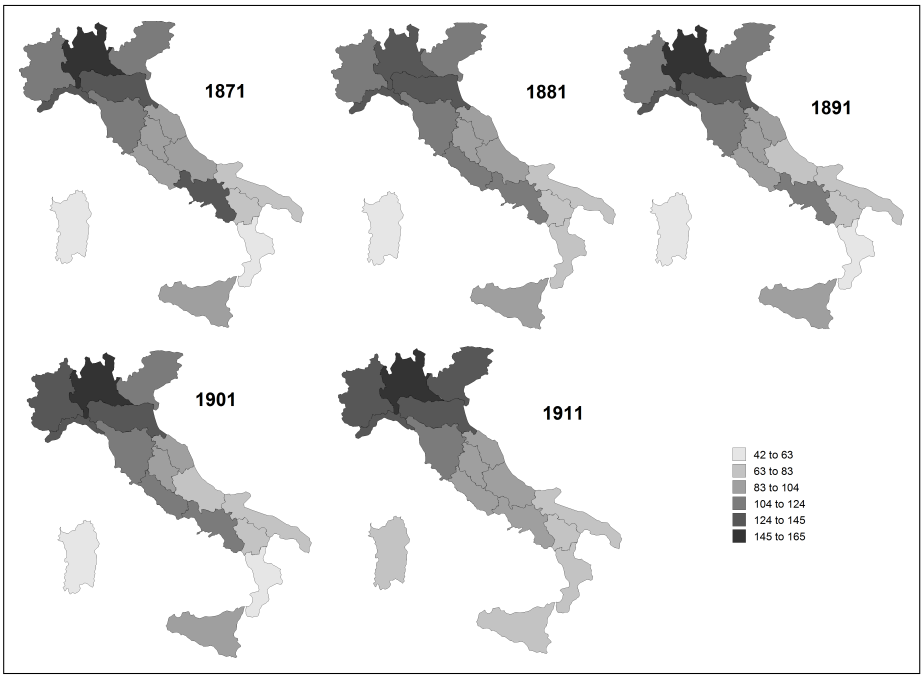


Source: our own calculations.

that there is a tendency over the period for the market access of the North to worsen with respect to the South. This tendency can be explained if we look at the transport costs in Tables 4.2, 4.3 and 4.4. Shipping costs drop relatively faster in this period than railway costs, giving an advantage to regions that have their node on the coast. This is the case of the main Southern regions. A similar result, connected to the access to shipping, is discussed in Schulze (2007) on the Habsburg Empire. In its case, the only two regions with access to the sea (Littoral and Dalmatia) have a persistent advantage over the others in terms of market potential in spite of their lower GDP. This relationship between sea access and market potential is clear when trading partners are taken out of the sample. This is because Littoral and Dalmatia are the only regions in the sample directly connected by sea to the foreign trading partners. Taking trading partners out, the two regions no longer have such advantage. In Italy this advantage is present even without the inclusion of trading partners because shipping is an available option in internal trade as well.

The second set of estimates uses straight line distances between nodes. Figure 4.10 shows the domestic market potentials when we take straight line distances instead of transport costs. Here we see that the process of worsening market access worsening in the North and improving in the South is not taking place. This version of market access also shows a much wider gap between North and South, with most Southern regions

Figure 4.10: Domestic market potential in Italian regions, 1871–1911 (constant 1911 prices, Italy=100, straight line distances).



Source: our own calculations.

doing sensibly worse than is implied by the calculation adjusted for transport costs. This version of market potential is the most similar to the one proposed by A'Hearn and Venables (2011). The authors calculate market potentials using the same GDP estimates and weight them by straight line distances. Their results show a large gap between North and South: the authors claim that domestic market access was the driving force for the location of industries in the period 1890–1950. Looking at the difference between the domestic market potentials calculated with transport costs adjusted distances and with straight line distances, the claim that market potentials were moving in the same direction as GDP or industrial value added appears to be supported much less by the former calculation.[14]

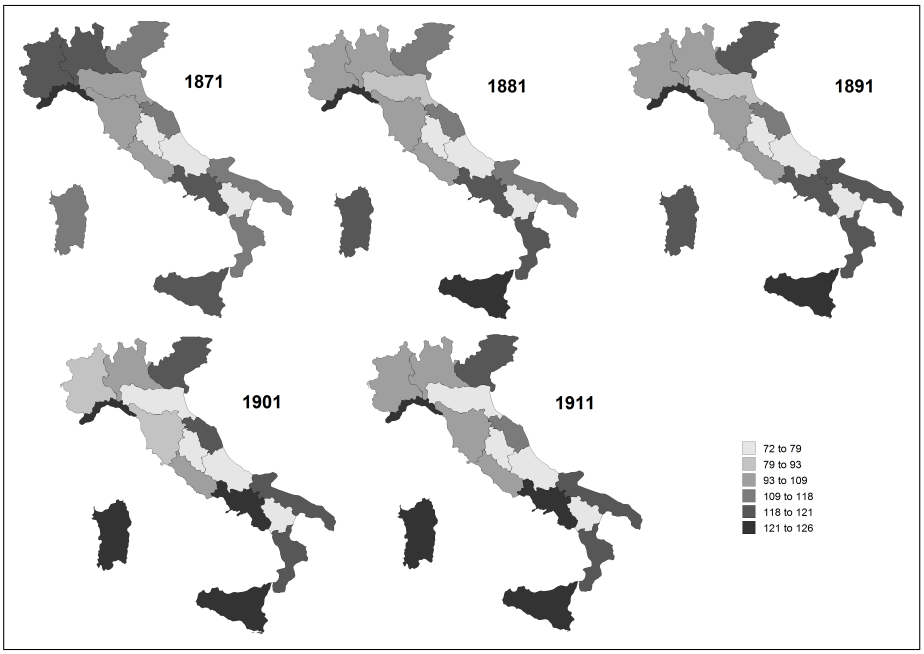
The third version proposed here, which we call total market potential, shows the market potentials calculated including the main trading partners of Italy.[15] Figure 4.11 shows the results.

This version of market potential shows a quite different picture from the domestic one. The South here appears not only to perform increasingly better in the period but also as starting from a higher level than the North, which experiences the opposite

[14] If we compared the other formulations of market potential calculated with transport costs and with straight line distances the difference would look even more marked.

[15] The choice of trading partners to include is discussed in section 4.3 above.

Figure 4.11: Total market potential in Italian regions, 1871–1911 (without US correction, constant 1911 prices, Italy=100).

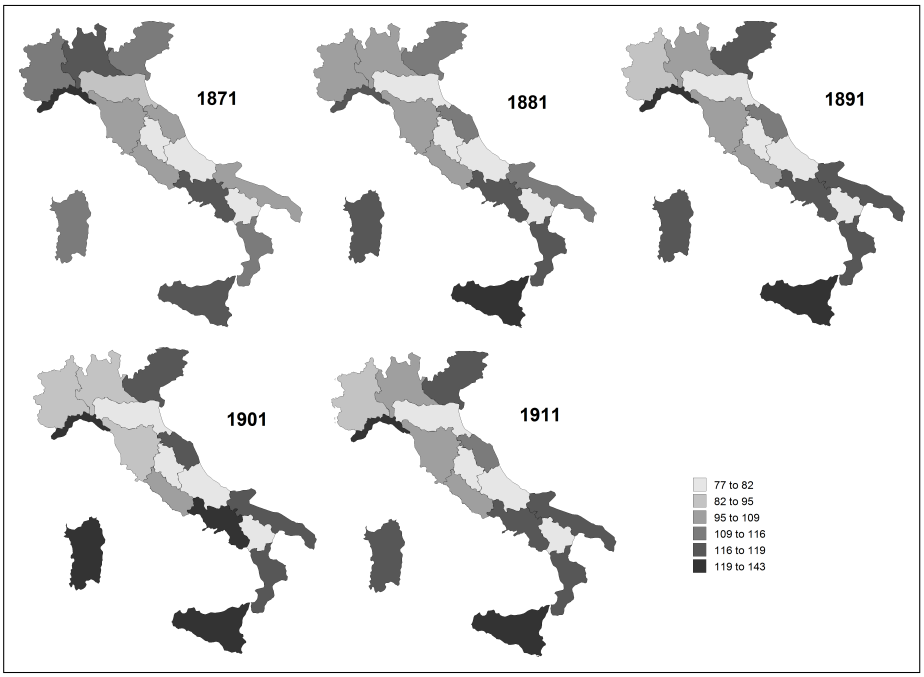


Source: our own calculations.

evolution. These estimates, which pool the GDP of Italian regions and that of very large trading partners, are very much influenced by the GDP of the latter, in particular the US, which has a very high GDP compared to Italy (see 4.13). Given that most trading partners are reached at least partially by sea, the sea effect is even higher in this formulation of market potential. Taking the US as one unit, we are forced to pick only one node and weight the entire GDP of the US according to this node, which in our case is New York. This practically corresponds to the assumption that the whole GDP of the US is as easily accessible as if it was all located on the East Coast. This of course is far from the fact. The next formulation addresses this problem by splitting the US into four macro regions (Northeast, Midwest, South and West). Doing so allows us to reduce the role of the US in the calculation without ignoring the presence of the US in the foreign markets.[16] This specification of market potential is theoretically a suitable intermediate solution. Domestic market potential ignores trading partners outside domestic borders. Total market potential without corrections assumes that the regions of Italy can trade with foreign countries as well and takes the United States as one entity, overestimating the accessibility of its GDP for the Italian

[16]The same problem could be posed by Austria and Hungary: we decided to keep them separate in all calculations as in this period, it must be remembered that the two regions of the Habsburg Empire became a dual monarchy in 1867 and therefore were quite economically independent.

Figure 4.12: Total market potential in Italian regions, 1871–1911 (constant 1911 prices, Italy=100).



Source: our own calculations.

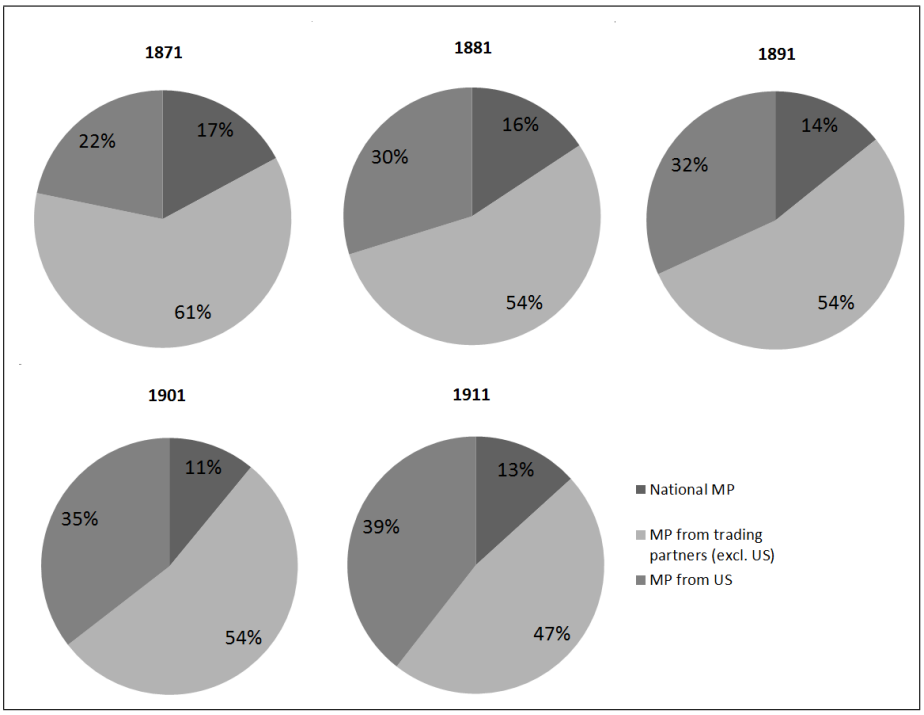
regions. This specification takes into account both these problems. The results are shown in Figure 4.12.

Figure 4.13 shows the contribution of the US to the total market potentials of the Italian regions. The contribution in terms of levels appears to be rather large, from about 22% in 1871 to 39% in 1911. However, at first glance, these results seem quite close to the ones without correction. The reason why this operation does not influence the result too much is that the Northeast of the US had a large proportion of the total GDP. The change is mostly driven by taking Chicago as the node for the GDP of the Midwest. South and West are quite small compared to the other two.

This figures suggest that the US is very important in absolute terms for the market potential estimates. However, we are interested in the role of US in the relative terms, which means how much the US changes the relative position of the regions vis-à-vis the others. Comparing Figures 4.11 and 4.12, the difference does not appear to be striking. We will at any rate use from now on the version of total market potential that includes the four US macro areas separately.

The next formulation is the European market potential, which is a version of the total market potential restricting trading partners to Europe. Figure 4.14 shows the results, which appear to be very similar to those of the total market potential.

Figure 4.13: Contribution of trading partners to total market potential, 1871–1911.



Source: our own calculations.

Figure 4.15 shows the formulation including only France and Austria-Hungary along with the Italian regions. These two are the main trading partners of Italy in this period and this formulation wants to capture an even narrower pool of trading partners. The result is that this formulation appears quite similar to the domestic one.

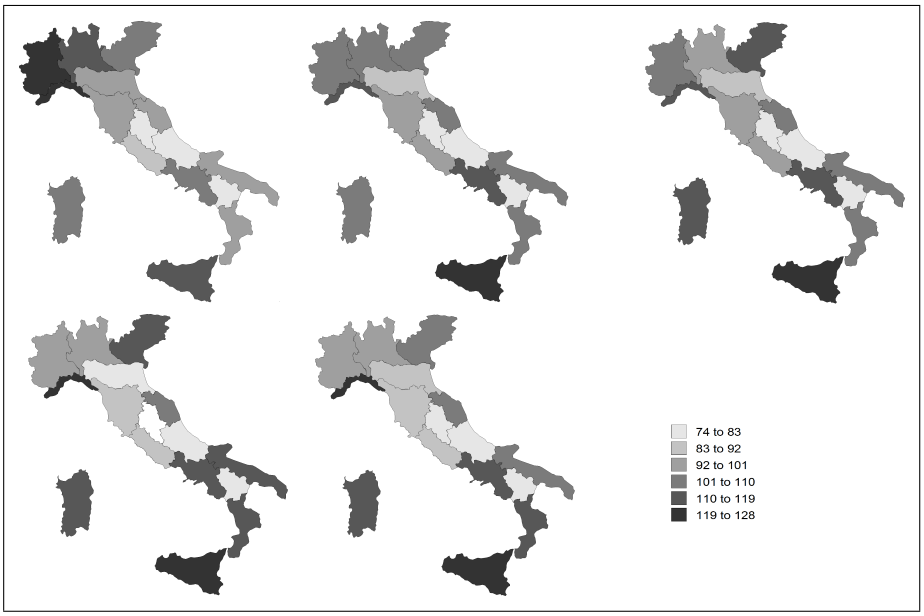
The last formulation we propose is foreign market potential, which shows the usual calculation with trading partners only. As before, Figure 4.16 illustrates the estimates of market potentials, showing a quite similar picture to the previous ones.

Now that we have calculated and discussed the different versions of market potential, we can in the next section move our focus to the relationship between these estimates and regional economic development.

4.5 Market access and economic development: empirical results

Section 4.4 presented market potential estimates for the Italian regions for five benchmark years, between 1871 and 1911. In this section we explore the relationship between market potential and regional GDP per capita, which represents a fundamental measure of economic development. We then show the same model using industrial value added per capita as the dependent variable, which represents the part of the GDP of

Figure 4.14: European market potential in Italian regions, 1871–1911 (constant t 1911 prices, Italy=100).



Source: our own calculations.

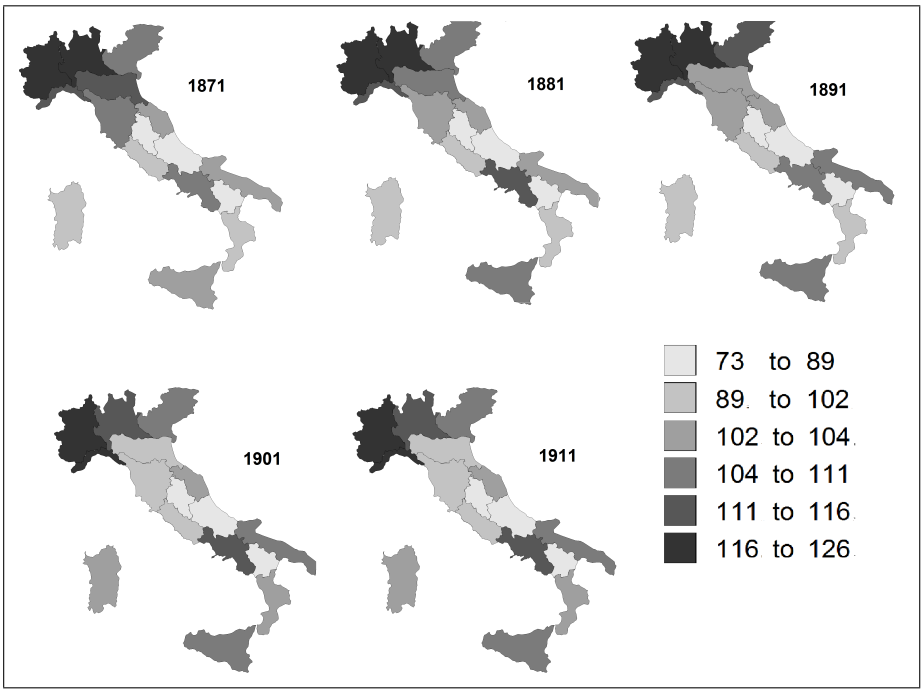
a region that comes from the secondary sector. To do so, we use both basic pooled OLS and first difference OLS. The main explanatory variable in all specifications is market potential in its various formulations, along with other geographic and economic controls. In the next section we show the results on GDP per capita.

4.5.1 Market potential and GDP per capita

In this section we show the empirical results based on the model of section 4.2.2. For the sake of simplicity, we start by showing the results for domestic and total market potential only; the specifications with European, Austria-Hungary and France and foreign market potentials are shown later in the section. Table 4.6 shows the OLS estimates of Equation 4.4. All years are pooled and standard errors are heteroskedasticity-robust.[17] Columns 1 and 2 show the basic pooled OLS regression with GDP per capita explained by domestic and total market potential. Here there are no controls. The relationship appears positive and significant at the 1% level for domestic market potential as well as for total market potential. The coefficients are expressed in logs and therefore they can be interpreted as elasticities. Domestic market potential has an elasticity of 0.351 and total market potential has an elasticity of 0.235. The R^2 is about 10% higher for the specification with domestic market potential, which is near 0.5, suggesting that the

[17] The pooling of the four available years (1871, 1881, 1901 and 1911) is necessary in order to increase the number of observations. This procedure is the one followed by Head and Mayer (2011).

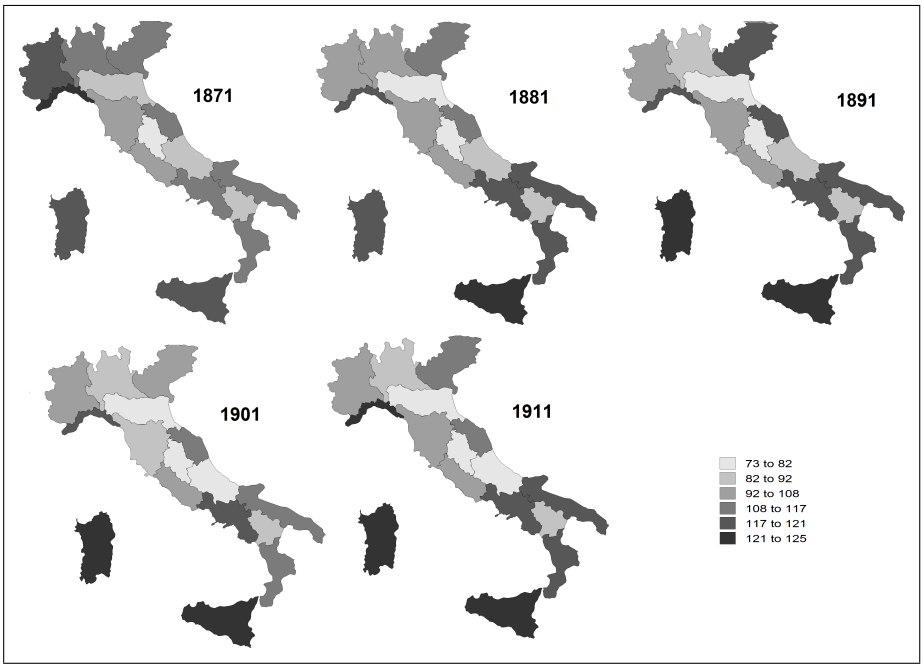
Figure 4.15: Austria-Hungary and France market potential in Italian regions, 1871–1911 (constant 1911 prices, Italy=100).



Source: our own calculations.

former has more explanatory power. The comparison with previous literature appears challenging, because the existing works are at country level rather than sub-national level. Redding and Venables (2004, p. 65) provide a coefficient of 0.146 for domestic market potential and 0.395 for total market potential. Head and Mayer (2011, p. 289) find a coefficient of 0.80 for the specification without specific country controls. As admitted by the authors, the difference in the magnitude of the coefficients is more than double that of Redding and Venables (2004) and "this difference in the coefficients stems mainly from the different construction of the market potential variable". Therefore, differences in the type of sample, in the historical periods and in the techniques used to calculate market potentials allow for very different magnitudes in the coefficients without affecting the validity of the different works. In columns 3 and 4 of Table 4.6 we add year dummies to take into account the fact that the data are pooled across years. In this version, the results change: domestic market potential increases its elasticity to 0.544 significant at 1% while total market potential is not significant in this case. The next step is to introduce further controls to capture differences across regions. The first candidate is physical geography. In columns 5 and 6 we introduce a

Figure 4.16: Foreign market potential in Italian regions, 1871–1911 (constant 1911 prices, Italy=100).



Source: our own calculations.

dummy for belonging to different macro areas.[18] In the regression, we decided to use the North-West as our baseline and include the dummies corresponding to the other two macro areas. The result is that the domestic market potential decreases its coefficient size and level of significance while the total market potential moves in the opposite direction. Both columns have market potentials significant at the 5% level while the dummy South is highly significant with a negative sign. The North-East-Centre is also negative but with a considerably smaller coefficient. The negative signs on both macro areas are not surprising, since we chose the richest macro area as the baseline. The fact that being in the South has the strongest effect is also expected because of the generally poorer conditions of Southern regions in this period. The use of these macro areas should be considered in light of the types of difference we want to capture. If the aim is to describe geographic differences across Italy, avoiding other elements that could be endogenous to GDP, the imposition of these macro borders is not necessarily the best option in spite of the strong results. This is because macro areas are often designed

[18]The classification of regions in the three different macro areas is taken from Felice (2007a) and was later used in his other works. The Northwest includes Piedmont, Lombardy and Liguria; the Northeast-Centre includes Venetia, Emilia, Marches, Tuscany, Umbria and Latium; the South comprises Campania, Apulia, Basilicata, Calabria, Sicily and Sardinia.

Table 4.6: GDP per capita and market potential, 1871–1911 (pooled OLS regression with geographic controls).

GDPpc	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Domestic MP	0.351$^{(***)}$		0.544$^{(***)}$		0.217$^{(**)}$		0.431$^{(***)}$	
	(0.0452)		(0.0853)		(0.0939)		(0.0929)	
Log Total MP		0.235$^{(***)}$		0.191		0.306$^{(**)}$		0.411$^{(**)}$
		(0.0450)		(0.194)		(0.115)		(0.172)
Northeast-Centre					-0.142$^{(**)}$	-0.163$^{(***)}$		
					(0.0566)	(0.0597)		
South					-0.315$^{(***)}$	-0.389$^{(***)}$		
					(0.0535)	(0.0406)		
Latitude							0.0207$^{(**)}$	0.0452$^{(***)}$
							(0.00801)	(0.00961)
Constant	-1.189	0.768	-5.049$^{(***)}$	1.773	1.760	-0.529	-3.634$^{(**)}$	-4.983
	(0.941)	(1.022)	(1.732)	(4.275)	(1.920)	(2.545)	(1.792)	(4.070)
Year Fixed Effects	no	no	yes	yes	yes	yes	yes	yes
Observations	64	64	64	64	64	64	64	64
R^2	0.491	0.309	0.537	0.376	0.667	0.671	0.563	0.519

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of GDP per capita in 1911 prices. Market potentials are in 1911 prices.

ex-post to collect regions with similar economic conditions.[19] In order to avoid this endogeneity problem, columns 7 and 8 use latitude as the geographic control. Latitude is a control that is completely exogenous, being the distance from the Equator, and has a positive effect on GDP per capita. The result is that both coefficients are around 0.4, with domestic market potential significant at the 1% and total market potential at 5%. The R^2 decreases slightly compared to that in columns 6 and 7, but are very much higher than the specification without geographic controls. From now on, whenever we decide to include a control for the geographic position of the regions we will use latitude.

The previous table aimed at exploring the relationship between market potential and GDP per capita using controls that are possibly not endogenous to GDP per capita. In Table 4.7 we try to introduce further controls and discuss whether or not these are appropriate in our case. The first control that we can think of including, to capture other fundamental variables that can affect GDP per capita is some measure of human capital. In modern studies, such as Head and Mayer (2011), average years of schooling is the best variable to use. For the case of pre-First World War Italy we decided to use a more basic output measure that is often used to capture human capital in the Italian

[19] See for example the inclusion of the North-East in the same macro area of the Centre and the decision to keep the regions of the Industrial Triangle separate from the rest.

Table 4.7: GDP per capita and market potential, 1871–1911 (pooled OLS regression with further controls).

Log GDPpc	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Domestic MP	-0.0531		0.431$^{(***)}$		0.430$^{(***)}$		0.430$^{(**)}$	
	(0.125)		(0.0843)		(0.127)		(0.181)	
Log Total MP		-0.155		0.335$^{(**)}$		-0.206		-0.206
		(0.158)		(0.162)		(0.212)		(0.286)
Log Literacy	0.623$^{(***)}$	0.640$^{(***)}$						
	(0.118)	(0.0998)						
Latitude	-0.0522$^{(***)}$	-0.0595$^{(***)}$	0.0241$^{(***)}$	0.0468$^{(***)}$				
	(0.0148)	(0.0178)	(0.00825)	(0.00961)				
Log Share of Arable Land 1871			-0.192$^{(***)}$	-0.153$^{(**)}$				
			(0.0513)	(0.0627)				
Liguria					0.165$^{(**)}$	0.245$^{(***)}$	0.165$^{(***)}$	0.245$^{(***)}$
					(0.0665)	(0.0816)	(0.0127)	(0.0695)
Lombardy					-0.0766	0.00284	-0.0766$^{(**)}$	0.00284
					(0.0773)	(0.0588)	(0.0280)	(0.0181)
Venetia					-0.262$^{(***)}$	-0.223$^{(***)}$	-0.262$^{(***)}$	-0.223$^{(***)}$
					(0.0690)	(0.0766)	(0.00276)	(0.0451)
Emilia					-0.153$^{(**)}$	-0.184$^{(***)}$	-0.153$^{(***)}$	-0.184$^{(***)}$
					(0.0680)	(0.0488)	(0.00469)	(0.0282)
Tuscany					-0.0989$^{(*)}$	-0.129$^{(***)}$	-0.0989$^{(***)}$	-0.129$^{(***)}$
					(0.0517)	(0.0459)	(0.0149)	(0.00718)
Marches					-0.269$^{(***)}$	-0.308$^{(***)}$	-0.269$^{(***)}$	-0.308$^{(***)}$
					(0.0508)	(0.0454)	(0.0273)	(0.0366)
Umbria					0.00337	-0.188$^{(***)}$	0.00337	-0.188$^{(***)}$
					(0.0659)	(0.0489)	(0.0682)	(0.0411)
Latium					0.388$^{(***)}$	0.283$^{(***)}$	0.388$^{(***)}$	0.283$^{(***)}$
					(0.0605)	(0.0433)	(0.0467)	(0.00728)
Abruzzi					-0.269$^{(***)}$	-0.483$^{(***)}$	-0.269$^{(***)}$	-0.483$^{(***)}$
					(0.0763)	(0.0638)	(0.0796)	(0.0345)
Campania					-0.175$^{(***)}$	-0.127$^{(*)}$	-0.175$^{(***)}$	-0.127$^{(**)}$
					(0.0610)	(0.0704)	(0.00215)	(0.0597)
Apulia					-0.128$^{(*)}$	-0.174$^{(**)}$	-0.128$^{(***)}$	-0.174$^{(***)}$
					(0.0705)	(0.0659)	(0.0318)	(0.0407)
Basilicata					-0.201$^{(**)}$	-0.494$^{(***)}$	-0.201$^{(*)}$	-0.494$^{(***)}$
					(0.0922)	(0.0483)	(0.112)	(0.0360)
Calabria					-0.366$^{(***)}$	-0.437$^{(***)}$	-0.366$^{(***)}$	-0.437$^{(***)}$
					(0.0649)	(0.0599)	(0.0443)	(0.0480)
Sicily					-0.204$^{(***)}$	-0.177$^{(**)}$	-0.204$^{(***)}$	-0.177$^{(**)}$
					(0.0631)	(0.0720)	(0.0106)	(0.0723)
Sardinia					-0.153$^{(**)}$	-0.251$^{(***)}$	-0.153$^{(**)}$	-0.251$^{(***)}$
					(0.0596)	(0.0752)	(0.0575)	(0.0545)
Constant	7.257$^{(***)}$	9.838$^{(**)}$	-3.100$^{(*)}$	-2.845	-2.631	10.66$^{(**)}$	-2.631	10.66
	(2.631)	(3.856)	(1.564)	(3.856)	(2.570)	(4.661)	(3.689)	(6.287)
Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes
Region Fixed Effects	no	no	no	no	yes	yes	yes	yes
Region Clustering	no	no	no	no	no	no	yes	yes
Observations	64	64	64	64	64	64	64	64
R^2	0.760	0.763	0.599	0.541	0.955	0.948	0.955	0.948

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of GDP per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate.

case: literacy rates. When literacy rates are introduced in the regression, they are highly significant with a coefficient of around 0.6 in both specifications. Market potentials loose their significance and latitude is incorrectly signed. These results clearly suffer from a bias. The reason why the plain inclusion of this variable is problematic is two-fold: literacy is endogenous to GDP per capita and it is also collinear to other variables that present a North-South gradient.[20] This is, for instance, the case of domestic market potential, which has a geographic distribution that appears very similar to that of literacy rates. In this case, it is very hard to disentangle the effect of literacy from that of market potential; moreover, it is very hard to establish the direction of the causality between literacy and GDP per capita. Columns 3 and 4 show the inclusion of the share of arable land in 1871 as a control.[21] Including arable land at the beginning of the period (1871) is a way to avoid endogeneity as the share of arable land in subsequent years may have been affected by changes in the economic or technological conditions of the regions. The share of arable land is significant and negatively signed in both specifications. The negative sign can be explained by interpreting the share of arable land as the presence of agricultural activity in a region. Since agriculture has lower value added levels than industries, leading to lower levels of GDP per capita, it has a larger weight in the regional economy. Here latitude is correctly signed and significant again, suggesting that endogeneity and multicollinearity are less of an issue in this specification. Columns 4–8 take a different approach to the specification. In the last four columns we introduce region fixed effects. This strategy is also used by Head and Mayer (2011). However, in their case the inclusion of these dummies leads to much less of an increase in the R^2 than our case shows. Here, region fixed effects lead to an increase from about 0.5 to values well over 0.90. This increase is explained by the number of regional dummies that are highly significant. The baseline is Piedmont, a fairly rich Northern region. This is why most other significant regional dummies have a negative sign (with the exceptions of Liguria and Latium which do show quite high levels of GDP per capita even compared to Piedmont in this period). Southern regions all have negative signs, which is expected given the lower levels of GDP per capita in this part of the country. The high explanatory power of these fixed effects

[20] We also tried to included similar controls such as the share of labour force in agriculture; the problems encountered in the estimation were very similar and we decided to deal with literacy rates only in the estimation to avoid making the issue even more problematic by including further controls.

[21] The share of arable land is also used as a control by Redding and Venables (2004). The authors here use a number of other controls, such as fraction of land in tropical areas, prevalence of malaria and risk of expropriation that appear sensible when doing a cross-country analysis but would lead to difficult quantification or have little meaning in the case of Italian regions in this period.

suggests that the inclusion of any further control other than market potential should be dropped in order to avoid the risk of over-identifying the model. For this reason, given the high share of variation explained, we assume that the region fixed effects capture a sufficient part of the regional differences (although they are not able to disentangle them) and we do not include further controls. Columns 6 and 7 show the inclusion of fixed effects without regional clustering, while Columns 8 and 9 show the results with clustering. Market potential here shows similar results to the previous specification: domestic market potential is positive and significant with an elasticity of 0.430; total market potential is not significant.

Summing up the results of the first two tables, we notice that domestic market potential is significant and correctly signed in all specifications except when literacy rates are introduced while total market potential is not significant in a number of specifications, most notably when fixed effects are used, appearing less robust as the explanatory variable for GDP.

We now move to the issues of endogeneity and multicollinearity that affect the model when literacy rates are introduced. On the first point, Head and Mayer (2011) attempt two different approaches. First, they substitute total market potential with foreign market potential, which is market potential calculated with own GDP removed.[22] This solution has been attempted for the case of the Italian regions but the results do not hold. According to Head and Mayer (2011, p. 291),"[foreign market potential] has nice features [in dealing with endogeneity], but is clearly not ideal as a replacement or instrument for RMP". The solution that Head and Mayer (2011) adopt in their work is to use an instrument for market potential. In particular, they take geographic centrality proxied by two instruments: the sum of the inverse of straight line distances and the inverse of transport costs. In their case the former is ruled out and the solution adopted is to use the latter. Unfortunately, this instrument does not appear to work for the Italian regions in this period.[23] Looking at the levels of our variables, in the absence of reliable instruments, we cannot establish the direction of causality between GDP per capita, domestic market potential and literacy. This is evident when looking at the geographical distribution of the levels in Figures 4.1, 4.2 and 4.10, where the North-South gradient appears clear. One solution here is to move our focus from

[22]This leaves us effectively with a market access measured only accounting for the GDP of foreign countries in the sample, ignoring the internal market.

[23]The results using both straight line distances and transport costs are not reported here for the sake of brevity. They can be found in the appendix.

levels to changes in the time of the variables of interest. By transforming all the logs of the variables in first differences we can effectively interpret the model in terms of growth rates. Running the model in first differences allows us to address the issue of multicollinearity, since the common long-term trend in the variables is not present in the growth rates.[24]

Table 4.8 shows the basic formulation without region or geographic controls in Columns 1 and 2. The result is a positive and significant coefficient for the domestic market potential and no results on the total market potential.[25] Columns 3–8 replicate the main specifications proposed so far: latitude as control with literacy rates first and then with the share of arable land and, in the last two columns, region fixed effects as only controls. Unlike the results with levels, first difference regressions show little effect from the controls, while domestic market potentials are always correctly signed and significant with a coefficient around 0.8 in all the specifications. Total market potential does not appear significant in any specification. The next section shows the same results with alternative measures for the market potentials.

4.5.2 Alternative measures of market potential

In this section we propose the specifications of the previous section with three alternative formulations of market potential: European market potential, which includes only the European trading partners in the sample; foreign market potential, which includes all trading partners and excludes the Italian regions; and the Austria-Hungary and France market potential, which is a version of market potential that includes the top two trading partners of Italy: France and Austria-Hungary. Table 4.9 shows the regressions in levels. Columns 1–3 show the three market potential formulations with latitude and share of arable land as the controls;[26] Columns 4–6 show the same formulations with region fixed effects as the controls. In the first three columns the controls behave as expected while we notice that the market potential formulations with stronger domestic components (meaning that Italian regions have a stronger weight in the calculation) seem to have a stronger effect on GDP per capita. When region fixed effects

[24] In particular, if we look at Figures 4.1, 4.2 and 4.10, we notice that literacy rates and domestic market potential in the South tend to converge with those of the North while GDP per capita tends to diverge.

[25] The coefficients here can be interpreted as percentage point increases in growth rate of GDP per capita when an explanatory variable increases by 1%. Therefore, in column 1, if the growth rate of domestic market access increases by 1%, the growth rate of GDP per capita increases by 0.649%.

[26] We decided to leave literacy rates out of this specification, for the reason explained in the previous paragraph.

Table 4.8: GDP per capita, market potential and literacy rates, 1871–1911 (pooled OLS regression in first differences).

Log GDPpc	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DLog Domestic MP	0.649$^{(***)}$		0.849$^{(***)}$		0.816$^{(***)}$		0.883$^{(**)}$	
	(0.206)		(0.235)		(0.249)		(0.345)	
DLog Total MP		0.0557		0.0731		0.111		0.370
		(0.332)		(0.399)		(0.373)		(0.489)
DLog Literacy			0.0645	-0.245				
			(0.272)	(0.304)				
Latitude			0.0124	-0.00195	0.0112$^{(*)}$	0.00296		
			(0.00812)	(0.0102)	(0.00612)	(0.00761)		
Share of Arable Land 1871					-0.000347	-0.00146		
					(0.00109)	(0.00127)		
Constant	-0.0764	0.258$^{(**)}$	-0.724	0.392	-0.629$^{(*)}$	0.167	-0.133	0.216
	(0.113)	(0.114)	(0.449)	(0.575)	(0.335)	(0.395)	(0.190)	(0.129)
Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes
Region Fixed Effects	no	no	no	no	no	no	yes	yes
Observations	48	48	48	48	48	48	48	48
R^2	0.619	0.520	0.651	0.531	0.651	0.532	0.696	0.592

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of GDP per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate. All variables are in first differences.

are used, the results disappear, proving that domestic market potential is the strongest determinant among of all market potentials. This finding is supported by the evaluation that Federico and Wolf (2011) provide of the relatively limited openness to trade of Italy in this period.[27] If the country as a whole was not trading very much with the international markets, it is expected that the GDP per capita of its regions is determined more by domestic market potential compared to the total one.

Table 4.10 shows the same specifications as Table 4.9 in first differences. Here no alternative formulation of market potential appears significant in explaining GDP per capita except the one considering France and Austria-Hungary only, which is significant at 10% level with geographic controls and at 5% with region fixed effects (Columns 3 and 6). The formulation of non-domestic market access that is closest to the domestic one, in the sense that it includes the lowest share of trading partners, is the only significant one. This result confirms that the further we take market potential from the domestic one, the less its explanatory power.

[27]Klasing and Milionis (2014) provide estimates of openness to trade of Italy in comparative terms. Italy starts in 1870 at a level of 12% and ends at 29% in 1911. France in the same period goes from 23% to 43%; Germany from 21% to 42%, Austria-Hungary from 54% to 42% and Britain from 38% to 53%. These figures confirm that Italy was not a particularly open country.

Table 4.9: Robustness checks: alternative market potential formulations, 1871–1911 (pooled OLS regression).

Log GDPpc	(1)	(2)	(3)	(4)	(5)	(6)
Log European MP	0.338$^{(**)}$			-0.112		
	(0.135)			(0.203)		
Log International MP		0.262			-0.351$^{(*)}$	
		(0.157)			(0.203)	
Log A-H and France MP			0.363$^{(***)}$			0.0255
			(0.126)			(0.186)
Latitude	0.0438$^{(***)}$	0.0477$^{(***)}$	0.0314$^{(***)}$			
	(0.00862)	(0.0106)	(0.00846)			
Share of Arable Land 1871	-0.00423$^{(**)}$	-0.00420$^{(**)}$	-0.00416$^{(**)}$			
	(0.00169)	(0.00186)	(0.00165)			
Constant	-3.078	-1.591	-2.857	8.594$^{(*)}$	13.79$^{(***)}$	5.607
	(3.119)	(3.765)	(2.598)	(4.425)	(4.410)	(3.966)
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Region Fixed Effects	no	no	no	yes	yes	yes
Observations	64	64	64	64	64	64
R^2	0.551	0.534	0.560	0.947	0.950	0.947

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of GDP per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate.

Summing up, this section presented several specifications of market potential in the model described by Equation 4.4. The bottom line result is that none of the alternative specifications show results that are as strong and consistent as the domestic market potential showed. In general, the more the specification goes towards domestic market potential, the more it explains. The next section shows the results using domestic and total market potential separating the North and the South of Italy.

4.5.3 Market potential in the North and South

Tables 4.11 and 4.12 show our model splitting the sample in the North (which merges the North-West and North-East-Centre) and the South.[28] As a result, the number of observations goes down to 21 for the South and 27 for the North. Let us start with the South. In Table 4.11 we notice that the level of GDP per capita in Southern regions is much more clearly affected by market potential when the regression is in levels (Columns 1–4) than in first differences (Columns 5–8). This is the case both without geographic controls and when we include latitude and share of arable land (Columns 3–4). Moreover, the coefficients are slightly higher for total market potential than

[28] Venetia, Lombardy, Piedmont, Liguria, Emilia, Tuscany, Latium, Umbria and Marches are considered North; the rest of the regions are considered South as in footnote 18.

Table 4.10: Robustness checks: alternative market potential formulations, 1871–1911 (pooled OLS regression in first differences).

Log GDPpc	(1)	(2)	(3)	(4)	(5)	(6)
DLog European MP	0.167			0.344		
	(0.328)			(0.391)		
DLog International MP		-0.101			0.182	
		(0.412)			(0.521)	
DLog A-H and France MP			0.531$^{(*)}$			0.762$^{(**)}$
			(0.273)			(0.326)
Latitude	0.00356	0.00111	0.00851			
	(0.00736)	(0.00785)	(0.00702)			
Share of Arable Land 1871	-0.00143	-0.00144	-0.00142			
	(0.00127)	(0.00127)	(0.00122)			
Constant	0.133	0.314	-0.246	0.240$^{(**)}$	0.272$^{(**)}$	0.0604
	(0.354)	(0.409)	(0.352)	(0.0986)	(0.122)	(0.137)
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Region Fixed Effects	no	no	no	yes	yes	yes
Observations	48	48	48	48	48	48
R^2	0.534	0.532	0.567	0.594	0.586	0.642

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of GDP per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate. All variables are in first differences.

for the domestic one. In first differences, the results do not hold, suggesting that after Unification market potentials do nothing to explain the growth rates of GDP per capita.

The picture looks quite different in Table 4.12, where the sample is restricted to the northern regions. In this case, total market potential is never significant while domestic market potential is significant in both levels and first differences, with fairly high coefficients. Market potential is therefore a stronger predictor of GDP per capita within northern regions compared to the South.

Considering the North and South of Italy separately brings some interesting insights. The effect of market access on the GDP per capita of these two different parts of the country is not the same: in the South, both domestic and total market potential have a strong role in determining the levels of GDP per capita but they do not seem to impact on the growth rates. For the North, only the domestic market potential is significant in both in levels and in first differences. This difference suggests that the results at national level are driven by the Northern part of the country, where the access to markets outside Italy was often more expensive because of the presence of rich but landlocked regions.

Table 4.11: GDP per capita and market potential, southern regions, 1871–1911 (pooled OLS regression and first differences).

Log GDPpc	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Domestic MP	0.514$^{(***)}$		0.642$^{(***)}$					
	(0.0647)		(0.0996)					
Log Total MP		0.624$^{(***)}$		1.030$^{(***)}$				
		(0.104)		(0.176)				
Latitude			0.0361$^{(**)}$	0.0589$^{(***)}$			0.00476	0.00591
			(0.0146)	(0.0164)			(0.0111)	(0.0106)
Log Share of Arable Land 1871			-0.132$^{(**)}$	0.0298				
			(0.0539)	(0.0508)				
DLog Domestic MP					0.617$^{(**)}$		0.489	
					(0.260)		(0.302)	
DLog Total MP						1.316		0.976
						(0.914)		(1.033)
DLog Literacy					0.539	0.427	0.523	0.446
					(0.437)	(0.419)	(0.455)	(0.435)
Share of Arable Land 1871							-0.00205	-0.00291
							(0.00205)	(0.00221)
Constant	-4.486$^{(***)}$	-7.906$^{(***)}$	-8.046$^{(***)}$	-19.31$^{(***)}$	-0.227	-0.303	-0.269	-0.324
	(1.295)	(2.266)	(2.203)	(4.336)	(0.212)	(0.324)	(0.539)	(0.608)
Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	28	28	28	28	21	21	21	21
R^2	0.824	0.750	0.866	0.870	0.700	0.652	0.719	0.697

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of GDP per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate.

The next section moves from GDP to industrial production. The industrial sector will be the main focus when we deal later with industrial location and its relationship with market access. Therefore we repeat the exercise using industrial value added per capita as the dependent variable.

4.5.4 Market potential and industrial value added per capita

One further question we can address is how far the factors that explain GDP per capita can also explain industrial value added per capita (which is the part of GDP that is generated by the industrial sector). This question can be seen as preparatory to the testing of the NEG hypothesis that market access attracts economic activity, and does so in particular industries. Although industrial value added per capita does not necessarily reflect the location of industries, it might be more informative about it than GDP per capita.[29] Let us start with Table 4.13, in which the main OLS regressions in

[29]Industrial value added, as all value added in general, is heavily driven by the productivity of labour. Therefore, when a researcher is interested in studying the location of economic activity, she should take account of these differences. In the literature, the issue is overcome by using employment figures, which say nothing about productivity but give a clearer picture of where the activity is located. See Klein and Crafts (2012) and all the related literature on industrial location.

Table 4.12: GDP per capita and market potential, northern regions, 1871–1911 (pooled OLS regression and first differences).

Log GDPpc	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Domestic MP	0.120		1.458$^{(***)}$					
	(0.210)		(0.212)					
Log Total MP		0.194		0.0767				
		(0.275)		(0.259)				
Latitude			-0.221$^{(***)}$	-0.0517			0.00255	0.0000621
			(0.0366)	(0.0325)			(0.0181)	(0.0283)
Log Share of Arable Land 1871			-0.318$^{(***)}$	-0.400$^{(***)}$				
			(0.0889)	(0.107)				
DLog Domestic MP					1.552$^{(***)}$		1.586$^{(***)}$	
					(0.338)		(0.343)	
DLog Literacy					-0.241	-0.109	-0.356	-0.176
					(0.291)	(0.354)	(0.451)	(0.584)
DLog Total MP						-0.146		-0.128
						(0.449)		(0.515)
Share of Arable Land 1871							0.00152	0.000694
							(0.00206)	(0.00238)
Constant	3.632	1.811	-12.75$^{(***)}$	8.108	-0.530$^{(***)}$	0.355$^{(**)}$	-0.698	0.332
	(4.298)	(6.063)	(3.062)	(5.572)	(0.179)	(0.167)	(0.813)	(1.352)
Observations	36	36	36	36	27	27	27	27
R^2	0.450	0.453	0.804	0.633	0.762	0.569	0.770	0.570

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of GDP per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate.

levels are reported. Again, we show only domestic and total market potential because we consider these two as the most representative specifications of market potential. Columns 1 and 2 show the baseline model with year dummies as the only controls. Here domestic market potential is positive and significant at 1% while total market potential is significant at the 5% level. The elasticities are considerably higher than the ones for GDP per capita. Columns 3 and 4 introducing the dummy for latitude show the same result; Columns 5 and 6 report the specification with the share of arable land and latitude together. It appears that in all specifications, both domestic and total market potentials are positive and significant with high coefficients (between 0.6 and 1) and a 1% level of significance. However, the results do not hold when fixed effects are introduced. This last two Columns provide a counter intuitive result for total market potential, which is negative and significant. To investigate further, we turn our attention to Table 4.14, where the same exercise is repeated in first difference. Here again the results on market potentials do not hold. As in the case of the GDP per capita of Southern regions, market potential seems to possibly explain levels of GDP

Table 4.13: Industrial value added per capita and market potential, 1871–1911 (pooled OLS regression).

Log Ind VA pc	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Domestic MP	1.136$^{(***)}$		0.997$^{(***)}$		0.997$^{(***)}$		-0.369	
	(0.142)		(0.153)		(0.151)		(0.240)	
Log Total MP		0.651$^{(**)}$		1.059$^{(***)}$		1.022$^{(***)}$		-0.835$^{(***)}$
		(0.272)		(0.207)		(0.214)		(0.214)
Latitude			0.0255$^{(**)}$	0.0840$^{(***)}$	0.0289$^{(**)}$	0.0847$^{(***)}$		
			(0.0110)	(0.0132)	(0.0116)	(0.0135)		
Log Share of Arable Land 1871					-0.193$^{(***)}$	-0.0741		
					(0.0656)	(0.0885)		
Constant	-18.96$^{(***)}$	-10.30$^{(*)}$	-17.22$^{(***)}$	-22.84$^{(***)}$	-16.68$^{(***)}$	-21.80$^{(***)}$	11.84$^{(**)}$	22.62$^{(***)}$
	(2.897)	(5.989)	(2.950)	(4.779)	(2.842)	(4.963)	(4.895)	(4.707)
Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes
Region Fixed Effects	no	no	no	no	no	no	yes	yes
Observations	64	64	64	64	64	64	64	64
R^2	0.801	0.538	0.817	0.742	0.832	0.744	0.953	0.957

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of the industrial value added per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate.

per capita but not the changes from period to period. The next section sums up the results and connects them to the theory and the next chapter of the thesis.

4.6 Conclusions

The primary purpose of this paper was to present the estimates of market potentials of the Italian regions for 10-year benchmarks in the period 1871–1911. Market potentials are based on constant 1911 price estimates of regional GDP for Italy from Felice (2009a) and Brunetti et al. (2011) and the GDP of the main trading partners of Italy in the period from 1871 to 1911 are from Prados de la Escosura (2000) and Crafts (2005a). In the calculation of market potentials, the GDP are weighted by distance-adjusted transport costs to take into account the actual distance among regions in terms of the costs of transporting one unit of a representative good. In the case of foreign partners a distance-equivalent tariff is calculated and added to the transport cost. In this chapter we propose different specifications ranging from domestic market potential, which comprises Italian regions only to total market potential that includes all Italian regions and all the main trading partners. The bottom line of these calculations is the following: domestic market potentials at the beginning of the period show a more traditional picture of Italy, with the North presenting higher values than the South, in

Table 4.14: Industrial value added per capita, market potential and literacy rates, 1871–1911 (pooled OLS regression in first differences.

Log Ind VA pc	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DLog Domestic MP	-0.0138		0.378		0.281		0.406$^{(*)}$	
	(0.195)		(0.251)		(0.249)		(0.216)	
DLog Total MP		-0.291		0.268		0.275		0.565$^{(*)}$
		(0.253)		(0.304)		(0.281)		(0.323)
Latitude			0.0244$^{(***)}$	0.0223$^{(***)}$	0.0248$^{(***)}$	0.0241$^{(***)}$		
			(0.00615)	(0.00658)	(0.00605)	(0.00614)		
Share of Arable Land 1871					-0.00268$^{(*)}$	-0.00307$^{(**)}$		
					(0.00144)	(0.00136)		
Constant	0.389$^{(***)}$	0.481$^{(***)}$	-0.980$^{(***)}$	-0.888$^{(**)}$	-0.722$^{(*)}$	-0.621$^{(*)}$	0.141$^{(**)}$	0.311$^{(***)}$
	(0.107)	(0.0878)	(0.299)	(0.343)	(0.362)	(0.329)	(0.0519)	(0.0849)
Year Fixed Effects	no	no	yes	yes	yes	yes	yes	yes
Region Fixed Effects	no	no	no	no	no	no	yes	yes
Observations	48	48	48	48	48	48	48	48
R^2	0.483	0.492	0.622	0.603	0.655	0.648	0.796	0.792

Notes: Heteroskedastic robust standard errors in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the log of industrial value added per capita in 1911 prices. Market potentials are in 1911 prices. Literacy is expressed as rate. All variables are in first differences.

particular at the beginning of the period. What contradicts the North-South traditional image is that North and South converge. This is explained by the relative cost of shipping, which goes down, unlike that of railways, over the period. This is an advantage for the main Southern regions such as Campania and Sicily, which have good access to the sea along with a fairly high total GDP, while Piedmont and Lombardy for instance do not. The role of transport costs is easily appreciated when we compare the same calculation with straight line distances: the picture is reversed, showing the strong and consistent position of the Northern regions. These comparisons show how useful it is, at least for the case of Italy and other countries with more than one viable mean of transportation, to correctly account for transport costs and existing lines. Introducing foreign markets in the total market potential, the results change for the first year, but the trend in time goes in the same direction. The North has no advantage in terms of market access at the beginning of the period and, as for the domestic one, it worsens its position compared to the South. This result is slightly smoothed when we take the US GDP by four macro-regions, calculating transport costs to four different nodes (New York, Chicago, New Orleans and San Francisco) but remains in substance the same.

Once the estimates of market potentials have been produced, we used them as explanatory variables for the main measure of economic performance: GDP per capita. We first proposed a baseline specification in levels and we then added further controls.

In the specifications in levels, we found that domestic market potential has a stronger and more significant positive effect on GDP per capita than total market potential. These findings are in line with our expectations from the descriptive analysis of the data. However, the inclusion of economic controls such as literacy rates cause concerns over the multicollinearity and endogeneity that could be affecting the results. To deal with these issues, we ran the model in first differences. Taking the first differences of the logs corresponds to considering the variables in growth rates. This procedure leaves out the common trends that the variables might present in the long run and restricts the focus to the change from one benchmark year to another. The model in first differences confirms that the domestic market potential is positive and significant when trying to explain the growth rate of GDP per capita of the Italian regions. A further step was to use "intermediate" formulations of market potential in terms of the inclusion of trading partners. Although one formulation that includes both Austria-Hungary and France and the other with all the European trading partners are positive and significant, when the model is ran in first difference the results become weaker.

The next step was to divide the sample into North and South, running the model separately. It is quite useful to look at different parts of the country separately whenever the number of observations allows us to do so. In this case it is especially useful to separate levels and growth rates as the main result here is that total market potential determined the level of GDP per capita in the South but it did not in the North. Moreover, growth rates in market potential of both types do not affect the growth rates of GDP per capita in the South but they do in the North when we consider domestic market potential. This insight tells us that in the South, the total market potential was positively correlated to the levels of GDP per capita but its growth rate did not drive the growth rate of GDP per capita. In the rest of the country, both the level and the growth rates of total market potential are not significant in explaining GDP per capita. This suggests that the access to international markets did matter more for the South compared to the rest of Italy. This result is in line with the view that the Southern economy was, until the invasion of agricultural products from the US in the late 19^{th}, quite open to international trade. A well known study by Morilla et al. (1999, pp. 333–337) takes into account the case of southern Italy as exporter of high value added agricultural products. The authors give the example of citrus production in Sicily, which supplied 95% of lemons and 16% of oranges consumed in the US in 1890. However, the trend over the period before the First World War was negative for

the southern Italian exporters because of the competition from California. We believe that this decline in exports can explain why the first difference regressions suggest that total market potential was not a determinant in the change in time in GDP per capita.

Finally, we ran the model in levels and first differences, using industrial value added per capita as the dependent variable. This was done to connect this piece of research to the work of the next chapter on industrial location. Here the main result was that both domestic and total market potentials were positive and significant in explaining the levels of industrial value added per capita, but the results were not robust to the use of fixed effect and first differences. This suggests that market potential, in its domestic formulation, is a more clear predictor of GDP per capita than industrial value added per capita.

The next chapter is concerned with the study of the location of industries in the Italian regions in the same period. Following the methodology used by Midelfart et al. (2000), we model location patterns taking into account both the NEG forces and the H-O forces. In doing so we use the estimates from this chapter.

Chapter 5

Market vs. Endowment: Explaining Early Industrial Location in Italy (1871–1911)

5.1 Introduction

This chapter investigates the determinants of the Italian regional industrialization in the period between Unification and the First World War. The main research question is "what accounts for the industrial location during the Italy's early industrialization?". The aim is to explain the patterns of the industrialization of regions within an analytical framework that takes account of both the Heckscher-Ohlin (H-O) view on factor endowment and the New Economic Geography (NEG) view on market access. The methodology used is theoretically grounded on the seminal work by Midelfart et al. (2000) on the location of European industry from the 1970s to 2000. This methodology has also been applied to historical cases by Crafts and Mulatu (2006), Wolf (2007), Martinez-Galarraga (2012) and Klein and Crafts (2012).

The choice of this period of Italian history has a precise reason. These years correspond to the first industrialization of the country. At the time of Unification, Italy was predominantly agricultural, with some early manufacturing in the Northwest, in particular in the textile sector (Cafagna, 1989). In this period, all the Italian regions experienced industrial growth of some kind. By 1911, all the modern sectors had been to some extent established (Zamagni, 1990). This process was much smaller in scale than the big industrial boom of the 1960s and 1970s, when Italy became one of the most industrialized countries in the world. However, this first wave of industrialization is worth our attention for several reasons. First of all, this is the period immediately after Italy's Unification, when the country became politically unified for the first time in centuries. All internal borders and tariffs were removed and the administrative and legal framework became the same for all regions. Second, in this period some sectors

were established for the first time and some regions experienced their very first industrialization: choosing this period gives a chance to partially avoid a path dependency bias that would later become more serious. This period also has limited State intervention, at least in relative terms compared to the Fascist and the post-Second World War era.[1] Finally, when evaluating the role of Economic Geography in Economic History, we want to isolate geographical factors from other factors, such as political and institutional ones. Ending the analysis on the eve of the First World War is quite convenient in order to leave out the troubled period of the war itself, and the subsequent twenty years of Fascist rule and the Second World War.

The methodology used here mainly follows Klein and Crafts (2012) with some adaptation, and is quite straightforward: the dependent variable is the share of employment by region and by sector over the total national employment of the sector. This is explained by interactions between industry characteristics and regional characteristics of both the H-O and the NEG type plus region, sector and year controls. The regional characteristics considered include market access, energy endowment, agricultural labour and human capital availability. Industry characteristics include measures of energy-, labour- and skill intensity, intermediate input use, mean plant size and sales to industry.

The contributions of this work are several. First, it provides a further study on the formation of the North-South gap by describing how industries located in the post-Unification period. Historical cases have shown that endowments or market conditions can have different impacts on industrialization patterns. Understanding these differences in order to shed light on the way that regions first industrialized is one of our goals. Moreover, the Italian case is particularly fruitful for the application of Economic Geography in an historical perspective due to its large and persistent regional imbalances. The development of the industrial sector had a big role in regional divergence in Italy in this period and studying how industries located is informative about the overall disparities among regions. This chapter applies for the first time a well established methodology for studying regional divergence to the Italian case. It proposes quantitative testing for several hypotheses regarding market and endowment forces. Some of these have previously been brought forward to explain the gap but were never formally tested.

The main results are that human capital interaction is the most consistent of all interactions, with positive and significant coefficients across virtually all interactions.

[1] For an overview of the history of State intervention, see Felice (2007a).

The agricultural interaction is also consistently significant but with a negative sign, suggesting that a high share of agricultural labour force is not necessary conductive to industrialization. Energy endowment also gives some positive results although less robust compared to the first two endowment interactions. Market forces give more mixed results, with the interaction of forward linkages and market potential only being consistently positive and significant.

The chapter is organized as follows. Section 5.2 explains the methodology for studying the location of industries and discusses the use of market potential as an explanatory variable for industrial location. Section 5.3 gives an overview of the sources. Section 5.4 shows the empirical results on the determinants of industrial location in Italy. Section 5.5 concludes.

5.2 Explaining industrial location across regions

5.2.1 Modelling industrial location

The methodology used in this chapter goes back to Midelfart et al. (2000), a reduced form of which has been applied to historical cases by Crafts and Mulatu (2006), Wolf (2007), Martinez-Galarraga (2012) and Klein and Crafts (2012). We rely on the form used in the last of these works. The model is described by Equation (5.1)

$$\begin{aligned} \ln(s_{i,k})_t = \sum_w \beta_w [j] + \sum_i \gamma_i, t \text{ Region} \\ + \sum_k \rho_k, t \text{ Industry} + \sum_t \alpha_t \text{ Year} \end{aligned} \tag{5.1}$$

where $(s_{i,k})_t$ is the employment of industry k in region i as share of the total employment of k. $[j]$ is a vector of the interactions between regional characteristics and industry characteristics. $\sum_w \beta_w$ are the coefficients of the interactions that we are interested in. A set of dummies for each region and for each industrial sector is included to control for size differences among regions and sectors and for any other unobserved characteristics of either group. Unlike previous authors, we decided to use time-variant fixed effects in this case. The reason is that our dataset embraces a fairly long period (50 years) and most importantly does not have observations for each year. Therefore, we believe that time-variant fixed effects can more effectively capture structural changes of a political or institutional nature that are not otherwise considered in our model. Finally, time dummies are included. The model has a time dimension because it will be estimated both as a repeated cross section and as a pooled OLS regression. The intuition behind

this model is the following. The coefficients of the interactions indicate whether industries with a high level of a given characteristic tend to be over represented in regions where the corresponding regional characteristic is more abundant. For example, if energy endowment is important, we expect the interaction between power production in the regions and horse power use in the sectors to be significant, meaning that industrial sectors with more use of energy tend to locate in regions with a higher production of power. The estimating equation (Equation 5.2) is the following:

$$\begin{aligned}\ln(s_{i,k})_t = \beta_1 &\text{ (Agr. Employment} \times \text{Agr. Production)} \\ &+ \beta_2(\text{Literacy Rate} \times \text{Whitecollars}) \\ &+ \beta_3 \text{ (Deposits Per Capita} \times \text{Horsepower)} \\ &+ \beta_4 \text{ (Waterpower} \times \text{Horsepower)} \\ &+ \beta_5 \text{ (Market Potential} \times \text{Forward Linkages)} \\ &+ \beta_6 \text{ (Market Potential} \times \text{Backward Linkages)} \\ &+ \beta_7 \text{ (Market Potential} \times \text{Mean Plant Size)} \\ &+ \sum_i \gamma_{i,t} \text{ Region} + \sum_k \rho_{k,t} \text{ Industry} + \sum_t \alpha_t \text{ Year}\end{aligned} \tag{5.2}$$

The analysis considers all 16 Italian regions and 15 industrial sectors according to the population and industrial censuses of the period. The population censuses were carried out in 1871, 1881, 1901 and 1911.[2] Therefore, this analysis is based on 10-year benchmarks, excluding 1891. The interactions are the ones presented in Tables 5.1 and 5.2.

Table 5.1 shows the H-O type interactions. The first one is an agricultural interaction that links the share of the labour force in agriculture to the share of inputs from agriculture. The second interaction measures the availability of human capital in the regions, through literacy rates. The intensity of human capital in an industrial sector is measured as the share of white collar workers over total number of workers in each sector. The fourth interaction captures the availability and intensity of capital, measured through credit per capita in the regions and the capital intensity proxied by horse power per worker. The last one is an energy endowment interaction. For this interaction it was decided to keep separate the three main sources of energy used in Italy in the period: water power, hydroelectric power and coal. Coal production is not included because Italian regions produced very little coal, relying mostly on imports.

[2]The census of 1891 was not carried out because of budget cuts.

Table 5.1: Heckscher-Ohlin interactions.

Region characteristic	Description	Industry characteristic	Description
Agricultural employment	Agricultural employment as share of total employment	Agricultural input	Use of primary goods as share of total value of production
Human capital endowment	Literacy rate	Human capital intensity	Share of white collars in workforce
Capital availability	Deposits per capita in the region	Capital intensity	Horse power per worker
Energy endowment	Water power production	Energy intensity	Horse power per unit of production

Table 5.2: New Economic Geography interactions.

Regional characteristic	Description	Industry characteristic	Description
Market potential	GDP weighted by transport costs	Forward linkages	Share of sales to domestic industry as intermediates and capital goods
Market potential	GDP weighted by transport costs	Backward linkages	Use of intermediates as share of production
Market potential	GDP weighted by transport costs	Economies of scale	Mean plant size in terms of workers per plant

Therefore, instead of production, we use coal prices. As direct coal prices are not available for Italian regions in this period, we construct a proxy that augments the price in Genoa by the variable transport cost from Genoa, which was the port through which coal was imported and from which we have direct prices. The intensity of the use of energy is measured by horse power per unit of production. The NEG-type interactions of Table 5.2 are based on the calculation of market potential, as in Harris (1954). The next section discusses this point in detail. Forward and backward linkages are the value of inputs and outputs taken from other sectors as a share of the total value added of the sector. The third interaction relates the average number of workers per plant with

market potential and captures the tendency of firms to exploit economies of scale by locating in central regions.

5.2.2 Market potential in industrial location

The formulation of market potential is that proposed by Harris (1954). In its original formulation, the market potential of region A is defined as the sum of the GDP of all the adjacent regions, each weighted by its distance from region A, plus the GDP of the region itself. The idea behind market potential is quite straightforward. For a given region A, the larger the GDP of the other regions, the better the access to the markets of the region; and the greater the distance between region A and the other regions, the lower the weight of the GDP of each of these regions in the market access of the region considered. The rationale here is that for a given level of GDP, the larger the region the more spread out, and therefore harder to access, its own GDP is. This type of formulation of market potential has been used in several works. Crafts (2005a) applies it to the regions of Britain (1870–1910), Schulze (2007) to the Habsburg regions (1870–1910) and Martinez-Galarraga (2012) to Spain (1859–1929).

The only adaptation to the estimates in Chapter 3 is that we convert GDP and all cost measures to current prices. This is a standard procedure that goes back to Midelfart et al. (2000) and the following literature. The reason for using current prices is basically that location decisions are influenced by current prices.

In Chapter 3 we have discussed different specifications of market potential, from the most geographically narrow which includes the Italian regions only (domestic market potential) to the widest, which includes all the Italian regions and the main trading partners of Italy. One of the results in Chapter 3 is that the market potential formulations in which the share of internal market potential is larger, such as the domestic market potential, are stronger and more consistent determinants of GDP per capita and industrial value added per capita. In this chapter we also use market potential as an explanatory variable. Although the aim of this chapter is quite different from that of Chapter 3, some of the considerations on which market potential formulation is more appropriate in the Italian case overlap one another.

The notion of market potential is that of the formulation proposed by Harris (1954) and its economic meaning. Unlike gravity model based market potentials, the ones that do not rely on trade volumes are not capturing actual trade flows among the regions of the sample but in fact the *potential* trade that these regions could engage

in, given their GDP and the transport costs that separate them. Our formulation of market potential does not tell us anything about the *actual* use of this potential by the regions. As we explained in Chapter 3, we do not have trade data at the regional level in this period. However, we can assess Italy's overall openness to trade by looking at the evolution of imports and exports over GDP. Klasing and Milionis (2014) provide estimates of trade shares, measured as the sum of imports and exports over GDP for 70 countries between 1870 and 1949. This dataset allows us to assess the openness to trade of Italy in comparative terms. Italy starts in 1870 at a level of 12% and ends at 29% in 1911, presenting a steadily increasing trend over the period. The same study finds that France in the same period goes from 23% to 43%; Germany from 21% to 42% and Britain from 38% to 53%. These figures show that Italy was not a particularly open country, although its openness had a positive trend.

Federico and Wolf (2011) discuss the specific case of Italy over the very long run. Their findings are in line with the numbers provided by Klasing and Milionis (2014). They show that before 1939 Italy's share of the world market was quite uncorrelated to those of its trading partners. Moreover, manufactures accounted for almost 40% of the total imports in our period, leading to a negative balance of trade, while Italy exported very few industrial products (Federico and Wolf, 2011, p. 8). At the time of Unification, exports were very highly concentrated on a few agricultural products or textiles (silk, olive oil, sulphur, silk cocoons and wine accounted for 65% of exports). In addition the number of trading partners was very limited, with Europe taking over 90% of exports and France receiving a third of the total (Federico and Wolf, 2011, p. 10). Of course, the tendency over the period was towards greater diversification of exports and of trading partners. However, the big opening of the Italian economy did not arrive until the Economic Miracle of the 1950s.

Relying both on the empirical results of Chapter 3 and on the historical evidence on Italy's position in world trade in this period, we decided to include in our model on industrial location the domestic market potential as a measure of market access. Therefore, all the results of Section 5.4 show the interactions between domestic market potential and the relevant industry characteristics.[3]

[3]We ran the baseline regressions with all the alternative formulations of market potential; however, we observed that the wider the formulation used, the more inconsistent the results were. For this reason, we concluded that, like the case of Interwar Poland studied by Wolf (2007) and the case of the US studied by Klein and Crafts (2012), the use of domestic market potential only is the most appropriate.

Before moving to the discussion on sources, let us discuss what our prior expectations are on the signs of these interactions. Agricultural employment and agricultural production are expected to be positive since, whenever there is a high share of labour force in agriculture, the regional economy is expected to attract industries that are more intensive in the use of agricultural inputs. However, this expectation might be not fulfilled when a high share of agricultural workers in the labour force is not reflected in the high availability of agricultural inputs. This can happen in regions where a large share of the population is engaged in agriculture but where the levels of agricultural productivity are very low. In these cases the abundance of agricultural labour may turn out to have a negative effect on industrial location. The human capital interaction is more straightforward, since higher literacy rates are always expected to attract sectors with a higher share of white collar workers. Similarly, deposits per capita are positively associated with the presence of more capital intensive sectors. Finally, among the endowment interactions, those of energy should be discussed one by one. Different energy sources can be included in the model. For the case of Italy we decided to use water power as the baseline interaction. This is because coal was largely imported and the hydroelectric production started only in the second half of our period. For water and hydroelectric power interacted with horse power the expected sign is positive. In particular, we expect water power to be more likely to drive the location of industries because it reflects an energy source that is more likely to be produced very close to the plant, if not in the plant itself. However, hydroelectric power could be transported over longer distances and was more likely to be produced in mountainous regions, where it could have been harder to locate industries because of the lower availability of transports or their higher cost. Finally, coal prices are expected to have a negative sign when interacted with horse power because firms tend to prefer locations where coal is cheaper.

In an New Economic Geography approach, when transport costs are very high or very low, market access does not influence location decisions. However, when transport costs fall to an intermediate level, market access becomes relevant. The three market interactions proposed are all expected to have a positive sign when transport costs are at an intermediate level and market forces determine industrial location. The two interactions based on inter-industry linkages are positive when firms tend to locate close to their suppliers or to the sectors for which they are suppliers. The last interaction between market potential and mean plant size is related to the notion of increasing

returns to scale. It is positive and significant when firms use market access to achieve economies of scale.

5.3 Description of sources

In this section we describe the sources for the dependent variable, the regional characteristics and the industry characteristics. We also show the variables as maps in the case of regional characteristics and as graphs in the case of industry characteristics. The figures underlying the maps and graphs are included in the statistical appendix.

5.3.1 Employment figures

The dependent variable of the model is the logarithm of the share of employment per region, as a share of the national sector employment. For instance, the chemical sector in Piedmont in 1871 had 1424 workers while the Italian chemical sector had 10736 workers. Therefore, one data point will be equal to 1424 divided by 10,736, which corresponds to 13.45%. The employment figures are taken from Ciccarelli and Missiaia (2013), where labour force estimates from the population censuses at provincial and regional level are presented.[4] Ciccarelli and Missiaia (2013) discuss at length the shortcomings related to the misreported textile figures for women in the Southern regions.[5] In order to use the data, we decided to correct female textile employment by capping the number of women at no more than four times that of men, as in Fenoaltea (2003b). The employment data in Figures 5.1 and 5.2 are proposed by sector and by region.

5.3.2 Regional characteristics

This section describes the sources for each of the regional characteristics. All data are presented as maps or graphs and the underlying figures are included in the statistical appendix.

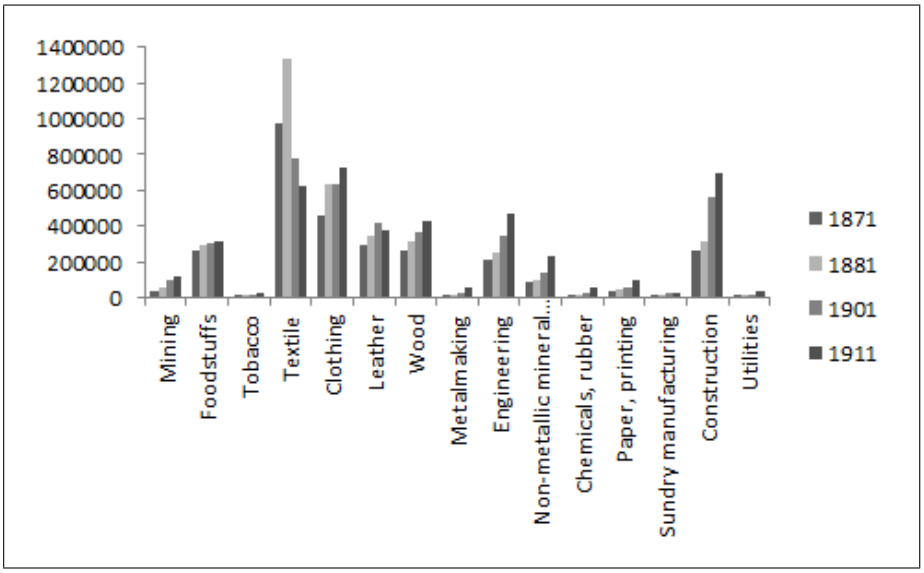
Energy Endowment. Table 5.3 shows the contribution of different energy sources in the period examined. To describe the role of energy, we use three different endowment variables: water power, coal and hydroelectric power.[6]

[4]The cited work uses provincial figures to then aggregate regional figures. This causes slight differences from the numbers proposed by Fenoaltea (2003b) at regional level. We considered the figures aggregated from provinces to be less affected by possible mistakes in calculation made at the time of the census.

[5]The over-representation is due to the very high number of women reported in textiles in Southern regions compared to the rest of the country. The problem is so severe that it is impossible to use the numbers without an ad hoc correction. Chapter 3 discusses the issue in detail.

[6]Although wood appears in the table to be the main energy source in this period, Bardini (1994) points out that it was mainly used for domestic purposes. Therefore, it is not appropriate to include wood in our model.

Figure 5.1: Total employment by industrial sector, 1871–1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

Table 5.3: Contribution of different energy sources, 1871–1911 (kcal).

	Coal	Natural Gas	Wood	Water power	Hydroelectric power
1871	13%	1%	77%	9%	0%
1881	26%	1%	63%	10%	0%
1891	40%	1%	49%	10%	0%
1901	46%	1%	43%	8%	2%
1911	58%	1%	28%	5%	8%

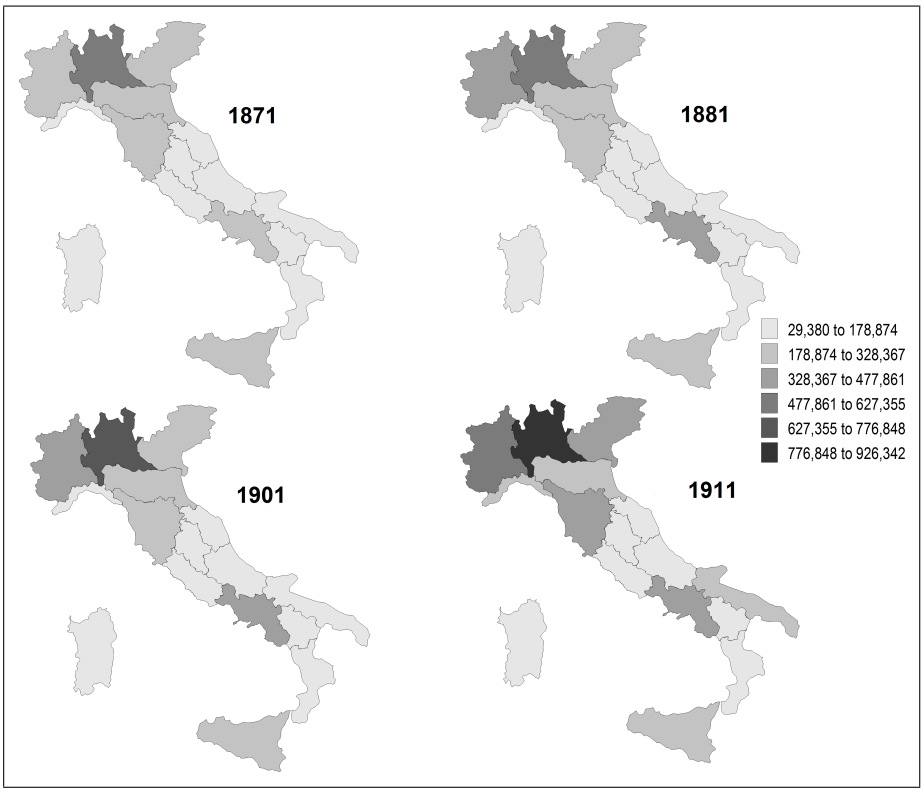
Source: Bardini (1991).

Water power data (Figure 5.4) are constructed from two ministerial sources: Bollettino di Notizie Agrarie (1884), which is a province-level census on the production of water power in 1877 and Servizio idrografico (1935) which records the new concessions for water power production between 1870 and 1932. The production level for 1877 is aggregated in regions and then the data on the new concessions are used to expand the series backward and forward in time.

Coal production is not included because the Italian regions had very low production of coal, relying mostly on imports.[7] Instead, coal prices are used (Figure 5.3). Direct coal prices at regional level are not available for this period. The solution is to take the coal price per tonne in Genoa, which was the main port for the import of coal at

[7]See Bardini (1998) for a full discussion on energy production in Italy in this period.

Figure 5.2: Total employment by region sector, 1871–1911.



Source: our calculations using employment data from Ciccarelli and Missiaia (2013).

the time and augment it for the transport cost from Genoa. The prices for Genoa are from Cianci (1933).[8]

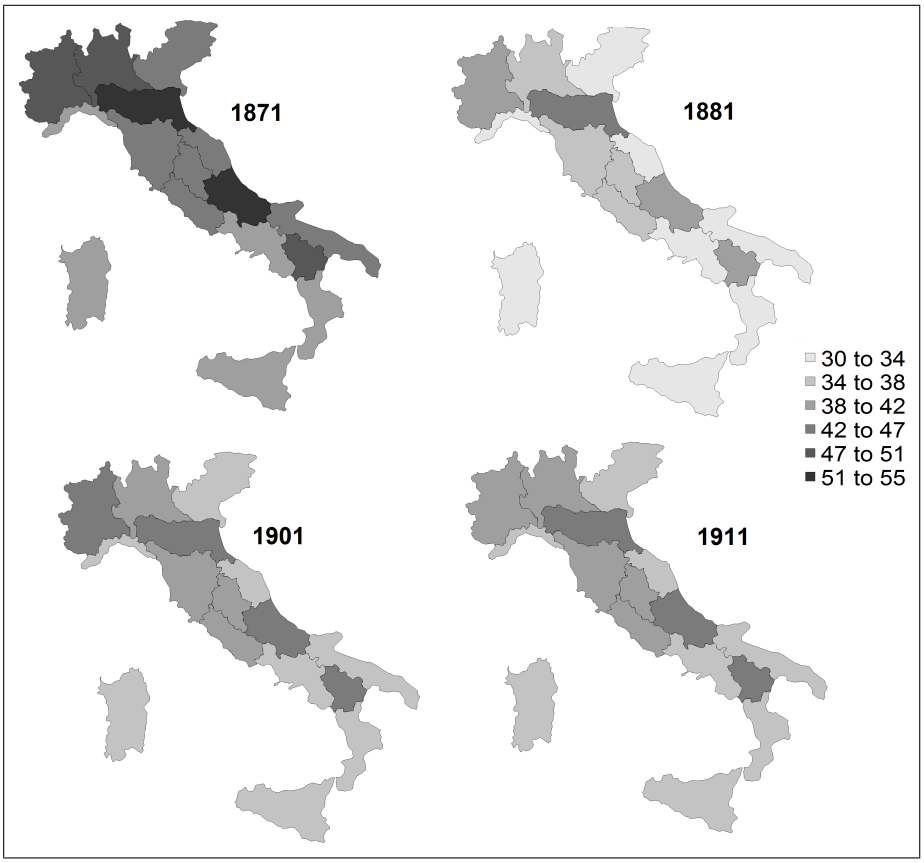
Hydroelectric power production is taken from Mortara (1934). Hydroelectric power production (Figure 5.5) was present only in the last two benchmark years of the sample, since the production before 1901 was negligible.

Human Capital. Literacy rates are used as a measure of human capital endowment in the regions. A'Hearn et al. (2011) provide the latest estimates for literacy rates at regional level for the whole population over the age of 15. This threshold is quite convenient for the present work because 15 and over is the age group that best captures industrial workers. Figure 5.6 shows the distribution of literacy rates across regions.

For literacy, we propose as instrument the inverse of the geographical distance from Paris. The motivation for adopting this instrument is that literacy rates, as shown in Figure 5.6, have a strong North-South gradient and a milder but still significant West-

[8]Bardini (1994) does not provide a comprehensive dataset of coal prices across the Italian regions, which proved to be hard to come by even using primary sources. Bardini (1994, p. 147) reports prices for Cardiff coal in 1899 for Genoa, Livorno and Catania. The price in Genoa was 33.10 lire per tonne, in Livorno between 28.7 and 33.8 and in Catania between 35.1 and 49.6. These figures support the hypothesis that coal was entering Italy through Genoa and then to its other ports.

Figure 5.3: Coal prices, 1871–1911 (current lire).



Source: Cianci (1933).

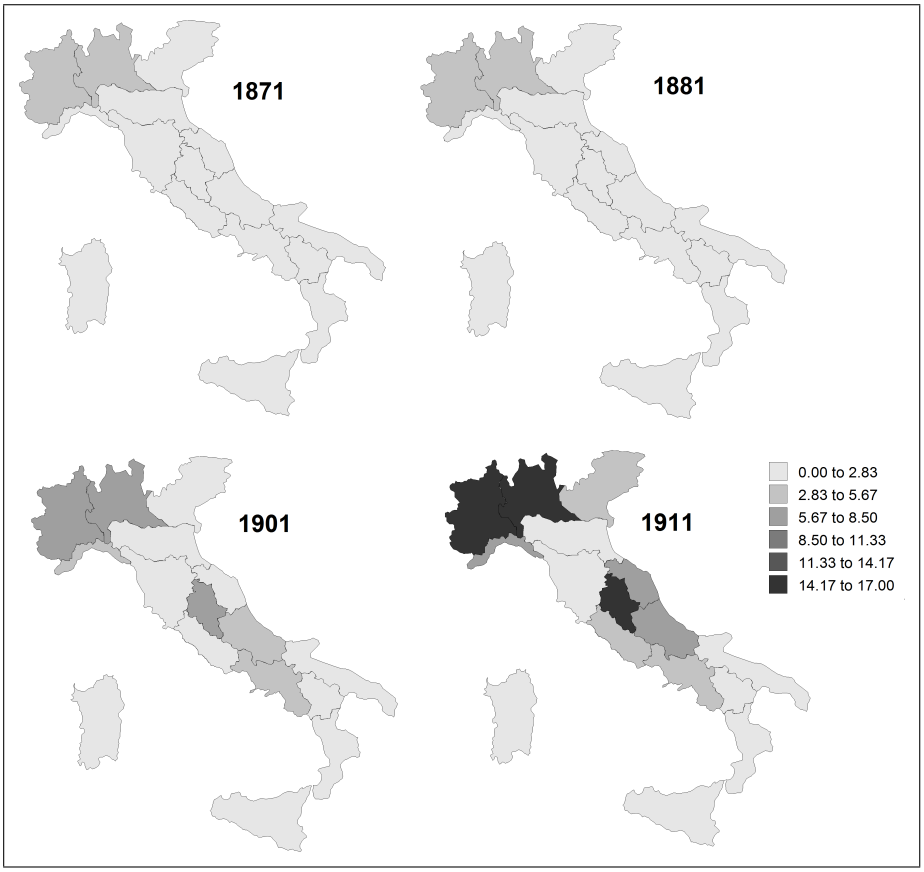
East gradient. This gradient is well reflected by the inverse of the distance from Paris in terms of straight lines.[9] The historical validity of this instrument goes back to the influence of France over the Italian pre-unitary states. During the Napoleonic Era, the Northwest and Centrewest of the Italian peninsula were annexed to the French Empire; in the Northeast a puppet state called the (Napoleonic) Kingdom of Italy was created as well as in the continental South, under the name of the Kingdom of Naples. Sicily and Sardinia were left under the rule of the House of Bourbons and Savoy, respectively.[10] Figure 5.7 shows the borders in 1810.

The French influence was certainly stronger in the parts of Italy under direct French rule and weaker in Sicily and Sardinia, which were left to their previous rulers, while the other parts of the peninsula lay somewhere in between. As we observe, the parts of Italy that were under direct French rule were also the ones closer to Paris. It is possible that

[9]If we were to take the transport cost from Paris we would incur in a similar problem to that of market potentials and we would also undermine the validity of the instrument, since transport costs are not necessarily exogenous.

[10]See Meriggi (2011) and Smith (1997) for a political history of pre-Unification Italy.

Figure 5.4: Water power production, 1871–1911 (horse power per km^2).



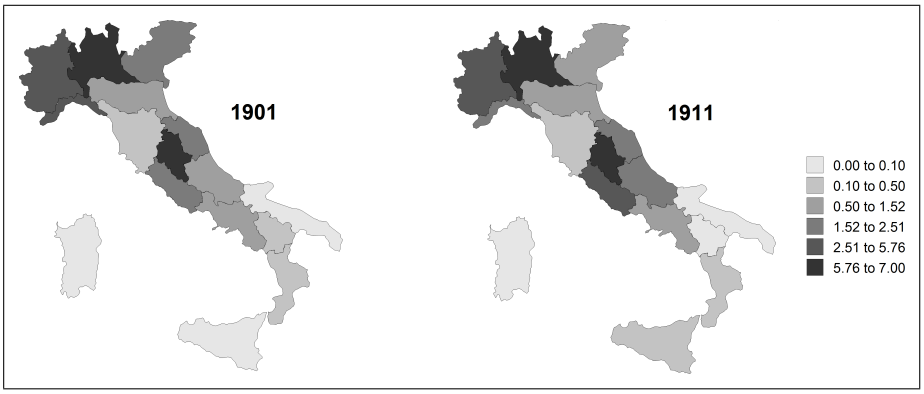
Source: MAIC (1884) and Servizio idrografico (1935).

the influence of France in this period contributed to shaping different school systems producing this Northwest-South gradient that is still visible after Unification. Looking at our candidate instrument, we see that it has a correlation of 0.93 with the literacy rates. Therefore, we claim that the inverse of distance from Paris can be used as an instrument for the literacy rates.

Agricultural Inputs. The agricultural regional characteristic used here is the share of the labour force in agriculture (Figure 5.8). Population censuses provide the figures for the active population in agriculture. Agricultural inputs are interacted with the share of labour force in agriculture to assess the effect of the presence of agriculture in the region whenever a sector uses agricultural inputs.

Credit. Bank deposits in 1911 are provided for the various types of bank from the Annuario Statistico Italiano (1912), which is the statistical yearbook for Italy. Unfortunately, not all the statistical yearbooks provide this information for all types of banks

Figure 5.5: Hydroelectric power production, 1871–1911 (horse power per sq km).



Source: Mortara (1934).

and all years. We decided to use the information on the Casse di risparmio ordinarie, which are available for all years, as a proxy for all types of bank. We are aware of the limitations of this strategy, but it has not been possible to find an organic source for all types of bank.

Market Potentials. The estimates for market potentials for the 16 Italian regions in the benchmark years 1871, 1881, 1901 and 1911 are discussed in Chapter 4.

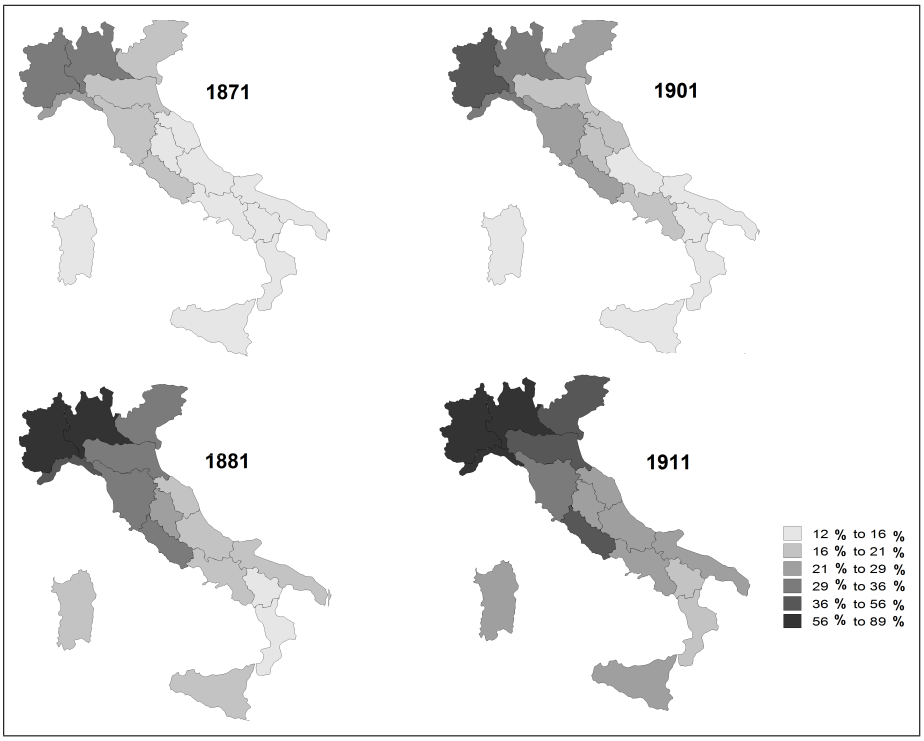
5.3.3 Industry characteristics

This section describes the sources for the industry characteristics used in the model. The two main sources for the industry characteristics are the Industrial Census of 1911 and the input-output table provided by Vitali (2003). The two sources are described in detail in this section.

Industrial Census of 1911. The Industrial Census of 1911 was the first complete census of this type carried out in unified Italy. It provides information on the number of plants, their number of workers in each, by type of occupation and by industrial sector. It also provides information on the horse power used by plants. The industry characteristics which are extrapolated from this census are by construction time invariant. The interactions which rely on this source are the human capital interactions, with the share of white collar workers per industrial sector (Figure 5.10); the energy interactions, with total horse power or hydraulic power used in the plants.[11] (Figure 5.11

[11] With total horse power we mean the total energy used in the sector; with hydraulic power we mean the part of the energy coming from hydraulic engines and we are going to use just that in the interaction with the regional water power production.

Figure 5.6: Literacy rates in the Italian regions, 1871–1911 (Italy=100).



Source: A'Hearn et al. (2011).

and 5.12); the financial capital interaction that uses horse power per worker as proxy for the capital–labour ratio (Figure 5.13) and the interaction between market potential and economies of scale measured by mean plant size (Figure 5.14).

Input-output table. Market potential is interacted with three industry characteristics. The first that we have seen is mean plant size, measured as in Figure 5.14 using information from the 1911 Industrial Census. The other two rely on forward and backward linkages which are measures of the value of outputs used as inputs by other industrial sectors (forward linkages) and the value of inputs that come from other industrial sectors (backward linkages), all as a share of the total value added of each sector.[12] The source here is the input-output table provided by Vitali (2003) for 1891 and 1911. Here we use 1911 as reference year. The input-output tables by Vitali (2003) also provide the value of inputs from agriculture to each industrial sector, which is used in the agricultural interaction.

[12]The value added for each sector is taken from Fenoaltea (2003b).

Figure 5.7: Italian peninsula, 1810.

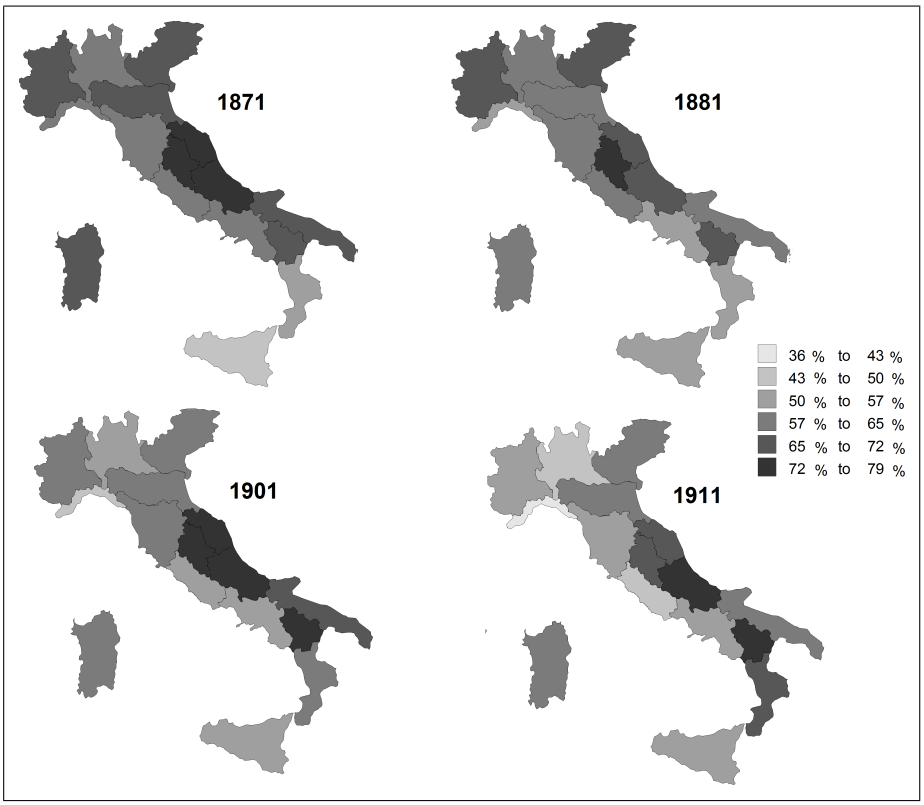
5.4 Determinants of the location of industries: empirical results

In this section we present the estimation results for the determinants of the location of industries. Table 5.4 shows the estimation of Equation 5.2 as a repeated cross section in the first four columns and as a pooled OLS in the next three columns. All coefficients are standardized and we use heteroskedastic-robust t-statistics.[13] Region and industry fixed effects are computed for each benchmark year and included in all specifications. Year fixed effects are also included for the pooled OLS.

Let us start our empirical analysis with the cross sectional regressions in Columns 1–4 of Table 5.4. We go through the H-O interactions first and then move to the NEG ones. The main result that stands out is for the human capital interaction. The interaction between literacy rate and share of white collar workers is significant across years and specifications. It is positively signed, which is what we would expect: regions with higher literacy rates attract firms from the sectors that are more intensive in the use of skills (meaning that they will have more white collar workers). Regarding the remaining H-O interactions, the cross sections do not reveal any other result that hold in all years. The other interaction with a significant coefficient, but only in 1871 is that of the deposits per capita interacted with horsepower per worker (which is a proxy of

[13] In this chapter we decided to show in this case t-statistics rather than standard errors because all the coefficients are standardized and the t-statistics are more easily interpretable.

Figure 5.8: Share of regional labour force in agriculture, 1871–1911.



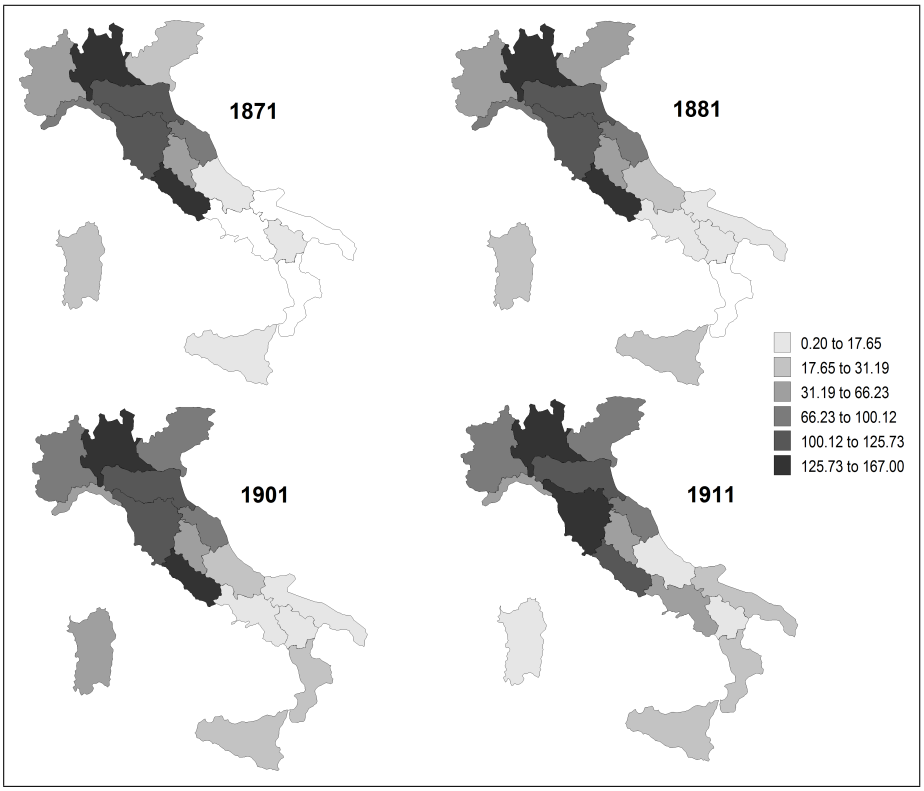
Source: MAIC (1874, 1883, 1902, 1914).

the capital-labour ratio). Among the non significant interactions, the coefficients are all correctly signed except the energy interaction for 1871 and 1881 and the capital interaction for 1901 and 1911.

Moving to the market interactions, the results are the following. The interaction with forward linkages is significant at the 5% level and correctly signed only in 1881 while market potential is positive and significant at the 10% level interacted with backward linkages in 1911. Finally, the interaction between market potential and mean plant size is negative in 1901. This latter is the only results so far that goes against our prior. A negative sign on the interaction that is intended to capture increasing returns to scale indicates that economies of scale are not exploited and that there is even a penalty for firms having a higher mean plant size to locate in regions with better access to markets. However, it should be noted that the negative sign is not consistent through the years, casting doubt on the reliability of this result.

In all specifications the R^2 are over 0.7, reassuring us that a large part of the variation is explained by the model. Standardized beta coefficients allow us to compare

Figure 5.9: Deposits per capita, 1871–1911 (current lire).



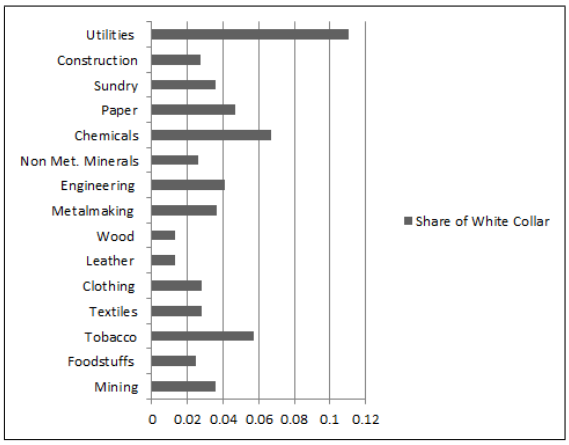
Source: Annuario Statistico Italiano 1871, 1881, 1901, 1911.

the relative impact of the interactions.[14] The human capital interaction has coefficients ranging from just below 0.3 to just below 0.6; market potential interacted with forward linkages has a coefficient of 0.370 and 0.341 with backward linkages, which is similar in size to the human capital one. Mean plant size interacted with market potential has a coefficient of -0.6, which is quite high but does not appear to be consistent over time.

In order to increase the variation, in columns 5–7 of Table 5.4 we pool the four benchmark years. Column 4 shows the results with no clustering and robust standard errors; Columns 6 and 7 show the same specification with region- and industry-specific clustering. The result for human capital is confirmed, with positive and significant coefficients although the magnitude decreases to 0.285 standard deviations. Here the agricultural interaction is significant and negatively signed, suggesting that for the case of Italian regions, a high share of labour force in agriculture is not attractive for industries, even if they are intensive in the use of agricultural inputs. This is because of other features associated with highly agricultural regions, for example the low productivity of labour. Water power and horse power are negative although with

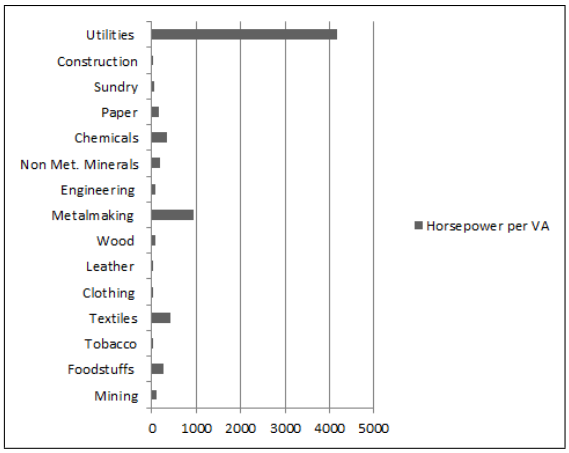
[14]Crafts and Mulatu (2006), Wolf (2007) and Klein and Crafts (2012) also use standardized beta coefficients to compare the effect of the various interactions.

Figure 5.10: Share of white collar workers, 1911.



Source: industrial census, 1911.

Figure 5.11: Horse power per million of value added, 1911.



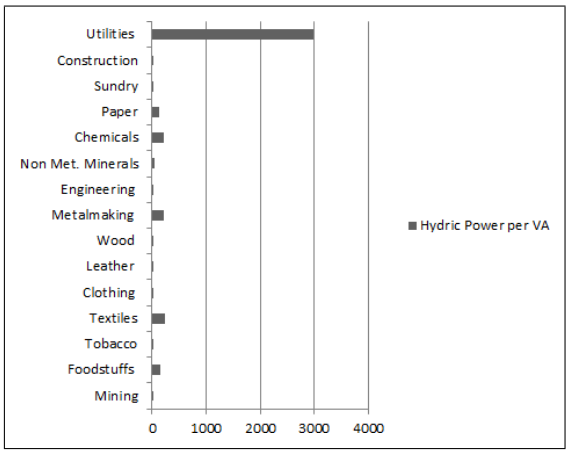
Source: MAIC (1914b).

a far smaller coefficient than to the other significant interactions show. This result may be linked to the fact that the use of water power production was probably more intensive in only some types of industry while others relied on coal or, in later years on hydroelectric power and if the two groups are analysed together the effect cannot be clearly identified.[15] Finally, backward linkages are significant and positively signed, suggesting some role for inter linkages across sectors. All the results except the first on the agricultural interaction are robust to clustering by region and by sector, as we can see in Columns 6 and 7.

Summing up, the cross sections show a persistent positive and significant effect of the human capital interaction and some positive effect of the market interactions in the earlier benchmark years through forward linkages, while mean plant size has an

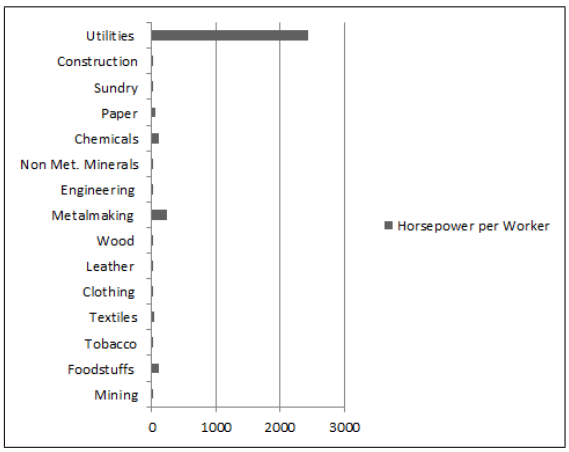
[15]In the next table we address this issue by running the model by sorting the selectors according to their technological level.

Figure 5.12: Hydraulic power per million of value added, 1911.



Source: MAIC (1914b).

Figure 5.13: Horse power per worker, 1911.



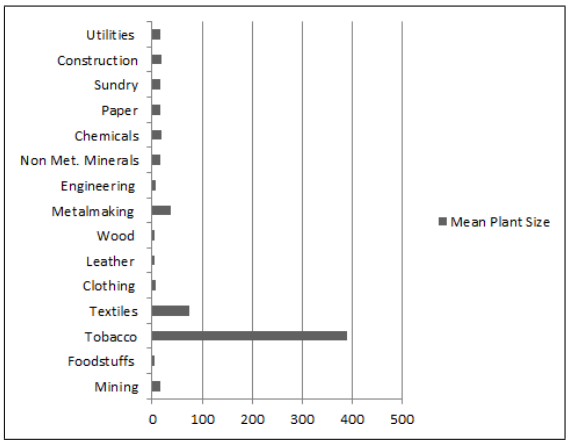
Source: MAIC (1914b).

unexpected negative sign. Neither of the results for market is confirmed in the pooled regression, where market potential is positive and significant only when interacted with backward linkages. In the pooled regression two of the endowment interactions (energy and agriculture) do not have the expected sign. We discussed why the negative agricultural interaction is plausible while we must move to Table 5.5 to account for the energy one.

Columns 1 and 2 of Table 5.5 show the same model as in the previous table, pooled, with robust t-statistics and sorting industrial sectors by technology level. The sectors in level 1 have a lower technological intensity while the sectors in level 2 have a higher intensity.[16]

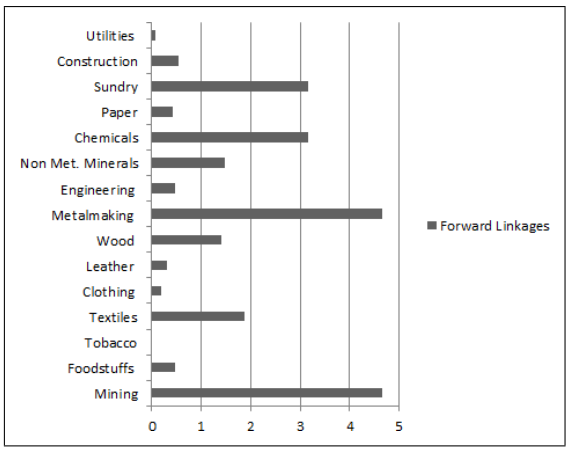
[16]The classification of industrial sectors by level of technology into 1 (low level) and 2 (high level) is an adaptation of the classification proposed by Midelfart et al. (2000) in their Table 3.4. The classification by these authors also includes the sectors with the higher technological levels. However, none of the

Figure 5.14: Mean plant size, 1911.



Source: MAIC (1914b).

Figure 5.15: Forward linkages, 1911.



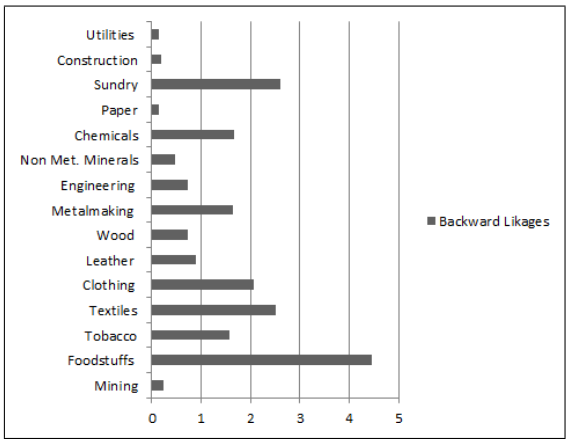
Source: MAIC (1914b).

This separation is useful for testing whether some of the interactions, in particular the endowment ones, have different effects for firms with different production characteristics. In comparing Columns 1 and 2 of Table 5.5, we notice that the negative effect of the agricultural labour force interacted with agricultural inputs is six times larger for the sectors that are more technology intensive. This may be due to the fact that the more a sector is technologically advanced, the more the difficult it is for the labour force to adapt from agriculture and the role of agriculture is negligible in the location decision, if not negative.

The second result, which is also expected, is that the magnitude of the human capital interaction is larger, almost double, for the more technologically advanced sectors.

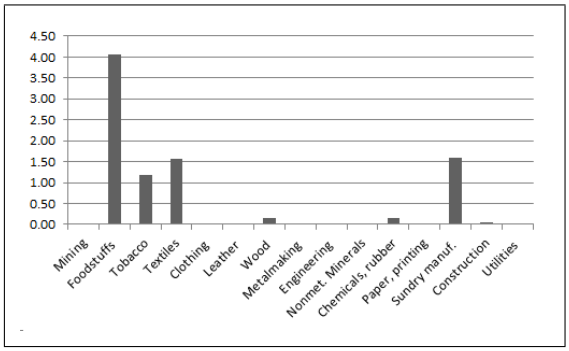
sectors in this study corresponds to any of the sectors with a higher technological level in Midelfart et al. (2000). In Group 2 we classified engineering, chemicals, sundry and utilities. The remaining sectors fall into Group 1.

Figure 5.16: Backward linkages, 1911.



Source: MAIC (1914b).

Figure 5.17: Agricultural inputs, 1911 (for current million lire of production).



Source: MAIC (1914b).

Deposits per capita interacted with horse power per worker is positive and significant at the 10% level for industries with a lower technological level and non significant for those with a higher level. This is probably related to the way that we measure capital availability: deposits per capita from the casse di risparmio are less likely to finance sectors as engineering or chemicals where the amount of capital needed to start a firm is higher than in more traditional sectors such as textiles. It should be noted here that there is a difference between the plant size and the firm size, since a single firm might have more than one plant. Quantifying the difference across industrial sectors is not possible using the information contained in the 1911 industrial census because this distinction is not made. The 1911 industrial census also does not include firms with only one employee, leading to an overestimation of the mean plant size of sectors with higher numbers of self employed workers. For this reason we do not know whether sectors with lower technological intensity are also smaller. However, when they are smaller, they most probably require smaller amounts of capital deposits per capita

Table 5.4: The determinants of industrial location, 1971–1911.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ind. employ.	1871	1881	1901	1911	Robust	Reg. cluster	Ind. cluster
Agr. Empolyment x Agr. Production	0.106	0.002	0.139	0.189	-0.173$^{(***)}$	-0.173$^{(***)}$	-0.173
	(0.49)	(0.01)	(0.56)	(1.01)	(-3.26)	(-3.58)	(-1.36)
Literacy Rate x White Collar	0.399$^{(***)}$	0.276$^{(***)}$	0.587$^{(***)}$	0.371$^{(***)}$	0.285$^{(***)}$	0.285$^{(***)}$	0.285$^{(***)}$
	(2.67)	(4.35)	(6.18)	(3.46)	(6.52)	(4.51)	(3.21)
Deposits Per Capita x Horse Power per worker	0.082$^{(**)}$	0.028	-0.031	-0.028	-0.015	-0.015	-0.015
	(2.14)	(0.75)	(-0.72)	(-0.68)	(-0.61)	(-0.53)	(-0.46)
Water power x Horse Power	-0.016	-0.024	0.036	0.009	-0.035$^{(*)}$	-0.035$^{(*)}$	-0.035$^{(**)}$
	(-0.12)	(-0.52)	(0.87)	(0.23)	(-1.67)	(-2.05)	(-2.15)
Domestic MP x Forward Linkages	0.460	0.370$^{(**)}$	0.421	0.272	-0.078	-0.078	-0.078
	(1.50)	(2.01)	(1.38)	(0.84)	(-1.26)	(-1.31)	(-1.19)
Domestic MP x Backward Linkages	0.071	0.074	0.289	0.341$^{(*)}$	0.294$^{(***)}$	0.294$^{(***)}$	0.294$^{(***)}$
	(0.40)	(0.60)	(1.31)	(1.67)	(4.50)	(3.65)	(3.11)
Domestic MP x Mean Plant Size	0.047	-0.043	-0.600$^{(**)}$	0.720	0.036	0.036	0.036
	(0.11)	(-0.27)	(-2.14)	(1.51)	(0.85)	(0.69)	(0.98)
Region fixed effects	yes	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	no	no	no	no	yes	yes	yes
Observations	229	234	235	238	936	936	936
R^2	0.733	0.917	0.741	0.740	0.734	0.734	0.734

Notes: Heteroskedastic robust t statistics in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the share of employment by region and by sector over the total national employment of the sector.

than the sectors in Group 1. This would also contribute to explaining the different sign of the capital interaction between the two groups. Finally, it should be noted that the magnitude of the capital interaction for both groups is quite low, suggesting that capital was not a strong determinant of industrial location, at least in its magnitude.

Moving on to energy, water power interacted with horse power has a very different impact in the two technological level groups. Water power is positive and significant at the 1% level with a coefficient of 0.140 for industries with a lower technological level and non significant in the others. This suggests that, like capital availability, water power availability had a stronger impact in one group of sectors, namely, the lower technology group. The example that may help to understand this result is the case of textiles, which represents one of the largest sectors among the low technology group. According to A'Hearn and Venables (2011, p. 20), textiles plants largely used energy produced by mills installed in the plant. Our results show precisely that this self-produced energy had a larger impact on sectors with lower technological intensity than on sectors in Group 2 where coal would have been a more important source of energy.

The market interactions in this case give mixed results. Market potential interacted with forward linkages is positive and significant with a very high coefficient for the group

at a higher technological level. This result suggests that for this group of industrial sectors, the linkages with other sectors providing inputs are far more important than the linkages in the other sectors. The interaction between market potential and forward linkages is far more problematic: it has a negative and significant coefficient for both technological levels. This result could be explained by the fact that Italian industries in this period are still quite highly dependent on imported intermediate inputs rather than in the intermediate inputs produced by Italian firms. This distortion may be the cause of the counter-intuitive results for forward linkages. Regarding the last interaction, economies of scale are again insignificant, suggesting that increasing returns to scale were not taken into consideration when deciding where to locate in this period in Italy.

Moving to Columns 3 and 4 of Table 5.5, we show the model with alternative sources of energy. Column 3 shows coal prices interacted with horse power. The coefficient is negative and significant, indicating a negative effect of coal prices on the location of industries. Although the prior on this interaction is fulfilled, the interpretation of this should be seen in light of the method for calculating coal prices and what their main drivers are. First of all, direct coal prices for Italian regions are not available for this period. We had to find a way to estimate coal prices indirectly: we did so by assuming that all coal was imported through Genoa and by taking the price in Genoa and augmenting it for the transport cost from Genoa to each node.[17] This procedure is not ideal, since it uses a measure of coal abundance that is very similar to a market measure: nodes with lower transport costs from Genoa that enjoy cheaper coal are often the ones that have good market access. It should be noted, however, that direct prices would not solve the problem because they also represent a sort of market access measure. In principle, it is quite hard to read coal prices as a proper endowment force when they do not depend on coal production in the country. Coal can be seen as a proper endowment only in regions that produce their own coal, as in the case of Britain studied by Crafts and Mulatu (2006). The Italian case is very different and this is why we decided not to use coal as the main energy source of our model. Finally, Column 4 of Table 5.5 shows the results with hydroelectric power production as the energy source. In this specification all other results remain similar but the energy interaction is not significant. This is probably due to the fact that hydroelectric production in this

[17] This is done by augmenting it only for the terminal component in the case of shipping, since we assume that for nodes reached by ship from Genoa coal was not unloaded and reloaded in the same port.

period accounted for only 2% of the total energy use in 1901 and 8% in 1911 (see Table 3 in Section 5.3.2).

The last set of estimates that we present here is included in Table 5.6. This table starts by showing the pooled OLS regression run by splitting the sample in North and South in Columns 1 an 2. This is done to test whether different macro areas have different dynamics in location decisions.[18] The main result is that in the South human capital is insignificant in determining the location of industries. In contrast, in the North, human capital is positive and significant. This is explained by the distribution of human capital within the two parts of the country: the South has very low levels of literacy in all its regions; the North has a large imbalance between the regions of the Industrial Triangle and the others. In particular, Veneto does quite poorly in terms of literacy and is also one of the least industrialized parts of the North. Therefore, if we take the North only, there is much more variation in the human capital interaction that leads to a clear result, while with the South this does not happen. The agricultural interaction behaves like the other specifications while other endowment forces do not show as significant.

Moving to the market interactions, the results are quite different between North and South. In particular, there is a strong effect of backward linkages in the North, with a positive and significant coefficient at the 1% level. The same effect is weaker both in magnitude and level of significance for the South. The same issue of a negative coefficient for forward linkages that arises for high technology industries arises here for industries located in the North. However, in this case the magnitude of the coefficient is much lower than that shown in Column 2 in Table 5.5. The final result to note is that in the South there seems to be some room for increasing returns to scale, with a coefficient positive and significant at the 10% level for the mean plant size and market potential interaction.

The last set of estimates proposed in Columns 3 and 4 of Table 5.6 addresses the issues of endogeneity and multicollinarity in our dataset. These problems can be addressed by different strategies. For endogeneity, the most standard strategy in the literature is to look for instruments for the variables that are thought to be affected by endogeneity. In our case, the variables that we would need as instruments are

[18] Unlike Chapter 3, where the unit of analysis was the province, in this case we decided to use two rather than three macro areas so as to run the model with sufficient observations. Therefore unlike our choice in Chapter 3, we keep the definition of the South as before and merge the North-West and North-East-Centre to obtain what we call the North.

both the literacy and the market potentials. The endogeneity for literacy rests in the relationship between the literacy rate and industrial employment (regions with higher literacy rates tend to be more industrialized, and the converse is also true) while for market potentials the relationship is between GDP and industrial employment (regions with higher industrial employment tend to be richer, and the other way around). For the latter case, we discussed in Chapter 4 the reasons why it was not possible to apply the standard instruments proposed in the literature to the case of the Italian regions. In particular, both distance from a point, such as the geographical centre of Italy (or of Europe in the case of specifications that take trading partners into account) or the market potential calculated excluding own GDP do not pass the first stage. This is because of the non linear relationship between transport costs and the distances that we observe in this specific case.[19] For human capital, as illustrated in Section 5.3.2, the inverse of the distance from Paris is used as the instrument.

Column 3 in Table 5.5 shows the result of the two stage least squares regression. What we observe is that the human capital interaction in this case is positive and significant, confirming that human capital was one of the determinants of industrial location. The results on the NEG interactions are similar for the interaction of market potential with backward linkages while the negative sign on forward linkages is no longer confirmed. The fact that this counter-intuitive result on forward linkages does not hold when literacy rates are instrumented while the one on backward linkages does suggests that this second result is more robust then the first.

To conclude this section, we show a final specification in which the variables are in first differences. By differencing the variables we take the change in time rather than the levels, getting rid of possible collinearity issues as we did in Chapter 4 where we explain the relationship between GDP per capita and market potentials. In column 4 we see the results. The human capital interaction is still positive and significant, confirming our findings so far. For what concerns market interactions, the change in time shows a reverse picture on forward and backward linkages of that shown by the model in levels. In particular, forward linkages interacted with market potential are positive and significant while backward linkages are negative and significant. These results suggest that the inter linkages between sectors in Italy in this period were evolving, with forward linkages becoming more important because of the growing scope of industrial production and backward linkages becoming less important.

[19] The topic is treated in detail in the relevant section of Chapter 4.

Before moving to the conclusions, a discussion on the economic interpretation and comparison of magnitude of these coefficients is necessary. As we have explained, all coefficients are standardized because of the difficulty of interpreting the size of interactions between variables that have very different units of measurement. This implies that they cannot be interpreted in absolute terms but only in comparison with one another. This comparative approach is taken by all the previous works using this model and we follow the same approach to assess the economic significance of our results.

Let us start with the coefficient of instrumented literacy of Column 3 in Table 5.6 and compare it with the coefficients obtained by Wolf (2007) for Poland and by Midelfart et al. (2000) for the EU, which are the two works that find human capital as a determinant of industrial location. Wolf (2007, p. 39) has a coefficient of 0.619 while Midelfart et al. (2000, p. 36) in the cross sections has coefficients ranging from 0.322 to 0.478. In our case we obtain a coefficient of 0.285 which is slightly lower than Midelfart et al. (2000) and half that of Wolf (2007). This level suggests that human capital was a fairly strong driver of industrial location although not as strong as it was in Poland. It should be noted, however, that both these works take into account cases of relocation rather than the early location of industry, and most importantly they focus on very different time periods. Therefore the comparability across results is not perfect and should be considered with a grain of salt.

The other coefficient to compare with other sectors, and with the human capital coefficient, is that of market potential interacted with backward linkages (Column 5 of Table 5.4). This NEG interaction is the only consistent one across specifications and we consider this result the most robust among the NEG interactions. The coefficient is 0.294 which can be compared with the coefficient of 0.365 by Wolf (2007, p. 39) and 0.6 by Midelfart et al. (2000, p. 36). Here again our result is slightly lower than in previous studies but in line with the human capital interaction. Beyond the comparisons across studies, what we can say about our results is that the two most consistent interactions have comparable weight in the location decisions. As for the other interactions, the agricultural one (Column 5 of Table 5.4) has a negative coefficient of roughly half the size of the human capital and backward linkages, suggesting a smaller but still economically meaningful role in shaping industrial location. Finally, energy interactions seem to have had a role too, with a quite high coefficient for coal of -0.294 (Column 3 Table 5.5), although we should not forget about the bias in the way that

coal availability is measured and water power with roughly half the size of coal when the sample is restricted to lower technology industries (Column 1 Table 5.5). The next section concludes this chapter, providing a general interpretation of the results obtained.

5.5 Conclusions

The objective of this chapter was to account for the factors that determined the location of Italian industries in the period 1871–1911. We used a methodology that explains the share of employment per region per sector with respect to the national employment of the sector, using a set of interactions between the industry characteristics and regional characteristics of both the the H-O and NEG types. To estimate the model, we used both cross section and pooled OLS regression analysis with fixed effects for industries, regions and years.

The general result is that endowment, and in particular human capital endowment, was central in the location of the Italian industrial sector during the first industrialization of the country. The focus on human capital as a determinant of the different development of the Italian regions is not new in the literature (see Zamagni (1978) and more recently A'Hearn et al. (2011) and Felice and Vasta (2012)). Southern regions, as well as the more backward regions of the North, Venetia in particular, had a persistent gap in literacy rates over the whole period. The importance of human capital has also been underlined in other works on industrial location (see for instance Wolf (2007) but also Midelfart et al. (2000)). Italy during its early industrialization seems to follow a similar pattern.

Endowment forces had a role in determining industrial location also through agriculture, which against our prior has a negative effect on industrial location. This result is explained by the fact that high shares on agricultural labour force can be associated not only with higher agricultural inputs but also with lower productivity in the region, which may have been detrimental for industries. Energy endowments show some results for coal prices, although these can hardly be considered an endowment measure. More interestingly, water power has a positive effect in industries that have a lower technology level and which are more than two thirds of our sample.

Moving on the discussion on market forces, the result that is more consistent is that backward linkages when interacted with market potentials are associated with industrial location while forward linkages either appear as insignificant or they are not correctly

signed. The explanation we give to this result is tentative and it is related to the changing of inter linkages among sectors in this period, when Italy moves from having very low levels of industrial exports to slowly opening to the international markets for industrial products Federico and Wolf (2011).

In conclusion, market forces provide more mixed results than endowment forces do, suggesting that the Italian case fits the typical pattern of 19^{th} century industrializing countries among which Britain is the most relevant comparison (Crafts and Mulatu, 2006). Other studies focusing on later periods, such as Midelfart et al. (2000) or on countries with a much larger internal market, such as Klein and Crafts (2012), find more evidence that market forces mattered more than endowment forces. In our case, market potential, even in its most geographically narrow formulation that includes Italian regions only, has little explanatory power compared to the sum of endowments variables.

Table 5.5: The determinants of industrial location, by technological level and energy source, 1871–1911.

	(1)	(2)	(3)	(4)
Ind. employ.	Tech. 1	Tech. 2	Coal	Hydroelectric
Agr. Empolyment x Agr. Production	-0.116$^{(*)}$	-0.675$^{(***)}$	-0.154$^{(***)}$	-0.174$^{(***)}$
	(-1.91)	(-5.96)	(-2.95)	(-3.28)
Literacy Rate x White Collar	0.259$^{(***)}$	0.501$^{(***)}$	0.397$^{(***)}$	0.275$^{(***)}$
	(5.22)	(4.46)	(8.53)	(6.43)
Deposits Per Capita x Horse Power per worker	0.070$^{(*)}$	0.010	0.022	-0.029
	(1.86)	(0.25)	(0.88)	(-1.16)
Water power x Horse Power	0.140$^{(***)}$	-0.075$^{(**)}$		
	(3.32)	(-2.25)		
Coal price x Horse Power			-0.294$^{(***)}$	
			(-5.32)	
Hydroelectric x Horse Power				0.003
				(0.14)
Domestic MP x Forward Linkages	-0.196$^{(**)}$	-1.281$^{(***)}$	-0.142$^{(**)}$	-0.075
	(-2.36)	(-3.79)	(-2.29)	(-1.21)
Domestic MP x Backward Linkages	0.147$^{(*)}$	2.051$^{(***)}$	0.255$^{(***)}$	0.295$^{(***)}$
	(1.95)	(5.82)	(4.04)	(4.50)
Domestic MP x Mean Plant Size	-0.026	0.095	-0.017	0.040
	(-0.44)	(0.35)	(-0.38)	(0.94)
Region fixed effects	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Observations	688	248	936	936
R^2	0.721	0.868	0.747	0.734

Notes: Heteroskedastic robust t statistics in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the share of employment by region and by sector over the total national employment of the sector.

Table 5.6: The determinants of industrial location, by macro area, instrumented and in first differnce, 1871–1911.

	(1)	(2)	(3)	(4)
Ind. employ.	South	North	2SLS	First Diff.
Agr. Empolyment x Agr. Production	-0.148$^{(*)}$	-0.265$^{(***)}$	-0.183$^{(***)}$	
	(-1.97)	(-3.21)	(-3.58)	
Literacy Rate x White Collar	-0.122	0.319$^{(***)}$	0.201$^{(***)}$	
	(-1.37)	(5.47)	(4.26)	
Deposits Per Capita x Horse Power per worker	-0.005	-0.048	0.014	
	(-0.15)	(-1.09)	(0.57)	
Water power x Horse Power	0.048	-0.051	-0.021	
	(1.47)	(-1.36)	(-1.15)	
Domestic MP x Forward Linkages	-0.026	-0.164$^{(**)}$	-0.063	
	(-0.24)	(-2.29)	(-1.07)	
Domestic MP x Backward Linkages	0.198$^{(*)}$	0.393$^{(***)}$	0.291$^{(***)}$	
	(1.86)	(4.12)	(4.65)	
Domestic MP x Mean Plant Size	0.145$^{(*)}$	-0.003	0.063	
	(1.91)	(-0.07)	(1.52)	
D.Agr. Empolyment x Agr. Production				-0.022
				(-0.34)
D.Literacy Rate x White Collar				0.226$^{(***)}$
				(5.37)
D.Deposits Per Capita x Horse Power per worker				-0.031
				(-1.33)
D.Water power x Horse Power				-0.005
				(-0.56)
D.Domestic MP x Forward Linkages				0.173$^{(***)}$
				(3.32)
D.Domestic MP x Backward Linkages				-0.341$^{(***)}$
				(-3.06)
D.Domestic MP x Mean Plant Size				0.050
				(0.94)
Region fixed effects	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Observations	401	535	936	720
R^2	0.742	0.790	0.733	0.443

Notes: Heteroskedastic robust t statistics in parentheses. $^{(*)}$, $^{(**)}$ and $^{(***)}$ correspond to a coefficient significantly different from zero with a 10%, 5% and 1% confidence level respectively. The dependent variable is the share of employment by region and by sector over the total national employment of the sector.

Chapter 6

Conclusions

The determinants of regional disparities in post-Unification Italy have for a long time been at the centre of the debate among economic historians of Italy. This area of research is particularly fruitful in the Italian case because of the large and persistent heterogeneity in the economic condition of its regions. What accounts for the differences in GDP per capita and levels of industrial activity in the Italian regions between Unification and the First World War? This question, which is the main research question of this thesis, has been addressed by several scholars before. The multitude of approaches to answering them corresponds to the multitude of answers. The "Questione Meridionale" is as old as Italy: the first decades after Unification saw a lively debate among intellectuals. The large group called the Meridionalisti, started to draw attention to the economic disparities between the South and the North of the country (Villari (1979), Sonnino (1877)). Well into the 20^{th} century, the opinion that the North was guilty of the colonial exploitation of the South was shared by several (Nitti (1900), De Viti de Marco (1930), Salvemini (1955)). More formal research has largely dismissed these theories, although opinions on the existence of a North-South gap before Unification still diverge.[1] The backwardness of southern agriculture has also been pointed out as the cause of the gap, but again without much consensus.[2] In the 1990s the work by Putnam et al. (1994) started a new line of research that focused on the study of southern culture and institutions. These were accused of being less conducive to economic growth in the South and therefore to show the origins of its different economic performance. Human capital has also gained increasing attention as an explanatory variable, along with social capital (Felice (2012)). More recently Felice and Vasta (2012) have proposed an explanation that focuses on the failure of elites in the

[1] See the debate between Daniele and Malanima (2014) and Felice (2014).

[2] Cafagna (1989) and Zamagni (1990) basically agree on this explanation which has been challenged by Federico (2007).

South to guide their society through the stages of active industrialization, letting all advances be imposed by state intervention. Over time, differences in physical geography have also been seen as possible causes of regional disparities. Fenoaltea (2006) focuses on the different energy endowments from water and Daniele and Malanima (2007) on proximity to the centre of Europe. In terms of methodologies adopted, the earlier works focused on anecdotal and qualitative evidence. The most frequent approach has probably been to use quantitative evidence but without applying it in formal modelling.[3] Others have used models tested through regression analysis to consider specific aspects of the North-South gap.[4] The three main chapters of this thesis (Chapters 3–5) aim to contribute to explanations for the regional disparities in Italy through the use of formal models borrowed from the Economic Geography literature. We engaged in studying the determinants of the location of economic activity in the Italian regions in the period 1871–1911. This period corresponds to the first industrialization of the country, in a modern sense. Between the date of Unification and the First World War we observe the formation of the Industrial Triangle in the Northwest of the country and the increase in the polarization of regions in terms of GDP per capita and levels of industrialization. In spite of the growth rates being well below those reached during the Industrial Miracle of the 1960s and 1970s, we believe that this period is essential to explaining the persistent North-South gap. The thesis is largely focused on industrial activity, which is measured through industrial employment. The decision to focus on industries was taken for two main reasons. As we said, both GDP per capita and industrial value added per capita illustrate regional divergence in this period. However, the divergence caused by the latter is more extreme. Therefore, the industrial sector is a clear driver of the overall divergence. Moreover, the industrial sector, in particular in a country that is undertaking modernization, is the one that is most subject to location decisions. Chapter 3 has two main aims, which can be seen as preparatory to Chapters 4 and 5. We first describe the regional patterns in terms of industrial employment. We measure regional specialization and the geographic concentration of industries. This is done through standard indices provided by the Economic Geography literature. We propose various measures of spatial concentration of the industrial sectors and regional specialization. We then evaluate spatial autocorrelation across regions. We find that the Italian regions ex-

[3] See the works by Romani (1976), Cafagna (1989), Toniolo (1990), Zamagni (1990), Fenoaltea (2006) and Ciocca (2007).

[4] Examples are, among others, A'Hearn et al. (2009b) on living standards and Felice (2012) on human and social capital.

perienced both concentration and specialization. The spatial autocorrelation analysis finds that the distribution of industrial sectors is not particularly interdependent at the regional level. The chapter then moves to studying whether changes in the distribution of industries in the Italian regions was affected by the presence of regional borders. The aim of this exercise was to test the effect of regional borders in the distribution of industrial activity. Following Overman and Puga (2002) we tested whether the change in industrial employment in the provinces was affected differently neighbouring provinces depending on whether they were in the same region or not. The use of provincial level data from Ciccarelli and Missiaia (2013) allows us to look into sub-regional patterns. The result is that there is a positive effect from neighbours in the same region and a negative effect from neighbours belonging to another region. This result is consistent with the findings on concentration, specialization and spatial autocorrelation. They all point to the fact that regions represent meaningful economic entities. Since regional borders often correspond to pre-unitary borders, the same model was run with pre-1861 borders applied to post-1861 employment. The results are similar, with a positive effect from neighbouring provinces in the same state and no effect from the other neighbours. We interpret this as a sign of continuity between pre- and post-unitary patterns. Market access has a central role in this work. The main prediction of New Economic Geography is that economic activity locates in regions which have the best access to markets. Market access can drive economic activity because of inter-linkages (meaning forward and backward linkages) that are exploited in the production process. Moreover, increasing returns to scale can be exploited through large plants. This can be achieved when transport costs are low enough to allow large plants to serve the entire market under review. Economic activity can also be driven by proximity to the final markets for products. One of the main purposes of this thesis is to quantify market access through the notion of market potential, following the seminal work by Harris (1954). Chapter 4 provides estimates of regional market potentials. Market potentials are calculated through regional GDP and transport adjusted distances between region. Following Head and Mayer (2011), in this chapter we look at the causal relationship between GDP per capita (and industrial value added per capita) and market potentials. We find that domestic market potential which takes into account only Italian regions, shows a more "traditional" picture of Italy. The North is always ahead of the South and even more so at the beginning of the period. Looking at the total market potential, which considers all the Italian regions and their trading partners, the picture

is reversed, with the South starting better off than the North. Regression analysis shows that market potential is a stronger determinant of the GDP per capita in the regions but only in its domestic formulation. This confirms the intuition that the home market matters more for growth then the international markets do. This is in line with the evaluation of the degree of openness to markets of Italy as a whole in the period 1871-1911 (Federico and Wolf, 2011). In this chapter we also showed the model in first differences to evaluate the effect of market access in the growth rate of GDP per capita. The result was that the domestic market potential is the most consistent predictor of growth rates. Another insight comes from the partition of the sample in the North and South. In levels, both the domestic and the total market potentials explain GDP per capital levels in the South, while the levels in the North are explained by domestic market potential alone. We also find that this predicts the growth rates in GDP per capita in the North but not in the South. If we compare the pattern in time and space of domestic and total market potential to that of GDP per capita, these results are not surprising: total market potential moves much more over time in an opposite direction to GDP per capita than does domestic market potential. The model using industrial value added as a dependent variable predicts that both types of market access have explanatory power in levels but not in first differences. This suggests that the change of industrial production in the regions was driven by other factors. The bottom line of this chapter is that the market matters to a different extent for explanations of GDP per capita and industrial value added in the Italian regions with different formulations of market potential. Domestic market potential is the strongest predictor because home markets are still the most relevant for Italy in this period. These results question the claim by previous scholars, such as Daniele and Malanima (2007), that proximity to the international markets sufficiently explains the performance of the North. Other than the market, in Economic Geography the Heckscher-Ohlin view predicts that endowments can explain how economic activity locates. Endowments are considered here in a very broad sense, as capital or natural resources that can be exploited in the regions. In this sense, we consider as endowments human capital, financial capital, the agricultural labour force and energy. Several of these have been proposed in the literature as explanations for the poor performance of the South. Human capital has been considered by authors such as Zamagni (1973, 1996), Felice (2012) and A'Hearn et al. (2011). The poor educational achievement of the South is often pointed to as the cause of its problems. Agriculture also has often been used in the analysis of divergence

by such authors as Cafagna (1989) and Zamagni (1990). Energy endowment, water, in particular, has been proposed as an explanation by Fenoaltea (2006). Chapter 5 of this thesis tests the effect of both market and endowment as determinants of industrial location, following the methodology introduced by Midelfart et al. (2000). This methodology integrates the Heckscher-Ohlin (H-O) view and that of New Economic Geography (NEG). The model explains the regional share of each industry in terms of employment with interaction between the industry and the regional characteristics of both the H-O and NEG types. The main results of this chapter are that industrial location is largely driven by endowment forces, most notably human capital, confirming the results of other scholars. The agricultural labour force proves to be a determinant with a negative sign. We interpret this with the associated of presence of much agriculture in a region with lower labour productivity. This condition is not conducive to industrial activity. Energy, water, in particular, is important in the North but not in the South. This is consistent with the intuition by Fenoaltea (2006) about the role of water in the industrialization of the North. Market potential, in this case used in its domestic formulation, is a driver of location through backward linkages between sections of industry. Other market interactions, such as the one capturing increasing returns to scale, do not provide consistent results.

The overall picture that emerges from these three chapters (Chapters 3-5) points to three main results. First of all, regions in this period are meaningful units of observation for the Italian industrial sector and the relatively high levels of specialization within it. This is mirrored in the geographical concentration of the industrial sector, suggesting that the study of Italian industrialization at regional level is fully justified. Second, the relationship between market and economic activity is far from simple. We can say that market access, measured through market potential, behaves quite differently according to the foreign trading partners that are included in the calculation. The formulation that performs best across models and specifications is domestic market potential. This is because of the relatively low level of openness in the Italian economy to trade. This leaves a large part of the potential for trade unexploited, by the South in particular. Last, endowment forces of which the greatest is human capital, appear to have a clearer role in explaining where economic activity located in Italy in the period between Unification and the First World War. Our results also contribute to the vast literature on market access, endowments and location that takes an historical perspective. The case of Italy speaks to scholars interested in the overall relationship between these forces.

Finally, the hope of this thesis was to bring new insights into the much wider picture of overall regional disparities in Italy during its early industrialization. The geographic approach to this topic is not entirely new, but it is still quite unexplored. We foresee further fruitful applications of Economic Geography with the purpose of shedding light on a most distinctive aspect of Italian Economic History.

Appendix A

Data Appendix

Table A.1: GDP of Italy and its main trading partners, 1871–1911.

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Austria	9221	7373	8806	12638	13035	84	62	65	81	60
Hungary	4651	3799	4902	7083	7323	42	32	36	46	33
France	28102	25676	30308	40102	46281	256	216	225	258	212
Germany	20993	22513	32495	51909	62911	191	189	241	334	288
UK	36447	35511	39057	59942	59182	332	298	290	385	271
Switzerland	1989	2218	2455	3782	4900	18	19	18	24	22
Argentina	2125	2370	2645	3889	5487	19	20	20	25	25
US	38960	54828	69230	106238	168432	355	460	514	683	771
US NorthEast	18549	24468	30525	46118	61990	169	205	227	296	284
US Midwest	15003	19791	24721	42581	56982	137	166	184	274	261
US South	7801	10290	12369	20462	31752	71	86	92	132	145
US West	3038	4008	6087	9825	17710	28	34	45	63	81
Italy	10975	11909	13466	15557	21860	100	100	100	100	100

Source: Baffigi (2011), Prados de la Escosura (2000) and Crafts (2005a).

Table A.2: GDP per capita in the Italian regions, 1871–1911.

	1911 lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	423	490	479	599	727	103	117	108	125	115
Liguria	568	532	638	671	970	139	127	144	140	154
Lombardy	454	431	510	589	752	111	103	115	123	119
Venetia	414	335	355	431	544	101	80	80	90	86
Emilia	389	389	468	455	680	95	93	106	95	108
Tuscany	430	448	452	446	614	105	107	102	93	97
Marches	336	347	389	398	511	82	83	88	83	81
Umbria	407	444	450	455	582	99	106	101	95	92
Latium	599	699	694	695	941	146	167	157	145	149
Abruzzi	327	331	300	311	429	80	79	68	65	68
Campania	439	402	429	436	594	107	96	97	91	94
Apulia	365	444	451	460	537	89	106	102	96	85
Basilicata	274	301	328	364	463	67	72	74	76	73
Calabria	283	331	296	331	442	69	79	67	69	70
Sicily	385	419	411	417	537	94	100	93	87	85
Sardinia	319	360	415	426	579	78	86	94	89	92
Italy	410	419	443	479	630	100	100	100	100	100

Source: Felice (2009a) for 1881 and 1901 and Brunetti et al. (2011) for 1871, 1891 and 1911.

Table A.3: Industrial value added per capita in the Italian regions, 1871–1911.

	1911 lire				Italy=100			
	1871	1881	1901	1911	1871	1881	1901	1911
Piedmont	67	80	116	187	115	120	129	139
Liguria	66	90	143	244	114	135	160	182
Lombardy	87	101	160	255	150	150	179	190
Veneto	63	67	93	132	109	100	104	98
Emilia	59	63	85	151	102	94	95	112
Tuscany	64	74	105	165	110	110	118	123
Marches	54	59	73	103	94	88	82	77
Umbria	46	46	71	103	80	69	80	77
Latium	67	81	99	140	116	120	111	104
Abruzzi	37	43	50	65	64	64	56	48
Campania	62	79	97	136	108	118	108	101
Apulia	56	59	74	108	96	88	83	81
Basilicata	43	48	48	65	75	71	54	49
Calabria	42	49	55	78	73	73	61	58
Sicily	67	74	91	110	115	110	101	82
Sardinia	45	59	72	107	79	88	80	80
Italy	58	67	90	134	100	100	100	100

Source: Fenoaltea (2003b) and MAIC (1874, 1883, 1902, 1914).

Table A.4: Present population in in Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Alessandria	683,361	729,710	811,833	807,696
Cuneo	618,232	635,400	638,235	646,719
Novara	624,985	675,926	743,115	756,326
Torino	972,986	1,029,214	1,124,218	1,213,709
PIEDMONT	2,899,564	3,070,250	3,317,401	3,424,450
Genova	716,759	760,122	934,627	1,050,052
Porto Maurizio	127,053	132,251	142,846	147,179
LIGURIA	843,812	892,373	1,077,473	1,197,231
Bergamo	368,152	390,775	459,594	511,237
Brescia	456,023	471,568	538,427	596,411
Como	477,642	515,050	580,214	616,212
Cremona	300,595	302,138	327,838	348,749
Mantova	288,942	295,728	311,942	349,048
Milano	1,009,794	1,114,991	1,442,179	1,726,548
Pavia	448,435	469,831	496,969	512,340
Sondrio	111,241	120,534	125,565	129,928
LOMBARDY	3,460,824	3,680,615	4,282,728	4,790,473
Belluno	175,282	174,140	192,800	192,793
Padova	364,430	397,762	443,227	519,358
Rovigo	200,835	217,700	221,904	257,723
Treviso	352,538	375,704	412,267	491,166
Udine	481,586	501,745	592,592	628,081
Venezia	337,538	356,708	401,241	466,752
Verona	367,437	394,065	422,437	475,049
Vicenza	363,171	396,349	447,999	496,438
VENETIA	2,642,817	2,814,173	3,134,467	3,527,360
Bologna	439,232	457,474	527,367	577,729
Ferrara	215,369	230,807	271,776	307,924
Forlì	234,090	251,110	280,823	301,408
Modena	273,231	279,254	315,804	353,051
Parma	264,381	267,306	294,159	326,163
Piacenza	225,775	226,717	245,126	256,233
Ravenna	221,115	225,764	235,485	248,356
Reggio Emilia	240,635	244,959	274,495	310,337
EMILIA	2,113,828	2,183,391	2,445,035	2,681,201
Arezzo	234,645	238,744	271,676	283,663
Firenze	766,824	790,776	939,054	999,423
Grosseto	107,457	114,295	144,722	146,634
Livorno	118,851	121,612	123,877	135,765
Lucca	280,399	284,484	319,523	333,011
Massa Carrara	161,944	169,469	195,631	212,430
Pisa	265,959	283,563	320,829	342,250
Siena	206,446	205,926	233,830	241,530
TUSCANY	2142525	2208869	2549142	2694706

Continued on next page...

Table A.4: Present population in in Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Ancona	262,349	267,338	302,172	319,709
Ascoli Piceno	203,004	209,185	245,172	253,635
Macerata	236,994	239,713	259,429	258,393
Pesaro	213,072	223,043	253,982	261,516
MARCHES	915,419	939,279	1,060,755	1,093,253
UMBRIA (Perugia)	549,601	572,060	667,210	686,596
LATIUM (Roma)	836,704	903,472	1,196,909	1,302,423
Aquila	332,784	353,027	396,629	407,005
Campobasso	364,208	365,434	366,571	349,618
Chieti	339,986	343,948	370,907	366,593
Teramo	246,004	254,806	307,444	307,490
ABRUZZI	1,282,982	1,317,215	1,441,551	1,430,706
Avellino	375,691	392,619	402,425	396,581
Benevento	232,008	238,425	256,504	254,726
Caserta	697,403	714,131	785,357	791,616
Napoli	907,752	1,001,245	1,151,834	1,310,785
Salerno	541,738	550,157	564,328	558,288
CAMPANIA	2,754,592	2,896,577	3,160,448	3,311,996
Bari	604,540	679,499	827,698	891,624
Foggia	322,758	356,267	425,450	467,020
Lecce	493,594	553,298	706,520	771,507
APULIA	1,420,892	1,589,064	1,959,668	2,130,151
BASILICATA (Potenza)	510,543	524,504	490,705	474,021
Catanzaro	412,226	433,975	476,227	483,235
Cosenza	440,468	451,185	465,267	474,001
Reggio Calabria	353,608	372,723	428,714	444,915
CALABRIA	1,206,302	1,257,883	1,370,208	1,402,151
Caltanissetta	230,066	266,379	327,977	342,557
Catania	495,415	563,457	705,412	789,147
Girgenti	289,018	312,487	371,638	393,804
Messina	420,649	460,924	543,809	517,248
Palermo	617,678	699,151	785,357	795,631
Siracusa	294,885	341,526	427,507	476,765
Trapani	236,388	283,977	368,099	357,106
SICILY	2,584,099	2,927,901	3,529,799	3,672,258
Cagliari	393,208	420,635	483,548	520,213
Sassari	243,452	261,367	308,206	332,194
SARDINIA	636,660	682,002	791,754	852,407
Italy	26,801,164	28,459,628	32,475,253	34,671,383

Source: MAIC (1874, 1883, 1902, 1914).

Table A.5: Active population in provinces and regions, 1871–1911.

	1871	1881	1901	1911
Alessandria	390,017	425,759	444,433	437,688
Cuneo	343,300	349,449	355,549	357,304
Novara	401,067	408,686	431,040	447,687
Torino	577,542	605,556	641,177	701,556
PIEDMONT	1,711,926	1,789,450	1,872,199	1,944,235
Genova	405,428	403,022	461,189	502,004
Porto Maurizio	82,082	82,772	82,496	85,523
LIGURIA	487,510	485,794	543,685	587,527
Bergamo	220,990	227,493	233,473	238,022
Brescia	280,402	284,901	277,587	293,786
Como	315,291	328,851	334,546	338,406
Cremona	179,201	182,141	180,035	187,066
Mantova	137,682	147,923	150,916	164,323
Milano	624,626	668,983	789,643	898,071
Pavia	267,168	266,621	269,707	280,094
Sondrio	76,084	79,162	82,680	81,747
LOMBARDY	2,101,444	2,186,075	2,318,587	2,481,515
Belluno	108,650	97,727	97,315	92,120
Padova	193,849	197,597	213,594	239,565
Rovigo	99,952	102,533	100,672	117,700
Treviso	200,168	196,831	211,634	242,954
Udine	273,493	293,116	331,500	311,144
Venezia	173,677	187,032	195,354	222,902
Verona	177,613	186,711	192,662	211,945
Vicenza	187,080	191,106	208,251	211,856
VENETIA	1,414,482	1,452,653	1,550,982	1,650,186
Bologna	244,581	253,074	258,307	277,942
Ferrara	106,336	106,492	131,898	145,736
Forlí	145,029	141,129	150,190	149,067
Modena	164,843	141,257	155,243	169,107
Parma	166,332	146,490	153,682	168,477
Piacenza	133,108	130,248	129,020	127,147
Ravenna	114,504	124,126	131,955	132,871
Reggio Emilia	131,728	129,553	142,888	156,005
EMILIA	1,206,461	1,172,369	1,253,183	1,326,352
Arezzo	146,035	143,748	141,899	143,233
Firenze	436,520	420,845	464,720	530,203
Grosseto	53,986	61,196	65,751	61,042
Livorno	52,717	59,325	55,699	57,892
Lucca	154,098	143,938	147,588	145,256
Massa Carrara	88,815	91,058	96,086	95,765
Pisa	141,518	152,698	164,696	166,882
Siena	119,607	105,551	121,237	116,145
TUSCANY	1193296	1178359	1257676	1316418

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Table A.5: Active population in provinces and regions, 1871–1911.

	1871	1881	1901	1911
Ancona	157,352	163,457	164,709	164,111
Ascoli Piceno	120,396	125,792	133,939	132,969
Macerata	176,443	145,751	135,799	124,997
Pesaro	137,762	122,030	145,399	129,519
MARCHES	591,953	557,030	579,846	551,596
UMBRIA (Perugia)	344,303	310,225	335,014	327,019
LATIUM (Roma)	483,606	502,308	587,909	604,784
Aquila	169,446	206,431	190,022	181,173
Campobasso	226,822	224,228	204,945	191,141
Chieti	177,864	140,924	165,212	188,248
Teramo	173,356	205,560	198,611	134,588
ABRUZZI	747,488	777,143	758,790	695,150
Avellino	224,108	230,139	211,593	214,421
Benevento	141,232	147,428	142,241	137,960
Caserta	422,013	425,285	405,673	390,733
Napoli	441,049	505,104	498,899	538,904
Salerno	398,411	321,552	294,069	276,000
CAMPANIA	1,626,813	1,629,508	1,552,475	1,558,018
Bari	305,863	364,534	343,528	349,571
Foggia	180,468	182,682	195,329	204,315
Lecce	306,089	332,528	360,740	387,710
APULIA	792,420	879,744	899,597	941,596
BASILICATA (Potenza)	285,288	313,665	224,635	234,813
Catanzaro	290,133	288,064	262,037	249,564
Cosenza	251,786	287,633	251,043	234,209
Reggio Calabria	207,054	232,689	232,619	220,947
CALABRIA	748,973	808,386	745,699	704,720
Caltanissetta	102,980	142,664	140,359	131,061
Catania	259,291	314,964	303,319	321,218
Girgenti	148,410	146,689	153,207	150,305
Messina	186,955	258,099	252,973	226,447
Palermo	290,759	362,530	299,041	289,955
Siracusa	139,971	177,589	177,767	185,432
Trapani	92,971	128,075	140,672	133,624
SICILY	1,221,337	1,530,610	1,467,338	1,438,042
Cagliari	158,222	190,147	202,492	206,447
Sassari	96,559	115,948	126,727	127,203
SARDINIA	254,781	306,095	329,219	333,650
Italy	15,212,080	15,151,908	16,272,526	16,402,250

Source: MAIC (1874, 1883, 1902, 1914).

Table A.6: Active population in the Italian provinces and regions as a share of the total population, 1871–1911.

	1871	1881	1901	1911
Alessandria	57%	58%	55%	54%
Cuneo	56%	55%	56%	55%
Novara	64%	60%	58%	59%
Torino	59%	59%	57%	58%
PIEDMONT	59%	58%	56%	57%
Genova	57%	53%	49%	48%
Porto Maurizio	65%	63%	58%	58%
LIGURIA	58%	54%	50%	49%
Bergamo	60%	58%	51%	47%
Brescia	61%	60%	52%	49%
Como	66%	64%	58%	55%
Cremona	60%	60%	55%	54%
Mantova	48%	50%	48%	47%
Milano	62%	60%	55%	52%
Pavia	60%	57%	54%	55%
Sondrio	68%	66%	66%	63%
LOMBARDY	61%	59%	54%	52%
Belluno	62%	56%	50%	48%
Padova	53%	50%	48%	46%
Rovigo	50%	47%	45%	46%
Treviso	57%	52%	51%	49%
Udine	57%	58%	56%	50%
Venezia	51%	52%	49%	48%
Verona	48%	47%	46%	45%
Vicenza	52%	48%	46%	43%
VENETIA	54%	52%	49%	47%
Bologna	56%	55%	49%	48%
Ferrara	49%	46%	49%	47%
Forlì	62%	56%	53%	49%
Modena	60%	51%	49%	48%
Parma	63%	55%	52%	52%
Piacenza	59%	57%	53%	50%
Ravenna	52%	55%	56%	54%
Reggio Emilia	55%	53%	52%	50%
EMILIA	57%	54%	51%	49%
Arezzo	62%	60%	52%	50%
Firenze	57%	53%	49%	53%
Grosseto	50%	54%	45%	42%
Livorno	44%	49%	45%	43%
Lucca	55%	51%	46%	44%
Massa Carrara	55%	54%	49%	45%
Pisa	53%	54%	51%	49%
Siena	58%	51%	52%	48%

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Table A.6: Active population in the Italian provinces and regions as a share of the total population, 1871–1911.

	1871	1881	1901	1911
TUSCANY	56%	53%	49%	49%
Ancona	60%	61%	55%	51%
Ascoli Piceno	59%	60%	55%	52%
Macerata	74%	61%	52%	48%
Pesaro	65%	55%	57%	50%
MARCHES	65%	59%	55%	50%
UMBRIA (Perugia)	63%	54%	50%	48%
LATIUM (Roma)	58%	56%	49%	46%
Aquila	51%	58%	48%	45%
Campobasso	62%	61%	56%	55%
Chieti	52%	41%	45%	51%
Teramo	70%	81%	65%	44%
ABRUZZI	58%	59%	53%	49%
Avellino	60%	59%	53%	54%
Benevento	61%	62%	55%	54%
Caserta	61%	60%	52%	49%
Napoli	49%	50%	43%	41%
Salerno	74%	58%	52%	49%
CAMPANIA	59%	56%	49%	47%
Bari	51%	54%	42%	39%
Foggia	56%	51%	46%	44%
Lecce	62%	60%	51%	50%
APULIA	56%	55%	46%	44%
BASILICATA (Potenza)	56%	60%	46%	50%
Catanzaro	70%	66%	55%	52%
Cosenza	57%	64%	54%	49%
Reggio Calabria	59%	62%	54%	50%
CALABRIA	62%	64%	54%	50%
Caltanissetta	45%	54%	43%	38%
Catania	52%	56%	43%	41%
Girgenti	51%	47%	41%	38%
Messina	44%	56%	47%	44%
Palermo	47%	52%	38%	36%
Siracusa	47%	52%	42%	39%
Trapani	39%	45%	38%	37%
SICILY	47%	52%	42%	39%
Cagliari	40%	45%	42%	40%
Sassari	40%	44%	41%	38%
SARDINIA	40%	45%	42%	39%
Italy	57%	53%	50%	47%

Source: MAIC (1874, 1883, 1902, 1914).

Table A.7: Literacy rates in the Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Alessandria	50%	60%	74%	84%
Cuneo	50%	60%	74%	84%
Novara	61%	67%	79%	88%
Torino	67%	74%	84%	92%
PIEDMONT	58%	66%	80%	88%
Genova	43%	53%	70%	81%
Porto Maurizio	52%	60%	74%	83%
LIGURIA	44%	54%	71%	82%
Bergamo	66%	70%	81%	91%
Brescia	58%	63%	75%	85%
Como	62%	70%	82%	91%
Cremona	47%	54%	67%	79%
Mantova	36%	43%	59%	72%
Milano	61%	65%	78%	88%
Pavia	49%	55%	69%	81%
Sondrio	63%	69%	82%	90%
LOMBARDY	56%	62%	76%	86%
Belluno	47%	56%	72%	82%
Padova	30%	37%	53%	68%
Rovigo	26%	34%	50%	62%
Treviso	35%	46%	62%	76%
Udine	33%	43%	61%	73%
Venezia	40%	44%	57%	67%
Verona	45%	52%	66%	78%
Vicenza	39%	48%	66%	80%
VENETIA	36%	45%	62%	73%
Bologna	34%	40%	57%	72%
Ferrara	28%	33%	44%	56%
Forlì	23%	27%	38%	50%
Modena	33%	38%	59%	66%
Parma	27%	33%	50%	66%
Piacenza	27%	34%	51%	67%
Ravenna	24%	30%	43%	59%
Reggio Emilia	30%	36%	50%	67%
EMILIA	29%	35%	51%	64%
Arezzo	24%	29%	38%	48%
Firenze	39%	43%	55%	65%
Grosseto	30%	36%	49%	57%
Livorno	52%	57%	69%	77%
Lucca	35%	43%	57%	70%
Massa Carrara	26%	34%	48%	61%
Pisa	33%	40%	50%	61%
Siena	27%	32%	41%	49%
TUSCANY	0.34	0.4	0.52	0.62

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Table A.7: Literacy rates in the Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Ancona	26%	31%	42%	55%
Ascoli Piceno	18%	21%	29%	38%
Macerata	21%	25%	34%	44%
Pesaro	22%	26%	35%	45%
MARCHES	22%	26%	36%	46%
UMBRIA (Perugia)	21%	27%	38%	49%
LATIUM (Roma)	35%	43%	55%	66%
Aquila	20%	25%	37%	51%
Campobasso	15%	18%	26%	36%
Chieti	14%	18%	24%	33%
Teramo	13%	16%	24%	32%
ABRUZZI	16%	19%	29%	39%
Avellino	15%	18%	24%	34%
Benevento	14%	19%	25%	34%
Caserta	19%	22%	30%	40%
Napoli	29%	34%	44%	55%
Salerno	16%	20%	27%	37%
CAMPANIA	21%	25%	34%	45%
Bari	17%	19%	28%	37%
Foggia	17%	22%	31%	41%
Lecce	15%	20%	29%	38%
APULIA	16%	20%	30%	39%
BASILICATA (Potenza)	13%	15%	23%	32%
Catanzaro	15%	17%	22%	29%
Cosenza	12%	14%	19%	27%
Reggio Calabria	14%	16%	21%	28%
CALABRIA	14%	16%	21%	30%
Caltanissetta	11%	16%	23%	32%
Catania	14%	17%	26%	39%
Girgenti	12%	15%	23%	32%
Messina	14%	17%	26%	33%
Palermo	21%	26%	36%	52%
Siracusa	13%	17%	24%	31%
Trapani	13%	18%	30%	36%
SICILY	15%	19%	28%	40%
Cagliari	17%	24%	36%	46%
Sassari	11%	16%	23%	32%
SARDINIA	18%	21%	31%	40%
Italy	32%	38%	50%	61%

Source: MAIC (1874, 1883, 1902, 1914).

Table A.8: Agricultural labour force in the Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Alessandria	275,982	297,080	320,485	278,452
Cuneo	228,863	241,909	257,749	242,714
Novara	261,913	257,693	254,464	239,737
Torino	340,783	325,474	328,708	296,431
PIEDMONT	1,107,541	1,122,156	1,161,406	1,057,334
Genova	198,092	170,131	174,633	153,469
Porto Maurizio	56,444	56,285	53,654	49,071
LIGURIA	254,536	226,416	228,287	202,540
Bergamo	121,927	110,856	121,731	103,727
Brescia	152,238	148,564	164,436	150,133
Como	182,750	172,400	150,569	127,836
Cremona	99,840	101,994	108,681	103,276
Mantova	74,583	82,066	95,353	101,012
Milano	303,203	284,434	272,088	231,945
Pavia	164,922	172,056	181,645	174,574
Sondrio	63,494	64,718	69,688	63,564
LOMBARDY	1,162,957	1,137,088	1,164,191	1,056,067
Belluno	76,152	64,069	65,004	60,497
Padova	112,541	117,128	140,933	148,397
Rovigo	53,667	59,406	67,631	80,397
Treviso	134,008	125,597	153,749	165,934
Udine	184,796	200,540	222,436	200,959
Venezia	68,613	76,655	91,343	101,779
Verona	91,211	92,895	113,344	116,938
Vicenza	103,649	100,432	123,928	114,877
VENETIA	824,637	836,722	978,368	989,778
Bologna	132,797	135,465	141,357	135,953
Ferrara	47,154	47,362	88,010	87,029
Forlì	87,146	83,879	103,278	86,842
Modena	83,599	72,358	94,222	99,418
Parma	102,492	83,790	103,048	103,255
Piacenza	72,152	79,546	87,869	78,759
Ravenna	59,755	58,145	78,385	67,843
Reggio Emilia	80,627	80,506	99,479	100,384
EMILIA	665,722	641,051	795,648	759,483
Arezzo	105,273	93,237	105,951	100,314
Firenze	192,022	166,984	223,728	212,150
Grosseto	27,910	34,608	45,831	40,340
Livorno	5,902	6,459	8,362	6,166
Lucca	93,014	81,490	93,800	77,351
Massa Carrara	62,659	55,092	65,309	58,467
Pisa	71,086	77,993	93,975	87,477
Siena	76,268	64,038	86,416	75,453
TUSCANY	634134	579901	723372	657718

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Table A.8: Agricultural labour force in the Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Ancona	90,336	92,674	106,237	96,511
Ascoli Piceno	75,217	76,377	98,738	92,408
Macerata	118,265	95,443	101,864	88,572
Pesaro	88,030	69,877	96,872	87,680
MARCHES	371,848	334,371	403,711	365,171
UMBRIA (Perugia)	217,081	193,197	246,309	223,313
LATIUM (Roma)	236,129	228,824	307,727	266,544
Aquila	96,354	102,645	132,158	130,664
Campobasso	159,457	159,234	169,743	152,013
Chieti	128,553	130,134	157,443	145,160
Teramo	122,418	88,101	130,739	99,165
ABRUZZI	506,782	480,114	590,083	527,002
Avellino	151,461	142,444	163,337	161,209
Benevento	88,605	94,777	113,093	108,270
Caserta	234,447	232,143	275,451	260,073
Napoli	73,842	81,459	109,368	109,277
Salerno	225,636	172,567	193,043	178,154
CAMPANIA	773,991	723,390	854,292	816,983
Bari	165,137	161,658	196,046	194,990
Foggia	92,748	96,686	132,881	136,437
Lecce	166,312	174,745	243,564	251,242
APULIA	424,197	433,089	572,491	582,669
BASILICATA (Potenza)	167,768	183,266	199,859	176,880
Catanzaro	133,974	118,228	160,796	163,491
Cosenza	112,606	122,973	179,232	168,462
Reggio Calabria	57,333	91,959	130,899	134,199
CALABRIA	303,913	333,160	470,927	466,152
Caltanissetta	46,946	55,995	73,296	73,649
Catania	90,175	133,212	154,136	151,038
Girgenti	56,051	57,018	78,533	79,867
Messina	72,704	101,856	141,224	129,503
Palermo	105,757	157,367	136,345	129,424
Siracusa	61,942	73,688	102,659	107,553
Trapani	47,338	59,231	81,764	73,624
SICILY	480,913	638,367	767,957	744,658
Cagliari	77,950	80,001	119,554	114,846
Sassari	45,113	50,511	82,255	78,459
SARDINIA	123,063	130,512	201,809	193,305
Italy	8,255,212	8,221,624	9,666,437	9,085,597

Source: MAIC (1874, 1883, 1902, 1914).

Table A.9: Agricultural labour force in the Italian provinces and regions as a share of the total active population, 1871–1911.

	1871	1881	1901	1911
Alessandria	71%	70%	72%	64%
Cuneo	67%	69%	72%	68%
Novara	65%	63%	59%	54%
Torino	59%	54%	51%	42%
PIEDMONT	65%	63%	63%	56%
Genova	49%	42%	38%	31%
Porto Maurizio	69%	68%	65%	57%
LIGURIA	53%	49%	44%	37%
Bergamo	55%	49%	52%	44%
Brescia	54%	52%	59%	51%
Como	58%	52%	45%	38%
Cremona	56%	56%	60%	55%
Mantova	54%	55%	63%	61%
Milano	49%	43%	34%	26%
Pavia	62%	65%	67%	62%
Sondrio	83%	82%	84%	78%
LOMBARDY	56%	54%	54%	48%
Belluno	70%	66%	67%	66%
Padova	58%	59%	66%	62%
Rovigo	54%	58%	67%	68%
Treviso	67%	64%	73%	68%
Udine	68%	68%	67%	65%
Venezia	40%	41%	47%	46%
Verona	51%	50%	59%	55%
Vicenza	55%	53%	60%	54%
VENETIA	60%	59%	64%	61%
Bologna	54%	54%	55%	49%
Ferrara	44%	44%	67%	60%
Forlì	60%	59%	69%	58%
Modena	51%	51%	61%	59%
Parma	62%	57%	67%	61%
Piacenza	54%	61%	68%	62%
Ravenna	52%	47%	59%	51%
Reggio Emilia	61%	62%	70%	64%
EMILIA	56%	55%	64%	58%
Arezzo	72%	65%	75%	70%
Firenze	44%	40%	48%	40%
Grosseto	52%	57%	70%	66%
Livorno	11%	11%	15%	11%
Lucca	60%	57%	64%	53%
Massa Carrara	71%	61%	68%	61%
Pisa	50%	51%	57%	52%
Siena	64%	61%	71%	65%

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Table A.9: Agricultural labour force in the Italian provinces and regions as a share of the total active population, 1871–1911.

	1871	1881	1901	1911
TUSCANY	57%	53%	61%	54%
Ancona	57%	57%	64%	59%
Ascoli Piceno	62%	61%	74%	69%
Macerata	67%	65%	75%	71%
Pesaro	64%	57%	67%	68%
MARCHES	63%	60%	70%	67%
UMBRIA (Perugia)	63%	62%	74%	68%
LATIUM (Roma)	49%	46%	52%	44%
Aquila	57%	50%	70%	72%
Campobasso	70%	71%	83%	80%
Chieti	72%	92%	95%	77%
Teramo	71%	43%	66%	74%
ABRUZZI	68%	67%	79%	76%
Avellino	68%	62%	77%	75%
Benevento	63%	64%	80%	78%
Caserta	56%	55%	68%	67%
Napoli	17%	16%	22%	20%
Salerno	57%	54%	66%	65%
CAMPANIA	55%	53%	65%	63%
Bari	54%	44%	57%	56%
Foggia	51%	53%	68%	67%
Lecce	54%	53%	68%	65%
APULIA	54%	50%	64%	62%
BASILICATA (Potenza)	59%	58%	89%	75%
Catanzaro	46%	41%	61%	66%
Cosenza	45%	43%	71%	72%
Reggio Calabria	28%	40%	56%	61%
CALABRIA	42%	41%	64%	66%
Caltanissetta	46%	39%	52%	56%
Catania	35%	42%	51%	47%
Girgenti	38%	39%	51%	53%
Messina	39%	39%	56%	57%
Palermo	36%	43%	46%	45%
Siracusa	44%	41%	58%	58%
Trapani	51%	46%	58%	55%
SICILY	40%	42%	53%	52%
Cagliari	49%	42%	59%	56%
Sassari	47%	44%	65%	62%
SARDINIA	48%	43%	61%	58%
Italy	54%	54%	59%	55%

Source: MAIC (1874, 1883, 1902, 1914).

Table A.10: Industrial labour force in the Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Alessandria	13%	13%	15%	19%
Cuneo	14%	13%	14%	15%
Novara	19%	23%	29%	31%
Torino	19%	23%	29%	35%
PIEDMONT	17%	20%	25%	29%
Genova	19%	24%	29%	35%
Porto Maurizio	8%	11%	14%	18%
LIGURIA	18%	22%	28%	34%
Bergamo	20%	24%	29%	35%
Brescia	21%	21%	23%	27%
Como	29%	35%	43%	44%
Cremona	25%	24%	24%	24%
Mantova	19%	20%	20%	21%
Milano	28%	34%	42%	49%
Pavia	15%	17%	20%	23%
Sondrio	6%	8%	10%	12%
LOMBARDY	24%	29%	35%	40%
Belluno	10%	14%	22%	18%
Padova	15%	15%	17%	19%
Rovigo	16%	17%	17%	17%
Treviso	14%	13%	16%	16%
Udine	16%	17%	25%	20%
Venezia	22%	23%	25%	25%
Verona	18%	18%	19%	22%
Vicenza	19%	24%	26%	29%
VENETIA	17%	19%	22%	22%
Bologna	20%	22%	24%	28%
Ferrara	17%	18%	17%	22%
Forlì	14%	16%	17%	24%
Modena	16%	20%	22%	25%
Parma	13%	15%	16%	20%
Piacenza	13%	15%	16%	20%
Ravenna	18%	19%	25%	30%
Reggio Emilia	14%	15%	17%	21%
EMILIA	16%	18%	20%	25%
Arezzo	11%	13%	15%	18%
Firenze	24%	30%	30%	39%
Grosseto	10%	11%	16%	17%
Livorno	29%	31%	36%	43%
Lucca	15%	16%	21%	29%
Massa Carrara	12%	14%	20%	24%
Pisa	16%	19%	22%	28%
Siena	12%	15%	15%	18%
TUSCANY	19%	24%	25%	33%

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Table A.10: Industrial labour force in the Italian provinces and regions, 1871–1911.

	1871	1881	1901	1911
Ancona	18%	18%	19%	22%
Ascoli Piceno	14%	16%	16%	18%
Macerata	12%	14%	14%	16%
Pesaro	14%	16%	15%	17%
MARCHES	15%	16%	16%	19%
UMBRIA (Perugia)	11%	12%	15%	17%
LATIUM (Roma)	15%	17%	19%	23%
Aquila	10%	12%	13%	14%
Campobasso	9%	11%	11%	10%
Chieti	13%	18%	14%	12%
Teramo	9%	9%	10%	14%
ABRUZZI	10%	13%	12%	13%
Avellino	10%	12%	13%	12%
Benevento	13%	11%	12%	11%
Caserta	14%	16%	16%	17%
Napoli	29%	34%	35%	38%
Salerno	13%	18%	20%	19%
CAMPANIA	20%	25%	26%	28%
Bari	14%	16%	20%	23%
Foggia	13%	15%	15%	16%
Lecce	13%	12%	16%	18%
APULIA	13%	14%	17%	20%
BASILICATA (Potenza)	11%	11%	13%	13%
Catanzaro	10%	12%	13%	14%
Cosenza	9%	9%	10%	12%
Reggio Calabria	10%	12%	13%	16%
CALABRIA	10%	11%	12%	14%
Caltanissetta	18%	22%	29%	27%
Catania	19%	20%	22%	24%
Girgenti	18%	21%	27%	25%
Messina	14%	13%	17%	19%
Palermo	20%	19%	22%	22%
Siracusa	15%	18%	17%	19%
Trapani	18%	18%	20%	20%
SICILY	18%	19%	22%	23%
Cagliari	14%	16%	20%	24%
Sassari	11%	11%	13%	15%
SARDINIA	13%	15%	18%	21%
Italy	16%	20%	22%	25%

Source: Ciccarelli and Missiaia (2013) and MAIC (1874, 1883, 1902, 1914).

Table A.11: Industrial labour force in the Italian provinces and regions by sector, 1871 (Part A).

	Mining	Foodstuffs	Tobacco	Textile
PIEDMONT	1,598	32,475	1,763	57,131
Alessandria	304	5,222	0	7,997
Cuneo	217	6,650	0	13,038
Novara	566	7,455	0	14,165
Torino	511	13,148	1,763	21,931
LIGURIA	2,108	8,497	349	17,718
Genova	2,096	7,445	349	17,418
P. Maurizio	12	1,052	0	300
LOMBARDY	1,924	49,255	1,013	171,653
Bergamo	866	4,687	0	25,038
Brescia	497	5,985	0	18,309
Como	266	4,742	0	45,292
Cremona	49	4,975	0	17,390
Mantova	34	4,360	0	2,847
Milano	191	16,778	1,013	56,482
Pavia	15	6,897	0	5,700
Sondrio	6	831	0	595
VENETIA	1,189	26,535	1,281	34,311
Belluno	785	1,284	0	1,110
Padova	3	3,403	0	4,141
Rovigo	0	2,176	0	3,096
Treviso	8	3,385	0	6,295
Udine	75	2,841	0	6,972
Venezia	35	3,946	1,280	3,690
Verona	100	5,298	1	3,526
Vicenza	183	4,202	0	5,481
EMILIA	868	18,359	1,760	58,523
Bologna	53	3,782	1,037	13,044
Ferrara	3	1,832	0	4,254
Forlì	490	1,789	0	5,062
Modena	62	2,056	230	11,966
Parma	6	2,803	329	7,415
Piacenza	1	2,338	0	4,653
Ravenna	253	1,617	164	7,406
R. Emilia	0	2,142	0	4,723
TUSCANY	5,072	19,530	933	30,904
Arezzo	4	1,685	0	3,286
Firenze	136	8,085	226	11,724
Grosseto	85	734	0	768
Livorno	538	1,819	0	827
Lucca	739	2,486	707	3,281
M. Carrara	2,559	886	0	1,040
Pisa	1,001	2,168	0	8,256
Siena	10	1,667	0	1,722

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Table A.11: Industrial labour force in the Italian provinces and regions by sector, 1871 (Part A).

	Mining	Foodstuffs	Tobacco	Textile
MARCHES	603	6,166	887	31,330
Ancona	81	1,774	884	9,693
Ascoli Piceno	1	1,173	2	7,377
Macerata	1	1,573	1	7,141
Pesaro	520	1,646	0	7,119
UMBRIA	63	3,928	0	5,460
Perugia	63	3,928	0	5,460
LATIUM	452	9,467	547	6,620
Roma	452	9,467	547	6,620
ABRUZZI	36	7,439	0	49,193
Aquila	10	2,154	0	23,143
Campobasso	17	1,994	0	6,252
Chieti	9	2,129	0	8,072
Teramo	0	1,162	0	11,726
CAMPANIA	1,047	26,447	668	131,368
Avellino	119	2,411	0	4,459
Benevento	59	1,785	0	7,902
Caserta	199	5,321	10	32,336
Napoli	556	12,029	658	51,440
Salerno	114	4,901	0	35,231
APULIA	2,441	14,480	53	82,303
Bari	1,203	5,654	0	30,957
Foggia	157	4,198	20	7,451
Lecce	1,081	4,628	33	43,895
BASILICATA	7	3,735	0	28,228
Potenza	7	3,735	0	28,228
CALABRIA	750	9,118	0	143,673
Catanzaro	313	3,938	0	54,006
Cosenza	420	2,415	0	47,876
Reggio Calabria	17	2,765	0	41,791
SICILY	17,205	26,435	2,481	124,028
Caltanissetta	6,205	2,135	0	11,894
Catania	1,330	4,773	0	23,412
Girgenti	7,554	2,978	32	11,305
Messina	36	2,972	1	39,403
Palermo	1,139	8,849	2,445	16,305
Siracusa	384	2,650	1	15,975
Trapani	557	2,078	2	5,734
SARDINIA	4,156	3,758	0	2,936
Cagliari	3,978	2,234	0	1,215
Sassari	178	1,524	0	1,721
TOTAL	39,519	265,624	11,735	975,379

Source: Ciccarelli and Missiaia (2013).

Table A.12: Industrial labour force in the Italian provinces and regions by sector, 1871 (part B).

	Clothing	Leather	Wood	Metalmaking
PIEDMONT	51,226	29,848	31,517	1,216
Alessandria	10,881	6,602	6,328	83
Cuneo	8,709	5,738	4,077	89
Novara	11,439	7,235	9,355	304
Torino	20,197	10,273	11,757	740
LIGURIA	11,289	8,559	9,188	1,058
Genova	9,823	7,304	8,369	1,048
Porto Maurizio	1,466	1,255	819	10
LOMBARDY	84,330	40,150	45,673	1,934
Bergamo	7,217	3,412	4,124	161
Brescia	11,157	5,492	5,010	464
Como	6,425	3,930	5,334	193
Cremona	7,605	3,779	3,900	63
Mantova	4,518	3,956	3,863	86
Milano	36,963	14,011	18,304	836
Pavia	9,400	4,802	4,542	76
Sondrio	1,045	768	596	55
VENETIA	41,959	23,397	30,834	934
Belluno	1,130	929	1,438	69
Padova	5,359	3,361	6,038	106
Rovigo	2,743	2,089	2,267	49
Treviso	4,518	2,754	3,380	80
Udine	5,431	3,277	4,502	104
Venezia	6,556	3,501	5,369	287
Verona	5,193	4,292	4,113	120
Vicenza	11,029	3,194	3,727	119
EMILIA	41,830	24,219	20,385	528
Bologna	8,747	5,599	4,260	199
Ferrara	3,223	2,482	2,142	25
Forlì	4,476	2,840	1,837	57
Modena	8,468	2,959	2,874	70
Parma	4,655	2,785	2,417	74
Piacenza	4,476	2,348	1,964	51
Ravenna	3,572	2,693	2,378	15
R. Emilia	4,213	2,513	2,513	37
TUSCANY	63,458	22,103	21,855	938
Arezzo	2,881	2,270	1,723	18
Firenze	46,775	8,652	9,442	462
Grosseto	555	936	569	87
Livorno	3,246	1,858	2,072	101
Lucca	3,660	2,423	2,539	53
M. Carrara	1,198	1,014	679	14
Pisa	2,908	2,813	2,991	62
Siena	2,235	2,137	1,840	141

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Table A.12: Industrial labour force in the Italian provinces and regions by sector, 1871 (part B).

	Clothing	Leather	Wood	Metalmaking
MARCHES	18,112	10,896	7,113	267
Ancona	4,971	3,346	2,334	146
Ascoli Piceno	5,437	2,217	1,257	46
Macerata	4,104	2,834	1,869	36
Pesaro	3,600	2,499	1,653	39
UMBRIA	6,129	5,891	4,233	163
Perugia	6,129	5,891	4,233	163
LATIUM	10,114	10,547	9,272	418
Roma	10,114	10,547	9,272	418
ABRUZZI	16,926	11,690	6,456	358
Aquila	4,700	2,898	1,603	276
Campobasso	3,823	3,026	1,975	38
Chieti	3,745	3,589	1,925	40
Teramo	4,658	2,177	953	4
CAMPANIA	46,107	33,297	28,684	2,193
Avellino	4,366	3,950	2,700	114
Benevento	3,177	2,510	1,352	4
Caserta	10,736	7,332	5,886	70
Napoli	20,230	14,259	14,137	1,968
Salerno	7,598	5,246	4,609	37
APULIA	16,702	16,063	10,432	256
Bari	7,069	6,269	3,966	118
Foggia	3,325	3,487	2,389	60
Lecce	6,308	6,307	4,077	78
BASILICATA	5,741	5,655	3,450	30
Potenza	5,741	5,655	3,450	30
CALABRIA	16,966	12,936	8,236	54
Catanzaro	7,691	5,090	3,153	17
Cosenza	4,480	4,203	1,969	8
Reggio Calabria	4,795	3,643	3,114	29
SICILY	24,116	36,229	22,085	459
Caltanissetta	1,773	2,798	1,011	2
Catania	4,422	7,398	4,446	30
Girgenti	2,561	4,627	1,456	3
Messina	4,195	4,607	3,627	12
Palermo	5,809	9,609	6,882	405
Siracusa	3,505	3,950	2,083	3
Trapani	1,851	3,240	2,580	4
SARDINIA	2,690	5,146	4,059	38
Cagliari	1,950	3,241	2,692	29
Sassari	740	1,905	1,367	9
TOTAL	457,695	296,626	263,472	10,844

Source: Ciccarelli and Missiaia (2013).

Table A.13: Industrial labour force in the Italian provinces and regions by sector, 1871 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
PIEDMONT	25,190	9,465	1,424	4,252
Alessandria	4,013	956	283	292
Cuneo	3,331	1,620	220	275
Novara	5,877	4,863	85	1,056
Torino	11,969	2,026	836	2,629
LIGURIA	12,372	2,899	452	2,328
Genova	11,877	2,749	400	2,273
Porto Maurizio	495	150	52	55
LOMBARDY	33,590	12,807	1,470	7,172
Bergamo	2,806	1,631	146	469
Brescia	6,422	1,151	177	1,178
Como	5,473	4,884	53	749
Cremona	2,150	683	83	204
Mantova	2,227	551	120	198
Milano	11,152	3,236	754	4,138
Pavia	2,838	580	134	208
Sondrio	522	91	3	28
Belluno	1,704	618	5	101
Padova	2,463	1,010	38	290
Rovigo	1,354	493	18	75
Treviso	2,717	824	44	924
Udine	3,591	5,289	49	396
Venezia	4,509	3,962	238	641
Verona	3,023	1,245	184	411
Vicenza	2,975	1,622	105	728
EMILIA	14,015	4,029	868	2,048
Ferrara	1,540	199	16	94
Forlì	1,510	538	170	115
Modena	1,913	543	60	412
Parma	1,559	357	269	258
Piacenza	1,350	348	15	157
Ravenna	1,320	520	31	294
R. Emilia	1,479	396	78	116
TUSCANY	15,870	12,720	1,072	3,489
Arezzo	1,759	906	74	86
Grosseto	630	300	5	26
Livorno	1,572	523	92	236
Lucca	1,806	2,016	93	1,255
M. Carrara	702	1,801	19	44
Pisa	1,528	1,339	144	125
Siena	1,674	890	59	209
MARCHES	7,144	2,016	254	919
Ancona	2,108	493	78	368

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Table A.13: Industrial labour force in the Italian provinces and regions by sector, 1871 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
Ascoli Piceno	1,442	323	37	93
Macerata	1,891	572	102	351
Pesaro	1,703	628	37	107
UMBRIA	3,971	1,554	67	339
Perugia	3,971	1,554	67	339
LATIUM	7,316	3,373	401	1,600
ABRUZZI	7,364	2,036	202	236
Aquila	1,559	592	18	58
Chieti	2,130	504	143	52
Teramo	1,223	395	2	43
CAMPANIA	19,631	7,928	1,482	3,929
Avellino	1,913	836	84	61
Benevento	1,089	482	71	28
Caserta	3,588	1,483	231	1,005
Napoli	9,253	3,320	991	1,993
APULIA	8,920	3,136	773	348
Bari	3,649	1,341	467	168
Foggia	2,428	408	57	45
Lecce	2,843	1,387	249	135
BASILICATA	3,487	800	60	53
Potenza	3,487	800	60	53
Catanzaro	2,716	612	54	89
Cosenza	2,605	445	45	63
Reggio Calabria	1,911	590	95	70
SICILY	16,180	7,063	1,289	972
Catania	3,350	1,815	136	146
Girgenti	1,176	1,078	22	39
Palermo	5,018	1,158	865	549
Siracusa	1,364	446	110	51
Trapani	1,413	794	40	32
Cagliari	2,830	360	35	94
Sassari	1,359	337	12	51
TOTAL	208,807	87,233	10,736	31,618

Source: Ciccarelli and Missiaia (2013).

Table A.14: Industrial labour force in the Italian provinces and regions by sector, 1871 (part D).

	Sundry manufacturing	Construction	Utilities	Total
PIEDMONT	2,062	31,631	122	280,920
Alessandria	202	5,952	12	49,127
Cuneo	160	4,573	9	48,706
Novara	309	12,495	11	75,215
Torino	1,391	8,611	90	107,872
LIGURIA	1,059	7,719	14	85,609
Genova	1,027	6,835	8	79,021
Porto Maurizio	32	884	6	6,588
LOMBARDY	2,391	41,716	205	495,283
Bergamo	74	3,051	0	53,682
Brescia	260	4,365	0	60,467
Como	26	14,443	3	91,813
Cremona	121	3,932	1	44,935
Mantova	106	3,836	0	26,702
Milano	1,707	7,635	192	173,392
Pavia	87	4,121	9	39,409
Sondrio	10	333	0	4,883
VENETIA	1,507	28,344	53	231,990
Belluno	53	1,648	0	10,874
Padova	244	2,913	14	29,383
Rovigo	143	1,988	0	16,491
Treviso	81	2,796	0	27,806
Udine	236	9,651	0	42,414
Venezia	519	3,327	21	37,881
Verona	104	3,571	10	31,191
Vicenza	127	2,450	8	35,950
EMILIA	743	21,627	32	209,834
Bologna	213	5,591	12	47,840
Ferrara	39	2,048	0	17,897
Forlì	43	1,957	12	20,896
Modena	166	2,697	0	34,476
Parma	99	2,556	8	25,590
Piacenza	42	2,492	0	20,235
Ravenna	51	1,815	0	22,129
R. Emilia	90	2,471	0	20,771
TUSCANY	1,824	17,422	48	217,238
Arezzo	65	1,352	0	16,109
Firenze	648	7,065	0	106,453
Grosseto	10	901	0	5,606
Livorno	754	1,369	19	15,026
Lucca	136	1,689	8	22,891
M. Carrara	39	868	3	10,866
Pisa	146	2,388	18	25,887
Siena	26	1,790	0	14,400

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Table A.14: Industrial labour force in the Italian provinces and regions by sector, 1871 (part D).

	Sundry manufacturing	Construction	Utilities	Total
MARCHES	449	6,603	1	92,760
Ancona	204	2,157	0	29,159
Ascoli Piceno	40	1,154	1	20,680
Macerata	179	1,456	0	22,110
Pesaro	26	1,836	0	20,894
UMBRIA	110	4,541	0	36,386
Perugia	110	4,541	0	36,449
LATIUM	265	10,160	43	70,148
Roma	265	10,160	43	70,595
ABRUZZI	80	6,894	13	108,887
Aquila	44	1,589	0	38,670
Campobasso	4	2,437	0	22,678
Chieti	15	1,792	13	24,166
Teramo	17	1,076	0	23,445
CAMPANIA	2,218	24,157	21	328,130
Avellino	27	2,139	0	24,107
Benevento	2	2,281	0	20,802
Caserta	44	5,465	0	73,566
Napoli	2,090	9,952	0	142,519
Salerno	55	4,320	21	69,116
APULIA	75	16,645	0	170,186
Bari	40	7,908	0	70,047
Foggia	25	3,390	0	28,486
Lecce	10	5,347	0	75,454
BASILICATA	0	4,127	0	55,366
Potenza	0	4,127	0	55,373
CALABRIA	179	8,507	0	208,964
Catanzaro	39	3,265	0	81,420
Cosenza	99	2,899	0	67,420
Reggio Calabria	41	2,343	0	61,607
SICILY	689	25,203	6	287,318
Caltanissetta	6	1,733	0	40,436
Catania	125	5,464	0	61,722
Girgenti	17	3,408	0	30,032
Messina	43	2,928	0	69,282
Palermo	252	5,719	0	63,984
Siracusa	226	3,862	0	35,282
Trapani	20	2,089	6	20,267
SARDINIA	75	6,075	0	29,923
Cagliari	36	3,701	0	22,573
Sassari	39	2,374	0	15,348
TOTAL	13,726	261,371	558	2,908,942

Source: Ciccarelli and Missiaia (2013).

Table A.15: Industrial labour force in the Italian provinces and regions by sector, 1881 (part A).

	Mining	Foodstuffs	Tobacco	Textile
PIEDMONT	552	33,023	2,051	69,018
Alessandria	155	5,617	1	7,490
Cuneo	177	6,102	0	13,235
Novara	62	7,772	0	20,892
Torino	158	13,532	2,050	27,401
LIGURIA	933	10,352	506	19,556
Genova	927	9,004	506	19,265
P. Maurizio	6	1,348	0	291
LOMBARDY	2,387	53,779	1,298	216,982
Bergamo	1,064	4,870	0	37,359
Brescia	707	6,124	0	22,769
Como	287	5,739	0	53,530
Cremona	27	5,037	0	16,835
Mantova	15	4,235	0	3,939
Milano	259	19,497	1,298	74,198
Pavia	1	7,308	0	7,382
Sondrio	27	969	0	970
VENETIA	1,892	26,789	1,359	40,123
Belluno	769	1,534	0	1,370
Padova	7	3,366	0	3,959
Rovigo	6	2,234	0	3,550
Treviso	96	3,296	0	4,521
Udine	262	3,160	0	8,771
Venezia	93	3,824	1,350	3,748
Verona	284	5,183	2	3,801
Vicenza	375	4,192	7	10,403
EMILIA	1,553	18,732	1,169	52,601
Bologna	22	4,131	718	11,082
Ferrara	1	1,630	0	4,183
Forlì	1,259	1,752	0	5,507
Modena	6	1,997	238	8,436
Parma	7	2,679	213	4,746
Piacenza	2	2,341	0	4,761
Ravenna	254	1,664	0	8,818
R. Emilia	2	2,538	0	5,068
TUSCANY	8,211	20,372	1,849	41,252
Arezzo	249	1,666	0	3,352
Firenze	214	8,451	717	12,831
Grosseto	857	894	0	295
Livorno	820	1,812	0	631
Lucca	1,110	2,310	1,131	3,815
M. Carrara	3,654	944	1	1,095
Pisa	1,261	2,648	0	17,572
Siena	46	1,647	0	1,661

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Table A.15: Industrial labour force in the Italian provinces and regions by sector, 1881 (part A).

	Mining	Foodstuffs	Tobacco	Textile
MARCHES	1,034	5,803	769	33,088
Ancona	5	1,843	769	11,273
Ascoli Piceno	4	1,237	0	8,469
Macerata	1	1,222	0	6,377
Pesaro	1,024	1,501	0	6,969
UMBRIA	13	3,832	0	5,124
Perugia	13	3,832	0	5,124
LATIUM	659	10,907	536	5,893
Roma	659	10,907	536	5,893
ABRUZZI	105	8,295	0	84,254
Aquila	16	1,881	0	39,429
Campobasso	28	2,591	0	9,556
Chieti	61	2,593	0	21,704
Teramo	0	1,230	0	13,565
CAMPANIA	2,336	35,491	941	170,768
Avellino	362	3,031	0	8,821
Benevento	64	1,890	0	9,873
Caserta	559	5,671	0	45,560
Napoli	732	18,592	932	67,174
Salerno	619	6,307	9	39,340
APULIA	3,785	14,224	35	131,920
Bari	1,735	5,650	0	67,537
Foggia	250	4,767	0	5,084
Lecce	1,800	3,807	35	59,299
BASILICATA	85	3,650	0	36,012
Potenza	85	3,650	0	36,012
CALABRIA	670	10,491	0	223,910
Catanzaro	216	4,206	0	81,792
Cosenza	342	2,942	0	78,395
Reggio Calabria	112	3,343	0	63,723
SICILY	27,121	33,123	722	195,359
Caltanissetta	9,665	3,059	0	22,265
Catania	2,655	6,401	290	42,326
Girgenti	9,123	3,924	0	16,161
Messina	276	3,870	72	52,682
Palermo	3,618	9,784	360	24,338
Siracusa	1,238	3,521	0	27,848
Trapani	546	2,564	0	9,739
SARDINIA	8,176	5,086	116	6,946
Cagliari	8,063	3,385	116	4,552
Sassari	113	1,701	0	2,394
TOTAL	59,512	293,949	11,351	1,332,806

Source: Ciccarelli and Missiaia (2013).

Table A.16: Industrial labour force in the Italian provinces and regions by sector, 1881 (part B).

	Clothing	Leather	Wood	Metalmaking
PIEDMONT	68,234	34,577	38,116	2,226
Alessandria	14,589	7,302	7,217	88
Cuneo	9,840	6,125	4,954	82
Novara	15,050	8,220	10,042	446
Torino	28,755	12,930	15,903	1,610
LIGURIA	18,094	10,615	11,317	1,929
Genova	15,920	9,097	10,114	1,917
Porto Maurizio	2,174	1,518	1,203	12
LOMBARDY	112,099	43,106	55,026	2,860
Bergamo	10,741	3,586	4,498	220
Brescia	15,592	5,700	5,322	652
Como	8,539	4,804	7,010	341
Cremona	8,438	3,790	4,050	47
Mantova	6,710	3,784	4,415	98
Milano	48,615	15,426	23,681	1,402
Pavia	12,127	5,097	5,163	89
Sondrio	1,337	919	887	11
VENETIA	46,758	25,988	34,309	803
Belluno	1,351	1,094	2,505	15
Padova	6,255	3,782	5,185	114
Rovigo	3,110	2,331	2,415	19
Treviso	3,854	3,049	3,529	121
Udine	6,208	3,527	5,680	42
Venezia	7,502	3,683	5,409	375
Verona	5,936	4,632	4,923	79
Vicenza	12,542	3,890	4,663	38
EMILIA	57,663	25,638	24,744	542
Bologna	13,757	6,035	5,440	345
Ferrara	4,296	2,697	2,465	30
Forlì	5,583	3,142	2,218	34
Modena	11,284	3,066	3,108	47
Parma	6,372	2,966	2,675	30
Piacenza	5,326	2,333	3,064	33
Ravenna	5,177	2,906	2,993	6
R. Emilia	5,868	2,493	2,781	17
TUSCANY	78,531	24,674	25,505	1,649
Arezzo	3,558	2,417	1,892	247
Firenze	59,438	9,850	11,167	664
Grosseto	766	1,070	825	49
Livorno	3,720	2,095	2,185	121
Lucca	3,784	2,332	2,569	34
M. Carrara	1,469	1,176	711	22
Pisa	3,429	3,242	3,971	310
Siena	2,367	2,492	2,185	202

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Table A.16: Industrial labour force in the Italian provinces and regions by sector, 1881 (part B).

	Clothing	Leather	Wood	Metalmaking
MARCHES	21,832	11,817	8,562	213
Ancona	5,897	3,722	2,954	148
Ascoli Piceno	7,404	2,608	1,574	19
Macerata	4,486	2,994	2,269	20
Pesaro	4,045	2,493	1,765	26
UMBRIA	6,382	6,354	4,906	281
Perugia	6,382	6,354	4,906	281
LATIUM	16,138	11,558	10,624	498
Roma	16,138	11,558	10,624	498
ABRUZZI	26,260	13,231	7,406	66
Aquila	9,723	3,529	2,049	19
Campobasso	4,864	3,615	2,102	16
Chieti	5,365	3,509	2,073	22
Teramo	6,308	2,578	1,182	9
CAMPANIA	62,424	40,679	36,901	1,656
Avellino	6,456	5,133	4,362	15
Benevento	3,519	2,939	1,620	5
Caserta	14,167	8,440	7,058	61
Napoli	30,152	18,303	18,085	1,522
Salerno	8,130	5,864	5,776	53
APULIA	28,468	19,762	14,916	195
Bari	14,146	8,190	6,495	71
Foggia	6,253	4,198	3,102	48
Lecce	8,069	7,374	5,319	76
BASILICATA	6,878	6,717	3,618	21
Potenza	6,878	6,717	3,618	21
CALABRIA	19,031	15,592	11,539	63
Catanzaro	8,467	6,389	3,883	14
Cosenza	5,532	4,951	2,261	7
Reggio Calabria	5,032	4,252	5,395	42
SICILY	56,281	43,718	26,760	403
Caltanissetta	8,681	3,432	1,275	0
Catania	13,055	9,807	5,655	31
Girgenti	4,844	4,737	1,872	5
Messina	6,721	5,576	4,888	25
Palermo	10,605	11,056	6,919	335
Siracusa	8,401	4,970	2,634	4
Trapani	3,974	4,140	3,517	3
SARDINIA	4,752	6,398	4,924	33
Cagliari	3,085	3,885	3,281	32
Sassari	1,667	2,513	1,643	1
TOTAL	629,825	340,424	319,173	13,438

Source: Ciccarelli and Missiaia (2013).

Table A.17: Industrial labour force in the Italian provinces and regions by sector, 1881 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
PIEDMONT	32,739	12,068	2,557	6,284
Alessandria	4,935	1,268	453	375
Cuneo	3,608	1,885	281	435
Novara	7,099	5,679	158	1,941
Torino	17,097	3,236	1,665	3,533
LIGURIA	14,427	2,750	739	2,396
Genova	13,791	2,529	646	2,283
Porto Maurizio	636	221	93	113
LOMBARDY	41,180	15,507	2,540	9,608
Bergamo	2,917	1,654	182	685
Brescia	6,669	1,569	217	1,235
Como	6,643	5,457	109	943
Cremona	2,270	868	568	172
Mantova	2,219	609	97	193
Milano	16,821	4,267	1,316	6,139
Pavia	3,124	852	42	200
Sondrio	517	231	9	41
Belluno	1,761	482	6	102
Padova	2,844	985	44	329
Rovigo	1,557	671	14	89
Treviso	2,855	786	55	688
Udine	4,008	5,843	173	384
Venezia	5,392	6,216	696	690
Verona	3,565	1,564	315	384
Vicenza	3,316	1,562	107	899
EMILIA	16,195	3,944	981	2,292
Ferrara	1,577	199	43	120
Forlì	1,769	534	214	161
Modena	1,887	336	18	370
Parma	1,806	356	101	223
Piacenza	1,620	417	51	249
Ravenna	1,481	642	57	109
R. Emilia	1,387	445	41	145
TUSCANY	17,892	13,815	1,323	3,597
Arezzo	1,880	988	105	118
Grosseto	729	223	71	32
Livorno	1,819	594	126	284
Lucca	1,754	1,634	87	1,008
M. Carrara	696	2,760	28	61
Pisa	1,740	1,732	241	152
Siena	1,770	883	69	323
MARCHES	7,769	2,469	280	1,624
Ancona	2,578	623	129	936

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Table A.17: Industrial labour force in the Italian provinces and regions by sector, 1881 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
Ascoli Piceno	1,518	448	33	118
Macerata	1,902	655	60	392
Pesaro	1,771	743	58	178
UMBRIA	4,160	1,499	119	449
Perugia	4,160	1,499	119	449
LATIUM	8,647	4,275	407	3,438
ABRUZZI	8,277	2,322	223	310
Aquila	2,077	810	29	78
Chieti	2,110	520	82	97
Teramo	1,371	449	35	42
CAMPANIA	26,822	8,277	2,307	5,388
Avellino	2,495	848	120	108
Benevento	1,247	494	40	62
Caserta	4,147	1,493	405	2,068
Napoli	15,143	3,906	1,383	2,462
APULIA	9,852	3,335	789	573
Bari	4,447	1,467	344	315
Foggia	2,272	550	78	99
Lecce	3,133	1,318	367	159
BASILICATA	3,523	917	183	91
Potenza	3,523	917	183	91
Catanzaro	2,720	707	140	111
Cosenza	2,590	558	42	65
Reggio Calabria	2,003	622	203	71
SICILY	18,943	9,652	1,330	1,284
Catania	4,209	2,481	373	250
Girgenti	1,316	968	72	57
Palermo	5,727	2,023	308	639
Siracusa	1,689	640	176	85
Trapani	1,841	1,145	70	45
Cagliari	3,283	518	51	144
Sassari	1,517	386	17	44
TOTAL	247,837	101,730	15,641	41,334

Source: Ciccarelli and Missiaia (2013).

Table A.18: Industrial labour force in the Italian provinces and regions by sector, 1881 (part D).

	Sundry manufacturing	Construction	Utilities	Total
PIEDMONT	994	41,608	332	344,379
Alessandria	24	7,401	17	56,932
Cuneo	10	4,786	20	51,540
Novara	416	16,889	31	94,697
Torino	544	12,532	264	141,210
LIGURIA	2,586	11,074	70	107,344
Genova	2,572	9,546	70	98,187
Porto Maurizio	14	1,528	0	9,157
LOMBARDY	2,754	53,192	176	612,494
Bergamo	173	3,697	7	71,653
Brescia	302	5,251	5	72,114
Como	210	20,340	5	113,957
Cremona	41	4,268	3	46,414
Mantova	106	3,590	0	30,010
Milano	1,900	10,695	149	225,663
Pavia	21	4,599	7	46,012
Sondrio	1	752	0	6,671
VENETIA	869	31,320	30	258,622
Belluno	4	2,219	0	13,212
Padova	142	2,884	8	29,904
Rovigo	79	1,843	0	17,918
Treviso	76	2,572	2	25,500
Udine	35	11,687	1	49,781
Venezia	444	3,319	16	42,757
Verona	43	3,801	2	34,514
Vicenza	46	2,995	1	45,036
EMILIA	574	21,924	56	228,608
Bologna	149	6,022	24	54,779
Ferrara	11	2,070	0	19,322
Forlì	28	2,041	9	24,251
Modena	70	2,493	6	33,362
Parma	33	2,581	8	24,796
Piacenza	148	2,300	5	22,650
Ravenna	42	1,885	4	26,038
R. Emilia	93	2,532	0	23,410
TUSCANY	3,527	18,539	39	260,775
Arezzo	24	1,615	0	18,111
Firenze	536	8,138	33	126,759
Grosseto	6	930	0	6,747
Livorno	2,415	1,542	3	18,167
Lucca	152	1,568	1	23,289
M. Carrara	18	930	2	13,567
Pisa	354	2,164	0	38,816
Siena	22	1,652	0	15,319

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Table A.18: Industrial labour force in the Italian provinces and regions by sector, 1881 (part D).

	Sundry manufacturing	Construction	Utilities	Total
MARCHES	302	7,699	5	103,266
Ancona	105	2,693	5	33,680
Ascoli Piceno	16	1,390	0	24,838
Macerata	141	1,573	0	22,092
Pesaro	40	2,043	0	22,656
UMBRIA	71	3,850	1	37,041
Perugia	71	3,850	1	37,041
LATIUM	440	12,421	162	86,603
Roma	440	12,421	162	86,603
ABRUZZI	89	7,817	11	158,666
Aquila	32	2,062	0	61,734
Campobasso	25	2,915	0	29,144
Chieti	22	1,922	11	40,091
Teramo	10	918	0	27,697
CAMPANIA	6,786	30,061	36	430,873
Avellino	136	2,892	0	34,779
Benevento	7	2,193	0	23,953
Caserta	93	6,357	0	96,079
Napoli	6,485	13,250	33	198,154
Salerno	65	5,369	3	77,908
APULIA	87	20,785	5	248,731
Bari	56	10,302	2	120,757
Foggia	13	4,044	0	30,758
Lecce	18	6,439	3	97,216
BASILICATA	28	4,945	0	66,668
Potenza	28	4,945	0	66,668
CALABRIA	93	10,431	5	301,657
Catanzaro	6	4,193	0	112,844
Cosenza	62	3,581	4	101,332
Reggio Calabria	25	2,657	1	87,481
SICILY	457	32,133	28	447,314
Caltanissetta	7	2,923	0	53,397
Catania	108	7,979	21	95,641
Girgenti	10	3,043	0	46,132
Messina	104	3,731	3	82,953
Palermo	121	6,538	3	82,374
Siracusa	53	4,767	0	56,026
Trapani	54	3,152	1	30,791
SARDINIA	11	6,757	8	49,167
Cagliari	9	4,438	8	34,850
Sassari	2	2,319	0	14,317
TOTAL	19,668	314,556	964	3,742,208

Source: Ciccarelli and Missiaia (2013).

Table A.19: Industrial labour force in the Italian provinces and regions by sector, 1901 (part A).

	Mining	Foodstuffs	Tobacco	Textile
PIEDMONT	2,345	35,705	1,129	88,361
Alessandria	507	6,571	0	7,298
Cuneo	198	6,441	0	11,515
Novara	358	8,389	0	30,270
Torino	1,282	14,304	1,129	39,278
LIGURIA	1,424	11,108	996	14,363
Genova	1,325	9,892	996	14,180
P. Maurizio	99	1,216	0	183
LOMBARDY	3,163	61,489	1,163	254,113
Bergamo	1,475	5,617	0	40,875
Brescia	481	7,081	0	16,377
Como	456	6,615	21	68,439
Cremona	41	5,688	0	10,362
Mantova	16	4,559	1	1,635
Milano	373	23,970	1,141	106,663
Pavia	27	7,111	0	8,148
Sondrio	294	848	0	1,614
VENETIA	2,324	28,978	1,145	44,338
Belluno	981	1,582	1	926
Padova	91	4,202	0	4,166
Rovigo	6	2,180	0	964
Treviso	77	3,874	1	6,319
Udine	33	3,351	0	12,068
Venezia	192	3,794	1,137	4,239
Verona	305	5,193	0	3,092
Vicenza	639	4,802	6	12,564
EMILIA	1,451	22,567	1,315	19,922
Bologna	98	5,127	487	5,169
Ferrara	56	2,072	1	1,959
Forlì	684	1,921	0	2,217
Modena	145	2,617	827	2,437
Parma	37	3,362	0	1,284
Piacenza	90	2,623	0	1,973
Ravenna	304	1,690	0	3,558
R. Emilia	37	3,155	0	1,325
TUSCANY	13,147	21,925	2,982	34,503
Arezzo	670	1,658	50	2,245
Firenze	420	10,197	1,430	11,248
Grosseto	2,684	808	1	205
Livorno	1,589	1,863	0	633
Lucca	1,092	2,319	1,493	3,836
M. Carrara	5,444	960	5	1,017
Pisa	820	2,449	0	14,640
Siena	428	1,671	3	679

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Table A.19: Industrial labour force in the Italian provinces and regions by sector, 1901 (part A).

	Mining	Foodstuffs	Tobacco	Textile
MARCHES	838	5,842	904	15,399
Ancona	119	2,033	904	5,441
Ascoli Piceno	5	1,078	0	4,025
Macerata	4	1,200	0	2,092
Pesaro	710	1,531	0	3,841
UMBRIA	577	3,519	0	4,184
Perugia	577	3,519	0	4,184
LATIUM	606	12,239	546	4,024
Roma	606	12,239	546	4,024
ABRUZZI	244	6,910	0	30,495
Aquila	101	1,719	0	14,880
Campobasso	66	1,898	0	2,705
Chieti	77	2,070	0	7,606
Teramo	0	1,223	0	5,304
CAMPANIA	1,357	30,790	1,236	67,030
Avellino	270	2,598	1	2,959
Benevento	150	1,453	31	2,800
Caserta	403	4,942	0	16,030
Napoli	261	16,880	1,038	27,820
Salerno	273	4,917	166	17,421
APULIA	3,900	13,198	113	38,979
Bari	1,941	5,396	0	20,857
Foggia	482	3,524	1	1,609
Lecce	1,477	4,278	112	16,513
BASILICATA	138	2,929	0	7,541
Potenza	138	2,929	0	7,541
CALABRIA	910	9,169	0	114,025
Catanzaro	410	3,996	0	43,120
Cosenza	432	2,181	0	26,164
Reggio Calabria	68	2,992	0	44,741
SICILY	49,381	31,044	638	43,847
Caltanissetta	21,469	3,118	0	2,511
Catania	4,795	6,589	399	7,353
Girgenti	18,544	3,598	0	3,812
Messina	211	3,422	0	19,597
Palermo	1,740	7,772	239	3,522
Siracusa	1,568	3,685	0	6,037
Trapani	1,054	2,860	0	1,015
SARDINIA	10,786	4,487	434	2,129
Cagliari	10,548	2,617	420	1,006
Sassari	238	1,870	14	1,123
TOTAL	92,591	301,899	12,601	783,253

Source: Ciccarelli and Missiaia (2013).

Table A.20: Industrial labour force in the Italian provinces and regions by sector, 1901 (part B).

	Clothing	Leather	Wood	Metalmaking
PIEDMONT	82,878	39,584	39,722	3,845
Alessandria	19,060	8,144	7,896	179
Cuneo	10,763	6,684	4,712	158
Novara	18,318	9,133	10,627	750
Torino	34,737	15,623	16,487	2,758
LIGURIA	22,546	13,502	13,741	4,067
Genova	19,869	11,547	12,291	4,063
Porto Maurizio	2,677	1,955	1,450	4
LOMBARDY	115,167	54,954	69,056	5,222
Bergamo	7,793	4,255	4,755	371
Brescia	11,360	6,276	5,825	694
Como	11,005	6,528	10,072	844
Cremona	8,997	4,724	4,382	51
Mantova	7,116	3,704	4,438	24
Milano	54,163	21,801	33,151	3,055
Pavia	13,357	6,828	5,448	173
Sondrio	1,376	838	985	10
VENETIA	51,037	26,519	38,663	934
Belluno	2,222	1,199	2,752	12
Padova	7,271	4,035	5,697	79
Rovigo	3,691	2,448	2,528	4
Treviso	4,903	3,237	4,146	57
Udine	7,280	3,247	6,927	256
Venezia	7,078	3,290	6,506	272
Verona	6,438	4,764	4,959	134
Vicenza	12,154	4,299	5,148	120
EMILIA	70,518	29,688	25,866	499
Bologna	16,464	7,196	6,513	314
Ferrara	4,562	3,393	2,862	6
Forlì	6,878	3,637	2,167	42
Modena	14,400	3,440	3,501	76
Parma	7,023	3,630	2,661	31
Piacenza	5,869	2,416	2,180	15
Ravenna	7,029	3,297	3,218	12
R. Emilia	8,293	2,679	2,764	3
TUSCANY	70,755	29,714	31,063	3,285
Arezzo	3,488	2,846	1,990	750
Firenze	48,756	12,340	14,719	834
Grosseto	866	1,403	1,068	86
Livorno	3,157	1,911	2,037	737
Lucca	4,729	3,008	3,310	53
M. Carrara	2,009	1,387	950	5
Pisa	5,481	3,850	4,575	697
Siena	2,269	2,969	2,414	123

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Table A.20: Industrial labour force in the Italian provinces and regions by sector, 1901 (part B).

	Clothing	Leather	Wood	Metalmaking
MARCHES	23,931	14,829	8,856	237
Ancona	7,242	4,107	3,031	107
Ascoli Piceno	7,202	3,823	1,701	18
Macerata	4,335	3,803	2,212	10
Pesaro	5,152	3,096	1,912	102
UMBRIA	7,496	8,254	5,731	2,049
Perugia	7,496	8,254	5,731	2,049
LATIUM	22,218	14,827	12,746	390
Roma	22,218	14,827	12,746	390
ABRUZZI	20,867	16,450	8,266	59
Aquila	6,838	4,638	2,375	24
Campobasso	4,293	4,211	2,226	21
Chieti	4,597	3,910	2,142	4
Teramo	5,139	3,691	1,523	10
CAMPANIA	62,101	50,717	37,886	1,891
Avellino	6,103	6,032	3,765	15
Benevento	3,654	3,407	1,710	1
Caserta	14,069	11,258	7,530	53
Napoli	29,776	22,460	18,105	1,646
Salerno	8,499	7,560	6,776	176
APULIA	24,952	25,289	17,638	163
Bari	10,399	10,271	7,667	58
Foggia	4,920	5,242	3,124	14
Lecce	9,633	9,776	6,847	91
BASILICATA	5,113	6,725	3,178	0
Potenza	5,113	6,725	3,178	0
CALABRIA	18,734	17,504	12,273	18
Catanzaro	7,357	7,111	4,337	5
Cosenza	5,508	5,411	2,766	3
Reggio Calabria	5,869	4,982	5,170	10
SICILY	31,465	55,855	34,580	623
Caltanissetta	2,429	4,464	1,696	5
Catania	6,604	13,353	7,733	83
Girgenti	3,114	5,861	2,336	19
Messina	4,803	6,769	5,654	48
Palermo	8,422	12,967	8,582	447
Siracusa	3,454	6,848	3,609	6
Trapani	2,639	5,593	4,970	15
SARDINIA	4,568	7,919	5,342	87
Cagliari	2,904	4,660	3,404	83
Sassari	1,664	3,259	1,938	4
TOTAL	634,346	412,330	364,607	23,369

Source: Ciccarelli and Missiaia (2013).

Table A.21: Industrial labour force in the Italian provinces and regions by sector, 1901 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
PIEDMONT	41,992	15,694	3,466	9,263
Alessandria	6,503	2,146	351	466
Cuneo	4,246	2,297	244	530
Novara	9,402	6,672	181	3,083
Torino	21,841	4,579	2,690	5,184
LIGURIA	27,965	4,635	1,044	2,777
Genova	27,091	4,288	977	2,665
Porto Maurizio	874	347	67	112
LOMBARDY	64,569	19,803	7,105	15,692
Bergamo	3,315	2,015	202	1,079
Brescia	7,907	2,221	218	908
Como	7,971	5,626	293	1,570
Cremona	3,170	1,206	120	272
Mantova	2,759	717	33	234
Milano	34,589	6,616	6,153	11,229
Pavia	4,211	1,137	77	340
Sondrio	647	265	9	60
Belluno	1,524	1,283	4	91
Padova	4,065	1,139	249	583
Rovigo	1,874	717	50	130
Treviso	3,337	1,231	27	671
Udine	4,904	14,774	238	478
Venezia	7,498	5,716	717	684
Verona	4,351	1,377	92	578
Vicenza	3,770	1,899	293	1,580
EMILIA	20,685	5,058	1,463	3,227
Ferrara	2,247	164	147	160
Forlì	2,042	619	148	186
Modena	2,224	475	25	402
Parma	2,060	608	54	348
Piacenza	1,790	734	7	395
Ravenna	1,863	581	42	221
R. Emilia	1,688	563	58	185
TUSCANY	23,600	19,876	1,679	5,478
Arezzo	1,886	906	49	149
Grosseto	971	323	3	61
Livorno	3,146	1,194	232	377
Lucca	2,087	2,608	109	1,323
M. Carrara	974	4,673	38	65
Pisa	2,355	2,720	217	225
Siena	2,211	1,148	43	365
MARCHES	9,064	2,687	340	2,172
Ancona	3,643	677	233	1,169

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Table A.21: Industrial labour force in the Italian provinces and regions by sector, 1901 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
Ascoli Piceno	1,626	395	44	208
Macerata	2,032	750	30	624
Pesaro	1,763	865	33	171
UMBRIA	6,164	1,630	367	620
Perugia	6,164	1,630	367	620
LATIUM	11,847	4,235	511	4,927
ABRUZZI	9,088	2,521	312	527
Aquila	2,177	870	50	122
Chieti	2,407	559	109	189
Teramo	1,845	501	105	111
CAMPANIA	38,238	9,642	2,339	5,583
Avellino	2,243	777	80	110
Benevento	1,387	450	103	68
Caserta	5,036	1,994	977	1,770
Napoli	25,195	4,850	967	2,998
APULIA	18,112	5,974	889	1,024
Bari	6,918	2,281	534	575
Foggia	4,288	775	47	158
Lecce	6,906	2,918	308	291
BASILICATA	3,316	874	98	123
Potenza	3,316	874	98	123
Catanzaro	2,593	804	175	200
Cosenza	2,298	455	77	107
Reggio Calabria	2,313	726	123	121
SICILY	25,286	11,484	1,362	2,033
Catania	5,605	3,377	531	452
Girgenti	1,879	1,153	71	83
Palermo	7,486	2,058	275	904
Siracusa	2,286	796	121	108
Trapani	2,709	1,488	51	98
Cagliari	4,048	646	102	185
Sassari	1,965	470	18	120
TOTAL	344,466	135,350	23,140	58,974

Source: Ciccarelli and Missiaia (2013).

Table A.22: Industrial labour force in the Italian provinces and regions by sector, 1901 (part D).

	Sundry manufacturing	Construction	Utilities	Total
PIEDMONT	2,555	60,556	3,003	427,753
Alessandria	152	9,454	374	68,594
Cuneo	61	6,529	152	54,332
Novara	1,066	25,122	278	123,291
Torino	1,276	19,451	2,199	181,536
LIGURIA	1,230	23,031	1,689	142,694
Genova	1,212	20,844	1,636	131,551
Porto Maurizio	18	2,187	53	11,143
LOMBARDY	5,071	84,758	2,738	760,900
Bergamo	494	7,463	179	78,413
Brescia	485	8,201	162	67,715
Como	333	29,080	155	148,552
Cremona	81	5,824	44	44,921
Mantova	273	4,856	39	30,388
Milano	3,329	22,409	1,976	330,245
Pavia	72	5,583	153	52,638
Sondrio	4	1,342	30	8,028
VENETIA	728	66,989	763	326,018
Belluno	25	8,576	15	20,212
Padova	192	4,276	81	36,035
Rovigo	32	2,539	8	17,165
Treviso	40	5,512	51	33,406
Udine	85	28,140	80	81,828
Venezia	159	6,395	378	47,863
Verona	118	5,249	58	36,403
Vicenza	77	6,302	92	53,106
EMILIA	1,061	46,808	580	249,257
Bologna	235	8,733	239	60,874
Ferrara	29	4,554	21	22,177
Forlì	37	5,454	126	25,474
Modena	101	4,800	45	35,370
Parma	38	4,187	79	25,365
Piacenza	513	3,262	17	21,794
Ravenna	35	11,165	28	32,739
R. Emilia	73	4,653	25	25,464
TUSCANY	2,495	44,659	763	292,777
Arezzo	39	4,429	25	20,510
Firenze	402	18,791	431	139,323
Grosseto	10	2,035	17	7,857
Livorno	1,214	1,959	131	18,591
Lucca	437	5,159	37	30,508
M. Carrara	29	2,235	34	14,381
Pisa	331	5,953	46	43,539
Siena	33	4,098	42	18,068

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Table A.22: Industrial labour force in the Italian provinces and regions by sector, 1901 (part D).

	Sundry manufacturing	Construction	Utilities	Total
MARCHES	335	12,373	101	97,070
Ancona	203	3,762	55	32,607
Ascoli Piceno	15	2,533	18	22,686
Macerata	106	2,466	20	19,680
Pesaro	11	3,612	8	22,097
UMBRIA	49	9,512	134	49,709
Perugia	49	9,512	134	49,709
LATIUM	354	19,853	749	109,466
Roma	354	19,853	749	109,466
ABRUZZI	115	12,371	126	108,107
Aquila	29	4,272	35	38,029
Campobasso	10	3,453	34	22,254
Chieti	16	2,650	50	26,309
Teramo	60	1,996	7	21,515
CAMPANIA	6,558	48,366	1,145	363,522
Avellino	32	3,813	5	28,533
Benevento	13	3,005	19	18,101
Caserta	81	9,114	48	72,902
Napoli	6,398	23,555	1,040	182,728
Salerno	34	8,879	33	61,258
APULIA	122	33,571	229	180,253
Bari	47	16,541	108	81,652
Foggia	23	5,692	30	29,447
Lecce	52	11,338	91	69,154
BASILICATA	17	5,342	17	35,273
Potenza	17	5,342	17	35,273
CALABRIA	45	16,151	24	197,935
Catanzaro	1	4,625	6	74,330
Cosenza	32	4,597	9	49,608
Reggio Calabria	12	6,929	9	73,997
SICILY	330	59,615	481	298,643
Caltanissetta	16	4,557	23	21,436
Catania	93	13,228	83	65,483
Girgenti	5	3,785	6	25,722
Messina	31	14,590	70	61,001
Palermo	140	10,973	255	64,042
Siracusa	13	7,040	15	34,018
Trapani	32	5,442	29	26,941
SARDINIA	24	14,693	54	47,291
Cagliari	14	10,311	31	30,431
Sassari	10	4,382	23	16,860
TOTAL	21,089	558,648	12,596	3,686,668

Source: Ciccarelli and Missiaia (2013).

Table A.23: Industrial labour force in the Italian provinces and regions by sector, 1911 (part A).

	Mining	Foodstuffs	Tobacco	Textile
PIEDMONT	8,376	36,207	1,688	108,466
Alessandria	1,626	6,168	1	7,655
Cuneo	1,271	5,971	1	12,125
Novara	1,954	10,613	106	41,381
Torino	3,525	13,455	1,580	47,305
LIGURIA	2,623	14,813	1,351	14,420
Genova	2,258	13,373	1,350	14,386
P. Maurizio	365	1,440	1	34
LOMBARDY	7,036	60,016	2,857	259,886
Bergamo	2,712	4,621	5	42,456
Brescia	1,350	5,819	1	18,788
Como	1,221	6,119	66	63,620
Cremona	51	5,739	0	11,560
Mantova	32	4,678	0	1,633
Milano	1,050	24,221	2,780	112,106
Pavia	120	7,834	3	8,182
Sondrio	500	985	2	1,541
VENETIA	3,790	27,771	1,158	54,070
Belluno	1,070	1,472	1	741
Padova	194	3,255	0	4,761
Rovigo	0	1,792	0	1,220
Treviso	192	3,551	2	7,954
Udine	829	4,792	3	13,679
Venezia	126	3,542	1,083	5,001
Verona	443	5,038	3	4,369
Vicenza	936	4,329	66	16,345
EMILIA	2,410	29,738	1,934	15,292
Bologna	144	5,845	627	3,258
Ferrara	198	3,608	10	3,942
Forlì	392	2,351	3	1,635
Modena	174	3,643	1,283	1,714
Parma	186	4,901	5	484
Piacenza	486	3,171	2	1,386
Ravenna	745	2,045	4	1,909
R. Emilia	85	4,174	0	964
TUSCANY	20,493	20,273	4,114	28,203
Arezzo	1,374	1,324	229	2,548
Firenze	1,259	8,791	1,614	10,086
Grosseto	2,788	744	0	150
Livorno	2,237	1,713	15	606
Lucca	2,119	2,409	2,199	3,783
M. Carrara	7,590	964	0	803
Pisa	1,383	2,737	55	9,738
Siena	1,743	1,591	2	489

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Table A.23: Industrial labour force in the Italian provinces and regions by sector, 1911 (part A).

	Mining	Foodstuffs	Tobacco	Textile
MARCHES	1,360	5,693	1,217	11,449
Ancona	655	2,106	1,216	4,852
Ascoli Piceno	71	1,084	1	2,212
Macerata	37	1,222	0	1,263
Pesaro	597	1,281	0	3,122
UMBRIA	1,296	3,581	61	5,601
Perugia	1,296	3,581	61	5,601
LATIUM	2,063	9,709	773	3,267
Roma	2,063	9,709	773	3,267
ABRUZZI	1,092	6,325	7	8,785
Aquila	347	1,612	0	3,305
Campobasso	163	1,713	1	1,200
Chieti	543	1,748	6	2,375
Teramo	39	1,252	0	1,905
CAMPANIA	3,365	30,943	2,394	33,519
Avellino	606	2,140	9	1,502
Benevento	145	1,438	125	959
Caserta	728	4,724	15	5,470
Napoli	1,471	16,751	2,086	18,712
Salerno	415	5,890	159	6,876
APULIA	5,061	17,573	1,706	15,540
Bari	1,912	5,637	354	5,720
Foggia	432	3,302	4	480
Lecce	2,717	8,634	1,348	9,340
BASILICATA	656	2,574	0	1,981
Potenza	656	2,574	0	1,981
CALABRIA	1,015	9,135	1	49,100
Catanzaro	408	3,863	1	19,268
Cosenza	516	2,857	0	8,895
Reggio Calabria	91	2,415	0	20,937
SICILY	36,679	30,900	1,491	13,351
Caltanissetta	15,581	3,037	3	460
Catania	4,036	6,348	629	1,840
Girgenti	11,767	2,942	0	1,631
Messina	913	3,302	1	5,932
Palermo	1,463	6,976	854	1,749
Siracusa	1,912	3,894	2	1,019
Trapani	1,007	4,401	2	720
SARDINIA	15,963	6,463	715	1,877
Cagliari	15,128	4,096	704	1,060
Sassari	835	2,367	11	817
TOTAL	113,278	311,714	21,467	624,807

Source: Ciccarelli and Missiaia (2013).

Table A.24: Industrial labour force in the Italian provinces and regions by sector, 1911 (part B).

	Clothing	Leather	Wood	Metalmaking
PIEDMONT	85,417	33,039	44,781	7,388
Alessandria	20,208	6,814	9,121	286
Cuneo	10,921	5,698	5,135	437
Novara	18,654	7,264	10,336	1,226
Torino	35,634	13,263	20,189	5,439
LIGURIA	24,717	11,629	17,404	9,669
Genova	21,035	9,994	15,708	9,333
Porto Maurizio	3,682	1,635	1,696	336
LOMBARDY	117,321	50,670	85,774	12,713
Bergamo	7,221	3,561	5,586	1,466
Brescia	10,160	5,270	7,143	2,242
Como	12,100	6,319	14,819	1,834
Cremona	8,283	3,710	5,608	92
Mantova	6,768	3,201	4,770	21
Milano	59,127	19,546	39,920	5,641
Pavia	12,320	8,286	6,812	1,388
Sondrio	1,342	777	1,116	29
VENETIA	52,062	24,642	48,382	1,363
Belluno	1,750	1,127	2,860	150
Padova	7,815	4,455	7,238	110
Rovigo	3,600	2,106	3,187	3
Treviso	5,558	2,980	6,346	9
Udine	8,931	2,776	8,124	575
Venezia	7,901	2,816	7,697	102
Verona	6,753	4,600	6,335	145
Vicenza	9,754	3,782	6,595	269
EMILIA	69,337	28,714	32,930	971
Bologna	18,497	6,844	7,380	613
Ferrara	5,629	3,229	4,070	25
Forlì	7,164	3,342	3,039	50
Modena	11,361	3,878	4,806	181
Parma	7,400	3,457	3,467	16
Piacenza	5,070	2,165	2,605	49
Ravenna	7,470	3,162	3,798	3
R. Emilia	6,746	2,637	3,765	34
TUSCANY	124,867	27,139	35,304	6,992
Arezzo	3,857	2,618	2,092	572
Firenze	99,821	11,839	15,506	1,331
Grosseto	517	1,288	1,091	12
Livorno	3,506	1,365	1,768	1,767
Lucca	6,094	2,692	4,783	212
M. Carrara	2,295	1,377	1,496	34
Pisa	6,142	3,369	5,263	3,010
Siena	2,635	2,591	3,305	54

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Table A.24: Industrial labour force in the Italian provinces and regions by sector, 1911 (part B).

	Clothing	Leather	Wood	Metalmaking
MARCHES	24,481	12,976	9,775	236
Ancona	8,037	3,559	3,346	46
Ascoli Piceno	6,700	3,535	1,959	17
Macerata	4,482	3,472	2,318	0
Pesaro	5,262	2,410	2,152	173
UMBRIA	8,379	7,299	5,204	3,730
Perugia	8,379	7,299	5,204	3,730
LATIUM	28,992	13,433	12,302	708
Roma	28,992	13,433	12,302	708
ABRUZZI	19,482	14,136	9,726	348
Aquila	5,548	3,966	2,884	318
Campobasso	4,093	3,447	2,298	14
Chieti	4,820	3,347	2,666	10
Teramo	5,021	3,376	1,878	6
CAMPANIA	67,723	47,702	41,989	5,518
Avellino	6,314	5,105	4,131	18
Benevento	3,270	2,926	1,608	0
Caserta	13,166	10,447	8,253	41
Napoli	36,961	22,302	20,892	5,312
Salerno	8,012	6,922	7,105	147
APULIA	32,117	23,601	22,959	522
Bari	11,878	9,542	10,199	422
Foggia	7,341	4,918	4,080	0
Lecce	12,898	9,141	8,680	100
BASILICATA	4,901	5,924	3,942	3
Potenza	4,901	5,924	3,942	3
CALABRIA	19,603	17,376	14,199	17
Catanzaro	7,610	6,812	4,623	2
Cosenza	5,731	5,339	3,650	4
Reggio Calabria	6,262	5,225	5,926	11
SICILY	36,504	51,877	36,908	751
Caltanissetta	2,621	4,033	1,920	5
Catania	10,229	13,466	9,824	175
Girgenti	3,753	5,262	2,683	14
Messina	4,640	6,348	5,553	53
Palermo	8,446	11,662	7,884	486
Siracusa	3,962	6,388	4,561	1
Trapani	2,853	4,718	4,483	17
SARDINIA	6,460	7,204	8,641	186
Cagliari	4,264	4,288	5,013	185
Sassari	2,196	2,916	3,628	1
TOTAL	722,363	377,361	430,220	51,115

Source: Ciccarelli and Missiaia (2013).

Table A.25: Industrial labour force in the Italian provinces and regions by sector, 1901 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
PIEDMONT	64,676	32,100	7,903	14,513
Alessandria	9,846	9,072	1,027	723
Cuneo	4,202	3,939	547	1,317
Novara	11,097	7,579	435	4,863
Torino	39,531	11,510	5,894	7,610
LIGURIA	42,760	9,039	3,426	4,332
Genova	41,642	8,163	3,270	4,180
Porto Maurizio	1,118	876	156	152
LOMBARDY	110,503	45,682	10,319	26,327
Bergamo	4,728	5,150	418	2,089
Brescia	11,815	4,324	680	1,383
Como	11,429	7,881	690	3,366
Cremona	3,477	3,570	149	693
Mantova	2,825	1,861	106	484
Milano	70,865	17,952	8,091	17,557
Pavia	4,694	4,506	161	681
Sondrio	670	438	24	74
Belluno	1,443	1,198	15	267
Padova	6,310	2,652	508	745
Rovigo	1,749	1,895	145	164
Treviso	4,181	2,474	126	1,065
Udine	6,114	5,197	566	818
Venezia	9,870	6,341	1,310	885
Verona	7,588	2,422	452	967
Vicenza	5,155	3,123	276	2,408
EMILIA	33,569	19,344	4,154	5,382
Ferrara	3,339	2,000	336	357
Forlì	2,816	2,119	575	238
Modena	3,845	2,289	112	849
Parma	3,118	2,223	528	420
Piacenza	2,879	1,927	194	440
Ravenna	2,592	1,715	161	371
R. Emilia	3,881	2,458	199	484
TUSCANY	32,581	32,093	5,238	10,307
Arezzo	2,619	1,524	307	296
Grosseto	877	843	150	108
Livorno	4,569	2,069	893	739
Lucca	3,166	4,493	396	2,419
M. Carrara	1,324	4,599	186	115
Pisa	3,738	5,744	1,041	484
Siena	2,427	2,271	154	620
MARCHES	8,902	7,402	1,158	2,945
Ancona	3,658	2,791	526	1,681

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Table A.25: Industrial labour force in the Italian provinces and regions by sector, 1901 (part C).

	Engineering	Non-metallic mineral products	Chemicals, rubber	Paper, printing
Ascoli Piceno	1,871	1,606	282	258
Macerata	1,741	1,341	52	756
Pesaro	1,632	1,664	298	250
UMBRIA	5,082	3,306	1,599	1,162
Perugia	5,082	3,306	1,599	1,162
LATIUM	16,122	7,588	1,173	8,255
ABRUZZI	8,014	5,975	1,031	854
Aquila	1,960	1,530	452	182
Chieti	2,089	2,045	404	333
Teramo	1,758	1,694	89	221
CAMPANIA	43,489	12,272	5,029	8,239
Avellino	1,909	1,154	328	132
Benevento	1,186	539	180	85
Caserta	3,967	2,958	2,006	3,218
Napoli	32,224	5,415	2,041	4,012
APULIA	17,185	9,022	2,171	1,884
Bari	6,134	5,606	1,413	1,064
Foggia	3,428	1,038	92	312
Lecce	7,623	2,378	666	508
BASILICATA	2,871	1,154	147	109
Potenza	2,871	1,154	147	109
Catanzaro	2,270	1,548	200	323
Cosenza	2,109	1,005	263	131
Reggio Calabria	2,801	2,152	900	116
SICILY	25,478	14,919	5,207	2,544
Catania	6,012	4,272	1,836	801
Girgenti	1,753	1,707	982	95
Palermo	7,419	2,776	720	1,010
Siracusa	2,223	1,372	530	176
Trapani	2,353	1,415	127	147
Cagliari	4,184	1,747	120	315
Sassari	2,303	858	40	98
TOTAL	467,309	232,508	53,476	95,155

Source: Ciccarelli and Missiaia (2013).

Table A.26: Industrial labour force in the Italian provinces and regions by sector, 1901 (part D).

	Sundry manufacturing	Construction	Utilities	Total
PIEDMONT	1,594	78,684	4,441	529,273
Alessandria	67	12,592	611	85,817
Cuneo	14	7,116	564	59,258
Novara	556	22,365	1,433	139,862
Torino	957	36,611	1,833	244,336
LIGURIA	490	31,683	2,498	190,854
Genova	487	27,952	2,323	175,454
Porto Maurizio	3	3,731	175	15,400
LOMBARDY	9,401	122,821	9,627	930,953
Bergamo	2,365	9,597	456	92,431
Brescia	1,648	11,874	912	83,409
Como	1,692	26,055	667	157,878
Cremona	73	8,300	219	51,524
Mantova	307	7,486	196	34,368
Milano	3,251	48,980	6,749	437,836
Pavia	63	8,473	325	63,848
Sondrio	2	2,056	103	9,659
VENETIA	1,340	60,111	2,466	355,584
Belluno	42	4,421	71	16,628
Padova	185	7,845	410	46,483
Rovigo	36	3,624	191	19,712
Treviso	291	6,242	127	41,098
Udine	56	12,885	453	65,798
Venezia	236	9,811	690	57,411
Verona	374	7,904	243	47,636
Vicenza	120	7,379	281	60,818
EMILIA	1,896	72,604	2,110	320,385
Bologna	305	14,522	549	78,568
Ferrara	18	4,937	286	31,984
Forlì	57	11,769	201	35,751
Modena	163	7,734	255	42,287
Parma	36	7,213	335	33,789
Piacenza	1,104	4,185	140	25,803
Ravenna	22	15,306	199	39,502
R. Emilia	191	6,938	145	32,701
TUSCANY	1,136	51,662	2,787	403,189
Arezzo	13	5,429	296	25,098
Firenze	373	21,613	1,041	205,322
Grosseto	50	2,086	49	10,753
Livorno	337	2,889	512	24,985
Lucca	120	6,692	253	41,830
M. Carrara	27	2,460	117	23,387
Pisa	152	7,489	377	50,722
Siena	64	3,004	142	21,092

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Table A.26: Industrial labour force in the Italian provinces and regions by sector, 1901 (part D).

	Sundry manufacturing	Construction	Utilities	Total
MARCHES	414	15,896	804	104,708
Ancona	263	5,113	280	38,129
Ascoli Piceno	19	4,060	228	23,903
Macerata	120	2,798	181	19,783
Pesaro	12	3,925	115	22,893
UMBRIA	30	10,123	269	56,722
Perugia	30	10,123	269	56,722
LATIUM	998	32,968	1,176	139,527
Roma	998	32,968	1,176	139,527
ABRUZZI	201	13,640	521	90,137
Aquila	31	3,945	177	26,257
Campobasso	0	3,870	164	20,080
Chieti	13	3,574	139	24,112
Teramo	157	2,251	41	19,688
CAMPANIA	3,147	58,734	2,438	366,501
Avellino	19	4,088	75	27,530
Benevento	10	2,893	46	15,410
Caserta	56	10,589	353	65,991
Napoli	2,936	31,431	1,719	204,265
Salerno	126	9,733	245	53,305
APULIA	407	39,749	1,347	190,844
Bari	150	20,623	703	81,357
Foggia	21	6,447	277	32,172
Lecce	236	12,679	367	77,315
BASILICATA	22	6,028	77	30,389
Potenza	22	6,028	77	30,389
CALABRIA	141	19,382	330	144,117
Catanzaro	53	5,432	71	52,484
Cosenza	16	6,155	119	36,790
Reggio Calabria	72	7,795	140	54,843
SICILY	384	70,934	1,641	329,568
Caltanissetta	7	4,428	102	35,736
Catania	135	18,444	445	78,492
Girgenti	6	5,867	43	38,505
Messina	33	15,461	168	49,287
Palermo	140	12,011	692	64,288
Siracusa	33	9,866	96	36,035
Trapani	30	4,857	95	27,225
SARDINIA	162	12,541	313	70,190
Cagliari	152	8,478	142	49,876
Sassari	10	4,063	171	20,314
TOTAL	21,763	697,560	32,845	4,252,941

Source: Ciccarelli and Missiaia (2013).

Table A.27: Domestic market potential in the Italian regions, 1871–1911.

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	766	932	1264	1528	2552	120	118	114	113	109
Liguria	768	946	1385	1702	2973	121	119	123	126	127
Lombardy	908	1033	1496	1779	3094	142	130	133	131	132
Veneto	777	893	1274	1570	2716	122	113	114	116	116
Emilia	783	889	1270	1414	2550	123	112	114	104	109
Tuscany	733	863	1197	1340	2365	115	109	106	99	101
Marches	612	774	1115	1374	2343	96	98	99	101	100
Umbria	541	593	811	916	1588	85	75	72	68	68
Latium	560	728	1013	1182	2063	88	92	89	87	88
Abruzzi	509	608	826	951	1634	80	77	74	70	70
Campania	747	915	1298	1574	2712	117	115	116	116	116
Apulia	547	765	1105	1401	2352	86	96	98	103	101
Basilicata	336	536	746	874	1489	53	68	67	64	64
Calabria	512	701	998	1307	2234	80	88	89	96	96
Sicily	641	869	1228	1527	2593	101	110	108	113	111
Sardinia	457	642	952	1247	2139	72	81	85	92	91
Italy	637	793	1124	1355	2337	100	100	100	100	100

Source: our own calculations.

Table A.28: Domestic market potential in the Italian regions, 1871–1911 (straight line distances).

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	61	74	81	95	143	116	123	120	128	121
Liguria	70	78	95	106	177	134	130	138	142	150
Lombardy	78	86	105	121	194	149	144	154	163	164
Veneto	61	62	71	82	131	116	104	105	110	111
Emilia	73	81	97	103	172	140	135	142	138	146
Tuscany	63	71	81	85	139	120	119	118	114	117
Marches	47	53	61	65	102	90	89	90	88	86
Umbria	48	53	59	63	98	92	89	86	84	83
Latium	51	63	71	77	124	99	105	101	104	105
Abruzzi	45	52	56	59	93	87	86	82	80	78
Campania	67	73	82	85	134	129	122	121	114	113
Apulia	38	49	55	59	89	74	82	80	80	75
Basilicata	35	42	46	49	75	68	70	69	66	63
Calabria	31	38	40	43	67	60	64	59	58	57
Sicily	44	55	61	64	98	84	93	87	87	83
Sardinia	22	27	31	34	53	43	45	45	45	45
Italy	52	60	68	74	118	100	100	100	100	100

Source: our own calculations.

Table A.29: Total market potential in the Italian regions (without US correction), 1871–1911.

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	4,095	4,910	7,294	10,922	16,168	112	99	93	90	91
Liguria	4,320	5,845	9,298	14,704	21,421	118	117	119	121	121
Lombardy	3,984	4,876	7,393	10,933	16,411	109	98	95	90	93
Venetia	3,858	5,376	8,606	13,382	19,272	106	108	110	111	109
Emilia	3,412	4,209	6,366	9,249	13,997	93	84	81	76	79
Tuscany	3,567	4,677	7,208	10,831	16,110	98	94	92	89	91
Marches	3,636	5,240	8,424	13,210	18,967	100	105	108	109	107
Umbria	2,922	3,864	5,961	8,896	13,137	80	78	76	74	74
Latium	3,398	4,695	7,317	11,223	16,564	93	94	94	93	94
Abruzzi	2,950	3,980	6,163	9,289	13,639	81	80	79	77	77
Campania	4,016	5,713	9,108	14,372	20,839	110	115	116	119	118
Apulia	3,645	5,336	8,576	13,550	19,463	100	107	110	112	110
Basilicata	2,844	3,985	6,188	9,402	13,818	78	80	79	78	78
Calabria	3,756	5,468	8,761	14,015	20,218	103	110	112	116	114
Sicily	4,153	5,963	9,443	15,190	21,891	114	120	121	126	124
Sardinia	3,841	5,591	8,984	14,478	20,951	105	112	115	120	119
Italy	3,650	4,983	7,818	12,103	17,679	100	100	100	100	100

Source: our own calculations.

Table A.30: Total market potential in the Italian regions, 1871–1911.

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	3,976	4,739	7,020	10,609	15,071	108	93	88	85	86
Liguria	4,322	5,912	9,361	14,902	20,886	118	116	117	119	119
Lombardy	4,010	5,032	7,697	11,533	16,665	109	99	96	92	95
Venetia	3,900	5,506	8,775	13,763	19,136	106	108	110	110	109
Emilia	3,402	4,312	6,589	9,744	14,216	93	84	82	78	81
Tuscany	3,628	4,874	7,523	11,470	16,421	99	95	94	92	93
Marches	3,673	5,363	8,582	13,573	18,790	100	105	107	108	107
Umbria	3,028	4,136	6,408	9,744	13,895	82	81	80	78	79
Latium	3,452	4,877	7,601	11,812	16,775	94	96	95	94	95
Abruzzi	3,048	4,235	6,577	10,086	14,293	83	83	82	81	81
Campania	4,025	5,791	9,188	14,600	20,372	109	113	115	117	116
Apulia	3,673	5,445	8,709	13,869	19,193	100	107	109	111	109
Basilicata	2,934	4,230	6,588	10,177	14,418	80	83	82	81	82
Calabria	3,767	5,548	8,846	14,251	19,767	102	109	111	114	112
Sicily	4,159	6,036	9,515	15,404	21,391	113	118	119	123	122
Sardinia	3,837	5,646	9,027	14,640	20,340	104	111	113	117	116
Italy	3,677	5,105	8,000	12,511	17,602	100	100	100	100	100

Source: our own calculations.

Table A.31: Total market potential in the Italian regions, 1871–1911 (straight line distances).

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	179	199	232	308	414	129	130	129	131	128
Liguria	178	192	234	302	429	128	126	128	128	132
Lombardy	197	213	259	339	473	142	140	143	144	146
Veneto	184	192	231	305	415	133	126	127	130	128
Emilia	174	188	228	289	411	125	124	126	123	127
Tuscany	158	173	205	261	365	114	113	113	111	113
Marches	136	148	178	231	315	98	97	98	98	97
Umbria	132	143	169	219	299	95	94	93	93	92
Latium	131	148	175	224	314	94	97	95	96	97
Abruzzi	125	137	160	208	284	90	90	89	89	88
Campania	138	149	175	217	305	99	98	97	92	94
Apulia	106	122	145	187	254	76	80	79	80	78
Basilicata	103	114	135	176	238	74	75	75	75	73
Calabria	89	101	117	153	209	64	66	65	65	64
Sicily	104	121	140	178	245	75	79	77	76	76
Sardinia	91	100	121	161	218	65	66	67	69	67
Italy	139	152	182	235	324	100	100	100	100	100

Source: our own calculations.

Table A.32: European market potential in the Italian regions, 1871–1911.

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	3,381	3,668	5,265	7,635	10,316	122	107	101	98	101
Liguria	3,310	3,984	6,103	9,316	12,262	119	116	118	120	120
Lombardy	3,191	3,534	5,192	7,372	10,204	115	103	100	95	100
Venetia	2,955	3,702	5,724	8,564	11,159	106	108	110	110	109
Emilia	2,691	3,010	4,422	6,136	8,540	97	88	85	79	83
Tuscany	2,721	3,214	4,780	6,866	9,236	98	94	92	89	90
Marches	2,721	3,546	5,508	8,332	10,744	98	103	106	107	105
Umbria	2,208	2,653	3,976	5,703	7,602	79	77	77	74	74
Latium	2,530	3,181	4,792	7,084	9,404	91	93	92	91	92
Abruzzi	2,210	2,709	4,065	5,899	7,780	80	79	78	76	76
Campania	3,024	3,883	5,964	9,078	11,855	109	113	115	117	116
Apulia	2,705	3,598	5,586	8,536	10,993	97	105	108	110	107
Basilicata	2,080	2,681	4,041	5,929	7,795	75	78	78	76	76
Calabria	2,772	3,650	5,637	8,757	11,300	100	107	109	113	110
Sicily	3,153	4,118	6,274	9,851	12,822	113	120	121	127	125
Sardinia	2,814	3,700	5,739	8,999	11,623	101	108	111	116	114
Italy	2,779	3,427	5,192	7,754	10,227	100	100	100	100	100

Source: our own calculations.

Table A.33: Foreign market potential in the Italian regions, 1871–1911.

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	3,210	3,807	5,756	9,080	12,519	113	97	92	90	92
Liguria	3,351	4,553	7,305	12,114	16,233	118	116	117	120	119
Lombardy	2,900	3,588	5,531	8,669	11,891	102	91	89	86	87
Venetia	2,920	4,200	6,830	11,107	14,741	102	107	109	110	108
Emilia	2,416	3,011	4,649	7,244	9,986	85	77	74	71	73
Tuscany	2,693	3,599	5,656	9,045	12,377	94	92	91	89	90
Marches	2,858	4,177	6,796	11,113	14,768	100	106	109	110	108
Umbria	2,285	3,080	4,848	7,647	10,461	80	79	78	75	76
Latium	2,689	3,737	5,917	9,545	13,032	94	95	95	94	95
Abruzzi	2,337	3,215	5,081	8,049	10,979	82	82	81	79	80
Campania	3,075	4,464	7,219	11,941	15,980	108	114	116	118	117
Apulia	2,922	4,268	6,933	11,383	15,161	103	109	111	112	111
Basilicata	2,395	3,282	5,171	8,217	11,249	84	84	83	81	82
Calabria	3,053	4,435	7,177	11,857	15,854	107	113	115	117	116
Sicily	3,316	4,755	7,616	12,791	17,119	116	121	122	126	125
Sardinia	3,177	4,592	7,404	12,308	16,521	111	117	119	121	121
Italy	2,850	3,923	6,243	10,132	13,679	100	100	100	100	100

Source: our own calculations.

Table A.34: Austria-Hungary and France market potential in the Italian regions, 1871–1911.

	1911 million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	2166	2111	2879	3837	5618	152	133	125	127	124
Liguria	1760	1812	2647	3527	5378	124	114	115	117	118
Lombardy	1925	1914	2713	3419	5297	135	120	118	113	117
Venetia	1560	1732	2557	3381	5062	110	109	111	112	112
Emilia	1568	1592	2259	2725	4301	110	100	98	90	95
Tuscany	1467	1577	2263	2829	4335	103	99	98	94	96
Marches	1318	1566	2324	3105	4598	93	98	101	103	101
Umbria	1135	1254	1803	2280	3422	80	79	78	75	75
Latium	1220	1442	2084	2697	4068	86	91	90	89	90
Abruzzi	1095	1242	1778	2278	3377	77	78	77	75	74
Campania	1493	1742	2552	3384	5091	105	110	111	112	112
Apulia	1267	1568	2329	3158	4649	89	99	101	104	102
Basilicata	934	1180	1710	2221	3266	66	74	74	73	72
Calabria	1256	1526	2249	3112	4605	88	96	98	103	101
Sicily	1393	1700	2488	3347	4989	98	107	108	111	110
Sardinia	1222	1485	2226	3093	4576	86	93	97	102	101
Italy	1424	1590	2304	3025	4540	100	100	100	100	100

Source: our own calculations.

Table A.35: Domestic market potential in the Italian regions, 1871–1911.

	current million lire					Italy=100				
	1871	1881	1891	1901	1911	1871	1881	1891	1901	1911
Piedmont	766	932	1264	1528	2552	120	117	112	112	109
Liguria	768	946	1385	1702	2973	121	119	123	125	127
Lombardy	908	1033	1496	1779	3094	142	130	133	131	132
Venetia	777	893	1274	1570	2716	122	112	113	115	116
Emilia	783	889	1270	1414	2550	123	112	113	104	109
Tuscany	733	863	1197	1340	2365	115	108	106	98	101
Marches	612	774	1115	1374	2343	96	97	99	101	100
Umbria	541	644	889	1011	1754	85	81	79	74	75
Latium	560	728	1013	1182	2063	88	91	90	87	88
Abruzzi	509	608	826	951	1634	80	76	73	70	70
Campania	747	915	1298	1574	2712	117	115	115	116	116
Apulia	547	765	1105	1401	2352	86	96	98	103	100
Basilicata	336	536	746	874	1489	53	67	66	64	63
Calabria	512	701	998	1307	2234	80	88	88	96	95
Sicily	641	869	1228	1527	2593	101	109	109	112	110
Sardinia	457	642	952	1247	2139	72	81	84	92	91
Italy	637	796	1129	1361	2348	100	100	100	100	100

Source: our own calculations.

Table A.36: Arable land in the Italian regions, 1870.

	Arable land 1870
Piedmont	26%
Liguria	24%
Lombardy	40%
Veneto	37%
Emilia	56%
Tuscany	29%
Marches	48%
Umbria	37%
Latium	36%
Abruzzi	46%
Campania	53%
Apulia	33%
Basilicata	36%
Calabria	29%
Sicily	41%
Sardinia	19%

Source: MAIC (1876).

Table A.37: Region characteristics.

	1871	1881	1901	1911	1871	1881	1901	1911
	Water power				Coal price			
Piedmont	2.94	3.20	6.93	16.07	47.40	38.77	42.57	41.96
Liguria	2.23	2.65	3.03	5.83	38.96	30.25	35.65	35.65
Lombardy	2.94	3.08	6.07	16.96	46.80	38.17	42.08	41.51
Venetia	1.93	2.12	2.57	3.95	44.69	33.84	37.77	38.04
Emilia	2.35	2.37	2.43	2.78	54.38	43.82	45.94	45.45
Tuscany	1.04	1.12	1.30	2.07	44.40	35.59	39.93	39.58
Marches	2.26	2.29	2.48	6.94	44.20	33.53	37.58	37.84
Umbria	1.21	1.44	6.38	15.72	45.57	36.53	40.61	40.25
Latium	1.01	1.03	1.61	3.40	43.97	34.92	39.30	39.06
Abruzzi	1.32	1.37	4.29	6.98	69.17	55.40	51.85	51.63
Campania	2.67	2.77	3.61	4.94	51.54	40.95	43.60	43.32
Apulia	0.08	0.08	0.09	0.09	40.74	31.37	36.31	36.39
Basilicata	0.76	0.77	0.79	0.84	50.02	40.05	43.11	42.73
Calabria	0.94	0.94	0.98	1.21	41.45	31.81	36.57	36.69
Sicily	0.49	0.50	0.51	0.64	41.12	31.61	36.45	36.55
Sardinia	0.06	0.06	0.06	0.06	40.79	31.40	36.33	36.41
	Hydroelectric power				Literacy rate			
Piedmont	0.00	0.00	1.00	4.12	58%	66%	80%	88%
Liguria	0.00	0.00	0.78	2.21	44%	54%	71%	82%
Lombardy	0.00	0.00	1.60	5.76	56%	62%	76%	86%
Venetia	0.00	0.00	0.33	1.41	36%	45%	62%	73%
Emilia	0.00	0.00	0.16	0.66	29%	35%	51%	64%
Tuscany	0.00	0.00	0.07	0.45	34%	40%	52%	62%
Marches	0.00	0.00	0.40	1.52	22%	26%	36%	46%
Umbria	0.00	0.00	2.10	6.93	21%	27%	38%	49%
Latium	0.00	0.00	0.71	2.51	35%	43%	55%	66%
Abruzzi	0.00	0.00	0.33	1.63	16%	19%	29%	39%
Campania	0.00	0.00	0.18	0.50	21%	25%	34%	45%
Apulia	0.00	0.00	0.00	0.00	16%	20%	30%	39%
Basilicata	0.00	0.00	0.01	0.04	13%	15%	23%	32%
Calabria	0.00	0.00	0.01	0.10	14%	16%	21%	30%
Sicily	0.00	0.00	0.01	0.14	15%	19%	28%	40%
Sardinia	0.00	0.00	0.00	0.00	18%	21%	31%	40%
	Agricultural employment				Deposits per capita			
Piedmont	72%	68%	63%	57%	4.66	17.49	39.22	99.75
Liguria	61%	54%	44%	36%	6.87	28.46	35.17	45.52
Lombardy	64%	59%	51%	45%	59.93	88.46	166.79	166.83
Venetia	68%	67%	62%	63%	3.63	16.06	47.82	66.23
Emilia	65%	63%	65%	60%	21.05	48.04	84.74	108.83
Tuscany	64%	60%	59%	52%	26.70	38.25	78.65	125.73
Marches	72%	69%	72%	69%	9.07	32.79	49.21	70.89
Umbria	77%	75%	74%	71%	5.64	15.91	28.18	50.39
Latium	64%	58%	54%	46%	29.16	58.22	94.08	100.12
Abruzzi	77%	71%	78%	78%	0.30	2.40	5.59	13.14
Campania	60%	54%	56%	55%	0.08	0.61	2.06	31.19
Apulia	65%	60%	65%	65%	0.17	1.24	3.42	17.65
Basilicata	71%	71%	74%	78%	0.24	1.88	1.41	4.01
Calabria	55%	53%	64%	69%	0.02	0.16	4.75	20.75
Sicily	49%	54%	55%	54%	0.43	5.64	4.61	27.23
Sardinia	69%	64%	63%	60%	0.74	10.37	9.47	4.46

Source: see text.

Table A.38: Industry characteristics.

	Horse power per VA	Hydric power per VA	Horse power per worker	Forward linkages
Mining	114	20	26.00	4.66
Foodstuffs	272	147	106.40	0.48
Tobacco	36	18	4.94	0.00
Textiles	408	233	34.34	1.88
Clothing	11	1	1.85	0.19
Leather	19	7	4.66	0.30
Wood	73	31	13.22	1.41
Metalmaking	931	222	229.12	4.67
Engineering	66	14	18.11	0.48
Non Met. Minerals	175	40	24.84	1.47
Chemicals	334	210	107.50	3.15
Paper	156	128	48.49	0.41
Sundry	42	19	7.32	3.15
Construction	2	1	1.27	0.53
Utilities	4,161	2,996	2,436.40	0.06
	Backward Likages	Mean plant size	Share of witecollar	Agricultural inputs
Mining	0.25	17	3.58%	0.0282
Foodstuffs	4.45	4	2.45%	4.0544
Tobacco	1.57	391	5.69%	1.1786
Textiles	2.50	74	2.81%	1.5678
Clothing	2.06	6	2.81%	0.0165
Leather	0.89	4	1.28%	0
Wood	0.74	4	1.30%	0.1451
Metalmaking	1.64	38	3.64%	0
Engineering	0.72	8	4.07%	0
Non Met. Minerals	0.47	15	2.58%	0
Chemicals	1.67	19	6.70%	0.1429
Paper	0.14	17	4.71%	0
Sundry	2.59	15	3.57%	1.5926
Construction	0.18	19	2.71%	0.0373
Utilities	0.13	16	11.02%	0.0158

Source: see text.

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