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The determinants of Italy's regional imbalances over the long run: exploring the contributions of human and social capital

Abstract

The article aims to present and discuss estimates of levels of human and social capital in Italy's regions over the long term, i.e. roughly from the second half of the nineteenth century up to the present day. A new composite index of human capital for Italy's regions is presented, whose quality and composition change over time, for the period spanning from 1871 to 2001, along with estimates of social capital for the liberal age. The results are linked to newly available evidence for regional value added in order to begin to form an explanatory hypothesis of long-term regional inequality in Italy. More particularly, convergence in value added per capita across Italy's regions is tested (through both cross-section and dynamic panel regressions) in light of the neoclassical exogenous growth approach, which incorporates human capital and social capital as conditioning variables into a long-term production function. On the whole, the results confirm the importance of conditioning variables, i.e. of regional differences in human capital and social capital, but also suggest that their impact significantly changed over the twentieth century, thus supporting the view that, in different periods, conditioning variables are determined by technological regimes. Both for human and social capital, the main regional qualifications are also presented and discussed.

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The usual disclaimers apply.

"There is only one good, knowledge"

Socrates[♣]

1. Introduction

The determinants of regional inequality in Italy have been debated since the late nineteenth century and are still the subject of an ever-expanding literature, one with remarkable international reach, not least due to the enduring persistence of the North-South divide. Thus far, the main questions remain unanswered, partly because the historical estimates of regional GDP and thus the very pattern of regional inequality have long been uncertain. On this last issue, however, some progress has recently been made, and a new article (Felice 2011) presents and discusses consistent historical estimates of value added, as well as of productivity and activity rates for Italy's regions for the first time over the long term, i.e. from the end of the nineteenth century to the present. The new picture challenges the conventional wisdom of a Southern Italy more or less uniformly backward and incapable of evolving: conversely, it is argued that in the decades following Unification (1861) Southern Italy was economically highly diversified;[1] most of the North-South divide emerged as late as the first half of the twentieth century, whereas some convergence took place during the post Second World War economic boom. This uneven historical pattern seems to be the most distinctive feature of Italian regional development, at least in the light of convergence models: convergence across Italy's regions, after beginning around the mid of the twentieth century, came to a halt in recent decades, leaving behind a persistent and well-known economic dualism. Why did this happen, what determined the timing and pace of the pattern? This article is motivated by the search for answers to the above question, being devoted to the analysis of the long-term role of intangible factors of production: estimates of human capital and social capital for Italy's regions over the long run – in benchmark years from 1871 to 2001 – are here presented, and linked to available estimates of regional value added in order to outline the fundamentals of an explanatory model.

In the first instance, the article aims to expand the available information about Italy's regional inequality over the long run by discussing new estimates of human capital and social capital. Sec-

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[♣] From Diogenes Laërtius, *The Lives and Opinions of Eminent Philosophers*, Literally translated by C.D. Yonge, H.G. Bohn, London, 1853, p. 68.

[1] Thus partly confirming the previous (and somehow pioneering) industrial estimates by Fenoaltea (2003). See also Daniele and Malanima (2007, 2011) who have produced yearly 1861–1951 series by juxtaposing the national cycles to the regional benchmarks estimated by Fenolatea (2003) for industry (in 1871, 1881, 1901, and 1911), by Federico (2003) for agriculture (in 1891, 1911, 1938, and 1951), and by Felice (2005a, 2005b) for services (in 1891, 1911, 1938) and for industry (in 1938).

ondly, the article reviews whether and how, at the present stage of the research, available data can be employed in the most conventional econometric models in order to explain the historical pattern of Italy's imbalances: both human capital and social capital are incorporated as conditioning variables in the conventional growth regressions, in cross-section and dynamic panel models, the dependant variable being the growth rate of value added per capita. It is worth anticipating that the results from econometric tests, provisional though they are, suggest that there is not one single explanatory variable over the long run. In the final part of the article, I sketch a basic interpretative hypothesis in order to account for the observed changes in the explanatory variables.

The article proceeds as follows; Section 2 is a précis of the available information about the pattern of regional value added in Italy and goes on to present the fundamentals of the neoclassical growth approach in a simplified version that, at the present stage of research, is suitable for being applied to the Italian case. Section 3 presents new estimates of human capital for Italy's regions in selected benchmark years from 1871 to 2001 and tests them as a conditioning variable in the growth regressions and Section 4 does the same for social capital. Section 5 adds qualifications to the econometric results and puts forward the basic long-term interpretation. Sources and methods employed to arrive at the new estimates are discussed in the Appendix.

2. From unconditional to conditional convergence

In order to illustrate the evolution of Italian economic imbalances over the long run, Table 1 shows estimates of per capita value added in Italy's regions in benchmark years from 1891 to 2001.[2] Unremarkable at first, North-South differences steadily increased over the 1891–1951 period; divergence was slow during the 1891–1911 years,[3] roughly the first age of globalization, but accelerated between 1911 and 1951, i.e. during the two world wars, the fascist dictatorship and the reconstruction following the Second World War. Conversely, the 1951–71 economic "miracle" saw convergence of the South, at quite a speedy rate,[4] but this came to a halt during the 1970s, the dec-

[2] Direct accounting figures are available only from the 1970s onwards, whereas for the previous benchmark years (1891, 1911, 1938 and 1951) regional value added has been reconstructed by allocating the most recent estimates of national value added, at a very high sectoral breakdown, through a number of different sources, mainly regional data on employment, wages, and horsepower. See Felice (2011) for further details.

[3] Although stronger in industry, as confirmed by Ciccarelli et al. (2010) with the avail of time-series evidence on construction movements. For liberal Italy, the benchmarks here presented incorporate all the available 1861–1913 regional time-series by Ciccarelli and Fenoaltea (see Felice 2011, p. 933).

[4] This finding is not new: see Iona, Leonida and Sobbrio (2008).

ade of the stagflation crisis. The *Mezzogiorno* also slightly fell back in the last two decades of the twentieth century.

Table 1. *Per capita value added in Italy's regions, 1891-2001 (Italy=1)*

	1891	1911	1938	1951	1971	1981	2001
Piedmont	1.08	1.15	1.39	1.47	1.21	1.14	1.15
Aosta Valley				1.58	1.35	1.30	1.24
Liguria	1.44	1.54	1.68	1.62	1.16	1.11	1.09
Lombardy	1.15	1.19	1.39	1.53	1.34	1.28	1.30
North-West	*1.16*	*1.22*	*1.43*	*1.52*	*1.28*	*1.22*	*1.24*
Trentino-Alto A.	-	-	0.95	1.06	1.01	1.12	1.29
Veneto	0.80	0.86	0.84	0.98	0.99	1.08	1.13
Friuli	-	-	1.19	1.11	1.00	1.09	1.12
Emilia	1.06	1.08	1.04	1.12	1.14	1.29	1.23
Tuscany	1.03	0.97	1.01	1.05	1.05	1.11	1.09
The Marches	0.88	0.81	0.79	0.86	0.91	1.05	0.99
Umbria	1.02	0.92	0.96	0.90	0.93	0.98	0.96
Latium	1.57	1.49	1.19	1.08	1.07	1.05	1.13
Center/North-East	*1.01*	*1.00*	*0.99*	*1.04*	*1.04*	*1.11*	*1.13*
Abruzzi	0.66	0.68	0.58	0.58	0.80	0.84	0.84
Campania	0.97	0.94	0.82	0.69	0.71	0.67	0.65
Apulia	1.02	0.85	0.72	0.65	0.75	0.72	0.67
Lucania	0.74	0.73	0.57	0.47	0.75	0.68	0.73
Calabria	0.67	0.70	0.49	0.47	0.67	0.65	0.64
Sicily	0.93	0.85	0.72	0.58	0.70	0.71	0.66
Sardinia	0.94	0.92	0.83	0.63	0.85	0.72	0.76
South and islands	*0.88*	*0.84*	*0.70*	*0.61*	*0.73*	*0.70*	*0.68*
Italy (2001 euros)	1,313	2,064	2,596	2,940	10,027	13,199	19,928
Yearly growth rate (%)	-	*2.29*	*0.85*	*0.96*	*6.33*	*2.79*	*2.08*

Note: Based on the regional borders of the time and on current population.

Source: Felice (2011, p. 933).

How does this pattern fit with theoretical models concerning regional convergence? The available information allows us to discuss only the most popular approach, albeit in a simplified version, i.e. the neoclassical model based on a unified long-term production function, characterized (in a closed economy, where savings are equal to gross investments) by diminishing returns to capital. The basic idea behind the well-known Solow–Swan (1956) model is that, given diminishing returns to capital, each addition to the capital stocks generates higher returns when the capital stock is small. Of course, the capital stock determines per capita GDP/income, via productivity. Thus output and income should grow faster in countries or regions with less capital, i.e. with a smaller income. In order to satisfy this condition, however, the model is in need of many collateral qualifications: among the most important is that all economies must have similar technology (considered in a broader sense to include taxation, property rights and other institutional factors) as well as similar

savings and population growth rates. Although these qualifications are less improbable in interregional comparisons – within a national state, where exogenous factors are more likely to be common – neoclassical models have been more frequently used to test convergence across national states, due to the availability of data and maybe also to the particular relevance of the subject. Assuming a Cobb-Douglas form of the production function, following Barro (1991), cross-country or cross-region growth regressions may be expressed as

$$\gamma_i=\beta\log y_{i,0} + \psi X_i + \pi Z_i + \varepsilon_i \quad (1)$$

Where γ_i is the growth rate of a i country/region, $y_{i,0}$ is its initial level of per capita GDP or value added (income), X_i represents other growth determinants suggested by the Solow model apart from the initial level of income, while πZ_i represents those determinants which are not accounted for by the Solow model.

We have unconditional β-convergence when

$$\gamma_i=\beta\log y_{i,0} + \varepsilon_i \quad (2)$$

with the negative sign of the coefficient β.

Data from Table 1 allow us to test unconditional b-convergence for the Italian regions, and the results are given in Table 2, both in cross-section and two panel models. Cross-section regressions indicate that the 1951–71 period is the only one when unconditional convergence took place. However, it is worth cautioning that in cross-section models the choice of time periods may heavily affect the results. If we had taken the 1951–2001 interval, for example, we would have found convergence, ignoring the divergence of the last three decades. Conversely, if we had considered the entire 1891–1971 period we would have found divergence, regardless of the 1951–71 convergence. If we had split the twentieth century into two halves (1901–51 and 1951–2001), we would have found the inverted U-shaped (*à la* Kuznets) figure proposed by a pioneering work by Jeffrey Williamson (1965): rising divergence at the early stages of industrialization, then (weak) convergence once industrialization begins to spread; yet this choice would have omitted an important part of the story, leading us to erratic conclusions.

In order to analyse convergence over the long term, panel models are more reliable. In Table 2, the random-effects model assumes that the omitted unknown variables – from equation (1) – randomly distribute, whereas the fixed-effects model assumes that they differ on a case by case basis but are constant over time. In other words, the random effects estimator adds the cross sectional

variation (between) to the time series variation (within) in the panel: by comparing the two estimators, as we do here and in the following sections, we have information about the importance of cross sectional variation, which may be significant after the time series variation is controlled for, if the random effects estimator is preferable to the fixed effect one. This is never the case, as we are going to see.

In the random model we have no convergence (after adding the robust option, i.e. after heteroskedasticity is allowed for), whereas according to the fixed-effects model some convergence indeed took place. The usual way of choosing between random and fixed-effects models is the Hausman test, which evaluates the null hypothesis that there is no correlation between individual effects and explanatory variables – in this case, both the random effects and the fixed effects estimators are consistent, but the former is efficient, while that of the latter is not. Under the alternative hypothesis, individual effects are correlated with the explanatory variables – thus the random effects estimator is inconsistent, while the fixed effects estimator is consistent and efficient. According to the Hausman test, the fixed-effects model is preferable.[5] In this model, the omitted variables (constant terms) of the Southern regions are negative and significant (for the regional constants, see Table 7 in Section 5), which implies an important qualification: the difference between the random and the fixed-effects model is due to the fact that a persistent and negative (and thus far unknown) condition prevented the Southern regions from growing faster.

Table 2. *Unconditional convergence of the Italian regions, 1891–2001*

	Cross-section linear regressions						Panel linear regressions (robust)			
	1891-1911	1911-1938	1938-1951	1951-1971	1971-1981	1981-2001	Rand.-eff. GLS	Fixed-eff. (within)	Rand.-eff. GLS	Fixed-eff. (within)
Constant	0.026	-0.074	-0.061	0.131	-0.016	0.010	0.0048	0.0215	0.0301	0.0416
Standard error	0.021	0.035*	0.050	0.008***	0.066	0.019	0.0036	0.0055***	0.0102***	0.0140***
VA	-0.001	0.010	0.009	-0.011	0.004	0.001	-0.0054	-0.0226	-0.0018	-0.0154
VA standard error	0.003	0.005**	0.006	0.001***	0.007	0.002	0.0033	0.0056***	0.0031	0.0041***
n									-0.0290	-0.0273
n standard error									0.0104***	0.0120**
R^2	0.011	0.264	0.101	0.892	0.022	0.009	0.026	0.026	0.155	0.094
N	16	16	18	19	19	19	107	107	107	107
F value	0.16	5.02*	1.79	131.5***	0.38	0.16	2.64 (1)	17.76***	8.99** (1)	7.27***

Notes: Dependent variable: Ln value added per capita growth rates by sub-period ($t_1 - t_0$). Independent variable: Ln value added per capita in t_0 (VA), population growth by sub-period (n). Here, as in the following regressions, to avoid non-stationarity problems all the variables are expressed relatively to the Italian average – i.e. to the mean weighted with the size (population) of each observation (region). The results of the model including population growth are displayed in the last two columns on the right. (1) Wald Chi2.

* Significant at the 0.1 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Source: Elaborations from Tables 1 and A.3.

[5] The test statistic (12.75) is higher than a Chi-squared at the 0.01 level of confidence (1df, 1% = 6.63), and Prob>Chi-squared is 0.0004. For the model including population growth, the level of confidence is only 0.05 (test statistic 8.99 and Prob>Chi-squared 0.0112; Chi-squared 2 df, 5% = 5.99; Chi-squared 2 df, 1% = 9.21).

These results beg for tests of conditional convergence. In econometric terms, conditional convergence takes place when, after adding other variables to (2), the β coefficient becomes negative (Barro and Sala-i-Martin 1991, 1992). In economic terms, the basic idea behind conditional convergence is that GDP differences are not permanent only due to cross-country (or cross regional) structural heterogeneity: that is, because the model does not satisfy collateral qualifications. This can be due, among other factors, to the presence of different resource endowments, institutions and migration rates, as well as to human and social capital differences. In the growth regressions, each one of these factors can be a "conditioning" variable, coming either from within the Solow model variable group X_i (i.e. human capital, institutions or social capital, if technology is considered in a broad sense) or from outside the Solow model, from the Z_i variable group (perhaps think of climate, but usually variables of this kind are much less common in the literature, whilst spanning a wide range of categories). The multiplicity of possible regressors is indeed a serious problem: conditioning variables which can be run in the model are practically countless. By 2005, Durlauf, Johnson and Temple (Durlauf et al. 2005) classified about 150 independent variables used in growth regressions (in almost 300 articles), plus about one hundred instrumental variables. In short, the number of possible regressors exceeds the number of cases, thus "rendering the all-inclusive regression computationally impossible" (Sala-i-Martin et al. 2004, p. 814): this is true even in cross-country comparisons, not to mention cross-regional ones where the number of cases is usually lower. The Bayesian models, which attach probabilities to each regressor, can provide an econometric solution to the multiplicity problem.[6] An alternative strategy is to look at the historical and institutional specificity of each country or region, in order to sift among the possible regressors with the benefit of case studies and qualitative research.

In our case, the number of regions is too few to profitably employ Bayesian techniques, even in panel data. Furthermore, these techniques would require many more explanatory variables, and thus much more information than that which historical research can reasonably provide us. For this reason, as anticipated, we have focused on two predictors: human capital and social capital. They are not the only ones that could have played a role: among the other determinants, most notoriously these could have included questions of geographical position or natural resources (e.g. Cafagna 1965, 1989). And yet human and social capital, also defined as the intangible factors of production, have been preferred for three reasons that lie behind formal modelling. Firstly, they are more closely linked to the "human" element (knowledge, ethics and value, policy), and thus pregnant

[6] Among these models, the Bayesian Averaging of Classical Estimates (BACE), which makes use of the classical ordinary least-squares (OLS) estimation, is probably the most appealing and popular technique (see Sala-i-Martin et al. 2004).

with implications for a policy maker and perhaps more challenging for historians and economists. Secondly, at first glance they seem more appropriate when accounting for the South's disappointing performance in recent decades – the big discrepancy over the long run – when economic characteristics such as natural resources and geographical position were less significant than in the past. Last but not least, human and social capital are probably the most popular predictors of economic growth in the literature, both in comparative economic history and in growth economics: a profitable example (one of many) could be the quoted article by Sala-i-Martin et al. (2004), which employs BACE techniques to allow for the multiplicity of regressors and finds primary school enrolment as the most significant explanatory variable, after the East Asian dummy.

In order to implement human and social capital factors into the growth regressions, we have to assume an augmented Solow model, following the approach originally proposed by Mankiw, Romer and Weil (1992), who first included human capital as a predictor of output together with labour and physical capital. As mentioned, unconditional convergence posits the hypothesis that technology, saving rates and population growth are equal across regions and in each benchmark year, and that the other determinants not accounted for by the Solow model are uninfluential. Given the lack of unconditional convergence – or the presence of a persistent negative variable in the South, which by itself begs for conditional tests – we relax one of these hypotheses, that of a similar technology, and consider technology in a broader sense in order to include human capital and/or social capital as well. We also include regional differences in population growth, a variable which incorporates differences in both fertility and migration (see the Appendix for further details), and which has been run in the unconditional model as from the last two columns of Table 2: although the variable is negative and significant, i.e. regions with higher population growth experienced a relatively minor growth in per capita value added, its inclusion does not change the coefficients of the other predictor, value added per capita.

We still maintain, however, that savings and/or physical capital investment rates (in the Solow model savings are a proxy of gross investments) are equal across regions, as well as that the other determinants external to the Solow model are uninfluential. The reason is the lack of data. For what concerns saving rates, for example, neither historical official sources (*Annuario statistico italiano*), nor more recent historical research (Cotula et al. 1996) report comprehensive regional figures of savings rates; at the very best, regional savings in specific institutions (*Banche popolari, Casse di risparmio*) can be found, but these are characterized by a strong regional specialization and, therefore, the use of a *pars pro toto* would risk severely distorting the results. Admittedly, the omission of physical capital investment rates is potentially even more problematic: arguably, the strong performance of southern regions during the 1951–71 period was due precisely to investment in physi-

cal capital there, as the government built infrastructure and large private and state-owned firms built factories. It goes without saying that further historical research could lead us to better knowledge of these variables which are temporally set aside, whereas in the meantime the present tests may, *inter alias*, offer some hints at the importance of these topics.

3. Human capital

A few years following the formalization of the Solow-Swan model, human capital was brought to the core of macroeconomic theory by Theodore Schultz, who proposed to treat education as an investment in human being and thus to refer to it as human capital, under the hypothesis that "some important increases in national income are a consequence of additions to the stock of this form of capital" (Schultz 1960, p. 571; 1961). Soon after, a collection of influential papers was published in a special issue of the Journal of Political Economy (October, 1962), with the indicative title "Investment in human beings", which was followed by the seminal book of Gary Becker (1964), he himself one of the contributors to the special issue (Becker 1962). These works paved the way for the formal modelling of the new growth economists (Romer 1986; Lucas 1988; then Ram 1990, 1991, who first used conditional convergence). Economic historians too have often regarded human capital as one of the preconditions for economic growth (e.g. Cipolla 1969, Easterlin 1981, Nuñez 1990; Crafts 1996 for a more critical appraisal). In a historical perspective, the link between education and growth is still a subject of the utmost interest, as proved among the others by recent works on the economic rise of United States (Goldin and Katz 2008) and Germany (Becker and Woessmann 2009; Becker, Hornung and Woessmann 2011), the two best-performing countries of the second industrial revolution. In this regard Italy too can be a profitable field of analysis due to its remarkable regional disparities in education at the time of Unification.

We employ three different measures of human capital, all consistent with the education-based approach:[7] 1) literacy; 2) gross enrolment rates; 3) a composite index, made up of literacy and enrolment rate, whose weighting changes according to the historical periods to allow for the shift in importance from primary education, in the nineteenth century, to secondary and higher education, during the twentieth century. The first two are the most widely accepted measures of human capital

[7] As shown by Prados de La Escosura and Rosés (2010) with reference to Spain, the alternative income-based approach can be preferable, especially for the last decades. Concerning the Italian regions, however, we lack data for computing human capital through the skill premium. Not least because of the availability of sources, historical estimates following the education-based approach are by far the most internationally used: for a recent application, a part from the cited references about Germany and US, see Ljungberg and Nilsson (2009) for Sweden.

– together with average years of schooling, a stock measure whose use is often seriously limited by lack of historical data.[8] To cite an instance, the recent article by Becker, Hornung and Woessmann (2011) uses as a proxy of human capital either average years of schooling in 1849 or literacy rates in 1871, both of them in turn instrumented through school enrolment rates in 1816. Over the long term, however, the characteristics of human capital as a factor of production presumably changed, as the technological and economic characteristics of production changed too. As stressed by Sianesi and Reenen in their widespread survey of the human capital indicator in growth accounting, "the impact of increases in various levels of education appears to greatly depend on the level of a country's development" (2003, p. 159).[9] This long-run change is now (more or less explicitly) acknowledged by a growing empirical literature. For example, in their book about US Goldin and Katz (2008) shifts focus from primary schools in the nineteenth century to secondary schools in the twentieth one, and the net secondary school enrolment rate.

As the present article is concerned with the long run, I've constructed a third indicator made up of different components and variable weights, in an attempt to maintain the predictive value of the proxy from the end of the nineteenth century up to our days. More in particular, in each benchmark to literacy is assigned a weight which is directly proportional to the national share of illiterate people (i.e., one minus the literacy rate). The remaining share is given to the enrolment ratio, which in turn is decomposed into three components: primary and secondary enrolment rate (the number of students registered, expressed as a percentage of the population included in the age brackets relative to the levels of primary and secondary education, from age 6 to 14), tertiary education enrolment rate (from age 14 to 19), higher education enrolment rate (from age 19 to 24), with weights directly proportional to their respective Italy's enrolment rates. In each benchmark, therefore, the regional index of human capital over the Italian average is given by the equation:

[8] In principle at least, our human capital indicator should be a measure of "flow", not of "stock". The choice in favour of a flow measure is a matter of necessity (the availability of sources), but above all of opportunity: flow measures are well suited to convergence models and are used for example by Mankiw, Romer and Weil (1992). For an excellent survey on the debate about the human capital indicator in growth studies, see Sianesi and Reenen (2003, pp. 167–9 and 177–80). Although there are some reasons to believe that stock measures can also be suitable for being computed in growth accounting (Schulze and Fernandes 2009), these are more difficult to implement from a historical perspective and, in the case of Italy, cannot be reconstructed for the years previous 1951, at least not according to the attainment census method (Felice 2007a); for a review of the approaches to estimating average years of schooling, see Wößmann (2003). Neither the available sources allow for alternative weighting schemes, based on earnings or occupational wage data (cfr. Psacharopoulos 1994; Psacharopoulos and Patrinos 2002).

[9] When dealing with education capabilities in advanced countries, the shift from compulsory to tertiary and higher education is also recommended by most of the literature on development economics (e.g. Costantini and Monni, 2005, with an application to the European regions). Of course, this shift does not rule out the possibility of decreasing returns to human capital in any (or some) specific period (Bils and Klenow 2000).

$$HC_{i/It=1} = (1 - Lit_{It}) \times Lit_{i/It=1} + Lit_{It} \times [GER1_{It} / (GER1_{It} + GER2_{It} + GER3_{It}) \times GER1_{i/It=1} + GER2_{It} / (GER1_{It} + GER2_{It} + GER3_{It}) \times GER2_{i/It=1} + GER3_{It} / (GER1_{It} + GER2_{It} + GER3_{It}) \times GER3_{i/It=1}] \quad (3)$$

where HC is human capital, Lit is Literacy, GER1, GER2, and GER3 are primary and secondary enrolment rate, tertiary education enrolment rate, and higher education enrolment rate respectively; the subscript *It* stands for the Italian average and the subscript *i/It=1* for the regional datum divided by the national average (on Italy = 1). This (admittedly straightforward) method results into a composite and dynamic index of regional differences in human capital, which in my view has the advantage of keeping arbitrariness at a minimum: the shift in importance from illiteracy to the enrolment rate, as well as within the enrolment rate from primary to advanced education, is measured through the relative diffusion of the pertinent indicator. That is, as long as most of the population becomes literate, differences in the share of illiterate people grow less and less important; on the other hand, regional differences in higher education become more and more important as long as higher education spreads throughout the population.[10]

Although I strive to use an "objective" criterion, I am aware the resulting human capital indicator may still be questionable, perhaps precisely because of its automatism. I believe, however, that any alternative composite indicator with varying weights can hardly escape criticism, essentially due to the enduring lack of agreement on two basic premises: which (and how much exactly) different types of education matter according to economic stages, and a precise definition of the different stages of Italy's development over the long run.[11] To settle these questions would be a task far beyond the scope of this article. As mentioned, my approach is rather to present the composite indicator together with the two simple/unvarying (and thus less arbitrary) measures, literacy and enrolment rates. As we are going to see, the results point towards a strong concordance across the various measures, and thus support the argument that the choice of a different proxy does not invalidate the main results of the article.

Table 3 displays estimates of the composite indicator, whereas for literacy and the enrolment rate reference must be done to Table A.1 in the Appendix. As can be seen, soon after Unification regional differences in human capital were remarkably high, much more so than those in value added. Convergence in human capital was relatively slow in the first decades of post-Unification Italy and increased after 1911, i.e. once a new national law (*Daneo-Credaro*) was issued, more effec-

[10] For further details about the separate components and for a brief discussion of the results, see the Appendix.

[11] For the latest analysis of the Italian economic growth over the long-run, which also presents the most updated Gdp series, see Brunetti, Felice and Vecchi (2011).

tive in enforcing compulsory education than previous ones (*Casati* in 1859, *Coppino* in 1877), and was later followed by other measures which further increased centralization.[12] During the rest of the twentieth century the regional gap in human capital was (almost) entirely bridged. However, here too the Southern regions fell back slightly in the last three decades of the previous century, after having successfully converged in the 1950s and 1960s.

Table 3. *Regional inequality in human capital, 1871-2001 (Italy=1)*

	1871	1891	1911	1938	1951	1971	1981	2001
Piedmont	1.848	1.650	1.338	1.115	1.078	0.990	0.998	0.969
Aosta Valley	-	-	-	-	1.148	0.931	0.942	0.887
Liguria	1.377	1.368	1.320	1.187	1.144	1.060	1.092	1.033
Lombardy	1.735	1.510	1.287	1.111	1.067	0.965	0.986	0.970
North-West	*1.739*	*1.548*	*1.309*	*1.122*	*1.080*	*0.982*	*1.000*	*0.975*
Trentino-Alto Ad.	-	-	-	1.257	1.168	0.966	0.912	0.870
Veneto	1.161	1.218	1.137	1.068	1.034	0.970	0.978	0.963
Friuli	-	-	-	1.209	0.954	1.030	1.020	1.066
Emilia	0.898	1.028	1.168	1.081	1.058	1.057	1.061	1.090
Tuscany	0.989	0.909	0.990	1.099	1.017	1.046	1.069	1.065
The Marches	0.683	0.747	0.867	0.972	0.995	1.039	1.038	1.079
Umbria	0.638	0.794	0.887	0.992	1.005	1.106	1.095	1.090
Latium	0.911	1.116	1.117	1.062	1.088	1.055	1.106	1.106
Center/North-East	*0.958*	*1.024*	*1.069*	*1.072*	*1.037*	*1.030*	*1.045*	*1.051*
Abruzzi	0.542	0.624	0.753	0.945	1.023	1.062	1.014	1.048
Campania	0.667	0.727	0.743	0.888	0.941	0.975	0.971	0.969
Apulia	0.494	0.589	0.701	0.799	0.867	0.949	0.928	0.950
Lucania	0.409	0.519	0.601	0.770	0.866	1.009	0.927	0.955
Calabria	0.427	0.454	0.540	0.761	0.909	0.980	0.920	0.957
Sicily	0.467	0.579	0.766	0.855	0.912	0.984	0.974	0.972
Sardinia	0.518	0.644	0.752	0.946	0.980	1.033	0.994	1.011
South and islands	*0.527*	*0.610*	*0.717*	*0.854*	*0.924*	*0.985*	*0.961*	*0.973*

Sources and notes: See the text and the Appendix.

The changes in the correlation between human capital and per capita value added are illustrated by a series of scatter-dot graphs, as in Figure 1. The slope of the fit line and the value of R^2 increased until 1951, indicating growing correlation. The value of R^2 decreased during the economic miracle, but was on the rise again in the 1970s, although remaining well below its 1951 level. Figure 1 also illustrates that the formation of the three macro-areas (North-West, Center/North-East and the *Mezzogiorno*) took place in both per capita value added and human capital. Around 1891, in fact, many Central regions were closer to the South than to the North-West, whereas by 1951 the three macro-areas had become more clearly evident. After two decades (1951–71) of convergence, which was more pronounced for human capital than for value added, during the 1970s the picture

[12] For a critical assessment of the early legislation about compulsory education, see Vasta (1996; 1999, pp. 220–2), Felice (2007b, pp. 155–7), and A'Hearn et al. (2011, pp. 163–9).

changed again, so much so that by 1981 the macro-areas had reduced to just two; the Center/North-East having caught-up with the North-West, the South (with the exception of the Abruzzi) having fallen behind.

Finally, Figure 1 also indicates those regions (those above the linear fit line) that scored a level of value added per capita higher than what expected from their level of human capital (given the observed linear correlation between human capital and value added across Italy's regions), and those on the contrary (below the fit line) which had a lower level of value added than what expected from their level of human capital (under the same hypothesis); and how these positions changed over more than a century. For example, Veneto passed from the second group (in the liberal age) to the first: at the end of the nineteenth century it was a poor region with a relatively high level of human capital; in the second half of the twentieth century, a rich region with relatively low education levels. Significantly, during the liberal age Southern Italy was around the fit line, whereas from 1951 onwards lay permanently below it: in the second half of the twentieth century, the *Mezzogiorno* had become an area with value added levels lower than expected, given its level of human capital (or vice versa: an area with higher than expected human capital, given its value added). To sum up, descriptive statistics indicate that the correlation between human capital and per capita value added was higher in the first half of the twentieth century; since in the second half of the century the correlation sharply declined, from descriptive statistics it can also be inferred that, in recent decades, the disappointing economic performance of Southern Italy can hardly be accounted for solely by differences in human capital.

Econometric tests and formal modelling can be useful to qualify what descriptive statistics may only suggest. As mentioned, the contribution of human capital to value added convergence can be tested via the model of conditional regression where human capital is the conditioning variable, as in equation (1) in Section 2. In Table 4, the results of conditional convergence tests are presented in the cross-section and panel regressions – in these latter, in order to control for endogeneity (i.e. for the reverse causation: income may impact upon education) human capital (either the composite indicator, enrolment rate, or literacy) has been instrumented by its lag.

To be correctly understood, the results from Table 4 should be considered alongside those from Table 2. Cross-section regressions indicate that human capital was significant from 1891 to 1951: the coefficient of per capita value added (the first independent variable) takes a negative sign and in the first sub-period becomes significant, whereas the coefficient of human capital is positive and significant too; thus we have convergence, but conditional on human capital. As expected, human capital is insignificant in the 1951–71 years of convergence when there are no changes in the coef-

ficient of per capita value added, as well as in the last three decades.[13] In short, human capital may have played some role during the liberal age and the first half of the twentieth century, and hardly at all in the second half.

Table 4. *Conditional convergence of the Italian regions (1891-2001): adding human capital*

	Cross-section linear regressions						Panel linear regressions (robust)			
	1891-1911	1911-1938	1938-1951	1951-1971	1971-1981	1981-2001	Rand.-eff. GLS	Fixed-eff. (within)	Rand.-eff. GLS	Fixed-eff. (within)
Constant	0.065	0.045	0.042	0.133	-0.048	0.010	-0.0065	0.0140	0.0179	0.0317
Standard error	0.017***	0.037	0.058	0.008***	0.074	0.019	0.0034*	0.0087	0.0107*	0.0147**
VA	-0.007	-0.008	-0.012	-0.012	0.004	0.002	-0.0091	-0.0208	-0.0056	-0.0111
VA standard error	0.003**	0.005	0.009	0.002***	0.007	0.002	0.0031***	0.0056***	0.0029*	0.0043**
HC	0.007	0.021	0.055	0.006	0.034	-0.007	0.0153	0.0058	0.0148	0.0103
HC standard error	0.002***	0.005***	0.021**	0.007	0.033	0.009	0.0030***	0.0041	0.0029***	0.0041**
n									-0.0277	-0.0318
n standard error									0.0098***	0.0132**
R^2	0.557	0.684	0.388	0.896	0.080	0.047	0.140	0.049	0.262	0.209
N	16	16	18	19	19	19	107	107	107	107
F value	8.19***	14.04***	4.75**	64.84***	0.69	0.39	26.88***(1)	20.18***	31.46***(1)	14.03***
Constant	0.061	0.010	-0.024	0.132	-0.008	0.013	-0.0118	0.0082	0.0128	0.0251
Standard error	0.017***	0.036	0.053	0.009***	0.100*	0.019	0.0039***	0.0087	0.0092	0.0137*
VA	-0.007	-0.003	0.000	-0.011	0.004	0.001	-0.0078	-0.0191	-0.0043	-0.0083
VA standard error	0.002**	0.005	0.008	0.001***	0.009	0.002	0.0030**	0.0054***	0.0028	0.0044*
GER	0.008	0.018	0.028	-0.002	-0.003	-0.007	0.0193	0.0101	0.0189	0.0161
GER standard error	0.002***	0.005***	0.018	0.006	0.024	0.007	0.0037***	0.0054	0.0038***	0.0055***
n									-0.0279	-0.0336
n standard error									0.0094***	0.0127**
R^2	0.570	0.613	0.228	0.892	0.022	0.065	0.159	0.068	0.283	0.256
N	16	16	18	19	19	19	107	107	107	107
F value	8.62**	10.28**	2.22	62.11***	0.183	0.556	27.13***(1)	15.41***	32.10***(1)	10.20***
Constant	0.066	0.034	0.125	0.143	0.149	0.013	-0.0045	0.0138	0.0196	0.0316
Standard error	0.018***	0.036	0.044**	0.014***	0.076*	0.019	0.0033	0.0093	0.0096**	0.0150**
VA	-0.007	-0.006	-0.026	-0.014	-0.034	-0.004	-0.0108	-0.0207	-0.0052	-0.0108
VA standard error	0.003**	0.005	0.007***	0.003***	0.014**	0.005	0.0032***	0.0057***	0.0029*	0.0043**
LIT	0.006	0.016	0.085	0.011	0.190	0.040	0.0151	0.0061	0.0144	0.0108
LIT standard error	0.001***	0.004***	0.015**	0.010	0.061***	0.044	0.0029***	0.0046	0.0028***	0.0044**
n									-0.0272	-0.0323
n standard error									0.0100***	0.0136**
R^2	0.543	0.680	0.714	0.899	0.391	0.058	0.157	0.056	0.276	0.238
N	16	16	18	19	19	19	107	107	107	107
F value	7.72***	13.82***	18.76***	66.99***	5.14**	0.49	28.61***(1)	24.02***	31.25***(1)	15.13***

Notes: Dependent variable: Ln value added per capita growth rates by sub-period ($t_1 - t_0$). Independent variable: Ln value added per capita in t_0 (VA), human capital relative to the Italian average (HC), population growth rates by sub-period (n), gross enrolment ratio relative to the Italian average (GER), literacy relative to the Italian average (LIT). In the panel regressions, human capital, gross enrolment ratio, and literacy are instrumented through their respective lags (the level of HC/GER/LIT in the previous period). The results of the model including population growth are displayed in the last two columns on the right. (1) Wald Chi2.

* Significant at the 0.1 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Source: Elaborations from Tables 1, 3 and A.3.

What about the entire period? In this case, the contribution of human capital has been tested through the use of two panels, with and without population growth, in both the random-effects and the fixed-effects model. Concerning the results when omitting population growth, these differ sig-

[13] Zamagni (1993) found evidence of a positive role for human capital in the 1951-1987 years, but the different results may be explained by the choice of a greater time interval and the use of different (and now outdated) GDP estimates for 1951.

nificantly when passing from the random effects to the fixed-effects model; in the first case, human capital is a significant conditioning variable, positively correlated with economic growth and therefore determining (conditional) convergence in per capita value added; conversely, the fixed-effects model suggests that human capital is just a redundant variable after the fixed effects. The Hausman test indicates that the null hypothesis must be rejected at the 0.01 level of confidence,[14] and thus the fixed-effects model is preferable: in the long-run, human capital is just a redundant conditioning variable. Above all, when population growth is also considered, human capital becomes a significant conditioning variable in the fixed-effects model as well. Is it that the fixed effect can be, after all, population growth? It does not seem so. In fact, in the panels that include population growth, after the application of the Hausman test, the fixed model is no longer preferable since the null hypothesis must be rejected at the 0.1 level of confidence;[15] in the random-effects model, some convergence remains, but at the cost of lowering significance. We may conclude that human capital did indeed play some role, albeit a weak one, too much so in order to significantly affect the results of the panel models when passing from unconditional to conditional convergence.

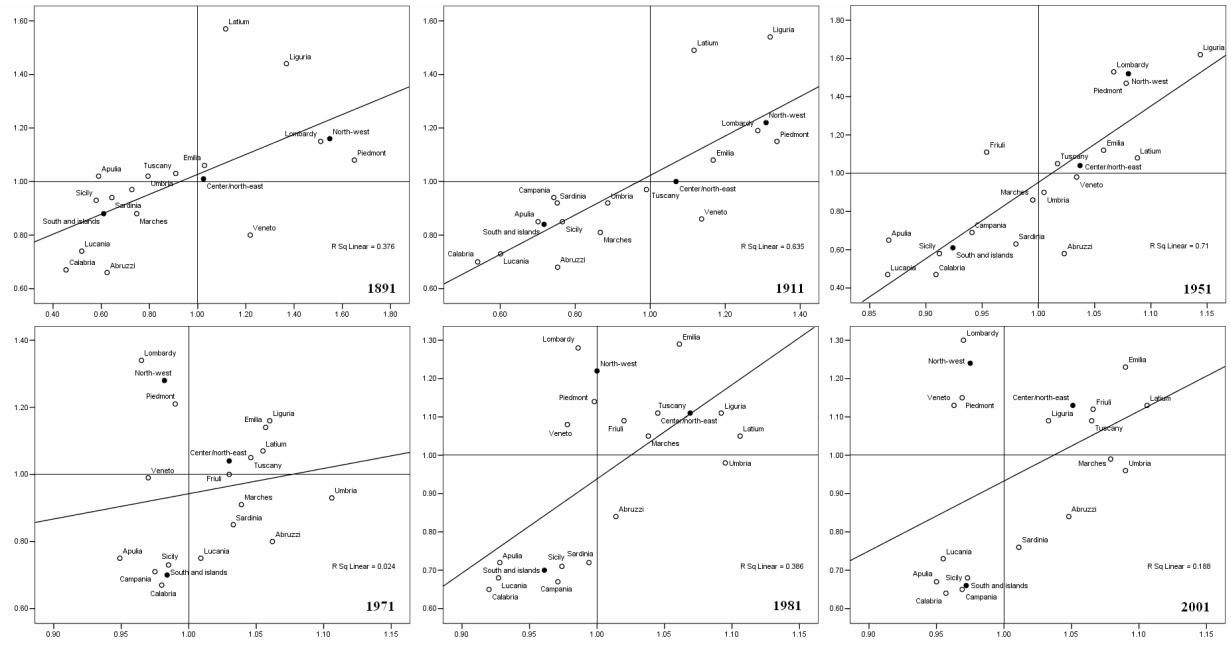
If we run the enrolment ratio or literacy as conditioning variables, instead of the composite indicator, we get by and large the same results. There are indeed some small differences: in the cross-section linear regressions, the lack of significance of the gross enrolment ratio in the 1938–51 years and, by contrast, the enduring significance of literacy up to the 1970s. Over the long run (panel regressions), the gross enrolment ratio seems to work a bit better than the composite indicator, since in the model without population growth its sign and significance slightly increase; this is confirmed by the Hausman tests,[16] but the improvement is by far too small in order to change the overall picture.

[14] The test statistic (9.96) is above the Chi-squared (2df, 1% = 9.21), and Prob>Chi-squared is 0.007. However, it is worth noting that after including human capital the choice in favour of the fixed-effects model is a bit less indisputable than in the case of unconditional convergence.

[15] The test statistic (7.03) is below the Chi-squared (3df, 5% = 7.82), and Prob>Chi-squared is 0.0709.

[16] In the models without population growth, when running the gross enrolment ratio the fixed-effects model is preferable at a lower level of confidence (0.05 instead of 0.01): the test statistic (6.23) is in between the two Chi-squared (2df, 5% = 5.99; 2df, 1% = 9.21) and Prob>Chi-squared is 0.0444. The same can be said for the model including literacy: the test statistic (6.76) is in between the two Chi-squared (2df, 5% = 5.99; 2df, 1% = 9.21) and Prob>Chi-squared is 0.0341. In all the models with population growth, the random-effects model results preferable at a level of confidence even higher than is the case with the composite indicator: for the gross enrolment ratio, the test statistic (4.84) is below the Chi-squared (3df, 5% = 7.82; 3df, 1% = 6.25), and Prob>Chi-squared is 0.1839; for literacy, the test statistic is 4.82 and Prob>Chi-squared is 0.1855.

Figure 1. *Human capital and per capita value added in Italy's regions, 1891–2001*



Notes: Per capita value added (y-axis) and human capital (x-axis) are expressed as a ratio to the Italian average. Elaborations from Tables 1 and 3.

4. Social capital

Social capital is still an elusive concept since it was introduced and gained momentum between the end of the 1970s and throughout the 1980s (Coleman 1988),[17] possibly an even more elusive and problematic one than human capital. The well-known definition by Putnam (1993, p. 167) which was proposed and empirically tested on the Italian regions,[18] refers to it as "features of social organization, such as trust, norms and networks that can improve the efficiency of society": it is a combination of formal and informal rules which are related to institutional performance, another recently successful explanatory variable of long term economic performance (e.g. Acemoglu *et al.*, 2005). Building on Putnam's approach, Guiso, Sapienza and Zingales define social capital as "good culture", that is as "a set of beliefs and values that facilitate cooperation among the members of a community" (2008a, p. 296). We can easily agree with this broad definition, based on a now well-

[17] For an overview of the studies with reference to economic growth, see Durlauf and Fafchamps (2005).

[18] See also Helliwell and Putnam (1995); see Felice (2007b, pp. 54–64) for elaborations on institutions and social capital from Putnam data.

established literature, but to find agreement on how to measure the concept is not as simple. Not by chance, and although Italy is probably the country paradigmatic (at least in the advanced world) of regional differences in social capital as a pioneering field of study, we still lack estimates of social capital for the Italian regions over the long run, which would link the nineteenth to the twentieth century, agricultural to industrial and post-industrial societies. The most updated and comprehensive work on historical measures of social capital in Italy, by Guiso, Sapienza and Zingales (2008b), does not present regional figures. These have been proposed instead by Giorgio Nuzzo (2006), who adopts a definition similar to Putnam and offers a reconstruction of social capital for the Italian regions from 1901 to 2001, in benchmark years. Up to the present, this work is the only one providing a century-long view of social capital through a coherent methodology, although still many qualifications could be made to the estimates. Other regional estimates probably superior to Nuzzo's ones are limited to the very last years, and are based on a methodology hardly replicable for the past.[19]

By extending Nuzzo's index to the second half of the nineteenth century, this article presents, for the first time, consistent estimates of social capital for the Italian regions covering all the period from Unification until our days. The article also tests for the first time social capital in growth accounting exercises, over the long run: the results and the following interpretation, as we are going to see, are also partly new. For what concerns the estimates, Nuzzo's index is a simple mean of social participation, political participation and trust, measured with different proxies but in line with Putnam's approach (for further details, see the Appendix). Here two more benchmarks (1871 and 1891) have been reconstructed, through a methodology that directly links the new estimates to those available from 1901 onwards, separately for each and one of Nuzzo's (and Putnam's) indicators (see again the Appendix). The results are shown in Table 5.

[19] Most remarkably, Sabatini (2008) has proposed a measure of social capital which overcomes some shortcomings of Putnam's definition and indicators. On theoretical grounds, Sabatini draws a distinction between bonding social capital on one hand, shaped by strong family ties and with a negative impact on economic growth and bridging and linking social capital on the other, shaped by weak ties among friends, neighbours and members of voluntary organizations, and with a positive impact on economic growth. With a few exceptions, those Italian regions rich in the former were deemed poor in the latter, and vice versa. On empirical grounds, the main innovation by Sabatini is the attention towards measures directly linked to social capital components, i.e. the attempt to distinguish between social capital and its outcomes. For the Italian regions, Sabatini's estimates are limited to very recent years (from 1998 onwards), while requiring a huge amount of data unavailable for previous periods: it is impossible to replicate them for other benchmarks, and thus for our purposes they are unusable. However, Sabatini's estimates by and large confirm Nuzzo's regional rankings: for 2001, the Pearson correlation between Nuzzo's and Sabatini's estimates is 0.923 (significant at the 0.01 level). Other available estimates, also limited to recent years, have been produced by Cartocci (2007), but they are less correlated with both Sabatini (0.902) and Nuzzo (0.792; in both cases correlation is significant at 0.01).

Unlike human capital and similarly to what happened in per capita value added, in this case over the long term there was no convergence between the Southern regions and the rest of the country. In the second half of the nineteenth century the *Mezzogiorno* was considerably behind the Centre-North – after all, the former was the homeland of what Banfield (1958) had coined "amoral familism" – and on the whole the differences remained consistently high throughout the twentieth century. Nonetheless, some movement occurred in the second half of the century: regional imbalances reduced between 1951 and 1971, but later increased again.

Table 5. *Regional inequality in social capital, 1871-2001 (Italy=1)*

	1871	1891	1911	1938	1951	1971	1981	2001
Piedmont	1.163	1.405	1.451	1.229	1.210	1.098	1.128	1.048
Aosta Valley	-	-	-	-	1.668	1.763	1.514	1.493
Liguria	1.337	1.306	1.189	1.091	1.040	1.022	1.091	1.050
Lombardy	1.313	1.449	1.364	1.196	1.179	1.087	1.067	1.096
North-West	*1.255*	*1.414*	*1.373*	*1.195*	*1.174*	*1.087*	*1.091*	*1.081*
Trentino-Alto Ad.	-	-	-	4.519	3.979	3.626	3.134	2.057
Veneto	0.725	0.971	1.113	1.055	1.055	1.128	1.257	1.255
Friuli	-	-	-	1.285	1.288	1.384	1.552	1.349
Emilia	1.239	1.120	1.231	1.131	1.206	1.093	1.297	1.272
Tuscany	1.669	1.437	1.359	1.309	1.334	1.169	1.303	1.247
The Marches	0.626	0.687	0.834	0.997	1.125	1.051	1.205	1.239
Umbria	1.292	1.166	1.198	1.115	1.112	1.125	1.331	1.366
Latium	1.627	1.306	0.919	0.798	0.812	0.867	0.796	0.804
Center/North-East	*1.169*	*1.130*	*1.152*	*1.228*	*1.231*	*1.181*	*1.260*	*1.193*
Abruzzi	0.417	0.621	0.629	0.665	0.661	0.726	0.887	1.031
Campania	0.560	0.476	0.505	0.514	0.542	0.659	0.374	0.430
Apulia	0.846	0.734	0.586	0.650	0.682	0.711	0.548	0.748
Lucania	0.454	0.596	0.697	0.573	0.557	0.789	0.785	0.830
Calabria	0.421	0.351	0.483	0.548	0.541	0.738	0.817	0.654
Sicily	0.982	0.741	0.722	0.680	0.669	0.806	0.733	0.823
Sardinia	0.695	0.669	0.510	0.632	0.799	0.914	1.045	1.095
South and islands	*0.673*	*0.605*	*0.596*	*0.613*	*0.630*	*0.743*	*0.646*	*0.728*

Sources: Elaborations from Nuzzo (2006). For 1871 and 1891, see the Appendix.

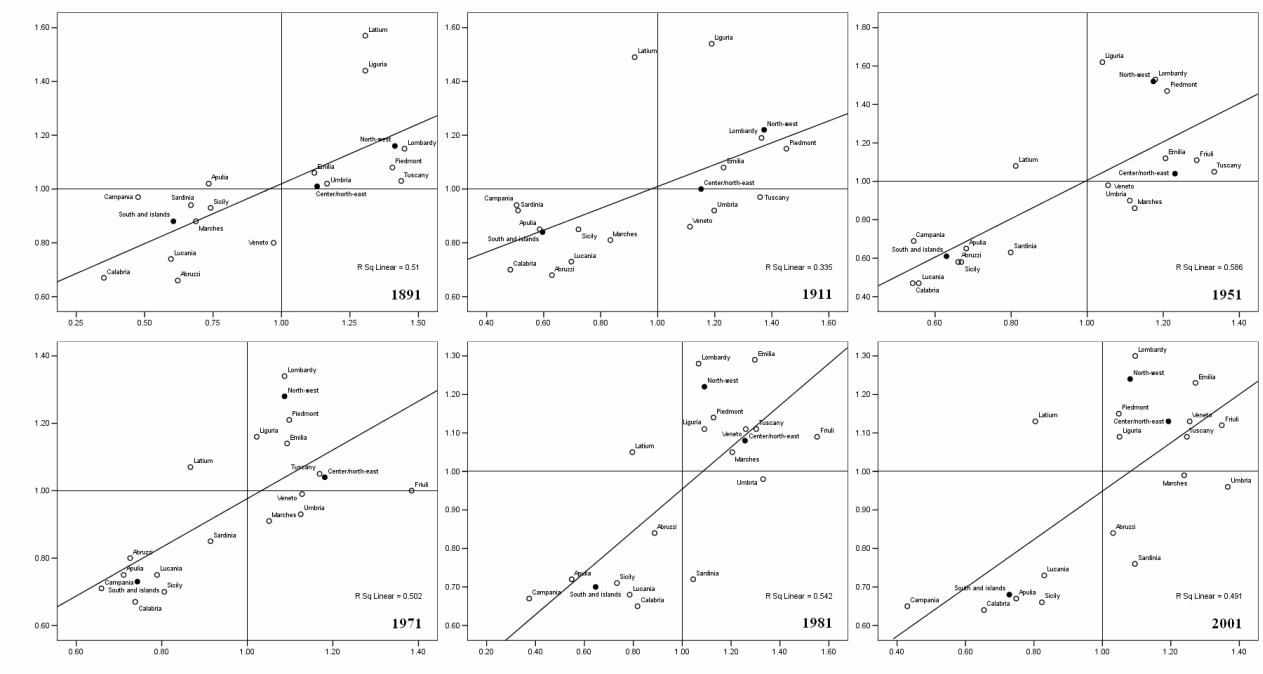
The reliability of Nuzzo's estimates may be called into question, yet both the conventional wisdom and the well-known Putnam essay with Leonardi and Nanetti (1993), *Making democracy work*, support the idea that disparities in social capital are entrenched in Italian history. According to Putnam, they date back to the Middle Ages. According to Tabellini (2005), sharp institutional regional differences between North and South (correlated with social capital, as in Putnam) were already present in the seventeenth century. The works by Brian A'Hearn (1998, 2000) share the view that social capital was lower in the South during the liberal age – and that this affected economic performance. On the persistence of social capital disparities, Nuzzo indeed takes an optimistic view since he argues that regional levels did change over time, with some improvement in the

South during the second half of the twentieth century: according to Nuzzo's figures, however, this is only true for some smaller Southern regions; Sardinia and Abruzzi in particular, perhaps too for Lucania or for the Marches in the Center/North-East, but not for the *Mezzogiorno* as a whole. Concerning the last decades, Putnam's (1993) estimates of "regional civicness" show higher regional disparities than Nuzzo, and the same can be said for other measures of social capital referring to recent years, such as those by Cartocci (2007) or Sabatini (2008) and thus we can say that in regard to the lack of convergence from the 1970s onwards there is wide consensus. In short, the basic picture emerging from Nuzzo's figures – high disparities in the liberal age and no convergence, unlike human capital, in the long run and particularly in more recent decades – should not be called into question by the use of different measures of social capital.

Figure 2 is a sequence of scatter/dot graphs analogous to Figure 1, with social capital in place of human capital. There are some differences between the two charts. First, during the liberal age the correlation between value added and social capital decreased, whereas the correlation between value added and human capital was on the increase: this datum suggests that in this period social capital was a conditioning variable far less significant than human capital. Secondly, in the last part of the twentieth century the correlation with value added remains high in the case of social capital, while declining in the case of human capital: conversely, this datum suggests that in recent decades social capital could be considered an effective conditioning variable. Regional patterns are also different; in Figure 2 we never see a three-fold repartition, always a two-fold one: Center-North and the *Mezzogiorno*. These two groups were already evident in the early twentieth century, when Veneto and Latium ranked in a middle position and the Marches belonged to the lowest group. In the first half of the century Latium got closer to the *Mezzogiorno*; Veneto and the Marches joined the Center-North, whereas on average the Center/North-East overtook the North-West. The primacy of the Center/North-East is an important discrepancy with the trend of per capita value added, and is probably the ultimate reason why in the first decades economic growth is more correlated with human capital than it is with social capital, as we are about to see. During the second half of the twentieth century other regions, namely Abruzzi and Sardinia, left the group of the *Mezzogiorno* and reached an intermediate position. It is worth considering that during the twentieth century Latium and the North-West always lay above the fit line: their value added was relatively high, as compared to what expected from their rank in social capital (which in the case of Latium was below average) given the observed linear correlation across Italy's regions. Conversely, Southern Italy lay below the fit line: its value added being relatively low compared to what expected from its level of social capital, although this too was below average. This last finding is common to human capital as well: the two variables may well have reinforced each other in

deciding the disappointing economic performance of the *Mezzogiorno* – and of course they may also be causally correlated.

Figure 2. *Social capital and per capita value added in Italy's regions, 1891–2001*



Notes: Per capita value added (y-axis) and social capital (x-axis) are expressed as a ratio to the Italian average. Elaborations from Tables 1 and 5. Aosta Valley and Trentino-Alto Adige have been excluded, being outliers.

As a first step, the contribution of social capital to economic growth can be tested by replicating the exercise carried out for human capital (Table 4) with social capital (Table 6), under the assumption that social capital is now the conditioning variable in (1) – also in this case, to control for endogeneity in the panel models, social capital has been instrumented with its lag. It is worth reminding that social capital is here included following the Mankiw-Romer-Weil generalisation of the Solow model, i.e. because it is itself a factor of production that can be accumulated like physical (or human) capital.[20] As a second step, results can be compared with those from Table 4 referring to human capital, and in so doing the contributions of the two variables – human capital and social capital – compared as well.

[20] Arguably, social capital can alternatively be viewed as an exogenous, fixed factor (like climate) that permanently affects the level of value added per capita, while not affecting the growth rate, or even as a factor indirectly affecting the rate of investment in physical capital. Both these arguments are plausible, but the implications are obviously different and, as we are going to see, in the case of an exogenous, fixed factor less in line with the interpretative findings of this article.

As expected from descriptive statistics, with regard to the cross-section regressions, social capital performs worse in the years 1891–1911 and better in the last two decades (1981–2001), whereas for the other periods the results are similar to those of human capital. Social capital not being a good predictor of economic growth in liberal age is an original result, which goes against the conventional wisdom based on the well-known Putnam's correlation.[21] Social capital was traditionally seen as a necessary pre-condition to embark upon modern economic growth; an alternative explanation, consistent with our findings, would be that social capital became truly important only after modern economic growth had begun, because the growing complexity of exchange relations raised transaction costs and thus made social capital – which lowered transaction costs through trust – more valuable; at the same time, in Italy differences in the institutional efficiency of regional governments, supposedly highly correlated with social capital, may have appeared not before the 1970s, when those regional governments were created.

As for the panel models, in those without population growth at a first instance results are also similar: in the random-effects model social capital is a conditioning variable which determines convergence, but in the fixed-effects model it becomes redundant after the fixed effects; the Hausman test indicates that the fixed effect model is preferable and yet in this case with significantly more confidence than that of human capital.[22] In the panels with population growth, unlike human capital social capital does not turn out to be a conditioning variable in the fixed effect model, which is preferable at the 5% level of confidence[23] (*inter alia*, in this case and in the random-effects model there is no convergence in value added per capita after the inclusion of social capital). It can be concluded that, over the long run, social capital played a significantly minor role than human capital.

Of course, social capital could be just a redundant variable after considering human capital (or after something else) and vice versa. This possibility can be further investigated by running human capital and social capital together in the growth regressions, i.e. by incorporating both as conditioning variables in (1), but the high collinearity between the two variables (coupled with the small

[21] The author found a rank correlation of 0.81 between social capital and regional per capita output in 1911 (Putnam 1993, p. 237); A'Hearn (2000, p. 70) has revised this datum to 0.87. Our rank (Spearman) correlation for 1911 is lower, 0.68 (all data are significant at the 0.01 level). Both Putnam's and A'Hearn's calculations were based on now out-dated output figures. Most recently, the detailed survey by Ciccarelli and Fenoaltea on industrial output at a provincial level in liberal Italy has implicitly questioned the role of social capital for that period, given that in the North many provinces with high levels of social capital did not undergo industrialization (Ciccarelli and Fenoaltea 2010, p. 10).

[22] The test statistic is higher than in the case of human capital (12.78 versus 7.63), and higher than the critical value of a Chi-squared also at the 0.01 level of confidence (Chi-squared 2df, 1% = 9.21), and the Prob>Chi-squared results considerably small (0.0017).

[23] The test statistic is 10.29 and the Prob>Chi-squared results 0.0163.

number of observations) makes the results too sensitive to small changes in the observations and thus unreliable – as a consequence, these results can be safely omitted from the present paper, although they by and large confirm those of the previous regressions.[24]

Table 6. *Conditional convergence of the Italian regions (1891-2001): adding social capital*

	Cross-section linear regressions						Panel linear regressions (robust)			
	1891-1911	1911-1938	1938-1951	1951-1971	1971-1981	1981-2001	Rand.-eff. GLS	Fixed-eff. (within)	Rand.-eff. GLS	Fixed-eff. (within)
Constant	0.054	-0.012	-0.042	0.131	0.017	0.035	0.0030	0.0137	0.0270	0.0338
Standard error	0.028*	0.028	0.048	0.008***	0.069	0.019*	0.0033	0.0073*	0.0098***	0.0143*
VA	-0.006	0.001	0.006	-0.011	0.000	-0.002	-0.0075	-0.0246	-0.0040	-0.0174
VA standard error	0.004	0.004	0.006	0.001***	0.008	0.002	0.0031**	0.0054***	0.0029	0.0045***
SC	0.004	0.012	0.004	0.000	0.004	0.002	0.0036	0.0091	0.0033	0.0094
SC standard error	0.003	0.003***	0.002*	0.001	0.003	0.001**	0.0011***	0.0069	0.0011***	0.0073
n									-0.0274	-0.0277
n standard error									0.0100***	0.0122*
R^2	0.147	0.689	0.260	0.892	0.131	0.318	0.103	0.100	0.222	0.181
N	16	16	18	19	19	19	107	107	107	107
F value	1.12	14.43***	2.631	61.89***	1.20	3.73**	12.74** (1)	10.46**	18.01*** (1)	6.25**

Notes: Dependent variable: Ln value added per capita growth rates by sub-period ($t_1 - t_0$). Independent variable: Ln value added per capita in t_0 (VA), social capital relative to the Italian average (SC), population growth by sub-period (n). In the panel regressions, all the variables are expressed relative to the Italian average, and social capital is instrumented through its lag (the level of SC in the previous period). The results of the model including population growth are displayed in the last two columns on the right. (1) Wald Chi2.

In the cross-section regression for 1971-81 if we excluded Trentino-Alto A. and Aosta Valley, by considering them outliers, social capital would result as positive (0.023) and significant at the 0.05 level (per capita value added negative and insignificant).

* Significant at the 0.1 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Source: Elaborations from Tables 1, 5, and A.3.

To sum up, the available evidence from econometric tests, scanty though it is, suggests that there was not one single conditioning variable over the long-run; human capital may have been important in the liberal age and perhaps in the interwar years, whereas social capital could have been the conditioning variable in the last two decades of the twentieth century. On the other hand, it can be argued that both human capital and social capital – even when combined – are insufficient

[24] In cross-section regressions, social capital is the redundant variables in the first two decades (1891-1911), human capital in the last two (1981-2001). The results from panel regressions suggest that in the random-effects model both human capital and social capital are positive and significant, that in the fixed-effects model both are insignificant (and these results do not change when including population growth, which is always negative and significant). In the panel without population growth, the fixed-effects model is again preferable after the Hausman test, with far less confidence than in the models with social capital as the only conditioning variable, and just slightly less confidence than in the models with human capital [the test statistic (9.18) is higher than the critical value of a Chi-squared at the 0.05 level of confidence (Chi-squared 3df, 5% = 7.81), lower at 0.01 level (Chi-squared 3df, 1% = 11.34), with a Prob>Chi-squared of 0.023]. In the panel with population growth, the random-effects model is preferable (test statistic 5.06, Prob>Chi-squared 0.272).

to explain the disappointing performance of Southern Italy over the long run. I will discuss the qualifications and implications of this (provisional) conclusion in the next paragraph.

5. A critical assessment: towards a dynamic approach

In order to critically review the main findings of the previous paragraphs, detailing the econometric results is a necessary preliminary step. The fixed-effects model can be written alternatively as $\Delta VA_{it} = \beta_1 X_{it} + a_i + u_{it}$, or as $\Delta VA_{it} = \beta_0 + \beta_1 X_{it} + \gamma_2 D2_i + \ldots + \gamma_n Dn_i$, where $D_{i=2,n}$ are regional dummies, and the constant terms (γ_i) are the regional intercepts. Table 7 shows the constant terms of the fixed effects regressions, and how they change according to the different models. As we can see, in the unconditional model the regional intercepts of the Southern regions are all negative and significant at the 0.05 level, with the exception of the Abruzzi. When a new predictor is added, such as instrumented human capital (HC)[25] or instrumented social capital (SC), if this is significant for a Southern region, the regional constant should lose significance and/or its value should decrease or become positive.

In the panel without population growth, this is in part what happens when adding human capital as a conditioning variable, after which the significance levels of the regional constants of the Southern regions pass from 0.05 to 0.1; nonetheless, the effect is weak, the constant value remaining practically unchanged. Concerning social capital, we observe an improvement (i.e., a weakening of significance) only in Campania, whereas for the other Southern regions the value and significance of the constant do not change, and indeed in some cases slightly increase. It is worth noting also that the regression in both human capital and social capital does not modify the value and significance of the constant term, thus resulting suboptimal when compared with the regression including only human capital. And yet there is one more model, the last one, which reports a decrease in both the value and significance of the constant term and thus seems to be preferable to the model including only human capital. This model, named "conditional on a mix of human capital and social capital", is truly no more than a mere statistical exercise: it has just one conditioning variable, made up of instrumented human capital from 1891 to 1951 and instrumented social capital from 1971 to 2001,[26] and its validity simply suggests that an effective conditioning variable may have been human capital up to the Second World War and social capital in the second half of the twentieth century. Re-

[25] Results for literacy and the gross enrolment ratio are omitted for reasons of space, but they are in line with what emerges from the human capital composite indicator.

[26] Given that for the years 1951–71 both human capital and social capital are insignificant, results do not change when also running social capital for 1951, and thus human capital only up to 1938.

markably, in this case when the conditioning variable is positive and significant also in the fixed-effects model,[27] after the Hausman test, the fixed-effects model results preferable to the random-effects one only in the panel without population growth and at a low level of confidence;[28] but in the random-effects model the conditioning variable has an even stronger role than in the fixed-effects one.[29]

When including population growth, however, the model with the greatest influence over the coefficients of the southern regions is by far the one conditional only on human capital; furthermore, as we have seen, in this case the random-effects model is preferable to the fixed-effects one. In other words, when differences in population growth are considered, social capital loses its significance even in recent decades, i.e. in one of the few periods when southern regions experienced population growth higher than the Italian average. However, it is worth noting that these two predictors are highly correlated, not least because in (and limited to) the last two decades differences in population growth are led by persisting differences in fertility rates, which in turn result as highly correlated with differences in social capital (see the appendix for further details), both being determined by different ethical values. Broadly speaking, these results are in line with the evidence that in recent decades the decline of southern Italy was due to decreasing activity rates, rather than to any reduction in per worker productivity (Felice 2011).

There are more results from Table 7 which are worth mentioning. Firstly it must be stressed that, with the exception of the Abruzzi, and to a minor degree Campania in the case of social capital, when excluding population growth all the Southern regions exhibit the same pattern: their fixed effects are akin and respond to the conditioning variable in the same way, and quite differently from the Central and Northern regions. This finding is all the more remarkable since the newly available estimates of per capita value added, incorporated here, show high disparities across the Southern regions in the late nineteenth century that decreased during the following century. Thus the growing uniformity in the *Mezzogiorno* can reasonably be attributed to the same conditioning factors, either

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[27] The coefficients of the fixed-effects model (with robust option) are the following; without population growth: constant 0.0170(***), B_1 (per capita value added) -0.0209(***), B_2 (mixed human capital and social capital) 0.0028(**); R^2 is 0.061. With population growth: constant 0.0383(**), B_1 (per capita value added) -0.0112(***), B_2 (mixed human capital and social capital) 0.0047(***); B_3 (population growth) -0.0327(**); R^2 is 0.241. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

[28] In the model without population growth, the test statistic (6.78) is higher than the critical value of a Chi-squared at the 0.05 level of confidence (Chi-squared 2df, 5% = 5.99), lower at 0.01 level Chi-squared (2df, 1% = 9.21), with a Prob>Chi-squared of 0.035. In the model with population growth, the test statistic is 4.02 and the Prob>Chi-squared equals 0.255.

[29] The coefficients of the random-effects model (with robust option) are the following; without population growth: constant 0.0028, B_1 -0.0091 (***), B_2 0.0059 (***); R^2 is 0.153. With population growth: constant 0.0280(***), B_1 -0.0057 (**), B_2 0.0061 (***), B_3 -0.0290(***); R^2 is 0.288.

human capital, social capital or other determinants. Secondly, in the Centre-North we detect no significant modification after allowing for human capital; conversely, and unlike in the South, here the constant values change after including social capital: in some cases (Friuli, Veneto, Tuscany, Trentino-Alto Adige) the coefficient turns from positive to negative, although it becomes significant only in Trentino-Alto Adige. These changes in the constant terms suggest that the above regions may have had a disappointing economic performance after all, given their level of social capital, although this conclusion is statistically significant only in the case of Trentino-Alto Adige – which not by chance is an outlier in social capital. Once again, the mixed model yields more useful insights: in this case, in fact, the coefficients return to the positive, also the case for Trentino-Alto Adige. This means that the disappointing performance was concentrated in the first period: from the late nineteenth century to the economic miracle, approximately, many Central and North-Eastern regions grew less than expected, given their high rank in social capital, but in later decades their economic growth returned in line with their social capital endowment. One more point in favour of the thesis of the minor role played by social capital during the earlier decades as compared to its significant influence from the 1970s onwards.

Table 7. *Constant terms of the fixed-effects models*

	Without population growth					With population growth				
	Uncondi-tional	Condi-tional on HC	Condi-tional on SC	Condi-tional on HC and SC	Condit. on a mix of HC and SC	Uncondi-tional	Condi-tional on HC	Condi-tional on SC	Condi-tional on HC and SC	Condition. on a mix of HC and SC
Piedmont	0.0026	0.0021	0.0009	0.0012	0.0017	0.0014	0.0001	-0.0003	-0.0005	-0.0007
Aosta Valley	-0.0014	-0.0015	-0.0065	-0.0066	-0.0031	-0.0027	-0.0033	-0.0077	-0.0077	-0.0059
Liguria	0.0016	0.0012	0.0017	0.0020	0.0011	0.0001	-0.0012	0.0003	0.0001	-0.0015
Lombardy	0.0050	0.0046	0.0039	0.0041	0.0042	0.0041	0.0028	0.0029	0.0027	0.0024
Trentino-Alto Ad.	0.0057	0.0056	-0.0263**	-0.0273**	0.0012	0.0054	0.0050	-0.0265**	-0.0259**	0.0014
Veneto	0.0008	0.0008	-0.0013	-0.0014	0.0004	0.0005	0.0004	-0.0016	-0.0016	-0.0004
Friuli	0.0013	0.0012	-0.0029	-0.0030	0.0005	0.0006	0.0002	-0.0036	-0.0036	-0.0010
Emilia	0.0035	0.0036	0.0016	0.0016	0.0032	0.0028	0.0026	0.0009	0.0009	0.0019
Tuscany	0.0003	0.0004	-0.0036	-0.0038	-0.0001	-0.0003	-0.0003	-0.0042	-0.0041	-0.0013
The Marches	-0.0014	-0.0010	-0.0029	-0.0032	-0.0014	-0.0017	-0.0010	-0.0032	-0.0031	-0.0019
Umbria	-0.0025	-0.0022	-0.0055	-0.0058	-0.0025	-0.0029	-0.0024	-0.0059	-0.0058	-0.0033
Abruzzi	-0.0054	-0.0049	-0.0060	-0.0064	-0.0049	-0.0054*	-0.0043	-0.0060	-0.0058	-0.0048
Campania	-0.0080**	-0.0079*	-0.0073*	-0.0076*	-0.0075*	-0.0078***	-0.0067*	-0.0072*	-0.0070*	-0.0070*
Apulia	-0.0080**	-0.0078*	-0.0086**	-0.0090**	-0.0075*	-0.0077***	-0.0062	-0.0082**	-0.0080**	-0.0067*
Lucania	-0.0086**	-0.0084*	-0.0095**	-0.0099**	-0.0080*	-0.0086***	-0.0070	-0.0094**	-0.0091*	-0.0076*
Calabria	-0.0089**	-0.0086*	-0.0094**	-0.0098**	-0.0080*	-0.0086***	-0.0068	-0.0090**	-0.0087**	-0.0074*
Sicily	-0.0085**	-0.0082*	-0.0098**	-0.0103**	-0.0077*	-0.0079**	-0.0071*	-0.0097**	-0.0095**	-0.0076*
Sardinia	-0.0081**	-0.0079*	-0.0086**	-0.0089**	-0.0078*	-0.0084***	-0.0067*	-0.0084**	-0.0082**	-0.0073*

Sources and notes: see the text. By construction, Latium is excluded and used as a pivot region.

*Significant at the 0.1 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

It must be remembered that the last panel model makes no sense within a "static" economic approach such as the present one, based on a unique long-term production function (there is no justification for any change of the conditioning variable in the middle of the ride). Its statistical validity supports the view that a "dynamic" approach would be more appropriate in understanding the de-

terminants of Italy's regional imbalances over the long term. The basic idea behind a dynamic approach is that changes in the technological regime are such as to produce changes in the production function, and thus in the very nature of the conditioning variables. In the first industrial revolution (in Italy approximately from the 1830s to the 1880s) the conditioning variable could be natural resources, whose importance has been highlighted among others by Cafagna (1965, 1989) and Fenoaltea (2006). In the second industrial revolution (approximately 1880–1970), the conditioning variable could be human capital, in line with the analyses proposed by Zamagni (1978), Vasta (1996, 1999), and Fenoaltea (2006). In the last post-Fordist age (from the 1970s onwards), it could be social capital as suggested, among others, by the works of Robert Leonardi (1995, 2005).

All these component parts have been recently assembled in a unified approach in order to account for the pattern of Italy's regional inequality over the long run, although merely as a speculative hypothesis (Felice 2010); in each period, the conditioning variable was the fixed resource capable of catalyzing the mobile resources (technical and financial capital), which in turn determined convergence. Southern Italy failed to converge because, in each period, it lacked the fixed resources required by the extant technological regime. The only exception was the economic miracle, when convergence can be attributable to massive regional policy (which "forced" mobile resources to go to the South) and interregional migration (for a more in-depth discussion of this issue, see Felice, 2007b, 72–92; 2010; 2011). For the first time, the present article provides econometric evidence in favour of a dynamic long-term interpretation.

6. Conclusions

This article had three main goals: first, to present and discuss new estimates of human capital and social capital for the Italian regions, roughly from the second half of the nineteenth century until the present; second, to link this new evidence to the available – and recently produced – information on per capita value added in Italy's regions over the long run, through the analytical framework of neoclassical growth economics; third, to explore the viability of a long-term interpretative hypothesis for the historical pattern of Italy's regional inequality.

As for human capital, in Italy we can observe sharp regional disparities at the time of Unification, which significantly decreased over the course of the twentieth century, particularly from 1911 until the 1970s. Remarkable imbalances were present also in social capital, but, unlike with human capital, in this case the North-South divide remained more or less unchanged over the course of the twentieth century. The information on human capital and social capital has been associated with

that available concerning per capita value added, where we observe divergence until 1951, with the rise of the industrializing North-West, then convergence in the 1950s and 1960s and later on, from the 1970s, again a falling behind of the South and convergence of the Center/North-East. The econometric tests, in both cross-section and panel models, fail to establish a single long-term conditioning variable and suggest instead that human capital was more important in the first half of the period (during the liberal and interwar years), social capital in the most recent decades (roughly from the 1970s onwards); conversely, social capital was not important in the first decades after Unification, a remarkable finding which contrasts with conventional wisdom based on Putnam's work. Concerning the whole period, human capital can be the main predictor only if we allow for regional differences in population growth; when limited to the most recent decades, these are led by differences in fertility rates that are, in turn, highly correlated with differences in social capital.

These results are consistent with a long term interpretative hypothesis based on a dynamic approach, where technological regimes determine, in the respective epochs, the nature of the conditioning variable, i.e. the key resources which may favour convergence. A possible explanation could start by posing a preliminary distinction between fixed and mobile resources: among the former, which are local, we have natural resources in the first industrial revolution (approximately 1830–80), human capital in the second (1880–1970), social capital in the post-Fordist age; mobile resources are mainly technical and financial capital, which determine convergence and tend to concentrate where the fixed resources are. The century and a half since Unification can be divided into four different periods. The first is the liberal age (1861–1913) when in Italy there was a concurrence between the first and second industrial revolutions and both natural resources (hydraulic power) and human capital were crucial, with the latter growing in importance in the later decades. The second period (1914–51) was characterized by international turbulence and rising protectionism, by lower GDP growth rates, as well as by further expansion of the second industrial revolution, with a relative decline in traditional industrial activities from the late 1920s: in these decades human capital, R&D activities and, generally speaking, endogenous growth may have played a decisive role in determining regional divergence. The third period (the 1950s and 60s) coincides with the economic miracle, when exports became more and more important and a significant interregional migration took place; in these years, a massive regional development policy was rolled out in the South, and was probably quite effective in temporarily raising value added by distorting the flows of mobile resources – and thus in favouring, together with migration, the convergence of the South, its lack of fixed resources notwithstanding. The most recent decades (1973–2001) are those of post-Fordism: GDP growth rates slowed, industry declined in comparison to services and regional policies in the South became ineffective if not harmful – but the export-led growth continued and was now based

around the industrial districts; human capital grew increasingly mobile, whereas social capital (which among the others was behind industrial districts) became the key fixed resource, because local institutions were infused with greater political powers, and because transaction costs grew in importance.

Although it would benefit from further research, the long-term interpretative hypothesis outlined above is now, for the first time, supported by quantitative evidence.

References

Acemoglu D, Johnson S, Robinson JA (2005) Institutions as a fundamental cause of long run growth. In: Aghion P, Durlauf SN (eds) Handbook of economic growth, Volume 1A. Elsevier, Amsterdam:385–472

A'Hearn B (1998) Institutions, externalities, and economic growth in Southern Italy: evidence from the cotton textile industry, 1861-1914. Econ Hist Rev 51(4):734–762

A'Hearn B (2000) Could Southern Italians cooperate? *Banche Popolari* in the Mezzogiorno. J Econ His 60(1):67–93

A'Hearn B, Auria C, Vecchi G (2011) Istruzione. In: Vecchi G. (ed) In ricchezza e in povertà. Il benessere degli italiani dall'Unità a oggi. Il Mulino, Bologna:159–206

Banfield E (1958) The moral basis of a backward society. Free Press, New York

Barro RJ (1991) Economic growth in a cross section of countries. Q J Econ 106(2):407–443

Barro RJ, Sala-i-Martin X (1991) Convergence across states and regions. Brookings Papers on Economic Activity 1:107–182

Barro RJ, Sala-i-Martin X (1992) Convergence. J Pol Econ 100:223–251

Becker GS (1962) Investment in human capital: a theoretical analysis. J Pol Econ 70(5):9–49

Becker GS (1964) Human capital: a theoretical and empirical analysis, with special reference to education. NBER, New York

Becker SO, Woessmann L (2009) Was Weber wrong? A human capital theory of protestant economic history. Q J Econ 124(2):531–596

Becker SO, Hornung E, Woessmann L (2011) Education and catch-up in the industrial revolution. American Economic Journal: Macroeconomics 3(3):92–126

Brunetti A, Felice E, Vecchi G (2011) Reddito. In: Vecchi G. (ed) In ricchezza e in povertà. Il benessere degli italiani dall'Unità a oggi. Il Mulino, Bologna:209–234

Cafagna L (1965) Intorno alle origini del dualismo economico in Italia. In: Caracciolo A (ed) Problemi storici dell'industrializzazione e dello sviluppo. Argalia, Urbino:103–150

Cafagna L (1989) Dualismo e sviluppo nella storia d'Italia. Marsilio, Venice

Cartocci R (2007) Mappe del tesoro. Atlante del capitale sociale in Italia. Il Mulino, Bologna

Ciccarelli C, Fenoaltea S (2009) La produzione industriale delle regioni d'Italia, 1861-1913: una ricostruzione quantitativa. 1. Le industrie non manifatturiere. Bank of Italy, Rome

Ciccarelli C, Fenoaltea S (2010) Through the magnifying glass: provincial aspects of industrial growth in post-Unification Italy. Quaderni di Storia Economica 4. Bank of Italy, Rome

Ciccarelli C, Fenoaltea S, Proietti T (2010) The effects of unification: markets, policy, and cyclical convergence in Italy, 1861–1913. Cliometrica 4(3):269–292

Cipolla CM (1969) Literacy and development in the West. Penguin, London

Coleman J (1988) Social capital in the creation of human capital. American Journal of Sociology 94:S95–121

Costantini V, Monni S (2005) Sustainable Human Development for European Countries. Journal of Human Development 6(3):329–51.

Cotula F, Raganelli T, Sannucci V (eds) (1996) I bilanci delle aziende di credito: 1890-1936. Laterza, Rome-Bari

Crafts NFR (1996) The first industrial revolution: a guided tour for growth economists. Am Econ Rev 86(2):197–201

Daniele V, Malanima P (2007) Il prodotto delle regioni e il divario Nord-Sud in Italia (1861-2004). Rivista di Politica Economica 67(3-4):267–315.

Daniele V, Malanima P (2011) Il divario Nord-Sud in Italia 1861-2011. Rubbettino, Soveria Mannelli.

Durlauf SN, Johnson PA, Temple JRW (2005) Growth econometrics. In: Aghion P., Durlauf SN (eds) Handbook of economic growth, Volume 1A. Elsevier, Amsterdam:555–677

Easterlin RA (1981) Why isn't the whole world developed? J Econ His 61(1):1–19

Federico G (2003) Le nuove stime della produzione agricola italiana, 1860-1910: primi risultati e implicazioni. Rivista di Storia Economica 19(3):359–81.

Felice E (2005a) Il reddito delle regioni italiane nel 1938 e nel 1951. Una stima basata sul costo del lavoro. Rivista di Storia Economica 21(1):3–30.

Felice E (2005b) Il valore aggiunto regionale. Una stima per il 1891 e per il 1911 e alcune elaborazioni di lungo periodo (1891-1971). Rivista di Storia Economica 21(3):273–314.

Felice E (2007a) I divari regionali in Italia sulla base degli indicatori sociali (1871-2001). Rivista di Politica Economica 67(3-4):359–405

Felice E (2007b) Divari regionali e intervento pubblico. Per una rilettura dello sviluppo in Italia. Il Mulino, Bologna

Felice E (2010) Regional development: reviewing the Italian mosaic. Journal of Modern Italian Studies 15(1):64–80

Felice E (2011) Regional value added in Italy, 1891-2001, and the foundation of a long-term picture. Econ Hist Rev 64(3):929–950

Fenoaltea S (2003) Peeking backward: regional aspects of industrial growth in post-unification Italy. J Econ His 63(4):1059–1102

Fenoaltea S (2006) L'economia italiana dall'Unità alla Grande guerra. Laterza, Rome-Bari

Goldin C, Katz L (2008) The race between education and technology. Cambridge MA, Harvard University Press.

Guiso L, Sapienza P, Zingales L (2008a) Social capital as good culture. Journal of European Economic Association 6(2-3):295–320

Guiso L, Sapienza P, Zingales L (2008b) Long-term persistence. NBER Working Paper no. 14278, downlowadable at http://www.nber.org/papers/w14278.pdf [last access on July 2011]

Helliwell JF, Putnam R (1995) Economic growth and social capital in Italy. Eastern Economic Journal 21(3):295–307

Iona A, Leonida L, Sobbrio G (2008) 'O convergence where art thou?' Regional growth and industrialization in Italy. Journal of Modern Italian Studies 13(3):366–387

Leonardi R (1995) Convergence, cohesion and integration in the European Union. Macmillan, Houndmills

Leonardi R (2005) Cohesion policy in the European Union. The building of Europe. Macmillan, Houndmills

Ljungberg J, Nilsson A (2009) Human capital and economic growth: Sweden 1870-2000. Cliometrica 3(1):71–95

Lucas R (1988) On the mechanics of economic development. J Monet Econ 22(1): 3–42

Mankiw G, Romer D, and Weil D (1992). A Contribution to the Empirics of Economic Growth. Q J Econ 102(2):402–437

Nuñez CE (1990) Literacy and economic growth in Spain 1860-1977. In: Tortella G (ed) Education and Economic Development since the Industrial Revolution. Generalitat Valenciana, Valencia: 29–41

Nuzzo G (2006) Un secolo di statistiche sociali: persistenza o convergenza tra le regioni italiane? Quaderni dell'Ufficio Ricerche Storiche 11. Bank of Italy, Rome

Prados de la Escosura L, Rosés JR (2010). Human capital and economic growth in Spain, 1850–2000. Explor Econ Hist 47(4):520–532

Psacharopoulos G (1994) Returns to investment in education: a global update. World Development 22(9):1325–1343

Psacharopoulos G, Patrison HA (2002) Returns to investment in education. A further update. The World Bank Policy Research Working Paper

Putnam RD (1993) Making democracy work: civic traditions in modern Italy. Princeton University Press, Princeton. With Leonardi R and Nanetti RY

Ram R (1990) Educational expansion and schooling inequality: international evidence and some implications. Review of Economics and Statistics 72(2):266–273

Ram R (1991) Education and the convergence hypothesis: additional cross-country evidence. Economia Internazionale 44:244–253

Romer P (1986) Increasing returns and long run growth. J Pol Econ 94(5):1002–1037

Sabatini F (2008) Social capital and the quality of economic development. Kyklos 61(3): 466–499

Sala-i-Martin X, Doppelhofer G, Miller RI (2004) Determinants of long term growth: a Bayesian averaging of classical estimates (BACE) approach. Am Econ Rev 94(4):813–35

Schultz T (1960) Capital formation by education. J Pol Econ 68 (6):571–83

Schultz T (1961) Investment in human capital. Am Econ Rev 51 (1):1–17

Schulze MS, Fernandes FT (2009) Human capital formation in Austria-Hungary and Germany: time series estimates of educational attainment, 1860-1910. In: Halmos K et al. (eds) A felhalmozás Míve. Történeti Tanulmányok Kövér György Tiszteletére. Századvég Kiadó, Budapest:275–289

Sianesi B, Reenen JV (2003) The returns to education: macroeconomics. Journal of Economic Surveys 17(2):157–200

Solow RM (1956) A contribution to the theory of economic growth. Q J Econ 70(1):65–94

Swan T (1956) Economic growth and capital accumulation. Economic Record 32(4):334–361

Tabellini G (2005) Culture and institutions: economic development in the regions of Europe. Igier working paper 292

Vasta M (1996) Innovative capabilities in the Italian take-off: The electrical and chemical industries (1880-1914). University of Oxford, D.Phil thesis

Vasta M (1999) Innovazione tecnologica e capitale umano in Italia (1880-1914). Le traiettorie della seconda rivoluzione industriale. Il Mulino, Bologna

Williamson J (1965) Regional inequality and the process of national development: a description of the pattern. Economic Development and Cultural Change 13(4):3–84

Wößmann L (2003) Specifying Human Capital. Journal of Economic Surveys 17(3):239–270

Zamagni V (1978) Istruzione e sviluppo economico. Il caso italiano 1861-1913. In: Toniolo G (ed) L'economia italiana 1861-1940. Laterza, Bari:137–178

Zamagni V (1993) L'offerta di istruzione in Italia 1861-1987: un fattore guida dello sviluppo o un ostacolo? Working Paper of the Economics Department of the University of Cassino 4

Appendix: Regional estimates of human capital, social capital, and fertility – sources and methods

Human capital

The weighting scheme of the human capital composite indicator has been illustrated in Section 3. It was devised with the aim of reducing arbitrariness when choosing between the different components of the index, while allowing for the shift in importance from primary to advanced education which took place over the long run. As can be seen from table A.1, for Liberal Italy the index of human capital is composed of literacy, with a weight decreasing from 70% in 1871 to 38% in 1911, and primary and secondary enrolment rate, with a weight growing from 30% in 1871 to 58% in 1911; the shares assigned to tertiary and higher education still are negligible. These latter began to grow significantly in the interwar period, touching one fifth by 1951; in this year, primary and secondary enrolment rate has the lion share of the indicator, almost 70%, whereas to literacy is left a mere 13%. As around the mid of the twentieth century the overwhelming percentage of the Italian population had become literate, these changes follow the assumption – which seems only reasonable – that differences in a minority of illiterate people no longer affected economic growth in any significant way. During the post Second World War economic boom, compulsory education extended throughout the country and regional differences became less and less important (see again Table A.1). Furthermore, as the industrialization spread and technological regimes changed, the characteristics of human capital as a factor of production arguably changed too: i.e., what mattered rather more was tertiary (non-compulsory) education attended from age 14 to 19 and later higher education, from age 19 to 24 and above. This change is captured by the human capital indicator: from 1971 to 2001, about one third of the indicator is made up of tertiary education enrolment rate, and the share of higher education enrolment rate has grown from 10 to 22%. By 2001, when combined these two indices total almost 60% of the human capital indicator; primary and secondary enrolment rate is around 40% and literacy has fallen to a negligible share.

A serious problem arises when dealing with regional figures for university enrolment: as evident in Table A.1, these tend to seriously underestimate small regions (Aosta Valley, Trentino-Alto Adige, Lucania), which did not host a university or higher education institute for most of the twentieth century. University students from small regions temporarily emigrated to the cities of the larger regions, often returning to their homes after gaining their degrees – this inter-regional mobility increased markedly during recent decades. However, mobility between the three macro-regions (North-West, Center/North-East, South and islands) was much lower and, even when the flows were remarkable, namely in the mobility from the South to the North, the return rates were considerably lower, so much so that, by and large, emigrating students could be considered as effectively acquired by the host regions. For these reasons, I calculate and use a new index of university attendance, which is based on macro-regional scores and on the regional enrolment ratios of tertiary education, according to the formula: newUr=Tr/Tm*Um, where *U* is university attendance, *T* is tertiary education, *r* is the region and *m* the macro-region. In other words, I assume that each region follows the university attendance of its macro-region, proportional to its rate of tertiary education enrolment (due to lack of space the new index is omitted, but it can be easily derived from the figures in Table A.1).

It is worth stressing that we always refer to the *gross* enrolment ratio, i.e. the total number of students enrolled (including repeaters and other students above/below the respective age brackets) as a percentage of the official population for a given level of education. Of course, the *net* enrolment ratio (the students enrolled of the official age-group for a given level of education, as a percentage of the corresponding population) and even more attendance rates (the number

of people attending a given level of education, as a percentage of the corresponding population), which in turn can be gross or net, would be preferable; but the available sources are not suitable for any long-term and consistent quantification of these variables (cfr. A'Hearn et al. 2011, pp. 180–1),[30] as with most of the countries around the world. As far as we can tell, however, north-south differentials in attendance, and more in general differences between enrolment and attendance, were in the liberal age higher than later (A'Hearn et al, pp. 187–93): i.e., they decreased over the course of the twentieth century.[31] As a consequence, a possible revised human capital indicator, which would allow for regional changes in attendance over the long-run, would probably show even higher convergence than the human capital indicator here presented.

The problem of the quality of education is maybe different, regional inequality probably persisted, but the solution (or lack of it) here proposed is analogous. Out of necessity: today PISA (Programme for International Student Assessment) data, which measure the knowledge and skills of 15-years-old students for many countries including Italy, show some north-south differences, but they are available only from 2000 onwards (Nardi 2001).

As a whole, the use of a composite indicator tends to increase regional (north-south) differences in human capital in the last decades, as compared to alternative unvarying measures of human capital such as literacy or the total enrolment rate: it does not come as a surprise that, as illustrated in Section 3, the use of alternative (and arguably less questionable) measures does not invalidate the overall result of the article, i.e. that human capital became less important in the last decades. The same can be said for out-of-reach more accurate measures, such as attendance rates. These are good reasons to believe that the view taken by the present article is by and large correct. However, Table A.1 is intended to provide any interested reader with full information about the individual components of the index and their trends, in order to make the methodology proposed entirely transparent, and amendable.

[30] It would be possible to estimate attendance rates of compulsory orders only for a few benchmarks: 1881–2, 1891–2 (Maic 1882, 1883, 1892), for the 1930s (Istat 1931, 1938), and for 2001 (Istat 2005).

[31] By 2001 they were truly negligible (Istat 2005).

Table A.1 (part 1). *A composite and dynamic index of human capital for Italy's regions: components and weights*

	Literacy								Total enrolment ratio (6-24 years)							
	1871	1891	1911	1938	1951	1971	1981	2001	1871	1891	1911	1938	1951	1971	1981	2001
Piedmont	57.7	76.1	89.0	96.5	97.5	98.5	99.0	99.3	11.8	13.8	15.2	41.7	41.6	52.5	62.6	77.6
Aosta Valley	-	-	-	-	97.5	98.9	99.3	99.5	-	-	-	-	41.3	44.9	57.0	67.3
Liguria	43.7	65.6	83.0	94.1	95.9	98.3	99.0	99.4	8.3	11.5	13.7	48.0	46.9	58.5	68.4	83.3
Lombardy	54.8	71.7	86.6	96.1	97.4	98.9	99.3	99.5	10.4	13.1	13.6	43.5	43.3	53.0	62.5	78.7
North-West	*54.7*	*72.7*	*87.0*	*96.0*	97.2	98.7	99.2	99.4	*10.7*	*13.2*	*14.2*	*43.6*	*43.3*	*53.4*	*63.1*	*78.7*
Trentino-Alto Ad.	-	-	-	98.6	99.1	99.6	99.7	99.7	-	-	-	56.0	46.6	52.4	55.6	71.9
Veneto	35.3	56.3	74.8	90.8	93.6	98.1	98.9	99.5	6.1	11.4	13.3	44.7	43.3	54.3	61.9	77.3
Friuli	-	-	-	91.6	95.9	98.7	99.3	99.7	-	-	-	53.5	36.6	50.0	63.6	87.0
Emilia	28.1	45.8	67.3	87.8	91.9	97.3	98.5	99.3	5.6	9.7	13.4	42.2	43.5	59.3	67.5	91.0
Tuscany	31.9	45.4	62.6	84.9	89.2	95.8	97.8	99.2	5.9	7.4	10.6	45.5	41.5	58.2	68.6	87.4
The Marches	21.0	32.0	49.3	79.1	86.2	94.6	97.3	99.1	4.4	7.2	10.0	42.7	42.5	59.2	65.3	88.1
Umbria	19.9	33.4	51.4	79.1	86.1	94.3	96.8	98.9	4.7	8.0	9.9	41.1	40.5	63.3	70.1	90.1
Latium	32.3	49.5	66.8	84.7	90.1	96.2	97.9	99.1	3.5	10.1	12.1	45.5	47.4	60.6	71.9	91.1
Center/North-East	*30.2*	*47.0*	*65.7*	*87.2*	91.3	96.8	98.3	99.3	*5.4*	*9.4*	*12.1*	*45.1*	*43.4*	*57.6*	*66.7*	*86.2*
Abruzzi	15.2	25.0	42.4	71.9	80.2	91.2	94.8	98.1	4.5	6.5	8.8	40.5	42.3	62.3	64.5	84.8
Campania	20.0	30.0	46.3	70.0	77.4	89.9	94.3	97.2	5.3	7.6	8.2	40.5	44.3	59.4	64.1	79.0
Apulia	15.5	25.4	40.6	67.2	76.4	90.1	94.2	97.3	3.4	5.8	8.1	33.4	40.1	56.5	60.8	75.4
Lucania	12.0	19.9	34.7	60.8	70.9	86.2	91.0	95.8	3.0	5.7	6.8	32.7	37.6	61.5	57.7	73.8
Calabria	13.0	18.2	30.4	58.2	67.9	84.8	90.4	95.3	3.1	5.1	6.7	32.1	41.5	59.1	58.1	75.8
Sicily	14.7	24.1	42.0	66.5	75.7	89.3	93.7	97.2	3.3	6.2	8.2	36.8	42.4	59.2	63.7	78.7
Sardinia	13.9	26.2	42.0	69.9	78.4	91.1	95.0	98.1	4.8	6.8	8.5	38.8	44.7	61.9	64.7	80.1
South and islands	*15.9*	*25.2*	*41.4*	*67.2*	75.8	89.3	93.7	97.1	*4.0*	*6.4*	*8.1*	*36.9*	*42.3*	*59.2*	*62.6*	*78.2*
Italy	31.2	45.2	62.4	82.4	87.3	94.8	96.9	98.6	6.3	9.3	11.1	41.7	42.9	57.2	64.2	81.0
St. dev. (on Italy = 1)	*0.47*	*0.42*	*0.31*	*0.16*	*0.11*	*0.05*	*0.03*	*0.01*	*0.41*	*0.30*	*0.25*	*0.15*	*0.07*	*0.08*	*0.07*	*0.08*
Weight in the index (%)	*68.8*	*54.8*	*37.6*	*17.6*	*12.7*	*5.2*	*3.1*	*1.4*	-	-	-	-	-	-	-	-

Table A.1 (part 2). *A composite and dynamic index of human capital for Italy's regions: components and weights*

	Primary and secondary enrolment rate (6-14)								Tertiary education enrolment rate (14-19)								Higher education enrolment rate (19-24)							
	1871	1891	1911	1938	1951	1971	1981	2001	1871	1891	1911	1938	1951	1971	1981	2001	1871	1891	1911	1938	1951	1971	1981	2001
Piedmont	54.7	71.1	61.1	75.1	77.1	80.6	85.5	96.6	0.8	1.7	2.6	12.5	23.1	40.6	50.3	86.4	0.5	1.2	1.3	1.6	4.5	9.1	19.5	43.1
Aosta Valley	-	-	-	-	87.4	80.6	86.2	96.6	-	-	-	-	5.1	31.3	46.9	89.8	-	-	-	-	0.0	0.0	0.0	5.6
Liguria	39.2	55.7	63.3	81.0	82.9	80.7	86.7	96.5	0.9	1.7	2.8	20.7	24.4	52.9	63.5	96.0	0.5	1.3	1.1	2.1	9.3	16.2	28.9	52.1
Lombardy	49.9	62.4	58.2	74.9	76.7	78.5	84.1	96.7	0.6	1.4	2.2	11.9	19.5	38.8	49.0	84.0	0.6	0.6	0.6	1.6	5.3	10.3	21.4	47.6
North-West	50.6	65.1	59.8	75.7	77.7	79.3	84.8	96.7	0.7	1.5	2.4	*13.3*	*20.9*	*40.8*	*50.8*	*85.8*	0.6	0.9	0.9	*1.7*	*5.5*	*10.5*	*21.5*	*46.4*
Trentino-Alto Ad.	-	-	-	88.3	87.6	82.6	86.0	97.1	-	-	-	7.2	12.2	33.5	39.1	71.1	-	-	-	0.0	0.0	4.2	4.1	29.9
Veneto	36.5	52.4	52.4	73.0	76.1	79.9	85.0	97.1	0.4	1.2	1.7	7.7	11.6	37.3	45.6	85.7	0.5	0.6	0.6	1.1	3.7	11.3	22.0	41.2
Friuli	-	-	-	85.4	68.0	81.6	85.7	97.8	-	-	-	9.0	12.8	47.9	54.9	93.8	-	-	-	0.6	2.4	7.1	18.6	66.0
Emilia	26.4	46.3	60.0	74.7	77.9	81.7	84.5	96.6	0.6	1.0	2.0	9.2	13.6	49.8	57.6	91.9	0.6	1.7	1.9	1.9	7.4	19.0	34.6	80.8
Tuscany	26.9	34.8	47.3	76.9	74.2	80.7	84.5	96.6	0.6	1.2	2.1	9.7	15.9	49.9	58.7	92.4	0.5	1.3	0.9	2.1	5.9	17.8	35.9	70.2
The Marches	20.9	35.3	44.9	67.2	73.1	81.5	84.1	96.8	0.9	1.4	2.5	7.6	14.6	48.4	58.1	96.0	0.5	0.4	1.3	1.0	4.5	13.7	25.4	69.1
Umbria	18.9	38.4	45.4	69.1	74.4	82.8	83.4	96.5	0.6	1.1	2.1	7.5	13.5	56.7	65.7	92.9	0.5	0.4	0.8	0.7	3.4	24.3	36.7	79.4
Latium	18.1	50.6	55.7	72.4	79.4	79.6	85.5	96.8	0.7	2.1	3.5	18.0	20.5	52.6	61.9	96.7	0.5	2.0	3.4	4.9	10.7	20.9	41.7	78.3
Center/North-East	27.7	44.4	52.2	73.9	75.9	80.6	84.9	96.9	0.6	1.3	2.2	*10.0*	*14.8*	*47.1*	*55.5*	*91.3*	0.5	1.1	1.4	*1.9*	*6.0*	*16.0*	*31.0*	*66.1*
Abruzzi	20.0	31.7	39.3	66.8	78.3	82.8	83.6	96.6	0.3	0.7	1.1	6.0	8.8	51.3	56.1	94.6	0.0	0.0	0.0	0.0	0.0	14.3	21.9	59.8
Campania	21.6	35.7	35.8	61.3	69.9	77.2	80.6	95.1	0.6	1.6	2.3	10.8	12.0	42.0	47.6	85.0	1.5	2.3	2.4	3.5	8.5	19.0	30.7	48.6
Apulia	14.4	27.7	35.9	54.5	63.8	75.9	80.9	95.4	0.5	1.0	1.8	7.9	11.0	40.7	44.2	87.3	0.0	0.1	0.1	0.8	4.9	13.7	18.3	36.7
Lucania	13.9	27.6	30.8	54.0	66.1	82.8	82.7	95.7	0.3	0.5	1.0	4.4	5.5	45.9	50.4	99.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.8
Calabria	13.4	23.0	28.2	53.6	70.3	79.8	79.9	94.7	0.3	0.6	1.2	6.0	7.1	45.3	49.7	91.3	0.0	0.0	0.0	0.0	0.0	0.2	8.0	34.0
Sicily	13.5	28.2	40.7	59.4	67.9	77.9	82.3	95.4	0.4	1.1	2.1	9.6	10.2	42.2	47.1	87.4	0.4	0.8	0.8	2.3	9.5	20.6	27.3	45.1
Sardinia	20.5	32.3	39.5	67.1	74.7	84.6	87.7	96.7	0.4	0.7	1.5	8.3	7.1	41.9	45.5	91.8	0.3	0.4	0.6	1.3	3.4	14.5	21.0	50.3
South and islands	16.9	30.0	36.7	59.4	69.2	78.5	81.8	95.4	0.5	1.1	1.8	*8.5*	*9.9*	*42.9*	*47.5*	*88.2*	0.5	0.8	0.9	*1.7*	*5.7*	*15.4*	*22.8*	*44.0*
Italy	29.6	44.2	48.3	68.5	73.4	79.4	83.6	96.2	0.6	1.3	2.1	10.2	14.1	43.9	51.1	88.7	0.5	1.0	1.1	1.8	5.7	14.3	25.4	52.2
St. dev. (on Italy = 1)	*0.43*	*0.32*	*0.23*	*0.15*	*0.09*	*0.03*	*0.03*	*0.01*	*0.33*	*0.35*	*0.31*	*0.40*	*0.40*	*0.16*	*0.14*	*0.07*	*0.66*	*0.77*	*0.86*	*0.72*	*0.62*	*0.52*	*0.48*	*0.40*
Weight in the index (%)	*30.1*	*43.0*	*58.5*	*70.1*	*68.7*	*54.7*	*50.6*	*40.0*	*0.6*	*1.2*	*2.5*	*10.4*	*13.2*	*30.2*	*30.9*	*36.9*	*0.6*	*0.9*	*1.3*	*1.8*	*5.3*	*9.8*	*15.4*	*21.7*

Sources: Maic (1878, 1893, 1914); Istat (1939, 1941, 1954, 1972, 1982, 2005). For the population brackets, elaborations from Census of Population, 1871, 1881, 1901, 1911, 1936, 1951, 1971, 1981, 2001 (1891 data are interpolated with the continuous compounding yearly rate).

Social capital

In this article, new estimates of social capital at the regional level are presented for two benchmark years, 1871 and 1891, whereas for other benchmarks (from 1901 onwards) the available figures by Giorgio Nuzzo are employed. In order to achieve a comprehensive and coherent long-term picture, the new benchmarks have been reconstructed through a methodology explicitly linked to Nuzzo's. However, when compared with the benchmarks from 1901 onwards, for 1871 and 1891 there were less indicators available and thus, in order to come to consistent figures, the hypothesis had to be introduced that, for each dimension of social capital, the ratio between the observed variables and the unobserved ones in 1891 was the same as in 1901, and in 1871 the same as in 1891.

As mentioned, Nuzzo's indicator is a simple mean of social participation, political participation and trust. Social participation is measured by an average of different non-profit institutions, i.e. those which, according to the author, effectively generated social capital (significantly, unions were excluded). For the second half of the nineteenth century, we can rely upon friendly societies, which were also used by Nuzzo for 1901: in both cases, the indicator is the number of members of such friendly societies, as a ratio to the total population. As a first step, data for 1904, 1895 and 1873 (the years for which data was available) have been extrapolated backwards in order to create the 1871, 1891 and 1901 benchmarks, via linear interpolation with the continuous compounding yearly rate. As a second step, in 1891 social participation has been estimated from the member of friendly societies in 1891 and by maintaining, for every region, the 1901 ratio of social participation / members of friendly societies, as in the equation:

$$R_{sp}1891 = R_{mf}1891*(R_{sp}1901/R_{mf}1901) \qquad (A.1)$$

where *R* is the region, *sp* is social participation, *mf* is the number of members of friendly societies.[32] Finally, this procedure has been replicated for 1871, using the 1891 estimate of social participation in place of Nuzzo's figure for 1901. The number of friendly societies and the total amount of deposits of the *banche popolari* have been tested too, alone or in combination (to also include the number of members), but they turned out to be weakly correlated with Nuzzo's figures.

Nuzzo's indicator of political participation is an average of the densities of political non-profit institutions, of the share of voters out of the total population at different elections, and of an informal indicator based on polls taken from 1993 to 2003 concerning political engagement. For 1901, the author relied only on the density of political non-profit institutions. For the second half of the nineteenth century we lack this information, but we can avail ourselves of the use of statistics on local newspapers, an indicator in line with Putnam's approach, where the readers of newspapers are used as a proxy of political participation. In our case, we have data about the number of local newspapers published in 1880 (1454), 1891 (1779), 1895 (1901) and 1905 (3120), which, via linear interpolation with the continuous compounding yearly rate, have been used to create 1871, 1891 and 1901 regional benchmarks; as can be seen from the figures in brackets, the numbers are relatively high, which partly comforts about the reliability of the proxy used. The rest of the procedure is analogous to the one outlined for calculating social participation, with the difference that in this case regional data on local newspapers are linked to Nuzzo's index of political participation.[33]

[32] For 1901, the correlation between the number of members of friendly societies and Nuzzo's index of social participation is unsurprisingly very high (Pearson coefficient 0.892 and significant at the 0.001 level).

[33] In this case, the Pearson correlation between the number of local newspapers in 1901 and Nuzzo's index of political participation is low (coefficient 0.219 significant at the 0.05 level, excluding the outlier Sardinia), but it is worth noting that this discrepancy is mitigated by the use of the same ratio between observed and unobserved variables (see Table A.1).

Nuzzo's indicator of trust is measured by the inverse of an average of estimates of violent criminality and of court proceedings, as well as of the share of perceived criminality as determined by polls conducted in 1995 and 2003. For the second half of the nineteenth century we can make use of almost the same data as those used by Nuzzo for 1901. More in particular, trust is approximated through the inverse of an average of criminal and civil court proceedings in 1901-04, 1891 and (here only criminal court proceedings) 1871.[34] Here too, at this point the procedure is analogous to the one outlined for the other two dimensions, in this case the data being correlated with Nuzzo's index of trust. For 1871, since only criminal statistics were available, these were in turn correlated with criminal statistics in 1891 and with the index of trust in 1891.

For each component, the regional data of the two-step procedure are shown in Table A.2. By construction, the results are in line with Nuzzo's benchmarks.

[34] Unsurprisingly, for 1901 the new benchmark is highly correlated with Nuzzo's index of trust (Pearson coefficient 0.845, significant at the 0.001 level, excluding the outlier Marches).

Table A.2. *The components of social capital in 1871, 1891 and 1901 (Italy=1)*

	Social participation						Political participation						Trust					
	Estimate (1)			Estimate (2), from Nuzzo			Estimate (1)			Estimate (2), from Nuzzo			Estimate (1)			Estimate (2), from Nuzzo		
	1871	1891	1901	1871	1891	1901	1871	1891	1901	1871	1891	1901	1871	1891	1901	1871	1891	1901
Piedmont	1.91	1.83	1.86	1.85	1.83	1.88	0.84	1.28	1.23	0.71	1.09	1.04	1.21	1.63	1.90	0.93	1.29	1.47
Liguria	0.77	1.08	1.25	1.13	1.62	1.89	1.59	1.35	1.45	1.12	0.96	1.03	1.21	1.11	1.02	1.77	1.34	1.20
Lombardy	1.47	1.53	1.58	1.36	1.46	1.54	1.02	1.00	0.94	1.12	1.10	1.03	1.21	2.23	2.01	1.46	1.78	1.56
Veneto	0.84	0.90	1.01	0.57	0.63	0.72	0.60	0.70	0.69	0.82	0.96	0.95	0.72	1.54	1.83	0.78	1.32	1.52
Emilia	1.47	1.19	1.37	0.98	0.82	0.95	0.86	1.03	1.22	0.84	1.02	1.20	1.53	1.84	1.97	1.90	1.53	1.60
Tuscany	2.19	1.52	1.29	2.58	1.84	1.59	1.25	1.25	1.27	1.00	1.01	1.02	1.07	1.48	1.51	1.42	1.46	1.45
The Marches	1.35	1.33	1.36	0.86	0.88	0.91	0.68	0.95	1.14	0.62	0.88	1.04	1.57	1.27	1.42	0.39	0.30	0.33
Umbria	1.53	1.07	1.07	1.75	1.27	1.28	0.61	0.94	0.94	0.75	1.17	1.17	1.57	1.27	1.42	1.37	1.06	1.16
Latium	1.24	1.14	0.90	1.54	1.46	1.17	1.83	2.04	1.66	1.24	1.39	1.13	0.75	0.50	0.40	2.10	1.07	0.84
Abruzzi	0.16	0.44	0.39	0.11	0.32	0.28	0.37	0.96	0.86	0.38	0.98	0.87	0.87	0.76	0.79	0.77	0.57	0.58
Campania	0.21	0.51	0.50	0.14	0.35	0.35	1.25	0.86	0.88	1.23	0.85	0.87	0.87	0.78	0.71	0.31	0.22	0.20
Apulia	0.36	0.43	0.29	0.72	0.90	0.62	1.08	0.69	0.81	1.30	0.84	0.98	0.87	0.65	0.62	0.51	0.47	0.43
Lucania	0.12	0.46	0.41	0.17	0.65	0.59	0.47	0.53	0.64	0.68	0.77	0.93	0.87	0.61	0.63	0.52	0.37	0.37
Calabria	0.06	0.31	0.32	0.02	0.11	0.11	1.07	0.85	1.00	0.92	0.73	0.86	0.87	0.62	0.73	0.33	0.21	0.24
Sicily	0.40	0.37	0.38	0.60	0.56	0.59	1.43	0.99	0.85	1.47	1.02	0.87	1.10	0.83	0.82	0.89	0.64	0.62
Sardinia	0.30	0.29	0.27	0.66	0.67	0.62	0.38	0.36	0.40	1.29	1.24	1.39	0.66	0.33	0.35	0.14	0.10	0.10

Notes: Estimate (1) is the first estimate of social capital made with the available and in some cases incomplete information. Estimate (2) is the final estimate, i.e. estimate (1) corrected to be consistent with Nuzzo's figures, with the assumption that the ratio between the observed variables and the unobserved ones was the same in 1891 as in 1901 and in 1871 as in 1891 (see the text). By construction, in 1901 estimate (2) is Nuzzo's estimate.

Sources: See the text and Maic (1878, 1881, 1893, 1900, 1908).

Fertility and population growth

Figures of fertility and population growth are shown in Table A.3. As can be observed also by the naked eye, usually differences in fertility rates do not automatically equal differences in population growth; in fact, in all the panel models (random and fixed effects) fertility is not significant as a predictor of population growth, although it certainly has a positive effect. More specifically, southern Italy scored fertility rates above the Italian average throughout the period, but a population growth below the average up to the 1970s, with the exception of the years 1938-1951. Although differences in mortality rates were important to some extent, the main reason for this was migration, both interregional and international, which depopulated southern Italy through most of the period (but it came almost to a halt in the 1930s, only to resume again in the 1950s). From the 1970s, migration from the south played a much diminished role, and thus for the first time, not having reduced their gap in fertility rates, the southern regions experienced a population growth higher than the Italian average. This difference is apparently more important than the one in social capital, when it comes to explaining the decline of the south in recent decades. It could be, however, that differences in social capital also determined differences in fertility rates, at least to some extent and perhaps until very recently. In any event, the two variables appear to be highly correlated in the last decades: their correlation grows from 1911 to 1938 and remains significantly high at least until the 1980s[35]. Needless to say, this is another topic that deserves thorough consideration in further research.

Table A.3. *Fertility rates and population growth for Italy's regions (Italy=1)*

	Fertility rates							Population growth					
	1891	1911	1938	1951	1971	1981	2001	1891-1911	1911-1938	1951-1938	1951-1971	1971-1981	2001-1981
Piedmont	0.90	0.72	0.63	0.63	0.81	0.78	0.84	0.94	0.83	0.91	1.10	0.96	0.93
Aosta Valley	-	-	-	1.05	0.95	1.08	0.98	-	-	-	1.02	0.97	1.04
Liguria	0.82	0.72	0.54	0.58	0.71	0.60	0.70	1.07	1.00	0.96	1.04	0.93	0.85
Lombardy	1.01	0.98	0.84	0.84	0.85	0.90	0.84	1.06	0.98	1.02	1.14	1.00	1.00
North-West	*0.95*	*0.85*	*0.73*	*0.74*	*0.82*	*0.83*	*0.83*	*1.01*	*0.93*	*0.99*	*1.12*	*0.98*	*0.97*
Trentino-Alto Ad.	-	-	0.92	1.10	1.09	1.02	0.98	-	-	0.97	1.01	1.01	1.04
Veneto	1.06	1.15	1.05	0.99	1.00	0.96	0.98	1.04	0.98	0.82	0.95	1.00	1.04
Friuli	-	-	0.79	0.58	0.71	0.72	0.77	-	-	1.08	0.91	0.97	0.92
Emilia	1.01	1.12	0.79	0.73	0.81	0.78	0.70	1.02	1.00	0.96	0.96	0.99	1.00
Tuscany	0.96	0.89	0.71	0.73	0.81	0.78	0.84	1.00	0.89	0.97	0.97	0.99	0.97
The Marches	0.98	1.10	1.00	0.89	0.85	0.96	0.98	0.96	0.93	0.97	0.88	1.00	1.03
Umbria	0.96	0.92	1.00	0.84	0.81	0.90	0.98	0.97	0.85	1.01	0.84	1.00	1.03
Latium	0.90	0.95	0.96	0.94	1.04	0.96	0.84	1.10	1.66	1.15	1.24	1.01	1.01
Center/North-East	*1.00*	*1.05*	*0.90*	*0.85*	*0.91*	*0.89*	*0.86*	*1.02*	*1.14*	*0.97*	*1.00*	*1.00*	*1.01*
Abruzzi	1.04	1.01	1.26	1.10	0.95	1.02	1.05	0.91	0.88	0.94	0.77	1.02	1.02
Campania	0.98	1.04	1.30	1.31	1.28	1.33	1.33	0.96	0.90	1.06	1.01	1.03	1.04
Apulia	1.14	1.18	1.42	1.41	1.28	1.27	1.26	1.06	1.00	1.10	0.96	1.04	1.03
Lucania	1.12	1.21	1.55	1.47	1.33	1.20	1.26	0.83	0.92	1.04	0.80	0.99	0.98
Calabria	0.98	1.07	1.38	1.47	1.28	1.27	1.33	0.94	1.00	1.04	0.82	1.00	0.98
Sicily	1.06	1.04	1.17	1.26	1.23	1.27	1.33	1.00	0.87	1.02	0.90	1.00	1.01
Sardinia	0.98	1.01	1.30	1.52	1.28	1.27	1.26	1.02	0.98	1.12	1.00	1.04	1.01
South and islands	*1.04*	*1.07*	*1.30*	*1.34*	*1.24*	*1.26*	*1.29*	*0.97*	*0.92*	*1.05*	*0.92*	*1.02*	*1.02*
Italy (abs. fig.)*	0.376	0.347	0.239	0.191	0.211	0.166	0.143	0.662	0.752	0.813	0.656	0.472	0.068

Sources. For fertility rates: Livi-Bacci 1977, from 1891 to 1951 (see also Franklin 2003); elaborations from Istat 1974, for 1971; Istat 1985, for 1981; Istat 2005, for 2001. For population growth: elaborations from Felice 2007a, p. 16, for 1911, 1951, 1971, 2001; Felice 2005b, p. 85, for 1891; Felice 2005a, p. 9, for 1938; Istat 1985, for 1981. Population growth is calculated on present population. * In the case of population growth, yearly growth rate (%).

[35] Without the outliers in social capital (Trentino-Alto Adige and Aosta Valley), the Pearson correlations between the two equal -0.511 in 1891, -0.560 in 1911, -0.890 in 1938, -0.875 in 1951, -0.817 in 1971, -0.775 in 1981 and -0.675 in 2001 (all significant at the 0.01 level, with the exception of 1891 and 1911 significant at the 0.05 level).

Appendix References

Bils M, Klenow PJ (2000) Does Schooling Cause Growth? Am Econ Rev 90(5):1160–1183

Felice E (2008) The correlation between human capital and economic performance. Historical evidence and some hypotheses for the Italian regions (1871-2001). Il Risparmio 56(2):55–93

Franklin R (2003) Italian fertility, 1864 to 1961: an analysis of regional trends. Mimeo 2003, downlowadable at http://www-sre.wu-wien.ac.at/ersa/ersaconfs/ersa03/cdrom/papers/542.pdf [last access on December 2010]

Istat, Istituto Centrale di Statistica (1931) Annuario Statistico Italiano, 1931. Rome

Istat, Istituto Centrale di Statistica (1938) Annuario Statistico Italiano, 1938. Rome

Istat, Istituto Centrale di Statistica (1939) Annuario Statistico Italiano, 1939. Rome

Istat, Istituto Centrale di Statistica (1941) Annuario Statistico Italiano, 1941. Rome

Istat, Istituto Centrale di Statistica (1954) Annuario Statistico Italiano, 1953. Rome

Istat, Istituto Centrale di Statistica (1972) Annuario Statistico Italiano, 1972. Rome

Istat, Istituto Centrale di Statistica (1974) 11° Censimento generale della popolazione. 24 ottobre 1971, vol. V, Sesso, età, stato civile. Rome

Istat, Istituto Centrale di Statistica (1982) Annuario Statistico Italiano, 1982. Rome

Istat, Istituto Centrale di Statistica (1985) 12° Censimento generale della popolazione. 25 ottobre 1981, vol. VII. Dati sulle caratteristiche strutturali della popolazione e delle abitazioni, Rome

Istat, Istituto Centrale di Statistica (2005) 14° Censimento generale della popolazione e delle abitazioni (http://dawinci.istat.it/MD/) [last access on July 2011]

Livi-Bacci M (1977) A History of Italian Fertility During the Last Two Centuries. Princeton University Press, Princeton, NJ

Maic, Ministero di agricoltura, industria e commercio (1878) Annuario Statistico Italiano, 1878. Rome

Maic, Ministero di agricoltura, industria e commercio (1881) Annuario Statistico Italiano, 1881. Rome

Maic, Ministero di agricoltura, industria e commercio (1882) Statistica dell'istruzione elementare. Rome

Maic, Ministero di agricoltura, industria e commercio (1883) Statistica dell'istruzione elementare. Rome

Maic, Ministero di agricoltura, industria e commercio (1892) Statistica dell'istruzione elementare. Rome

Maic, Ministero di agricoltura, industria e commercio (1893) Annuario Statistico Italiano, 1892. Rome

Maic, Ministero di agricoltura, industria e commercio (1900) Annuario Statistico Italiano, 1900. Rome

Maic, Ministero di agricoltura, industria e commercio (1908) Annuario Statistico Italiano, 1905-07. Rome

Maic, Ministero di agricoltura, industria e commercio (1914) Annuario Statistico Italiano, 1913. Rome

Nardi E (2001) Il progetto nazionale Ocse-Pisa 2000. Downloadable at http://www.scribd.com/doc/17681430/Il-progetto-OCSEPisa-2000- [last access on July 2011]