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Emanuele Felice

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Emanuele Felice[a]

Department of Economics and Economic History
Autonomous University of Barcelona
Edifici B - Campus de Bellaterra
08193 Bellaterra (Cerdanyola del Vallès), Barcelona, Spain

Department of Economics
University of Siena
Piazza S. Francesco, 7
53100, Siena, Italy

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. 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.

JEL keywords: regional history, human capital, social capital, convergence
JEL codes: E13, E24, N93, N94, R11

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Email: emanuele.felice@gmail.com.

Echaste un velo de sombra
sobre el bello mundo, y vas
creyendo ver, porque mides
la sombra con un compás.[1]

Antonio Machado, *Parábolas*

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:[2] conversely, it is argued that in the decades following Unification (1861) Southern Italy was economically highly diversified; 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 wish to provide answers to the above question. It presents estimates of human capital and social capital for Italy's regions over the long run – in benchmark years from 1871 to 2001 – and links them 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. Secondly, 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 advance an interpretative hy-

[1] *Author's Translation:*

> You cast a veil of shadow
> on the beautiful world, and you go
> believing to see, 'cause you measure
> the shadow with a compass.

[2] And partly confirms the previous (and somehow pioneering) industrial estimates by Fenoaltea (2003).

pothesis in order to account for the observed changes in the explanatory variables, and briefly discuss how further research can refine the model and reinforce the explanation.

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 main econometric results and puts forward a long-term interpretative hypothesis, along with briefly positing possible future lines of research. 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.[3] Unremarkable at first, North-South differences steadily increased over the 1891–1951 period; divergence was slow during the 1891–1911 years, roughly the first age of globalization, but increased markedly 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, but this came to a halt during the 1970s, the decade 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).

[3] 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.

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

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

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

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

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 the first 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.[4] 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***
B_1	-0.001	0.010	0.009	-0.011	0.004	0.001	-0.0054	-0.0226	-0.0018	-0.0154
B_1 standard error	0.003	0.005**	0.006	0.001***	0.007	0.002	0.0033	0.0056***	0.0031	0.0041***
B_2									-0.0290	-0.0273
B_2 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 growth rates by sub-period ($t_1 - t_0$). Independent variable: Ln value added in t_0 (B_1), population growth by sub-period (B_2). In the panel regressions, both the dependent variable and the explanatory variable are expressed relatively to the Italian average – i.e. to the mean weighted with the size (population) of each observation (region). (1) Wald Chi2. Here, as in the following regressions, to avoid non-stationarity problems all the variables are expressed relative to the Italian average. * 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.

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 and 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

[4] 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).

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.[5] 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 and 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 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

[5] 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).

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. Conversely, we still maintain that savings rates were equal across regions, as well as that the other determinants external to the Solow model were uninfluential. It goes without saying that further historical research could lead us to better knowledge of these variables which are temporally set aside,[6] whereas in the meantime the present tests may, *inter alias*, offer some hint at the importance of these topics.

[6] Among these, savings rates are possibly the most important, yet at the moment neither historical official sources (*Annuario statistico italiano*), nor more recent historical research (most notoriously Cotula, Raganelli and Sannucci, eds, 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.

3. Human capital

From Carlo Maria Cipolla (1969), at least, economic historians have regarded human capital, usually measured as education, as one of the preconditions for economic growth (Easterlin, 1981; Nuñez, 1990), thus paving the way for the formal modelling of the new growth economists (Romer, 1986; Lucas, 1988; then Ram, 1990 and 1991, who first used conditional convergence). In this regard Italy can be a profitable field of analysis due to its remarkable regional disparities in education at the time of Unification.

Estimates of human capital at the regional level, in benchmark years, are shown in Table 3. Human capital is here approximated through 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 (for details on the methodology and the individual components, see the Appendix). In principle, the human capital indicator is a measure of 'flow', not of 'stock'. Limited to the first benchmarks, an exception is the use of literacy and yet this is common to most of the literature when dealing with past and even contemporary contexts where the vast majority of the population is illiterate. In order to be computed in growth regressions, flows are more suitable than stocks, essentially because the former more directly reflect the incremental contribution of human capital (and the related cost) to the growth of per capita GDP, which is also a flow. Conversely, stock measures, such as years of schooling per capita, should be properly employed as a social indicator alternative or complementary to income, that is as a goal rather than as a means – in this regard, human capital stocks have been computed as a component of the human development index (Felice, 2007a) and of the improved human development index (Felice, 2007b) for the Italian regions.

As Table 3 indicates, during the liberal age soon after Unification, regional differences in human capital were remarkably high, much more so than those in value added. Convergence in human capital was slower in the first decades after Unification and increased only after 1911, i.e. once a new national law (*Daneo-Credaro*) was issued, more effective in enforcing compulsory education than previous ones (*Casati* in 1859, *Coppino* in 1877).[7] 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	1.857	1.584	1.388	1.026	1.141	0.874	0.910	0.935
Aosta Valley	-	-	-	-	0.598	0.694	0.849	0.971
Liguria	1.373	1.344	1.266	1.456	1.365	1.096	1.149	1.039
Lombardy	1.722	1.498	1.279	1.070	1.121	0.848	0.886	0.909
North-West	*1.735*	*1.511*	*1.317*	*1.110*	*1.153*	*0.882*	*0.920*	*0.928*
Trentino-Alto Ad.	-	-	-	0.923	0.830	0.810	0.812	0.894
Veneto	1.078	1.235	1.199	0.901	0.896	0.884	0.947	1.077
Friuli	-	-	-	0.973	0.784	1.048	1.141	1.179
Emilia	0.897	1.028	1.165	0.965	1.032	1.122	1.197	1.155

[7] For a critical assessment of the early legislation about compulsory education, see Vasta (1996; 1999, pp. 220–2) and Felice (2007, pp. 155–7).

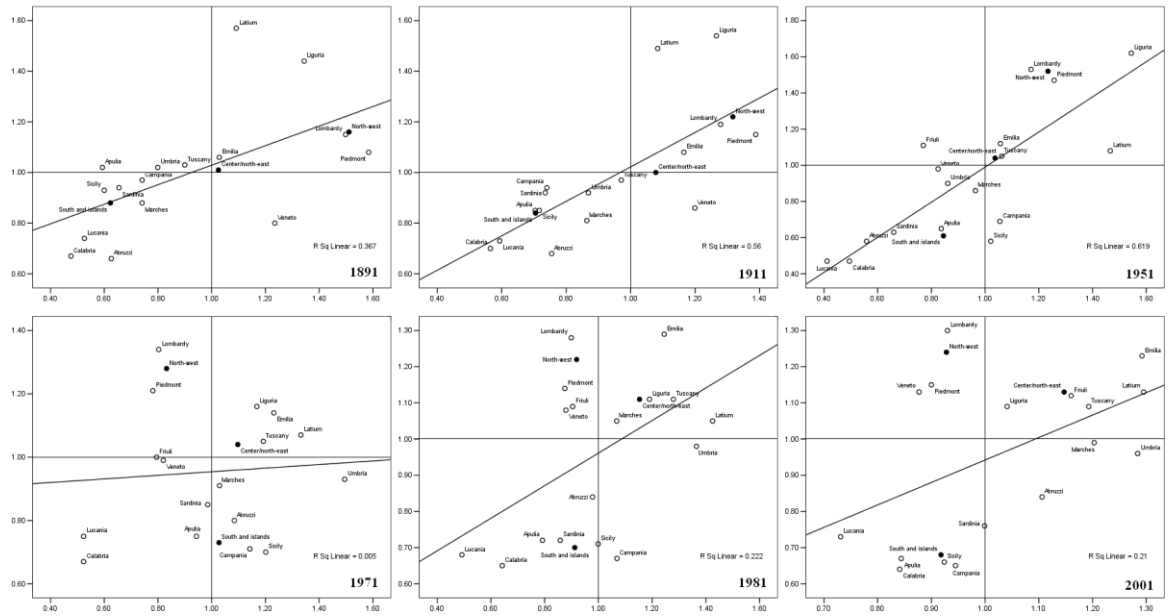
Tuscany	0.994	0.900	0.971	1.049	1.021	1.119	1.220	1.162
The Marches	0.681	0.741	0.864	0.878	0.985	1.097	1.207	1.206
Umbria	0.674	0.799	0.869	0.849	0.890	1.260	1.364	1.167
Latium	0.877	1.091	1.084	1.512	1.327	1.177	1.285	1.215
Center/North-East	*0.931*	*1.025*	*1.078*	*1.035*	*1.024*	*1.069*	*1.152*	*1.148*
Abruzzi	0.562	0.626	0.755	0.756	0.729	1.179	1.078	0.985
Campania	0.707	0.741	0.740	1.117	1.035	1.001	0.915	0.886
Apulia	0.511	0.593	0.704	0.775	0.874	0.967	0.849	0.909
Lucania	0.415	0.526	0.594	0.587	0.588	1.080	0.968	1.035
Calabria	0.442	0.476	0.565	0.654	0.680	1.058	0.954	0.951
Sicily	0.489	0.600	0.717	0.953	0.989	1.005	0.906	0.910
Sardinia	0.550	0.655	0.735	0.878	0.790	1.011	0.874	0.956
South and islands	*0.553*	*0.623*	*0.705*	*0.890*	*0.890*	*1.017*	*0.913*	*0.918*

Sources and notes: See 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 last three decades, from 1971 to 2001, 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 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 changed again, so much so that by 1981 and even more visibly around 2001, 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 fit line) that scored a level of value added per capita higher than their level of human capital, as compared to the average correlation in Italy's regions and those which on the contrary (below the fit line) had a lower level of value added, given their ranking in human capital; 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 (from 1951 onwards): 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 became 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.

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.

Econometric tests and formal modelling can be useful to qualify that which 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 has been instrumented with its lag.

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	0.021	-0.118	0.122	-0.056	0.008	0.0021	0.0204	0.0284	0.0382
Standard error	0.017***	0.036	0.070	0.009***	0.076	0.019	0.0037	0.0075**	0.0107***	0.0145**
B_1	-0.007	-0.004	0.018	-0.010	0.007	0.001	-0.0083	-0.0221	-0.0049	-0.0117
B_1 standard error	0.003**	0.005	0.010	0.001***	0.008	0.002	0.0030***	0.0062**	0.0027*	0.0043**
B_2	0.007	0.018	-0.017	-0.004	0.012	-0.002	0.0059	0.0007	0.0065	0.0041
B_2 standard error	0.002***	0.005***	0.015	0.003	0.012	0.003	0.0014***	0.0021	0.0015***	0.0017**
B_3									-0.0305	-0.0314
B_3 standard error									0.0110***	0.0135**
R^2	0.564	0.646	0.176	0.905	0.085	0.038	0.088	0.030	0.228	0.170
N	16	16	18	19	19	19	107	107	107	107
F value	8.40***	11.86***	1.59	71.70***	0.74	0.32	27.29***(1)	15.30***	29.11***(1)	12.14***

Notes: Dependent variable: Ln value added growth rates by sub-period ($t_1 - t_0$). Independent variable: Ln value added in t_0 (B_1), human capital relative to the Italian average (B_2), population growth by sub-period (B_3). In the panel regressions, all the variables are expressed relative to the Italian average and human capital is instrumented through its lag. (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.

In order 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 1938: 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 coefficient of per capita value added, as well as in the last three decades.[8] 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.

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 significantly 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 0.05 level of confidence (not at the 0.01),[9] and thus (with come caution) the fixed effects model is preferable: in the long-run, human

[8] 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.

[9] The test statistic (7.63) is approximately in between the two Chi-squared (2df, 5% = 5.99; 2df, 1% = 9.21), and Prob>Chi-squared is 0.022.

capital is just a redundant conditioning variable. However, it is worth noting that after including human capital the choice in favour of the fixed effects model is less indisputable than in the case of unconditional convergence. 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.[10] 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.

[10] The test statistic (5.56) is below the Chi-squared (3df, 5% = 7.82), and Prob>Chi-squared is 0.0622.

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),[11] 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,[12] 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).

For our purposes we can make use of a recent work 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. 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). To date, this is the only work offering a century-long view of social capital for the Italian regions via a coherent methodology, although still many qualifications could be applied to the estimates.[13] In order to make them comparable with the figures on value added and human capital, in this article two more benchmarks (1871 and 1891) have been reconstructed, through a methodology that directly links the new estimates to those available from 1901 onwards (see again the Appendix). The estimates of social capital for Italy's regions are shown in Table 5.

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 termed '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.

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

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

[13] Most remarkably, Sabatini (2005) 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).

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

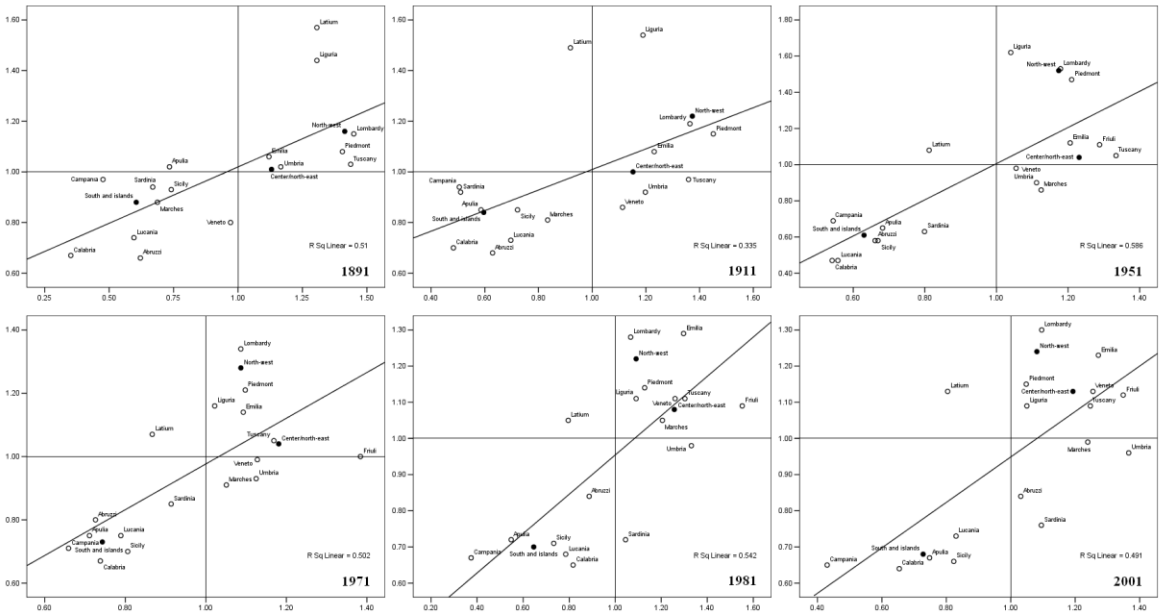
	1871	1891	1911	1938	1951	1971	1981	2001
Piedmont	1.163	1.405	1.451	1.229	1.210	1.098	1.128	1.048
Aosta Valley	-	-	-	-	1.668	1.763	1.514	1.493
Liguria	1.337	1.306	1.189	1.091	1.040	1.022	1.091	1.050
Lombardy	1.313	1.449	1.364	1.196	1.179	1.087	1.067	1.096
North-West	*1.255*	*1.414*	*1.373*	*1.195*	*1.174*	*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 and 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 (2005) 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 unlike human capital, no convergence in the long run and particularly in more recent decades – is not 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, from 1971 onwards 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 taken into account 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 their rank in social capital (which in the case of Latium was below average) given the average correlation across Italy's regions. Conversely, Southern Italy lay below the fit line: its value added relatively low compared to 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*.

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 undertook 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. 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. As expected, 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. 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.14 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 confidence15 (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.

[14] 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).

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

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*
B_1	-0.006	0.001	0.006	-0.011	0.000	-0.002	-0.0075	-0.0246	-0.0040	-0.0174
B_1 standard error	0.004	0.004	0.006	0.001***	0.008	0.002	0.0031**	0.0054***	0.0029	0.0045***
B_2	0.004	0.012	0.004	0.000	0.004	0.002	0.0036	0.0091	0.0033	0.0094
B_2 standard error	0.003	0.003***	0.002*	0.001	0.003	0.001**	0.0011***	0.0069	0.0011***	0.0073
B_3									-0.0274	-0.0277
B_3 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 growth rates by sub-period ($t_1 - t_0$). Independent variable: Ln value added in t_0 (B_1), social capital relative to the Italian average (B_2), population growth by sub-period (B_3). In the panel regressions, all the variables are expressed relative to the Italian average, and social capital is instrumented with its lag. (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.

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 number of observations) makes the results too sensitive to small changes in the observations and thus unreliable – as a consequence, these figures can be safely omitted from the present paper, although they by and large confirm the results of the previous regressions.[16]

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

[16] 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 (9.37) 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 0.025]. In the panel with population growth, the random effects model is preferable (test statistic 5.17, Prob>Chi-squared 0.2706).

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 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) 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 evidence and significance of the constant term, thus resulting suboptimal when compared with the regression including only human capital. Yet there is one more model, the last one, which reports a decrease in both the value and the significance of the constant term and thus is far 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,[17] and its validity simply suggests that an effect conditioning variable may have been human capital up to the Second World War and social capital in the second half of the twentieth century. Remarkably, in this case when the conditioning variable is positive and significant also in the fixed-effects model,[18] after the Hausman test, the fixed effects model results as preferable to the random effects one only in the panel without population growth and at a low level of confidence,[19] but it is worth noticing that in the random effects model the conditioning variable has an even stronger role than in the fixed effects model.[20]

[17] 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.

[18] The coefficients of the fixed effects model (with robust option) are the following; without population growth: constant 0.0172(***), B_1 (per capita value added) -0.0210(***), B_2 (mixed human capital and social capital) 0.0029(**); R^2 is 0.060. With population growth: constant 0.0384(**), B_1 (per capita value added) -0.0114(***), B_2 (mixed human capital and social capital) 0.0048(***); B_3 (population growth) -0.0328(**); R^2 is 0.240. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

[19] In the model without population growth, the test statistic (6.75) 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 0.034. In the model with population growth, the test statistic is 4.04 and the Prob>Chi-squared equals 0.257.

[20] The coefficients of the random effects model (with robust option) are the following; without population growth: constant 0.0027, B_1 -0.0093 (***), B_2 0.0059 (***); R^2 is 0.154. With population growth: constant 0.0280(***), B_1 -0.0058 (**), B_2 0.0061 (***), B_3 -0.0292(***); R^2 is 0.289.

When including population growth, however, the model with the greatest influence over the coefficients of the southern regions is the one conditional only on human capital (although the coefficients are quite similar to those of the model conditional on a mix of human and social capital). 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).

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

	Without population growth					With population growth				
	Unconditional	Conditional on HC	Conditional on SC	Conditional on HC and SC	Condit. on a mix of HC and SC	Unconditional	Conditional on HC	Conditional on SC	Conditional on HC and SC	Condition. on a mix of HC and SC
Piedmont	0.0026	0.0027	0.0009	0.0010	0.0018	0.0014	0.0001	-0.0003	-0.0012	-0.0014
Aosta Valley	-0.0014	-0.0014	-0.0065	-0.0066	-0.0019	-0.0027	-0.0027	-0.0077***	-0.0077***	-0.0055**
Liguria	0.0016	0.0016	0.0017	0.0019	0.0010	0.0001	-0.0013	0.0003	-0.0008	-0.0025
Lombardy	0.0050	0.0050	0.0039	0.0040	0.0043	0.0041	0.0030	0.0029	0.0021	0.0017
Trentino-Alto Ad.	0.0057	0.0057	-0.0263**	-0.0265**	0.0032	0.0054	0.0061*	-0.0265*	-0.0255*	0.0006
Veneto	0.0008	0.0008	-0.0013	-0.0014	0.0008	0.0005	0.0009	-0.0016	-0.0012	-0.0000
Friuli	0.0013	0.0013	-0.0029	-0.0030	0.0012	0.0006	0.0009	-0.0036	-0.0033	-0.0005
Emilia	0.0035	0.0034	0.0016	0.0016	0.0036	0.0028	0.0029	0.0009	0.0010	0.0020
Tuscany	0.0003	0.0003	-0.0036	-0.0037	0.0004	-0.0003	-0.0001	-0.0042	-0.0039	-0.0010
The Marches	-0.0014	-0.0014	-0.0029	-0.0031	-0.0008	-0.0017	-0.0006	-0.0032	-0.0023	-0.0011
Umbria	-0.0025	-0.0025	-0.0055	-0.0057	-0.0019	-0.0029	-0.0020	-0.0059**	-0.0052*	-0.0027
Abruzzi	-0.0054	-0.0054	-0.0060	-0.0063	-0.0043	-0.0054*	-0.0035	-0.0060*	-0.0046	-0.0037
Campania	-0.0080**	-0.0080*	-0.0073*	-0.0076*	-0.0072*	-0.0078***	-.00063*	-0.0072***	-0.0060**	-0.0062***
Apulia	-0.0080**	-0.0081*	-0.0086**	-0.0089**	-0.0069*	-0.0077***	-0.0057	-0.0082***	-0.0067*	-0.0056**
Lucania	-0.0086**	-0.0087*	-0.0095**	-0.0098**	-0.0073*	-0.0086***	-0.0063	-0.0094***	-0.0076*	-0.0063*
Calabria	-0.0089**	-0.0090*	-0.0094**	-0.0098**	-0.0075*	-0.0086***	-0.0061	-0.0090***	-0.0071	-0.0060*
Sardinia	-0.0085**	-0.0086*	-0.0098**	-0.0101**	-0.0075*	-0.0079**	-0.0061	-0.0084***	-0.0070*	-0.0062*
Sicily	-0.0081**	-0.0082*	-0.0086**	-0.0089**	-0.0072*	-0.0084***	-0.0065*	-0.0097***	-0.0082**	-0.0066**

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.

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 remarkable 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 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.

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 determinants 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, 2007a, 72–92; 2010; 2011). For the first time, the present article provides econometric evidence in favour of this long-term interpretative hypothesis.

Admittedly this evidence is still rather weak, but in order to make it more substantial a remarkable amount of new data is required – data whose collection and analysis goes well beyond the scope of this article. Here we can only briefly outline the research to come, in order to verify and possibly refine the present (and again: provisional) conclusions; in some cases, this research has already begun.

First, in line with the neoclassical approach the econometric tests could be made more reliable by increasing the number of observations. This can be achieved either by estimating new historical

benchmarks, or by producing provincial estimates. Concerning any new benchmarks, the big problem is with value added, where as a first step reliable (and possibly detailed) national figures at current prices are needed; these have now become available for industry in the interwar years (Carreras and Felice, 2010), and will probably soon be available for services from 1861 to 1951 too, on which a research team is currently at work under the auspices of the Bank of Italy. As a consequence, the formulation of regional value added estimates for some crucial benchmarks – such as 1921 and 1931 – should become possible relatively soon. With regard to provincial estimates, these have recently been proposed, albeit limited to the industrial production in the liberal period, for benchmark years from 1871 to 1911 (Ciccarelli and Fenoaltea, 2010); significantly enough, these support the view that in those years social capital was not a determinant of economic growth, since in the North many provinces with high levels of social capital did not undergo industrialization. From the new regional figures, additional provincial estimates covering more sectors and periods and also including more indicators could easily be produced in the future.

Secondly, the neo-classical approach could be refined, for example by relaxing assumptions about the production function. In this regard, the well-known data envelopment analysis could be of use, at least with regard to industry but it requires historical estimates of capital and labour at the regional level; to produce them is a demanding and uncertain task, which thanks to the available sources could be successfully carried out for the period spanning from 1911 onwards, in benchmark years.

Thirdly, a time-series approach could be implemented, in order to verify and integrate the benchmark approach. Amongst others, a time-series analysis would make it possible to consider and model relevant interventions such as the changes in the tariff policy, the completion of some key infrastructures, or the introduction of a territorial wage scale (*gabbie salariali*) proportional to the cost of living between 1945 and 1954, and its abolition between 1969 and 1972 (with consequent higher wages in real terms in the South); to discuss more properly the endogeneity problem, i.e. the effects of economic growth on human capital and social capital; to verify the hypothesis of multiple equilibria over the long-run, according to the different technological regimes. At least in principle, this latter approach would seem to be highly promising but, as usual with time series, is by far the more demanding one in terms of data. Nonetheless, some steps have already been taken in this direction: namely by Ciccarelli and Fenoaltea (e.g. 2009) concerning annual series of regional value added of many industrial sectors, at constant prices from 1861 to 1913; or by Daniele and Malanima (2007) who produced provisional annual series of regional GDP from 1861 to 1951 based on the 'strong' hypothesis that the national sectoral cycles had the same impact on every region, in proportion to each regional sectoral share. At present, however, both these works are either incomplete or not entirely satisfactory.

Not least, and quite evidently, it may also be argued that the present estimates of human capital and social capital should be revised and possibly improved. Although this may be true, there are some reasons to believe that the broad picture discussed in this article and perhaps the main econometric results may well remain by and large unchanged in the future. For further details on this issue, the reader may refer to the Appendix.

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 lay the foundations of a long-term interpretative hypothesis concerning the pattern of regional inequality in Italy. Regarding this last goal, the explanation proposed still looks empirically weak, but there are however good reasons to believe that future research will substantially confirm the broad interpretative framework presented here.

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). Concerning the whole period, human capital can be the main predictor only if we allow for regional differences in population growth, which when limited to the most recent decades 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. The explanation proposed poses 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 was once behind industrial districts became the key fixed resource, not least because local institutions were infused with greater political powers.

The long-term interpretative hypothesis outlined above is now, for the first time, supported by quantitative evidence and econometric tests, though it will benefit from further research.

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

Human capital

For Liberal Italy, human capital is measured by a weighted average of literacy (with decreasing weighting: 2/3 in 1871, 1/2 in 1891, 1/3 in 1911) and the gross enrolment ratio (that is the number of students registered, expressed as a percentage of the population included in the age brackets relative to the levels of primary, secondary and tertiary education, as well as university attendance, from age 6 to 24). By 1938, most of the Italian population (4/5) had become literate (see Table A.1), and thus it would be unrealistic to maintain that a minority of illiterate people still affected economic growth in any significant way; conversely, higher education had grown in importance, not only for the numbers of people involved, but also because technological change increasingly required highly educated people. As a consequence, in 1938 literacy is left aside and the human capital indicator is made up of enrolment ratio in compulsory education for one half (primary and secondary school, from 6 to 11 years and from 11 to 14 years respectively) and of the enrolment ratio in higher (14–19 years) and further (university, 19–24 years) education for the other half. The same weighting is maintained for 1951.

During the post Second World War economic boom, compulsory education spread throughout the country and regional differences became less and less important (see again Table A.1), at least when measured by the official enrolment ratio – the real enrolment ratio, like today, was probably lower in the South, as was the quality of the education on offer, but we lack historical figures for these dimensions. For this reason, what mattered rather more was higher (non-compulsory) education attended from age 14 to 19 and later further education, from the age of 19 to 24 and above. As a consequence of this, for 1971, weighting of 1/4 to compulsory education, 1/2 to tertiary education and 1/4 to higher education has been assigned. By 1981, university attendance had become a mass phenomenon and differences in primary and secondary education were negligible (at least in terms of enrolment ratio), thus primary and secondary education are now entirely excluded from the index, which is made up of higher education for one half and tertiary education for the other. This weighting is also maintained for 2001.

A serious problem arises when dealing with regional figures for university attendance: 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 interregional 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).

The weighting assigned to the individual components could be thought to be somewhat arbitrary, but on this point two further considerations are warranted. First, on empirical grounds, some of these measures taken singularly (literacy, enrolment ratio), as well as other measures (per capita years of schooling) and different combinations of both, when run in growth regressions do not yield results substantially different from those proposed in this article, at least in the cross-section models where they have been tested (Felice, 2008). Secondly, from a theoretical perspective, the shift from compulsory to tertiary and higher education is supported by most of the literature on development economics, specifically when dealing with education capabilities in advanced countries (e.g. Costantini and Monni, 2005, with an application to the European regions). For these reasons, we believe that the view taken by the present article is by and large both reliable and correct. However, Table A.1 is intended to provide any interested reader with further information about the individual components of the index and their trends, in order to make the methodology proposed entirely transparent, and amendable.

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

	Literacy				Total enrolment ratio (6-24 years)						Tertiary education enrolment rate (14-19)					Higher education enrolment rate (19-24)				
	1871	1891	1911	1938	1871	1891	1911	1938	1951	1971	1938	1951	1971	1981	2001	1938	1951	1971	1981	2001
Piedmont	57.7	76.1	89.0	96.5	11.8	13.8	15.2	41.7	41.6	52.5	12.5	23.1	40.6	50.3	86.4	1.6	4.5	9.1	19.5	43.1
Aosta Valley	-	-	-	-	-	-	-	-	41.3	44.9	-	5.1	31.3	46.9	89.8	-	0.0	0.0	0.0	5.6
Liguria	43.7	65.6	83.0	94.1	8.3	11.5	13.7	48.0	46.9	58.5	20.7	24.4	52.9	63.5	96.0	2.1	9.3	16.2	28.9	52.1
Lombardy	54.8	71.7	86.6	96.1	10.4	13.1	13.6	43.5	43.3	53.0	11.9	19.5	38.8	49.0	84.0	1.6	5.3	10.3	21.4	47.6
North-West	*54.7*	*72.7*	*87.0*	*96.0*	*10.7*	*13.2*	*14.2*	*43.6*	*43.3*	*53.4*	*13.3*	*20.9*	*40.8*	*50.8*	*85.8*	*1.7*	*5.5*	*10.5*	*21.5*	*46.4*
Trentino-Alto Ad.	-	-	-	98.6	-	-	-	56.0	46.6	52.4	7.2	12.2	33.5	39.1	71.1	0.0	0.0	4.2	4.1	29.9
Veneto	35.3	56.3	74.8	90.8	6.1	11.4	13.3	44.7	43.3	54.3	7.7	11.6	37.3	45.6	85.7	1.1	3.7	11.3	22.0	41.2
Friuli	-	-	-	91.6	-	-	-	53.5	36.6	50.0	9.0	12.8	47.9	54.9	93.8	0.6	2.4	7.1	18.6	66.0
Emilia	28.1	45.8	67.3	87.8	5.6	9.7	13.4	42.2	43.5	59.3	9.2	13.6	49.8	57.6	91.9	1.9	7.4	19.0	34.6	80.8
Tuscany	31.9	45.4	62.6	84.9	5.9	7.4	10.6	45.5	41.5	58.2	9.7	15.9	49.9	58.7	92.4	2.1	5.9	17.8	35.9	70.2
The Marches	21.0	32.0	49.3	79.1	4.4	7.2	10.0	42.7	42.5	59.2	7.6	14.6	48.4	58.1	96.0	1.0	4.5	13.7	25.4	69.1
Umbria	19.9	33.4	51.4	79.1	4.7	8.0	9.9	41.1	40.5	63.3	7.5	13.5	56.7	65.7	92.9	0.7	3.4	24.3	36.7	79.4
Latium	32.3	49.5	66.8	84.7	3.5	10.1	12.1	45.5	47.4	60.6	18.0	20.5	52.6	61.9	96.7	4.9	10.7	20.9	41.7	78.3
Center/North-East	*30.2*	*47.0*	*65.7*	*87.2*	*5.4*	*9.4*	*12.1*	*45.1*	*43.4*	*57.6*	*10.0*	*14.8*	*47.1*	*55.5*	*91.3*	*1.9*	*6.0*	*16.0*	*31.0*	*66.1*
Abruzzi	15.2	25.0	42.4	71.9	4.5	6.5	8.8	40.5	42.3	62.3	6.0	8.8	51.3	56.1	94.6	0.0	0.0	14.3	21.9	59.8
Campania	20.0	30.0	46.3	70.0	5.3	7.6	8.2	40.5	44.3	59.4	10.8	12.0	42.0	47.6	85.0	3.5	8.5	19.0	30.7	48.6
Apulia	15.5	25.4	40.6	67.2	3.4	5.8	8.1	33.4	40.1	56.5	7.9	11.0	40.7	44.2	87.3	0.8	4.9	13.7	18.3	36.7
Lucania	12.0	19.9	34.7	60.8	3.0	5.7	6.8	32.7	37.6	61.5	4.4	5.5	45.9	50.4	99.4	0.0	0.0	0.0	0.0	17.8
Calabria	13.0	18.2	30.4	58.2	3.1	5.1	6.7	32.1	41.5	59.1	6.0	7.1	45.3	49.7	91.3	0.0	0.0	0.2	8.0	34.0
Sicily	14.7	24.1	42.0	66.5	3.3	6.2	8.2	36.8	42.4	59.2	9.6	10.2	42.2	47.1	87.4	2.3	9.5	20.6	27.3	45.1
Sardinia	13.9	26.2	42.0	69.9	4.8	6.8	8.5	38.8	44.7	61.9	8.3	7.1	41.9	45.5	91.8	1.3	3.4	14.5	21.0	50.3
South and islands	*15.9*	*25.2*	*41.4*	*67.2*	*4.0*	*6.4*	*8.1*	*36.9*	*42.3*	*59.2*	*8.5*	*9.9*	*42.9*	*47.5*	*88.2*	*1.7*	*5.7*	*15.4*	*22.8*	*44.0*
Italy	31.2	45.2	62.4	82.4	6.3	9.3	11.1	41.7	42.9	57.2	10.2	14.1	43.9	51.1	88.7	1.8	5.7	14.3	25.4	52.2
St. dev. (on Italy=1)	*0.54*	*0.51*	*0.44*	*0.27*	*0.50*	*0.44*	*0.42*	*0.28*	*0.07*	*0.08*	*0.45*	*0.40*	*0.16*	*0.14*	*0.07*	*0.72*	*0.62*	*0.52*	*0.48*	*0.40*
Weight in the index	67%	50%	33%	0	33%	50%	67%	50%	50%	25%	50%*	50%*	50%	50%	50%	0**	0**	25%	50%	50%

Notes: * Including higher education. ** Included in higher education.

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 fewer indicators were available and thus in order to come to consistent figures a 'strong' hypothesis had to be introduced: for each dimension of social capital, the ratio between the observed variables and the unobserved ones in 1891 was declared 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 are able to rely only on 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:

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

where *R* is the region, *sp* is social participation, *mf* is the number of members of friendly societies.[21] 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, 1891, 1895 and 1905, which, via linear interpolation with the continuous compounding yearly rate, have been used to create 1871, 1891 and 1901 regional benchmarks. 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.[22]

[21] 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).

[22] 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

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.[23] 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.

that this discrepancy is mitigated by the use of the same ratio between observed and unobserved variables (see Table A.1).

[23] 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 (not entirely by chance, the migration 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[24]. Needless to say, this is another topic that deserves thorough consideration in further research.

[24] 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).

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: Franklin, 2003, from 1891 to 1951; 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, 2005a, p. 85, for 1891; Felice, 2005b, p. 9, for 1938; Istat, 1985, for 1981. Population growth is calculated on present population.

* In the case of population growth, yearly growth rate (%).

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