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Social capital and growth: Causal evidence from Italian municipalities

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Abstract

The macroeconomic effects of social capital are typically studied using data at country, region or, at most, province level of aggregation. However, social capital is defined by connections among agents who know each other and its effects, if any, should be detected at a more detailed level of spatial aggregation. To the best of our knowledge, this is the first study using longitudinal municipality-level data to investigate the causal link between social capital and growth. We extend earlier research by accounting for the endogeneity of all the covariates as well as unobserved heterogeneity. The evidence suggests that social capital has been a source of growth inequality in Italy between 1951 and 2001. The causal effect of social capital on growth is positive, on average, and stronger in the Centre-North of Italy. In addition, it was higher in the 1950s. The paper also presents local estimates of the growth return to social capital, which are of interest for specific sub-populations of municipalities.

JEL classification: O43, R11, Z13
Keywords: social capital, growth, Italy, municipality

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1. Introduction

The role of institutions in shaping economic performance has been emphasized at least since North (1991), if not earlier (Hayek, 1949; Myrdal, 1957). Institutions are seen as humanly devised constraints, which affect political, social and economic interaction. These constraints can be both formal (constitutions, laws, property rights) and informal. Customs, traditions and codes of conduct belong to the latter category. Communities may well be different for their customs, and these differences may well explain their relative stages of economic development. For example, in societies where individuals are used to trust each other, trade is likely to be easier and more developed. Trust, cooperation and participation in the community life are important characteristics of what is usually referred to as "social capital".

This paper looks at the link between social capital and economic growth. The specific interest on this link follows the contributions by Putnam (1993, 2000) arguing that civic engagement promotes the formation of trust, which in turn improves the quality of governance and thus economic performance. Analogously, Knack and Keefer (1997) argue that social capital may affect growth in a variety of ways. Economic activities that require some agents to rely on others are accomplished at lower cost in environments with higher social capital. Individuals spend less time to protect themselves from being exploited, thus being more productive. Entrepreneurs devote less time to monitor their employees and suppliers, thus having more time to devote to innovation. Governments are more credible, and people adopt more appropriate horizons in making investment decisions. Publicly provided goods, including education, have higher quality. Hiring decisions are more transparent and based on education credentials.[1]

The above view implicitly assumes that social capital has a positive effect on growth. The validation of this hypothesis has inspired several empirical studies, which typically rely upon data available at country, region or, at most, province level of aggregation (e.g., Algan and Cahuc, 2010; Tabellini, 2010). However, as argued by Putnam and Feldstein (2003, p. 9), "social capital is necessarily a local phenomenon because it is defined by connections among people who know one another". In line with Putnam and Feldstein's intuition, this paper investigates the link between social capital and growth at a more detailed level of spatial aggregation. In particular, we use municipality-level data for Italy.

The research questions that we address are the following: What is the average elasticity of social capital to real growth over a long time span? Is it positive? Is there a causal link from social capital to real growth? Is there time heterogeneity in the link? Is there spatial heterogeneity?

The answers to these questions are important because they shed further light on what lies behind the Solow residual, which is "a measure of our ignorance" in standard empirical growth models, as emphasized by Abramovitz (1956). Most economies show a decreasing trend in the growth rate of real GDP per capita over time. Is this pattern related to a decreasing level of social capital? Or to a decreasing return to social capital? Or to both? Some economies show regional

[1] Knack and Keefer (1997) also argue that both trust and civic involvement improve the quality of governance, which in turn raises the quality of public-provided education and the return to human capital. Zak and Knack (2001) show that, in a context of moral hazard where more resources are allocated to inspection and monitoring, both the return to physical capital investment and the rate of investment decrease. Akçomak and ter Weel (2009) argue that the willingness to invest in innovation is higher when social capital is higher. Dasgupta (2011) shows that an increase in trust among members of a group will manifest itself in a total factor productivity growth. Papagapitos and Riley (2009) argue that higher trust leads to higher stocks of physical capital, which increase the productivity of human capital. Carlin et al. (2009) show that, in societies with no complete contracts, no punishment for opportunistic behaviour and/or no frequent interactions, more regulation results in less trust, which depresses aggregate investment and growth. However, Routledge and von Amsberg (2003) show that, in a model when the frequency of trade influences agent decisions to trade cooperatively, a reduction in social capital may have ambiguous effects on welfare.

imbalances. Are they related to social-capital levels? Or to returns to those levels? Or to both? Though some of these questions are not novel, this paper makes five contributions.

First, there is no systematic study of the social capital vs. growth nexus which answers all the above questions using longitudinal municipality-level data.[2] These data have several advantages. Being longitudinal, they allow us to separate the growth effects of unobserved time-invariant city characteristics,[3] such as the average quality of formal local institutions, from those of social capital attributes. As municipality-level data, they allow us to better approximate the local nature of social capital as well as to increase the number of cross-sectional units, making the empirical analysis more robust to the presence of outliers.

Second, we innovate by accounting for the endogeneity of all the explanatory variables, including social capital, by means of *internal* instruments. In particular, we investigate whether a change in the social capital endowment of a municipality affects the growth rate of its per capita value added over the 1951-2001 period.

Third, we investigate the extent to which lower growth in the South of Italy can be, in part, attributed not only to a lower level of social capital but also to a lower return to social capital.

Fourth, we consider the possibility of a time-varying relationship between social capital and economic growth. If social capital behaves as a substitute of formal institutions in achieving economic growth (Ahlerup et al., 2009), its growth-enhancing role is likely to decline over time as formal institutions develop. In the specific case of Italy, the formal institutional system of the country was pretty much under construction during the 1950s, after the end of the Monarchy and the enforcement of the Republican Constitution in 1948. It is, therefore, likely that social capital played a more important role in that period than in others.

Fifth, we provide novel local estimates of the impact of social capital on growth, using an identification approach based on two municipality-level *external* instruments (here, the term "local" is used in the spirit of Angrist and Pischke, 2009).

The rest of the paper is organized as follows. Section 2 provides reasons to use municipality-level data. Section 3 discusses our measures of social capital and growth. Section 4 describes the dataset and the empirical model. Section 5 presents results and robustness checks. Section 6 deals with local estimates. Section 7 concludes.

2. Municipalities as units of analysis

The economic literature on social capital has discussed the interaction between various forms of social capital and economic development. For example, Sabatini (2008) has performed an empirical study using two hundred variables on different aspects of economic development and four dimensions of social capital: strong family ties (generally referred to as "bonding" social capital), weak informal ties ("bridging" social capital), voluntary organizations ("linking" social capital), and political participation. Each dimension includes from 4 to 25 variables. This should immediately alert the reader about the multiplicity of the definitions of social capital and outcome indicators that have been explored in earlier studies so far.

One feature of this heterogeneity has to do with the nature of the data used, and specifically with the unit of analysis. With reference to the latter, the existing studies on social capital and economic outcomes can be broadly divided in two main categories: the "macro" studies typically using data at regional or country level; and the "micro" studies using data on individuals and firms. A striking feature of the literature is that the "micro" studies are not necessarily consistent with the "macro" studies, or vice-versa.

[2] We are aware of only two earlier studies that explore the link between social capital and growth using municipality-level data: Corazzini et al. (2011) and Eliasson et al. (2013). Yet, these works focus on correlation rather than causation and the evidence presented is cross-sectional.

[3] We use the words *municipality* and *city* as referring to the same territorial unit.

On the one hand, many "macro" studies report zero or even negative effect of social capital on economic performance, with Italy being a "special case" where the link looks stronger and positive (Westlund and Adam, 2010).[4] On the other hand, the "micro" studies find clear evidence that social capital affects firm performance (e.g., Laursen et al., 2012) and people behaviour (e.g., Guiso et al., 2004).[5] It follows that the evidence on the nexus between social capital and economic performance or behaviour at the micro (firm or individual) level, while having the expected sign, does not necessarily imply that social capital matters at the macro (GDP growth) level, which is the level investigated in this paper.

To the extent that spatial proximity is crucial even in the internet era (Rutten et al., 2010) and influences the cost of social capital investment (Glaeser et al., 2002), the step from firm or individual outcomes to regional or even national outcomes may be too big. This is one reason why a number of recent studies (Albanese and de Blasio, 2014; Westlund et al., 2014; Eliasson et al., 2013; Corazzini et al., 2011; Rutten and Gelissen, 2010) have focused on smaller spatial units, such as municipalities.[6]

However, there are four additional reasons for using municipality-level data:

1) Disaggregation allows for the use of primary data on social capital. Our measure of social capital is voter turnout in political elections (Putnam, 1993). In Italy, measures of turnout rates in elections and referenda are *produced at municipality level* because the law (*Decreto del Presidente della Repubblica del 20 marzo 1967*) attributes to the municipalities the role of organizing and managing the voting operations, regardless of the type of popular consultation.[7] It

[4] The authors attribute these findings, in part, to the fact that the measures of social capital used (typically trust and association membership/density) are hardly able to capture the causal nexus from social capital to economic development when the analysis refers to spatial units characterized by a large number of unrelated actors, such as nations or regions. And, they conclude that it is crucial for future research to develop new and better measures of social capital at national and regional level, for instance for values like creativity, entrepreneurship, and tolerance.

[5] Laursen et al. (2012) suggest that social capital, measured as social interaction and political participation, increases firm ability to innovate as well as internal investments in R&D. Analogously, Guiso et al. (2004) show that social capital affects the behaviour of households and individuals, in the direction of boosting financial development.

[6] Albanese and de Blasio (2014) use municipality-level data to study the impact of social capital on proxies of economic development (employment rate, employment density, and plant density) in Italy. The authors estimate a static panel-data model with fixed effects, assuming social capital to be exogenous, and a number of cross-sectional models dealing with the endogeneity of social capital only. They find that social capital is beneficial for development. Westlund et al. (2014) investigate the influence of local entrepreneurial social capital on start-ups per capita, where the former is measured as the firm perception of local public attitudes to entrepreneurship and as the share of small businesses. It is found that both measures positively influence the start-up propensities among Swedish municipalities. The effect is stronger in rural areas. Analogously, Eliasson et al. (2013) report a positive relationship between enterprises' opinion on the quality of the local business-related social capital (the local business climate) and economic growth at municipality level in Sweden. The authors also suggest that the quality of social capital may be more important than the quantity. A similar approach is taken by Corazzini et al. (2011) who use several measures of social cohesion, social division and attitude towards religion, estimating a growth model with data on Brazilian municipalities. Overall, they suggest a positive influence of social-capital indicators on growth. Finally, Rutten and Gelissen (2010) develop a theory of how social values influence economic development, which is tested in European regions. The evidence highlights that social values matter for subgroups in the population rather than the region as a whole.

[7] For instance, the municipality issues the so-called *tessera elettorale*, which is the document needed for voting; citizens can only vote in the municipality of residence; the municipality chooses the specific infrastructure (typically a secondary school) where each citizen of the municipality is invited to vote; the municipality defines the composition of the committee that supervises the voting operations and enforces the application of the law; this committee certifies the identity of the voters in the day of the elections and provides them with the so-called *scheda elettorale*, which is the document where the voters are invited to express their preferences; this committee makes the counting of the votes and so on.

follows that provincial and regional data on voter turnout, extensively used in earlier studies, are inevitably *secondary* data, more likely to be measured with error.

2) Aggregation can affect the level of social capital. Since the concept of social capital itself can only be defined within a given community, a change in the administrative definition of the community (e.g., municipality, province, region or nation) may affect the level of social capital. For instance, an inhabitant of a city may be very cooperative with an inhabitant of the same city, but not cooperative at all with an inhabitant of another city in the same province. Thus, cooperation may be high at city level, but low at province level.

3) Aggregation can affect the estimate of the growth return to social capital. After Openshaw and Taylor (1979), who argued that correlations in Iowa between Republican voting and percentage of old people could vary a lot depending on how counties were aggregated, the Modifiable Area Unit Problem (MAUP) literature has expanded in several directions, including intersections with the growth literature. An example is Resende (2011) who has recently shown that "the determinants of economic growth in Brazil may manifest themselves differently on various spatial scales" (Resende, 2011, p. 639), namely, states, micro-regions, spatial clusters, and municipalities.

4) Disaggregation provides both reliable GMM-SYS estimates and novel 2SLS estimates of the growth return to social capital. As we will see, the aggregation of data at provincial and regional level does not allow us to obtain reliable GMM-SYS estimates because identification criteria are not passed. In contrast, municipality-level data help us to obtain *both* reliable GMM-SYS estimates and novel 2SLS estimates of the causal effect of interest.

The overall conclusion from the above discussion is that an analysis based on more disaggregated data is important because (dis)aggregation matters, or does it in principle, both from an empirical and a theoretical point of view.

3. Measures of growth and social capital

The analysis of the link between social capital and growth with municipality-level data presents at least two empirical challenges. On the one hand, in absence of a direct measure of economic growth at municipality level, we need to compute a proxy for the growth rate of the real per capita value added at such a detailed level of aggregation. We do this by using the municipality-level sectoral employment shares as weights to spread the value added at province level on all the municipalities of the same province. On the other hand, among the various definitions and related measures of social capital, we need to pick one definition whose measure is available at municipality level. In particular, we use the notion of civic capital (Guiso et al., 2011) proxied by the voter turnout at political elections (Putnam, 1993), i.e. the percentage of eligible voters who actually cast their vote. This measure captures the citizen engagement in the life of the community (Almond and Verba, 1963; Fowler, 2006) even though its use as a proxy of social capital may be controversial. This section discusses our measures of growth and social capital in detail.

3.1 Growth

Our measure of economic development cannot be directly observed because, to the best of our knowledge, data on the value added are only available, at most, at the province level of aggregation. However, as province level data are available for each sector j, we can compute a proxy for the per capita value added at municipality level by using the sectoral employment shares – available at municipality level – as weights to spread the value added at province level on all municipalities of the same province. The sectoral employment shares are computed as the number of employees of a given sector in a given municipality over the total number of employees of the same sector in the entire province.[8]

In practice, we multiply the value added in sector j in province p (say va_p^j) times the employment share in sector j of municipality i in province p (say $\frac{empl_i^j}{empl_p^j}$). The result is the value added in sector j of municipality i (say $va_i^j = va_p^j \cdot \frac{empl_i^j}{empl_p^j}$). This approach implicitly assumes that the average labour productivity in a municipality in a given sector is equal to that of the province in the chosen sector ($\frac{va_i^j}{empl_i^j} = \frac{va_p^j}{empl_p^j}$). This assumption is consistent with the idea that labour mobility within a province implies an equalization of wages and productivities in a sector among municipalities in the same province, which is in turn consistent with the long-run approach taken in this paper.[9]

Adding up the value added of each sector at municipality level, we get the total value added at municipality level (say $va_i = \sum_j va_i^j$). We use the population to compute the per capita value added. The real per capita value added is obtained using the national price index as deflator (base year = 1951). Finally, as we can only compute the value added at Census dates (i.e. every 10 years), its growth rate is obtained as difference between the natural logarithms of real per capita value added at Census dates.

3.2 Social capital

But, what do we mean by social capital here? And, how do we measure it? The rest of this section provides an answer to both these questions.

3.2.1 Defining social capital as civic capital

After its introduction by Bourdieu at the beginning of the 1970s (Bourdieu, 1972),[10] the concept of social capital has gained wide acceptance in social sciences, including economics, over the past four decades. Yet, its success has been proportional to the ambiguity of the term.[11]

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[8] Some municipalities have been part of different provinces in different decades. We take this issue into account when we construct the value added.

[9] To provide an example, suppose a province has two cities. Consider the manufacturing sector. For simplicity, assume the labour supply in each city is inelastic and both cities have the same labour supply. The labour-demand schedule in city 2 is above that of city 1 because of some labour-demand shifter (for example, a better quality of machineries). The equilibrium wage in city 2 is thus initially bigger than in city 1. In this situation, workers would move from city 1 to city 2 (within a province, labour mobility is likely to be high because people can work in one city and be resident in another one). The decrease in the labour supply in city 1 would increase the wage in city 1. The increase in the labour supply in city 2 would decrease the wage in city 2. The flow of workers will only stop when the manufacturing wage in the two cities will be the same. This would imply the same labour productivity in the two cities. Thus, the productivity in each city will be the same as that in the province (the latter is the average of the productivities in the two cities), no matter whether labour demand conditions differ. A similar argument can be made if labour supply conditions differ.

[10] Some attribute the real origin of the term to L.J. Hanifan, a social reformer, in 1916.

[11] As suggested by Rutten et al. (2010), there are two main approaches to social capital: the "structuralist" and the "interactionist". The first investigates how network structures affect the performance of networks and of individuals

In this paper, we follow the literature originated by Solow (1995) who described the specific characteristics that social capital must have "to be more than a buzzword". First, to retain the term "capital", likewise other forms of capital, social capital must have a dynamics of accumulation and depreciation. Second, it must have a non-negative economic payoff. Third, it has to be measurable, even inexactly. Fourth, to retain the term "social", social capital must be clearly distinguishable from other forms of capital accumulated at firm (physical capital) or individual (human capital) level.

As convincingly argued by Guiso et al. (2011), a concept of social capital which fits all the Solow criteria is the concept of "civic capital", defined as "those persistent and shared beliefs and values that help a group overcome the free rider problem in the pursuit of socially valuable activities" (Guiso et al., 2011, p. 419).[12] Guiso et al. (2011) go one step further suggesting that civic capital is not just one, but it is *the only* concept of social capital satisfying all the Solow criteria. Despite the latter may be controversial, and a less radical view is advisable, this paper follows the approach by Guiso et al. (2011) using a proxy of civic capital in the empirical analysis.

3.2.2 Measuring civic capital as voter turnout

From now on, we will use the expressions "social capital" and "civic capital" interchangeably. Guiso et al. (2011) provide an outstanding overview of all the possible direct and indirect measures of civic capital.

Direct measures of civic capital are not currently available at municipality level. So, the analysis must rely on indirect measures. According to Guiso et al. (2011), the most important *indirect* measures of civic capital are two: anonymous blood donations and participation in referenda. The former is an ideal measure of social capital because an anonymous blood donation is a free individual choice giving no personal returns and supporting the community life. The latter measure, instead, though widely used in the earlier research, is subject to two types of criticism. First, low participation in a referendum does not necessarily mean low participation in the community life – i.e. low social capital in a particular community – because people who are in favour of a particular law may choose not to vote in order to avoid that a referendum reaches the 50% cutoff needed to repeal a law.[13] Second, people may have a personal return from a particular law under scrutiny (e.g., married couples and divorce, Catholic women and abort, and so on).

Both the above two indirect measures of civic capital are not available at municipality level for our period of interest. Thus, we must rely on a different indirect measure of civic capital. In particular, we use voter turnout at political elections as a proxy of civic capital (Putnam, 1993).

The usual argument against our proxy is that voting at political elections may be a constrained choice, not a free one as an anonymous blood donation. In addition, it may imply personal returns as politicians may provide benefits to their electorate in exchange for votes. However, both these two arguments do not seem to apply to the case of this paper.

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within those networks. The second looks at the connection between association and obligation as well as the impact of this connection on how individuals behave (being associated to other individuals implies the obligation of sharing some form of "morality", i.e. of norms, values, trust, rules, beliefs, and codes).

[12] As put by Sabatini (2008, p. 469), "repeated interactions among group members foster the diffusion of information and raise reputations' relevance. The higher opportunity cost of free-riding in prisoners' dilemma kind of situations makes agents' behaviour more foreseeable causing an overall reduction of uncertainty. Therefore, an increase in trust-based relations may reduce the average cost of transactions, just as an increase in physical capital reduces the average cost of production".

[13] Of all the referenda occurred in Italy between 1946 and 2000, only two did not have the 50% cutoff because they did not involve the abrogation of an existing law (Monarchy vs. Republic in 1946; European Parliament in 1989).

The dutifulness of the vote was debated in the *Assemblea Costituente*. The compromise between those who wanted to qualify the exercise of voting as a legal duty and those who, instead, wanted to qualify it as a moral duty (Solenne and Verrilli, 2012) led to the qualification of voting as a civic duty in the constitutional chart (*Costituzione della Repubblica italiana*, art. 48). The constitutional norm allowed for the legislator to set only weak penalizations for voter abstention in 1957 (*Decreto del Presidente della Repubblica del 30 marzo 1957*, art. 115). Abstention should have been justified to the city mayor, who in turn had to publish a list of unjustified non-shows in the municipal *albo* for one month. In addition, the expression "he/she did not vote" had to be recorded for five years in the *certificato di buona condotta* issued by the municipality. However, the application of the 1957 law was progressively disregarded (Cuturi et al., 2000), until the electoral reform of 1993 (*Decreto Legislativo del 20 dicembre 1993*) fully recognized the abstention as an expression of political choice (Cassese et al., 2009).

Hence, even though voting is still intended as a civic duty in the Constitution – something that one should do – it is reasonable to think that voting at political elections has always been a substantially free choice because no punishment for abstention has ever been set, besides a mere register of non-voting.

As for the personal returns, the possibility of a benefit-vote link is a real issue and should not be disregarded. However, the argument is more likely to apply to the administrative elections (e.g. city mayor) than to the political ones. Indeed, elected deputies in Italy have the constitutional right to operate without a binding mandate (*Costituzione della Repubblica italiana*, art. 67), meaning that, once elected, they can do whatever they like, even against the interests of their party or electorate. In addition, despite in the elections covered in our sample people could vote both for parties and specific persons, parties and elected typically had to set coalitions in order to achieve a Parliamentary majority and form a Government. Therefore, compared to a referendum where the potential outcomes are known with certainty (abrogation or not of a specific law), the vote at political elections provided, at best, non-predictable personal returns to the average voter.[14] In contrast, the potential troubles could be easily forecasted: the law established – and still does – strong criminal sanctions for both those who promise and those who accept benefits in exchange for votes at political elections (*Decreto del Presidente della Repubblica del 30 marzo 1957*, art. 96).

In sum, voter turnout at political elections may not be the best measure of social capital[15] but we use it in this paper because: i) it has already been used by many authors including Putnam (1993), ii) it suffers from fewer distortions than referenda turnouts, and iii) to the best of our knowledge, it is the only measure available at municipality level over the long time span that we investigate. The "smoking gun" is the relationship between data on anonymous blood donations (see Guiso et al., 2004), available only for the year of 1995 and at province level, and data on voter turnout at Parliamentary elections (Chamber of Deputies) for the closest year of elections in our dataset, i.e. 1992. Figure 1 suggests that an increase in voter turnout is associated with a more-than-proportional increase in blood donations. The estimated elasticity is, indeed, equal to 7.2 and statistically significant at 1% level.

In addition, the evidence presented in the Appendix Table I supports our choice because voter turnout at political elections is, in general, linearly correlated with other proxies of social capital available at province level, with the expected sign (note that imposing a linear association between two variables may be rather restrictive, as documented in Figure 1).

[14] As Keynes would put it, "It is not a case of choosing those [politicians] which, to the best of one's judgment, are really the prettiest, nor even those that average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practice the fourth, fifth and higher degrees." (Keynes, 1936, p. 156).

[15] Our proxy cannot be intended as an alternative to the "ideal" measures proposed by Westlund and Adam (2010).

[Figure 1]

4. Empirical strategy

Our main data sources are: i) the *Istituto Tagliacarne* for data on the value added at province level; ii) the *Istituto Nazionale di Statistica* (ISTAT) for the Census data on surface, population and employment at municipality level; iii) the *Atlante Storico Elettorale d'Italia* provided by the *Istituto Cattaneo* for data on political participation, measured as voter turnout at Parliamentary elections (Chamber of Deputies) at municipality level; and iv) the *Associazione Nazionale dei Comuni Italiani* (ANCI) for data on geographic characteristics of cities.

We use data on about 2,100 municipalities with at least 5,000 inhabitants in 1951 and we consider the 1951-2001 period, divided in time intervals that correspond to the Census decades. The analysis is not extended further in time because of data constraints.

Table 1 provides the summary statistics for the sample. On average, each city has a population of 20,349 inhabitants and extends over 71 square kilometres. The 17% of cities in the sample is located close to the seaside and the 40% is located in the South. The real per capita value added is on average equal to 797 thousand constant Italian liras (base year = 1951) and displays a 39% average growth rate over 10 years. The first growth rate refers to the 1951-1961 period. The last is for 1991-2001. Our measure of social capital displays an average of 90%. Ideally, we would like to have data on social capital every 10 years since 1951. In practice, we use data on voter turnout at political elections held in 1953, 1963, 1968, 1979 and 1992.

[Table 1]

Figure 2 suggests that voter turnout in Italy has decreased over time.[16] This pattern is consistent with the one found in Albanese and de Blasio (2014).

[Figure 2]

Interestingly, Figure 3 depicts a pattern of growth which is similar to the one observed for our proxy of social capital. What is really intriguing, however, is the fact that growth has decreased proportionally more than social capital, which opens the door to the possibility that the growth return to social capital has decreased over time.

[Figure 3]

As for the empirical strategy, our idea is that social capital may constitute a pre-condition for future growth. Hence, we estimate a model of the following form:

$$(1) \quad g_{i,t} = \mu_i + \mu_t + \alpha \ln y_{i,t-10} + \beta \ln sc_{i,t-10} + \gamma \ln pop_{i,t-10} + \sum_{k=1}^{N} \delta_k X_{k,i} + e_{i,t}$$

where $g_{i,t}$ is the growth rate of real per capita value added between year t and year $t-10$ for the unit of interest i (the first observed growth rate refers to the 1951-1961 period); μ_i is the vector of the city fixed effects; μ_t represents the time effects between year t and year $t-10$

[16] We measure a type of social capital that is likely to be losing importance (indeed, we will document that its return was higher in the 1950s). In the knowledge economy, other types of social capital (more business related) are likely to be gaining importance. But we cannot test this hypothesis because of lack of data.

(1951-1961, 1961-1971, and so on); $ln\, y_{i,t-10}$ is the log of real per capita value added at the beginning of the period (the first observation is for 1951); $ln\, sc_{i,t-10}$ is the log of social capital endowment at the beginning of the period (the first observation should be for 1951, but the closest observation we have is for 1953);[17] $ln\, pop_{i,t-10}$ is the log of population at the beginning of the period (the first observation is for 1951); X_1 to X_N are observable, mainly geographical, control variables; and $e_{i,t}$ is an i.i.d. disturbance.

Our model is a "social capital & growth" version of a famous "financial intermediation & growth" model proposed by Levine et al. (2000) in an article in the *Journal of Monetary Economics*. This article has been very influential in the finance-growth literature and its title has inspired the title of our manuscript. Following Levine et al. (2000), our model can be written as a dynamic panel-data model by noting that $g_{i,t} \cong ln\, y_{i,t} - ln\, y_{i,t-10}$. As our model is specified in logarithms, the parameter of interest β should be interpreted as the elasticity of the growth rate of real per capita value added with respect to social capital.[18]

Our empirical model imposes a given direction of causality, which goes from social capital to GDP growth. This hypothesis is supported by the panel VAR estimates proposed in Appendix A.

We control for city fixed effects to capture unobserved time-invariant city characteristics, such as the average quality of formal local institutions. We control for the lagged log of population and time effects to capture agglomeration economies and decade heterogeneity, respectively.

The variables X_1 to X_N are as follows: a dummy equal to one if the municipality is located in the South; a dummy equal to one if the municipality is close to the seaside; a dummy equal to one if it is a province capital; the log of surface in square kilometres; the log of altitude from the townhouse in meters; the log of difference in altitudes within the municipality.

We control for geographical variables for three main econometric reasons:

i) Turnout is potentially correlated with geographical factors. For example, altitude may be correlated with turnout through weather conditions (the probability of raining in the day of the elections is higher at higher altitudes).[19] Hence, not controlling for geographical factors would introduce a new source of social-capital endogeneity in the residuals of the growth regression.

ii) Geographical variables are useful for identification as instruments in dynamic panel-data models because they can be treated as exogenous covariates.

iii) Geography explains a share of growth variability in regression analyses using country-level data, as stressed by Gallup et al. (1999), among others. Controlling for geographical variables in studies using more disaggregated data is in line with Gennaioli et al. (2013) and Ketterer and Rodríguez-Pose (2016), among others.

[17] We must acknowledge that our measure of social capital is not perfect, mainly because it measures "one type" of social capital.

[18] On the lines of Audretsch and Keilbach (2004), among others, we look at civic capital, proxied by voter turnout, as an additional component of a production function. The empirical model proposed in this paper is embedded in the standard endogenous growth theory (Eliasson et al. 2013) where cooperation among agents matters for growth. Our main theoretical reference is an article by Routledge and van Amsberg (2003) where social capital affects growth by reducing trade uncertainty and free-riding behaviour, thus making production activity more efficient. Another example is a model by Cozzi (1999) where R&D cooperation among firms is positive for growth under some assumptions about the state of technology. A recent example is a model by Akçomak and ter Weel (2009) where social capital affects growth by fostering innovation.

[19] As argued by Sforza (2014), turnout significantly decreases if it is raining in the day of the elections.

Our estimation strategy is as follows. We start by disregarding the presence of city fixed effects and estimate model (1) by Ordinary Least Squares (OLS). We first control for initial income only; we then add time dummies; and, finally, we add both time dummies and the control set. Our definition of "control set" includes lagged population and all the variables X_1 to X_N. Afterwards, we control for the role of unobserved heterogeneity through a Fixed Effects (FE) approach. Note, however, that we expect the FE estimates to be biased due to the presence of both unobserved heterogeneity and lagged value added among regressors. This source of bias can be only resolved by estimating model (1) with a dynamic Generalized Method of Moments (GMM) approach.

In the dynamic GMM framework, a GMM-system (GMM-SYS) approach (Arellano and Bover, 1995; Blundell and Bond, 1998) should be the preferred estimation method for a variety of reasons. First, like the GMM-difference (GMM-DIF) approach (Arellano and Bond, 1991), it allows for dealing with the potential endogeneity of all explanatory variables, rather than only that of social capital. Second, it is more efficient than GMM-DIF as it uses more moment conditions. Indeed, likewise GMM-DIF, the GMM-SYS approach uses lags of regressors as instruments for the first-difference transformation of model (1). But, differently from GMM-DIF, the GMM-SYS approach also uses lagged differences of regressors as instruments for model (1) itself. Third, GMM-SYS allows us to estimate the coefficients of time-invariant regressors, while GMM-DIF does not. Fourth, the GMM-SYS estimator has been shown to behave better (in terms of bias and precision) than the GMM-DIF estimator in case of persistent variables (Blundell and Bond, 1998; Blundell et al., 2000), as social capital is likely to be.

The choice of instruments is based on Bond et al. (2001), who show how to estimate empirical growth models using the GMM-system approach. In particular, as instruments for the first-difference equation, we use $ln\, y_{i,t-20}$, $ln\, sc_{i,t-20}$, $ln\, pop_{i,t-20}$ and earlier. As instruments of the level equation, we use $\Delta ln\, y_{i,t-10}$, $\Delta ln\, sc_{i,t-10}$, $\Delta ln\, pop_{i,t-10}$ and earlier. The variables X_1 to X_N are taken as exogenous covariates and used as instruments in the standard dynamic GMM practice. The instrument matrix is collapsed (Roodman, 2009). Standard errors are Windmeijer-corrected (Windmeijer, 2005). The goodness of fit for GMM-SYS is based on Bloom et al. (2007). The results are presented in the next section together with a variety of robustness checks.

5. Results and robustness

In presenting the results, we focus on the link between social capital and growth. Before commenting on our preferred estimate, it is worth investigating how the social capital coefficient changes in different specifications and estimation methods.

<u>Main results</u>

Controlling for initial income only, the OLS estimate of the social capital coefficient (Table 2, column 1) is positive and significant. Adding time effects (column 2), the estimate slightly decreases in terms of magnitude but remains highly significant. When adding the control set (column 3), the coefficient remains significant but its magnitude decreases. When aggregating the data at provincial and regional level, we find evidence of a Modifiable Area Unit Problem (see Appendix Table II). In line with Resende (2011), aggregation causes the return to social capital to change and the standard error to get larger.

A source of bias may be due to the fact that unobserved time-invariant city characteristics (e.g. the average quality of formal local institutions) are likely to be correlated with social capital. When controlling for such characteristics, the FE estimates (column 4 and, including the control set, column 5) are lower in magnitude than the OLS ones, but they are still positive and significant.

As highlighted in the previous section, our preferred estimation method is the one that allows for dealing with the endogeneity of all covariates, including the lagged value added, as well as with the unobserved heterogeneity, i.e. the GMM-SYS approach. The GMM-SYS estimates (column 6) confirm the positive and significant link between social capital and growth. The social capital coefficient estimate is larger than the one obtained using the FE estimator.

[Table 2]

The identification approach is supported by the fact that both the Hansen and the Difference-in-Hansen tests do not reject the null hypothesis of instruments joint validity (the p-values are equal to 0.276 and 0.131, respectively) as well as by the fact that the Arellano-Bond test does not reject the null hypothesis of no second order autocorrelation of residuals in first differences (the p-value is equal to 0.819). In contrast, identification is problematic when using data at province level because the instruments for the level equation do not pass the Difference-in-Hansen test (see column 6 in Appendix Table III(a) for estimation results). Identification is even more problematic when aggregating the data at regional level because the Arellano-Bond test rejects the null at 10%, the Hansen test rejects the null at 10%, and the Difference-in-Hansen test rejects the null at 5%.

Interestingly, we find that aggregation changes the return to social capital, which lowers as aggregation increases (see the GMM-SYS estimates in Table 2, Appendix Table III(a) and Appendix Table III(b)). This is in line with Westlund and Adam (2010) because the growth return to social capital becomes not statistically significant at 5% level when aggregating at provincial level (see column 6 in Appendix Table III(a) for estimation results), and even negative when aggregating at regional level (see column 6 in Appendix Table III(b) for estimation results). The OLS results in Appendix Table II go in the same direction.

An important thing to notice is that the additional moment conditions imposed by the GMM-SYS estimator are valid provided the validity of some initial-condition restrictions. The latter hold under (sufficient but not necessary) assumptions of mean stationarity of the stochastic processes that generate the data involved in the estimation. This assumption also guarantees that the instruments for the first-difference equation are not weak (Blundell and Bond, 1998, 2000; Bond, 2002).

In order to test the mean-stationarity hypothesis, we follow Blundell and Bond (2000) and estimate an AR(1) process (with a constant) for the log of real per capita value added, the log of the social capital proxy, and the log of population. In presence of city fixed effects, the OLS method gives an upward-biased estimate of the lagged dependent variable coefficient. This means that an OLS estimate of the autoregression coefficient below the critical value of 1 would ensure us that we are not working with unit-root series.

In the case of the real per capita value added, the estimate is 0.7, i.e. well below the critical value. In the case of the social capital proxy, the estimate is equal to 0.9, i.e. still below the critical value. In the case of population, the estimate increases to 1.0 but the fact that it is upward biased reassures about the mean stationarity of the true data-generating process. Intuitively, there is no reason to believe that growth, social capital and population evolve as random walks. It is more realistic to think that steady-state (i.e. equilibrium) values of these variables do exist, even though persistence is high. The latter is also consistent with standard growth models, including ours.

Our first result is that the social capital endowment of a city matters for subsequent economic growth in a positive and significant way. In particular, according to the preferred estimation method (GMM-SYS), the elasticity of social capital endowment with respect to growth is 0.6.

The coefficient of initial income is found to be negative and significant. This suggests that municipalities with higher (lower) initial income grow slower (faster), which supports the idea of convergence. However, we do not find evidence of convergence among all Italian municipalities.

Since the estimated coefficient of the dummy for location in the South is negative (-0.341) and significant at 1% level,[20] the municipalities in the Centre-North of Italy converge to an equilibrium growth rate which is higher than in the South.

In the rest of this section, we will provide additional results useful to explain time and spatial growth variability, and the role potentially played by social capital.

Spatial externalities

As a first robustness check, we control for the existence of spatial externalities (Table 3). Specifically, we augment model (1) with the aggregate initial income of all the other municipalities in the same province. The GMM-SYS estimate of the coefficient of this variable is very close to zero from the left (-0.006) and it is not significant. As a result, the social capital impact changes only a little. If we construct an interaction between the initial income of the municipality and the aggregate initial income of all the other municipalities in the same province, the interaction coefficient is still very close to zero (-0.002) and not significant. Again the social capital coefficient does not change much (since the results are very similar to those in Table 3, we omit their presentation in a table).

[Table 3]

We also estimate a spatial panel Arellano-Bond linear dynamic regression using a spatial weight matrix based on inverse distance. In this model, the social capital coefficient is equal to 0.525 with a standard error equal to 0.235, therefore being significant at 5%. This compares favorably with our main estimate of 0.595, which is significant at 1% level. The implication is that, while spatial correlations may in principle play a role, there is no evidence of such a role being crucial in our sample.

Non-linearities

Some explanatory variables may also affect growth in a way that depends on the level of other explanatory variables, such as deeply lagged population or initial income level.[21]

In Table 4, we replicated Table 2 using both (social capital) and (social capital × population in 1951) as covariates. The evidence suggests that population in 1951 does not generally affect the growth return to social capital. The intuition is that controlling for initial income and population makes the population size in 1951 redundant in the model.

[Table 4]

As a second exercise, we augment model (1) with the interaction between social capital and the initial value added (Table 5). The results, however, are not much different from those in

[20] The estimated coefficients of the additional control variables, not reported in Table 2, generally have the expected sign.

[21] For instance, Durlauf et al. (2001) estimate a Solow growth model in which the parameters vary according to the initial income level of a country, finding evidence of heterogeneity along that dimension. Contributions on the heterogeneity of the link between social capital and growth are quite few. For instance, Knack and Keefer (1997) include in their regression the interaction term "trust multiplied by initial income" and find a negative coefficient. This implies that the effects of trust on growth might be stronger for poorer economies. Dearmon and Grier (2009) divide their sample in poorest and richest countries (respectively, the 25th and 75th percentiles of the income distribution) and show that there is no differential impact of social capital on growth between the two sub-samples. Ahlerup et al. (2009) find that the effect of social capital on economic performance is positive and decreases as formal institutions develop. On the same lines, Mauro and Pigliaru (2011) show that the strength of social capital as a determinant of long-run growth may depend on the institutional context.

Table 2 and the coefficient of the interaction term is very small in magnitude. Furthermore, when we estimate the specification with the GMM-SYS method, the coefficient of the interaction is not significant. Hence, we do not find evidence of significant non-linearities, with respect to the initial-income level.

[Table 5]

In addition, we consider the possibility of differentiated returns between the Italian macro areas. In line with Putnam (1993), the descriptive statistics suggest that the level of social capital is lower in the South, with an average of 85% against an average of 94% in the Centre-North in the 1953-1992 period. Thus, one may expect the productivity of social capital to be lower where the level of social capital is higher (law of decreasing marginal productivity). To test this hypothesis, we replicate the analysis in Table 2 by adding an interaction term between social capital and a dummy for South. In this model, the coefficient of social capital alone represents the impact of social capital on growth in the Centre-North. The impact in the South is given by the sum between the coefficient of social capital alone and the coefficient of the interaction term (social capital × South). The regression analysis is somehow surprising. In our preferred specification, the elasticity of social capital with respect to growth in the South is 0.551 (Table 6), being 79% of the elasticity for the rest of Italy (0.696). This suggests that not only the level but also the return of social capital is lower in the South.

[Table 6]

Finally, we consider the possibility that the link between social capital and growth varies with time. To investigate this issue, we allow for the social capital coefficient to change over time by interacting social capital with time dummies (Table 7). The coefficient of social capital at baseline represents the impact of social capital on the 1951-1961 growth rate. This number is 1.055 in our preferred specification. The interaction coefficients are always significant and negative. This means that social capital matters more for growth in the 1951-1961 period than after.[22] The latter is another important result of our analysis. A similar result is presented by Albanese and de Blasio (2014) who find evidence of a positive and time-decreasing correlation between voter turnout and measures of economic development other than growth, at the municipality level of aggregation.

[Table 7]

Figure 4 provides a clearer picture. The average impact of social capital on growth hides some heterogeneity over time. The role of social capital is bigger immediately after WWII when its level was higher (see Figure 2). This result is consistent with the one for the macro areas (South vs. Centre-North). In short, we find that the return to social capital is higher when and where the social capital is higher.

The fact that the elasticity of social capital is bigger in the 1950s may have several explanations. Our preferred one is in line with Ahlerup et al. (2009) who suggest that the effect of social capital on economic performance is higher when formal institutions are less developed. Indeed, since the *Costituzione della Repubblica italiana* was enforced in 1948 and radically changed the Italian formal institutional system, it is reasonable to think that Italy was a country

[22] Table 7 reports the p-values of the coefficients of all the interactions. Since all these coefficients are different from zero and negative, all the social-capital returns for the periods after 1951-1961 are different from the social-capital return in the period 1951-1961 (the reference period in the regression model) and they are lower. Thus, the return to social capital is higher in the 1950s than in any other decade until 2001.

under construction during the 1950s – which explains why social capital may have played a more important role.

Of course, additional factors may be at work. For instance, a higher quantity of social capital may imply a higher quality of social capital, and thus higher productivity. Such a mechanism would be in line with what some authors (among others, see Hungerford and Solon, 1987; Budría and Pereira, 2011) have argued to hold for human capital.[23] However, further investigation on this hypothesis requires municipality-level measures of social-capital quality which, to our knowledge, are not available.

[Figure 4]

Different outcomes

As a further robustness check, we also estimate GMM-SYS models with different outcomes using municipality-level data. In particular, Table 8 considers the growth rates of the following variables as additional outcomes:[24]

- Plant density (plants over municipality square kilometers) (column 2)
- Employees density (employees over municipality square kilometers) (column 3)
- Employees per capita (employees over population) (column 4)

The estimates are compared with our main GMM-SYS results (column 1), which are based on the growth rate of real GDP per capita as outcome. The results suggest that the effect of social capital changes with the outcome chosen, but it is generally positive and significant, as one would reasonably expect.

[Table 8]

Sample selection

We work with a sample of municipalities with at least 5,000 inhabitants in 1951 because identification is problematic with the full sample.

The results obtained with the full sample are provided in the Appendix Table V. Even though the general picture is very close to the one obtained with the sample of municipalities with at least 5,000 inhabitants in 1951, estimates in column 6 pass neither the Arellano-Bond test nor the Hansen and the Difference-in-Hansen tests. In particular, we find a lower return to social capital than in the restricted sample (both coefficients are significant).

There are two possible explanations for this difference in returns. One is that restricted sample estimates are not reliable because of sample selection bias (Hypothesis I). Another one is that full sample estimates are not reliable because of lack of model identification (Hypothesis II).

As it is known, sample selection bias occurs when the probability of being in the sample, i.e. the probability of the municipality population being higher than 5,000 inhabitants in 1951, is affected by unobservables that are correlated with the unobservables of the growth equation.

[23] As most of the important issues in economics, also this one is somehow controversial. Indeed, some studies have argued that the return to education may decrease with the education level, in line with the standard relative scarcity theory (see Psacharopoulos, 1985; Psacharopoulos, 1994; Psacharopoulos and Patrinos, 2004).

[24] These are the outcomes chosen by Albanese and de Blasio (2014). We do not use population growth as outcome because, though it is positively associated with real GDP growth (0.319), as shown by the correlation matrix in Appendix Table IV, this paper studies the determinants of the growth rate of the real GDP *per capita*. So, population growth is unlikely to be a good proxy for our outcome variable, as suggested by the correlation coefficient in Appendix Table IV (-0.012).

Here, the role of housing prices is key. Housing prices in 1951 are unobservables in our dataset, and this may create a correlation between the residuals of the growth equation and those of the "participation equation" (i.e. the equation modeling the probability of being in the sample). Housing prices in 1951 are likely to affect population size in 1951 and thus the probability of being in the sample. Thus, if the growth return to social capital is responsive to population size in 1951 in the full sample, this may be an indication of selection bias in the restricted sample.

We test the sample-selection bias hypothesis (Hypothesis I) in Table 9 and reject it because the interaction term (social capital × population in 1951) is not significant. This reinforces our view that using the restricted sample is preferable because identification tests are passed in the restricted sample, while they are passed neither in the full sample nor in the sample of municipalities with less than 5,000 inhabitants in 1951.

[Table 9]

Overall, disregarding municipalities with less than 5,000 inhabitants in 1951 does not appear to be a major issue because about 77% of the Italian population is concentrated, on average, in the sample of cities that we use (a minimum of 74% occurs in 1951). In addition, earlier studies, including Guiso et al. (2016), have used municipalities with more than 5,000 inhabitants, which makes our restricted sample results more comparable with the previous ones.

<u>Province-time effects</u>

In Table 10, we replicate Table 2 with the only difference being the introduction of additional controls in the form of (province × time) interactions. We find that the coefficient of social capital slightly increases from 0.595 to 0.650 in the main (GMM-SYS) specification. However, the introduction of these additional covariates implies a substantial increase in the number of instruments, which weakens the identification tests, in line with Roodman (2009), even after collapsing the instrument matrix. In addition, the standard error goes from 0.109 to 0.309, with a clear loss of efficiency.

[Table 10]

<u>Physical and human capital</u>

As another check, we control for a proxy of physical capital endowment (Table 11). The latter is measured as the number of plants per inhabitant at the beginning of the period (i.e. at year $t-10$). Although this variable is a candidate for the main specification, we find the coefficient of physical capital to be close to zero from the left (-0.051) and not significant (p-value = 0.230). As a result, the coefficient of social capital does not change much. One possible explanation is that controlling for the initial income level already captures the effect of the initial physical capital stock.

[Table 11]

In addition, we control for the roles that both physical and human capital endowments (at year $t-10$) as well as the evolution of working age population (from year $t-10$ to year t) may play in a growth regression (Table 12). As proxies for human capital endowments, we use both the share of population with high-school diploma and the share of population with university degree. The evolution of the working age population is the growth rate of the population aged between 15 and 64. These variables should, in principle, be included among the controls in the main specification.[25] However, municipality-level data on both human capital and working age population are available in electronic format only since 1971. Hence, this exercise is restricted to a shorter time period. Nevertheless, the positive link between social capital and growth is confirmed and the magnitude of the social capital coefficient decreases. This is consistent with the idea that the effect of social capital on growth is higher in the 1950s.

[Table 12]

Summing up

Summing up, our analysis suggests the following picture. The link between initial social capital endowment and subsequent growth at municipality level is positive and significant. The result does not change when controlling for spatial externalities, when accounting for non-linearities in initial income and population, when accounting for province-time effects, when accounting for physical capital endowment, and when accounting for both physical and human capital endowment of a city as well as for the evolution of the working age population. The results for different outcomes are consistent with those for the main outcome. However, the strength of the link between social capital and growth looks stronger in the Centre-North of Italy and in the 1950s.

6. Local estimates

GMM-SYS uses lagged levels and differences of endogenous variables as instruments. These are called internal instruments. Yet, the identification based on internal instruments, while solving a number of statistical problems (including the Nickell bias in dynamic panel-data models, such as our model), is not appealing from a theoretical perspective because the causal chain between the instruments and the endogenous variables is much more opaque than in a 2SLS just-identified model. To address this criticism, this section proposes 2SLS estimates from two just-identified models, which are identified using two different municipality-level external instruments.

In defense of our GMM-SYS approach, it should be stressed that 2SLS estimates have low external validity because they refer to the specific group of municipalities *whose level of social capital was affected by the instrument*. This is why 2SLS estimates are "local estimates" in the spirit of Angrist and Pischke (2009). In contrast, GMM-SYS estimates are more likely to have external validity because all municipalities in the sample are affected by the instruments by construction (the instruments are internal). Even if our GMM-SYS estimates refer to a restricted sample (more than 5,000 inhabitants in 1951), they are still of interest for a large, well-defined sub-population. This is generally not the case when estimating local effects with 2SLS.

With the above caveats, our first instrument, inspired by Guiso et al. (2016), is a dummy equal to one if a municipality was a *free* city in 1300.[26] The second instrument, inspired by Andini et al. (2017), is a dummy equal to one if the municipality was an *incorporating* city (i.e. a larger municipality incorporating a smaller one), as a result of a consolidation decision taken by Mussolini during the fascist dictatorship, in the 1920s.

An instrument must be valid and relevant. In our 2SLS context, validity means that the instrument must be uncorrelated with the error term of the growth equation. This is like saying that, conditional on other regressors, the instrument must not affect growth directly (exclusion

[25] The importance of human capital as a determinant of growth has been widely documented (Barro, 1991; Mankiw et al., 1992; Temple, 2001). Unfortunately, we cannot directly control for other factors such as ethnic diversity (Platteau, 1994; Alesina et al., 1999; Knack and Keefer, 1997; Ottaviano and Peri, 2006; Florida, 2002), income inequality (Alesina and Rodrik, 1994; Alesina and Perotti, 1996) and the quality of governance (Hall and Jones, 1999; Acemoglu et al., 2001; Acemoglu and Robinson, 2006). However, the average quality of formal local institutions is somehow captured by our city fixed effects.

[26] Note that the estimates by Guiso et al. (2016) refer to municipalities with more than 5,000 inhabitants, like ours.

restriction; see also Bürker and Minerva, 2014, p. 830). To be relevant, the instrument must be (not weakly) correlated with the endogenous variable, i.e. voter turnout.

As is well known, while the relevance condition can be theoretically argued and empirically tested, the validity of an instrument can only be theoretically argued. The main argument for validity here is that both historical events, on which our instruments are based, are too distant in the past to have a direct effect on growth from 1951 onwards, *once we condition on initial income* (see also Bürker and Minerva, 2014; Crescenzi et al., 2013; Tabellini, 2010).

The idea behind the first-stage regression in column (1) of Table 13 is well grounded in the work of Guiso et al. (2016), which highlights the transmission across generations of inhabitants, over long periods of time, of civic-capital characteristics (see also Bürker and Minerva, 2014). Following Guiso et al. (2016), we restrict the sample to the Centre-North due to the Norman domination in the South of Italy. The estimated coefficient is positive (0.042) and significant at 1% level, as expected. The relevance condition is supported by the first-stage F statistic, which is well above the usual reference values. The latter is robust to the control set (column (2)), though the F statistic decreases a lot.

The idea behind the first-stage regression in column (3) of Table 13 requires a few more explanations. Andini et al. (2017) use the fascist consolidation of *small* municipalities (less than 5,000 inhabitants) which were merged *each other* into a *new born* municipality to investigate how a substantial enlargement of small-sized cities affects the local welfare of inhabitants. Differently from Andini et al. (2017), we use the fascist consolidation of *small* municipalities which were merged to an *already existing bigger* municipality (more than 5,000 inhabitants) to investigate how a small enlargement of already existing bigger municipalities changes the level of social capital in bigger cities (this is our first-stage regression in column 3). Thus, we use the same historical event as Andini et al. (2017) but consider a different group of municipalities, which does not overlap with earlier work.

The key argument for the relevance of our second instrument is that the level of social capital in a municipality, measured as voter turnout, is responsive to the fact that the municipality was an incorporating city in the past. This can happen for two reasons. The first one is mechanical: a consolidation is likely to change both the denominator (eligible voters) and the numerator (actual voters) of the turnout rate, both at the time it happens and from that moment onwards. The second one is theoretical: a consolidation is likely to increase the propensity to participate in democratic processes for people (the inhabitants of incorporating cities) who have been exposed to an *additional* dictator imposition (relative to the non-exposed, i.e. the inhabitants of non-incorporating cities). Following Guiso et al. (2016), such a characteristic is likely to be transmitted across generations of inhabitants.

The estimated coefficient is positive (0.021) and significant at 1% level. The F statistic ensures that the instrument is relevant. Notably, the result is robust to controlling, among other covariates, for population and surface (column (4)), with the implication that the status of incorporating city has a direct positive effect on voter turnout, independent of population and surface.

[Table 13]

Reduced-form estimates are provided in Table 14, reporting how each of the instruments affects the growth rate of GDP per capita *through* civic capital. The estimated coefficients are all positive and significant. The results in columns (1) and (2) extend the work of Guiso et al. (2016) in an interesting direction. The findings in the columns (3) and (4) are in line with the evidence of Andini et al. (2017) that Mussolini's consolidation has been welfare-enhancing, though our results are not strictly comparable with those of Andini et al. (2017) for the reasons explained above.

[Table 14]

As shown in Table 15, the general result that civic capital has a positive and significant effect on growth is confirmed by our 2SLS experiments, even after extending the conditioning set of covariates.

[Table 15]

It is worth noting that 2SLS estimates based on different instruments refer to different local sub-populations and, therefore, these estimates do not need to be similar to each other[27] and, most importantly, they do not need to be similar to our main GMM-SYS estimate (0.595), even if exactly the same growth model is estimated. This is in line with our results.

7. Conclusions

In this paper, we have investigated the causal link between social capital and economic growth at a very detailed level of aggregation, the municipality. By using data on Italian municipalities over the 1951-2001 period, we have presented evidence of a positive and significant link between social capital endowment and subsequent economic growth. In particular, accounting for the endogeneity of all the explanatory variables as well as for unobserved heterogeneity, we have argued that the elasticity of social capital endowment with respect to growth is equal to 0.6, on average. The result has been shown to be robust to a variety of checks. We have also found that the link between social capital and growth is stronger in the Centre-North of Italy, where the elasticity is 0.7. Considering the time dimension, the link is found to be stronger in the 1950s, with an elasticity of 1.0. For specific sub-populations of municipalities, the elasticity is much bigger, with values ranging between 2.9 and 3.7.

One limitation of this paper is that we have used only one measure of social capital and it is an indirect measure. Though the panel fixed-effects approach partly controls for measurement errors, future research could go in the direction of replicating our analysis using different measures of social capital and, in particular, direct measures of social capital at municipality level. Future research may also take advantage of direct measures of per capita GDP growth at municipality level, when they will become available for Italy.

Another limitation is that we have implicitly assumed that the effect of social capital on growth is constant along the conditional growth distribution. The use of panel quantile regression techniques may shed light on the existence of quantile parameter heterogeneity (see Andini and Andini, 2014; Deng et al., 2012). This is important because social capital, besides shifting the mean of the conditional growth distribution towards the right, thus being a source of between-groups growth inequality, may be a factor changing the dispersion of the conditional growth distribution, thus being a source of within-groups growth inequality or a brake on it.

Due to data limitations, we have not entered the debate about the quality and the quantity of social capital (Eliasson et al. 2013) as well as the issue of the heterogeneity between rural and urban areas (Westlund et al. 2014). Future studies on these topics are warranted.

Another interesting topic for future research is that of testing the hypothesis that Italy is a special case (Westlund and Adam 2010), by replicating our analysis using municipality data from other countries. It is possible that the use of appropriate municipality-level data brings out the underlying link between social capital and growth which is unclear in analyses based on national or regional-level data for countries other than Italy. Nevertheless, if one believes in the argument that the effect of social capital on economic performance is higher when and where the

[27] A higher return is found in the sub-population of municipalities whose level of social capital has been affected by the free-city experience. Since these municipalities are located in the Centre-North of Italy, the higher-return result is consistent with our GMM-SYS evidence in Table 6.

level of social capital is higher, it is likely that differences in the levels of social capital among countries would lead to differences in returns. So, our empirical results cannot be generalized. What can instead be generalized is the econometric approach to the issue that we have presented here.

One reason why we look at growth as outcome is that, in our main theoretical frame, social capital affects non-measurable or hardly-measurable "intermediate" outcomes such as trade uncertainty and free-riding behaviour making the production activity more efficient (Routledge and van Amsberg, 2003). Yet, in a different theoretical frame such as a model by Akçomak and ter Weel (2009), social capital affects growth by increasing innovation. Future research may test this hypothesis by using specific measures of innovation at municipality level as dependent variables, corroborating the existing evidence on firm-level outcomes (Laursen et al., 2012).

Following Sabatini (2008), a further interesting topic for the research agenda is the effect of social capital on broader measures of economic development, capturing the quality of economic development. Whether the link exists at the municipality level, it is an open issue.

Appendix A

Our empirical strategy is based on the idea that social capital is a pre-condition for future growth. Though this hypothesis is supported by a number of theoretical articles (e.g. Routledge and van Amsberg, 2003; Cozzi, 1999; Akçomak and ter Weel, 2009), from an empirical point of view it may be questionable whether the direction of causality goes from social capital to growth, and not vice-versa. To address this concern, we provide estimates of a simple panel VAR(1) between social capital and growth, with the following reduced form (the superscripts identify the corresponding equation):

$$(a) \quad g_{i,t} = v_i^a + v_t^a + \rho_1^a g_{i,t-10} + \rho_2^a \ln sc_{i,t-10} + v_{i,t}^a$$

$$(b) \quad \ln sc_{i,t} = v_i^b + v_t^b + \rho_1^b \ln sc_{i,t-10} + \rho_2^b g_{i,t-10} + v_{i,t}^b$$

The evidence suggests that the coefficient $\hat{\rho}_2^a$ is equal to 0.225 with standard error of 0.075 (being statistically significant at 1% level), while the coefficient $\hat{\rho}_2^b$ is equal to 0.002 with standard error of 0.013 (being not statistically significant). On the one hand, these results confirm the chosen direction of causality. On the other hand, they provide indirect support to our proxy of social capital.

Nevertheless, we are aware that our results cannot be generalized. For instance, Martins and Veiga (2013) find that economic conditions help to predict voter turnout at legislative elections in Portugal. This is an additional reason why we treat social capital as an endogenous explanatory variable in our main regression model, and we use lagged social capital to avoid simultaneity.

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Table 1. Summary statistics

Variable	Obs.	Mean	St.Dev.	Min.	Max.
Real growth rate (10 years)	10,145	0.39	0.37	-2.18	3.28
Social capital	10,145	0.90	0.07	0.41	0.99
Population	10,145	20,349.42	82,210.04	771	2,546,804
Real income (base year = 1951)	10,145	797.58	525.78	35.56	6,613.81
Altitude	10,145	233.42	229.10	0	1,211
Difference altitude	10,145	532.60	547.14	1	3,282
Coast location	10,145	0.17	0.37	0	1
Surface	10,145	71.10	77.87	1.62	1,307.71
Provincial capital	10,145	0.05	0.22	0	1
South	10,145	0.40	0.49	0	1

Notes. Data sources are: ANCI, ISTAT, *Istituto Cattaneo*, *Istituto Tagliacarne*. Social capital is measured with voter turnout at the Parliamentary elections (Chamber of Deputies).

Table 2. Conditional mean estimates on growth
Baseline estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.853***	0.749***	0.309***	0.221***	0.170**	0.595***
	(0.0301)	(0.034)	(0.039)	(0.067)	(0.068)	(0.109)
Initial income	-0.302***	-0.281***	-0.395***	-0.903***	-0.904***	-0.660***
	(0.004)	(0.007)	(0.008)	(0.010)	(0.010)	(0.024)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared	0.375	0.387	0.441	0.682	0.683	0.407

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 3. Conditional mean estimates on growth
Controlling for spatial externalities

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.819***	0.708***	0.319***	0.217***	0.163**	0.562***
	(0.030)	(0.036)	(0.039)	(0.068)	(0.069)	(0.110)
Initial income	-0.306***	-0.285***	-0.395***	-0.903***	-0.905***	-0.624***
	(0.004)	(0.006)	(0.007)	(0.010)	(0.010)	(0.024)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared	0.382	0.388	0.441	0.682	0.683	0.409

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 4. Conditional mean estimates on growth
Controlling for interaction between social capital and population size in 1951

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.705***	0.797***	0.325***	-0.627	-0.676	0.558***
	(0.0335)	(0.0376)	(0.0427)	(0.782)	(0.784)	(0.102)
Initial income	-0.248***	-0.294***	-0.411***	-0.821***	-0.820***	-0.654***
	(0.00362)	(0.00662)	(0.00725)	(0.00955)	(0.00956)	(0.0239)
Social capital ×	0.000249	0.00148	-0.0129***	0.0775	0.0813	0.00579
Population in 1951	(0.000956)	(0.000944)	(0.00255)	(0.0852)	(0.0853)	(0.00542)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared / G. of fit	0.335	0.366	0.435	0.616	0.616	0.408

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 5. Conditional mean estimates on growth
Controlling for interaction between social capital and initial income

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.753***	0.451***	0.096**	0.263*	0.216***	0.653***
	(0.030)	(0.030)	(0.041)	(0.070)	(0.071)	(0.121)
Initial income	-0.406***	-0.400***	-0.475***	-0.900***	-0.901***	-0.675***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.028)
Social capital ×	0.022***	0.034***	0.027***	-0.004**	-0.005**	-0.004
Initial income	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared / G. of fit	0.386	0.409	0.454	0.682	0.683	0.408

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 6. Conditional mean estimates on growth
Controlling for interaction between social capital and South

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.463***	0.420***	0.324***	0.341**	0.296**	0.696***
	(0.034)	(0.036)	(0.038)	(0.134)	(0.134)	(0.107)
Initial income	-0.340***	-0.348***	-0.381***	-0.903***	-0.905***	-0.661***
	(0.004)	(0.007)	(0.007)	(0.010)	(0.010)	(0.024)
Social capital ×	-0.037***	-0.039***	-0.046***	-0.141	-0.149	-0.145***
South	(0.001)	(0.001)	(0.001)	(0.137)	(0.136)	(0.004)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared / G. of fit	0.408	0.422	0.436	0.682	0.683	0.423

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 7. Conditional mean estimates on growth
Controlling for interaction between social capital and time effects

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.773***	1.391***	0.709***	0.548***	0.573***	1.055***
	(0.035)	(0.144)	(0.141)	(0.161)	(0.162)	(0.195)
Social capital × 1961-1971	0.034***	-0.562***	-0.544***	-0.421***	-0.451***	-0.672***
	(0.002)	(0.167)	(0.159)	(0.146)	(0.148)	(0.218)
Social capital × 1971-1981	0.049***	-0.416***	-0.326**	-0.268*	-0.304**	-0.515***
	(0.002)	(0.160)	(0.152)	(0.145)	(0.148)	(0.198)
Social capital × 1981-1991	0.040***	-0.983***	-0.777***	-0.683***	-0.720***	-0.966***
	(0.003)	(0.153)	(0.146)	(0.143)	(0.147)	(0.195)
Social capital × 1991-2001	0.026***	-0.384**	-0.218	-0.251*	-0.295**	-0.488**
	(0.003)	(0.153)	(0.146)	(0.144)	(0.149)	(0.196)
Initial income	-0.291***	-0.293***	-0.410***	-0.819***	-0.819***	-0.597***
	(0.006)	(0.006)	(0.007)	(0.009)	(0.009)	(0.023)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared / G. of fit	0.366	0.371	0.437	0.618	0.618	0.511

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 8. Conditional mean estimates on different outcomes
Changing the dependent variable (measured as growth rate)

	(1)	(2)	(3)	(4)
	GMM-SYS Real GDP per capita	GMM-SYS Plant density	GMM-SYS Employees density	GMM-SYS Employees per capita
Social capital	0.595***	0.477**	0.522*	0.721***
	(0.109)	(0.223)	(0.284)	(0.230)
Initial income	-0.660***	-0.112***	-0.0853	-1.530***
	(0.0247)	(0.0369)	(0.0538)	(0.0679)
Observations	10,145	10,145	10,145	10,145
G. of fit	0.407	0.195	0.243	0.290

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 9. Conditional mean estimates on growth
Changing the sample size

	(1)	(2)	(3)
	GMM-SYS	GMM-SYS	GMM-SYS
	Full sample	Below 5,000	Above 5,000
Social capital	0.522^{***}	0.254^{**}	0.558^{***}
	(0.0748)	(0.104)	(0.102)
Initial income	-0.766^{***}	-0.811^{***}	-0.654^{***}
	(0.0184)	(0.0197)	(0.0239)
Social capital ×	-0.0127	0.0132	0.00579
Population in 1951	(0.00923)	(0.0119)	(0.00542)
Observations	40,185	30,040	10,145
G. of fit	0.398	0.393	0.408

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 10. Conditional mean estimates on growth
Controlling for province-time effects

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.464***	0.465***	0.347***	0.181**	0.171**	0.650**
	(0.0480)	(0.0478)	(0.0484)	(0.0758)	(0.0770)	(0.309)
Initial income	-0.364***	-0.367***	-0.426***	-0.897***	-0.897***	-0.747***
	(0.00739)	(0.00729)	(0.00802)	(0.0107)	(0.0107)	(0.0502)
Province-time effects	YES	YES	YES	YES	YES	YES
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared / G. of fit	0.495	0.499	0.513	0.667	0.667	0.389

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 11. Conditional mean estimates on growth
Controlling for physical capital endowment

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.842***	0.715***	0.278***	0.184***	0.125*	0.585***
	(0.030)	(0.035)	(0.039)	(0.067)	(0.068)	(0.117)
Initial income	-0.334***	-0.319***	-0.434***	-0.929***	-0.933***	-0.639***
	(0.006)	(0.008)	(0.008)	(0.011)	(0.011)	(0.028)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	10,145	10,145	10,145	10,145	10,145	10,145
R-squared / G. of fit	0.378	0.392	0.447	0.684	0.685	0.408

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 12. Conditional mean estimates on growth
Controlling for physical and human capital endowments as well as the evolution of the working age population

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.772***	0.502***	0.162***	0.013	-0.023	0.481***
	(0.032)	(0.036)	(0.039)	(0.075)	(0.076)	(0.14)
Initial income	-0.323***	-0.323***	-0.416***	-1.049***	-1.051***	-0.799***
	(0.010)	(0.009)	(0.010)	(0.014)	(0.014)	(0.028)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	6,087	6,087	6,087	6,087	6,087	6,087
R-squared / G. of fit	0.332	0.362	0.412	0.716	0.717	0.411

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 13. Conditional mean estimates on social capital
First-stage regressions

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
	Guiso et al.	Guiso et al.	Andini et al.	Andini et al.
Instrument	0.0420***	0.0185***	0.0211***	0.0161***
	(0.00444)	(0.00558)	(0.00255)	(0.00255)
Initial income	0.0299***	0.0260***	0.0297***	0.0253***
	(0.00141)	(0.00139)	(0.00143)	(0.00141)
Constant	4.301***	4.121***	4.301***	4.123***
	(0.00933)	(0.0169)	(0.00939)	(0.0168)
Control set	NO	YES	NO	YES
Time effects	NO	YES	NO	YES
Province effects	NO	YES	NO	YES
Observations	6,006	6,006	10,145	10,145
R-squared	0.050	0.624	0.050	0.621
F statistic	89.47	10.99	68.57	39.67

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 14. Conditional mean estimates on growth
Reduced-form regressions

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
	Guiso et al.	Guiso et al.	Andini et al.	Andini et al.
Instrument	0.150***	0.0697***	0.0617***	0.0468***
	(0.0135)	(0.0139)	(0.00837)	(0.00829)
Initial income	-0.280***	-0.286***	-0.279***	-0.288***
	(0.00563)	(0.00574)	(0.00564)	(0.00579)
Constant	2.102***	1.919***	2.096***	1.922***
	(0.0363)	(0.0496)	(0.0362)	(0.0492)
Control set	NO	YES	NO	YES
Time effects	NO	YES	NO	YES
Province effects	NO	YES	NO	YES
Observations	6,006	6,006	10,145	10,145
R-squared	0.318	0.469	0.317	0.469

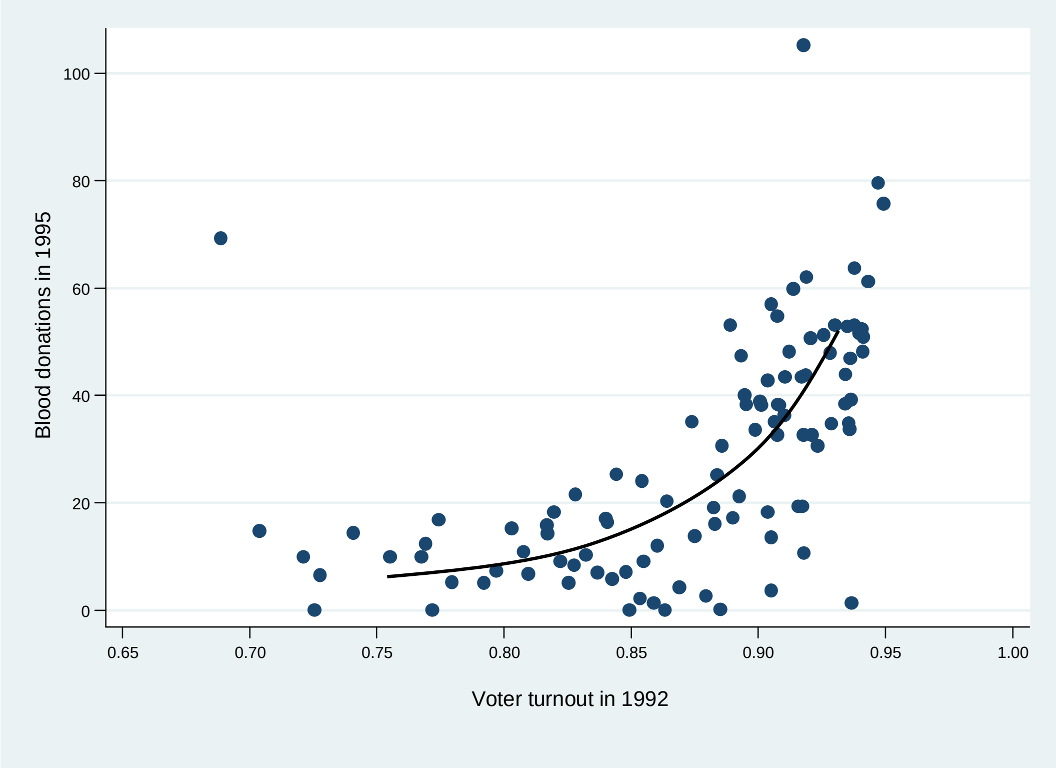
Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Table 15. Conditional mean estimates on growth
Second-stage regressions

	(1)	(2)	(3)	(4)
	2SLS	2SLS	2SLS	2SLS
	Guiso et al.	Guiso et al.	Andini et al.	Andini et al.
Social capital	3.562***	3.765***	2.924***	2.911***
	(0.432)	(1.214)	(0.433)	(0.570)
Initial income	-0.386***	-0.384***	-0.366***	-0.362***
	(0.0155)	(0.0327)	(0.0153)	(0.0165)
Constant	-13.22***	-13.60***	-10.48***	-10.08***
	(1.851)	(4.991)	(1.857)	(2.343)
Control set	NO	YES	NO	YES
Time effects	NO	YES	NO	YES
Province effects	NO	YES	NO	YES
Observations	6,006	6,006	10,145	10,145

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Figure 1. Correlation between voter turnout and blood donations



Notes. Data are at province level. Blood donations are measured as the number of blood bags (each bag contains 16 ounces of blood) per million inhabitants in the province. Voter turnout refers to the Parliamentary elections (Chamber of Deputies).

Figure 2. The evolution of voter turnout at political elections

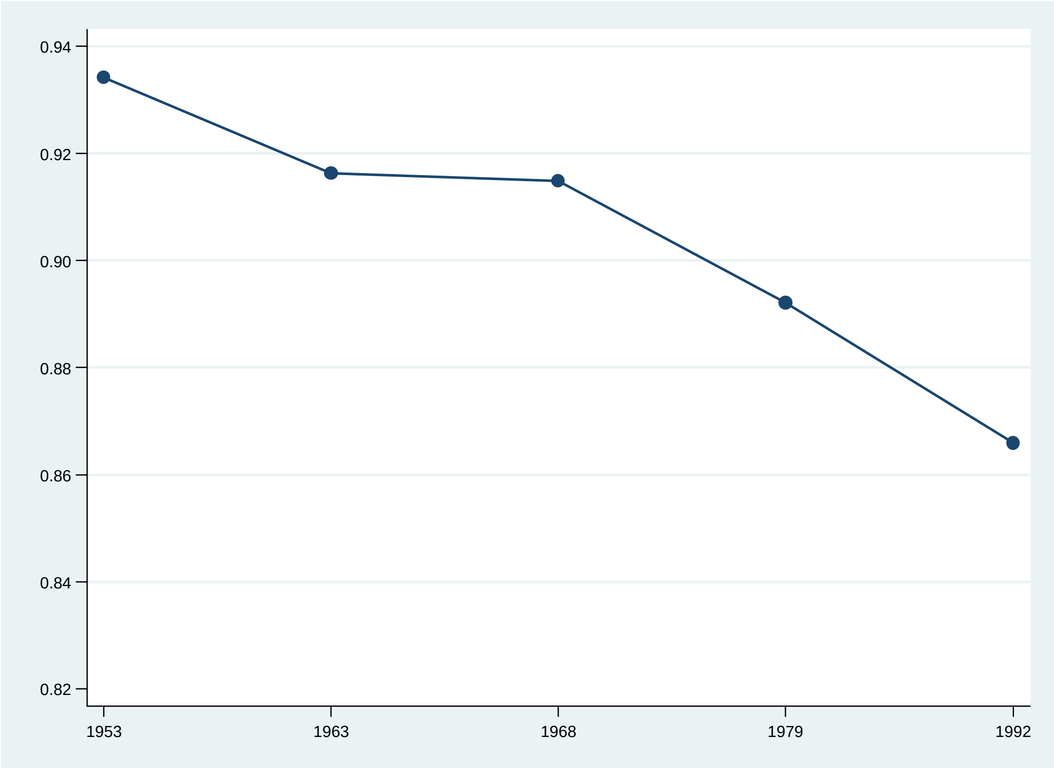


Figure 3. The evolution of real growth

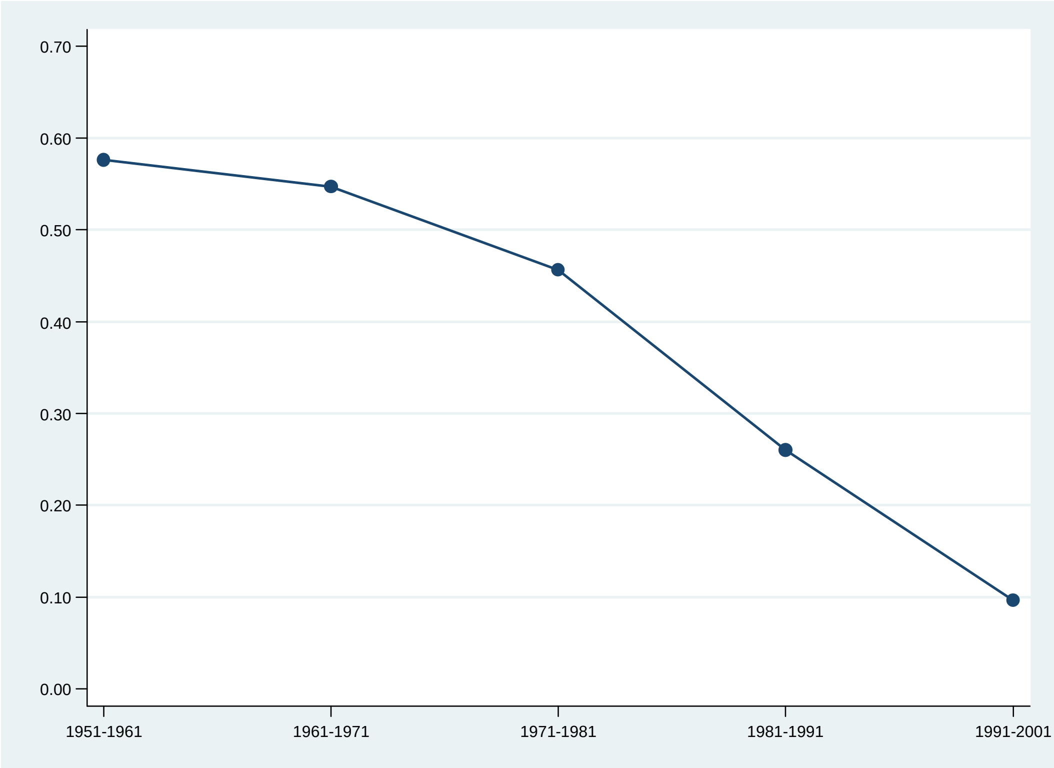
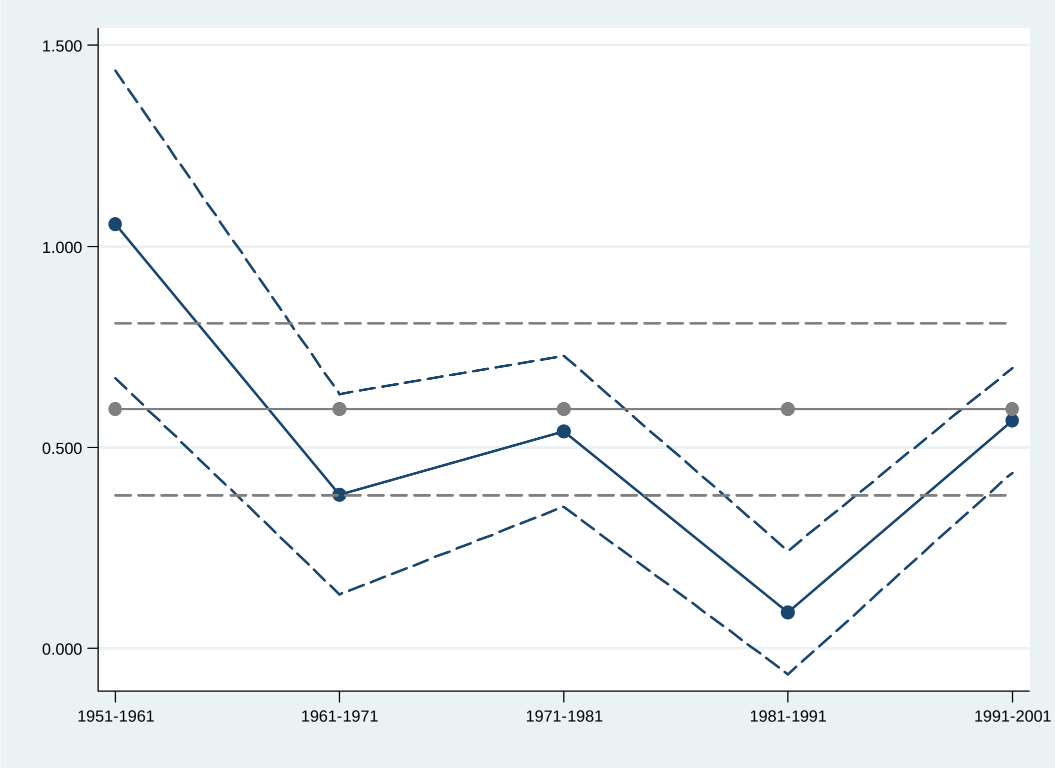


Figure 4. The impact of social capital on real growth over time



Notes. The gray lines are based on Table 2, col.6. The blue lines are based on Table 8, col.6.

Appendix Table I. Linear correlation between voter turnout at political elections and alternative proxies of social capital at province level

Alternative proxy	Source	Correlation with	Coefficient
Blood bags per 1,000,000 inhabitants, 1995	AVIS	Turnout at political elections, 1992	0.566
Propensity to collective action, 1965-1974	ISL-UP	Average turnout at political elections, 1963-1968	0.552
Volunteers associations per 100,000 inhabitants, 1999	ISTAT	Turnout at political elections, 1992	0.493
Volunteers per 100,000 inhabitants, 2000	ISTAT	Turnout at political elections, 1992	0.476
Non-profit institutions per 100,000 inhabitants, 2000	ISTAT	Turnout at political elections, 1992	0.426
Associations per 100,000 inhabitants, 1982	ISL-UP	Turnout at political elections, 1979	0.285
Share of employment in non-profit sector, 2000	ISTAT	Turnout at political elections, 1992	0.176
Violent crimes per 100,000 inhabitants, 1998	ISTAT	Turnout at political elections, 1992	-0.239

Notes. ISL-UP = *Istituzioni e Sviluppo Locale - Università di Parma*. ISTAT = *Istituto Nazionale di Statistica*. AVIS = *Associazione Volontari Italiani del Sangue*. The propensity to collective action is a principal-component indicator elaborated by Arrighetti et al. (2003) using information for different years between 1965 and 1974. The number of associations per 100,000 inhabitants in 1982 has been elaborated by Mortara (1985).

Appendix Table II. Conditional mean estimates on growth
MAUP evidence

	(1)	(2)	(3)
	OLS Municipality	OLS Province	OLS Region
Social capital	0.309***	0.067	-0.237
	(0.039)	(0.152)	(0.218)
Initial income	-0.395***	-0.560***	-0.471***
	(0.008)	(0.038)	(0.0771)
Time effects	YES	YES	YES
Control set	YES	YES	YES
Observations	10,145	515	100
R-squared	0.441	0.702	0.893

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Appendix Table III(a). Conditional mean estimates on growth with aggregation at province level

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.878***	0.854***	0.067	-0.037	-0.163	0.551*
	(0.107)	(0.145)	(0.152)	(0.204)	(0.221)	(0.332)
Initial income	-0.269***	-0.293***	-0.560***	-0.890***	-0.884***	-1.013***
	(0.012)	(0.032)	(0.038)	(0.043)	(0.043)	(0.219)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	515	515	515	515	515	515
R-squared / G. of fit	0.545	0.592	0.702	0.796	0.797	0.589

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Appendix Table III(b). Conditional mean estimates on growth with aggregation at regional level

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.938***	0.240	-0.237	-0.126	-0.226	-0.104
	(0.181)	(0.248)	(0.218)	(0.253)	(0.324)	(0.785)
Initial income	-0.250***	-0.0580	-0.471***	-0.681***	-0.671***	-0.863
	(0.0189)	(0.0665)	(0.0771)	(0.0781)	(0.0806)	(0.619)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	100	100	100	100	100	100
R-squared / G. of fit	0.700	0.799	0.893	0.926	0.927	0.760

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.

Appendix Table IV. Correlation matrix for outcome measures (growth rates)

	Real GDP per capita	Real GDP	Population	Plant density	Employees density	Employees per capita
Real GDP per capita	1.0000					
Real GDP	0.8778	1.0000				
Population	-0.0124	0.3199	1.0000			
Plant density	0.3622	0.5963	0.4210	1.0000		
Employees density	0.6323	0.7750	0.3187	0.6638	1.0000	
Employees per capita	0.6710	0.7139	0.0120	0.5637	0.9516	1.0000

Appendix Table V. Conditional mean estimates on growth with the full sample

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	FE	FE	GMM-SYS
Social capital	0.850***	0.892***	0.283***	0.239***	0.103***	0.444***
	(0.020)	(0.021)	(0.0251)	(0.038)	(0.038)	(0.201)
Initial income	-0.380***	-0.408***	-0.498***	-0.962***	-0.967***	-0.792***
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.148)
Time effects	NO	YES	YES	YES	YES	YES
Fixed effects	NO	NO	NO	YES	YES	YES
Control set	NO	NO	YES	NO	YES	YES
Instruments	NO	NO	NO	NO	NO	YES
Observations	40,185	40,185	40,185	40,185	40,185	40,185
R-squared / G. of fit	0.336	0.350	0.408	0.688	0.691	0.398

Notes. * - ** - *** denotes statistical significance at the 10% - 5% - 1% level. Standard errors in brackets.