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ESSAYS ON SOCIAL CAPITAL AND SPACE

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ai miei genitori, perché mi hanno insegnato l'importanza di costruire una casa *"fondata sopra la roccia"*. (Mt 7,25)

ad Antonella, le mie sole vere pupille, e alle milioni di scale che scenderemo insieme.

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Introduction

> "what makes the difference between a low level of living and *la miseria* (i.e. the misery) comes from culture. Unlike the primitive, the peasant feels himself part of a larger society which he is 'in' but not altogether 'of.'" (Banfield, 1958)

The idea of specific values and beliefs (i.e. *"culture"*) as, ceteris paribus, the main explanatory of growth differentials, has recently received lot of attention by social scientists. Economists, in particular, focus on certain shared values and beliefs, constituting a social "stock" of good values fostering growth and cooperation. Thus the name, social capital. This interest is motivated by the resilience of development gaps across and within similar countries, even after years (or decades, as in the case of the Southern Italy) of ad *ad-hoc* policy programmes. Identifying the "right" values conducive to growth (and how to breed them) could become a new policy paradigm. Unfortunately, social capital is an elastic concept (Knack and Keefer, 1997). Moreover, to the extent that social interactions type and strength matter, social capital clearly requires attention for the role of space. Thus, this thesis attempts to clarify some of the issues related to social capital and space. Keeping in mind these considerations, the thesis is organized as follows.

Chapter 1 outlines the main questions of this thesis. At first, the concept of social capital is investigated through a careful review of the socio-economic literature, where social capital emerges as a multidimensional (and multidisciplinary) topic. In order to achieve a synthesis, following *"Solow's critique"* (Solow, 1995) and Guiso et al. (2011), we focus on the concept of "civic capital", i.e. *"those persistent values and shared beliefs, which allow a group to overcome the free rider problem in the pursuit of socially valuable activities"*. It follows the need to understand the relationship between social capital and economic growth. Indeed, several channels have been documented, namely

crime, corruption, trust, thriftiness, productivity, ethnicity, religion and, last but not least, migration, which is the natural carrier of values and beliefs in communities with different socio-economic characteristics. Unfortunately, there are also many confounding factors at work, such as human capital and institutions, complicating the identification. On top of that, a theory of capital requires, by definition, a clear (dis)investment process. Therefore, we select and present four models of cultural transmission which capture the dynamics of (dis)investment of social capital, focusing on the role of parents and the socio-economic environment. Moreover, some of these models provide an explanation for values persistence and impact on policy.

Once some important theoretical issues have been discussed, we focus on the relevant empirical studies, in particular with respect to its measurement. Indeed, social capital has been the object of extensive research, with the consequent abundance of empirical measures, also requiring some degree of synthesis. Chapter 2 abides to this task and expands the discussion to consider the relationship between social capital and space. Indeed, social capital can be transmitted within an horizontal continuous space marked by distance, an horizontal discontinuous space marked by borders and a hierarchical space with discontinuities due to multiple levels of markets and governance. Clearly, handling spatial data requires specific techniques (Anselin and Arribas-Bel, 2011). Spatial econometrics tools are discussed, with particular reference to dynamic spatial techniques. Apart from space, another technical issue is represented by the multidimensional nature of social capital, a sign of the richness of the concept, unfortunately complicating also the analysis. To the extent we want to preserve such multidimensional nature, without using single variables as proxy for more complicated concepts, we need specific techniques to achieve data reduction. Our choice is the Principal Component Analysis (PCA).

Previous chapters reported on the complex world of social capital. In Chapter 3, building on previous considerations, we propose new synthetic measures of social capital. We also explore the difference between the *"structural"* and *"cognitive"* component of social capital suggested by Righi and Scalise (2013), with particular reference to the spatial distribution of social capital across Europe, looking for possible clusters of regions sharing similar values and beliefs.

Eventually, previous chapters were conductive to an analysis of social capital and economic growth, with particular reference to sub national divides. In this regard, we refer to previous work

by Tabellini (2010). Focusing on European regions, he analyses the factors inducing economic growth differentials, with social capital, ceteris paribus, having a significant and sizable explanatory power. However, results are likely biased due to endogeneity. In the last Chapter we try to formally test the existence of a weak instruments problem, following Stock and Yogo (2002) and Kleibergen and Paap (2006). Once the problem is verified, we proceed along the cited literature linking social capital and space (LeSage and Fischer 2008; Anselin and Arribas-Bel 2011 for technicalities), and introduce a spatial regression approach, in order to solve the likely misspecification problem. This conclude our inspection of social capital: from theoretical issues related to the definition, across a review of empirical measures. Then we define new measures used in a within country analysis. The last chapter draws some conclusions and highlights some possible policy implications and suggestions for further research.

Chapter 1

Social capital: an extended review of the relevant literature

Much has been said about social capital[1], but still, there is little consensus on the meaning nor on the origin of the term[2]. In what follows there will be an attempt to clarify the definition of social capital (section 1.1), disentangling the channels through which it affects economic growth (section 1.2). Eventually, a theory of (social) capital cannot ignore accumulation nor, in this specific case, transmission processes: four selected models of cultural transmission are presented in section 1.3.

1.1 What is social capital?

Durlauf (1999) credits Loury (1977) as the first talk about social capital (at least in the economics literature), focusing on the income differentials across ethnic groups due to social networks: Glaeser et al. (1999) praise Jacobs (1961) and its 'neighbouring effects'. Instead, de Blasio and Sestito (2011) and Routledge and von Amsberg (2003) date it back to Hanifan (1916), who used the term

[1] As of November 2013, there were more than 11.292 search results on Ideas, 98.845 on Jstor and an astonishing 731 millions on Google.

[2] Arrow (1999) has even suggested to discard the term, while Durlauf (1999) says that *"there is strong reason to ask whether the rise in interest in social capital is due to its demonstrated strength in elucidating socio-economic phenomena or whether it is the intellectual equivalent of a stock market bubble."*, although it's unanimously recognized its important role as *lubricant of a social system* (Arrow, 1974).

to describe the active support of local communities towards the Virginia system of rural schools. Whatever may be the origin, the concept has been mostly ignored by economists until the 90s; indeed, while definitions were plagued by vagueness, the neoclassical theory of general competitive equilibrium became dominant and all non-market interactions, such as those related to social capital, were discarded either because not interesting or, most likely, because they were intractable. In fact, according to Manski (2000):

> "from the perspective of general equilibrium theory, non-market interactions were not phenomena of intrinsic interest. Instead, they were problems of incomplete markets that may prevent the economy from achieving a social optimum. Welfare economics prescribed that the externalities created by non-market interactions should, if possible, be eliminated by setting property rights that would permit trade to take place."

This might explain why the concept has been explored by sociology and political science first, and just recently 'discovered' by economists. In the following, we briefly describe the evolution of the concept into three domains: sociology, political science and economics.

1.1.1 Social capital: a multidisciplinary concept

Social capital in sociology

For sociologists, social capital is the value accruing from being part of a community, and the focus is on networks and social interactions (Granovetter, 1973). Indeed, individual actions alone are not enough whereas the outcome is partially or totally dependent on other agents' actions. Thus, each individual establishes a set of durable relationships. To this extent, as pointed out by Bordieu (1986),

> "social capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition."

Thus social capital is the result of an investment in a network of useful resources with a specific aim,

> "facilitating the achievement of goals that could not be achieved in its absence or could be achieved only at a higher cost." (Coleman, 1990)

However, this definition of social capital is flawed, as networking is something that can be incorporated in standard model of human capital accumulation (Trigilia, 2011): one could decide to invest in tertiary education at an expensive Ivy League University for establishing useful and enduring relationships. Another definition, provided by Coleman (1990), states that

> "social capital is the normative structure ensuring that unattended children will be looked after by adults in the vicinity."

To this extent, social capital is a way to enforce social norms but this interpretation does not provide a way to measure nor a clearly defined accumulation process. Moreover, while in the previous example, the social norm was desirable (protecting children), generalizing the definition could comprise the enforcement of questionable social norms, such as excluding outsiders (protecting incumbents against newcomers) or punishing deviations (e.g. gangs). Over time, the definition of social capital based on network analysis has evolved into three separate and almost mutually exclusive types, according to the type of ties between people: bonding, bridging and linking social capital (Woolcock, 1998; LSE, 2007). More precisely:

- *bonding* social capital refers to ties within close community and is the source of amoral familism;
- *bridging* social capital characterizes ties between similar, but not immediate, people, such as those belonging to the same community and it has been the object of vast empirical investigation;
- *linking* social capital connects people more dissimilar and outside the community, allowing network members to reach a greater variety of resources. It also refers to the interactions with public institutions.

Social capital in political science

The seminal work about social capital in political science is due to the case study of Banfield (1958), an american scholar who spent one year (1955) in *Montegrano*, a small town of Basilicata, a southern Italian region, comparing the way of living of the town with that of an American one. He argues that the backwardness of the former is the result of a specific set of values discouraging cooperation,

an individualistic society promoting only trust towards family members and peers, which he names "amoral familism".

However fascinating, the idea of Banfield is just a case study which can't be generalized. His fortunate expression, however, ignited a debate followed by other political scientists, such as Putnam (1993) and Fukuyama (1995), defining social capital as a group or community property, affecting the individuals of a city, region or even a country. Focusing on the regional divide in Italy, Putnam (1993) speak of horizontal vs. vertical relationships characterising Italy in the Middle Ages:

> "in the North the crucial social, political, and even religious allegiances and alignments were horizontal, while those in the South were vertical. Collaboration, mutual assistance, civic obligation, and even trust - not universal, or course, but extending further beyond the limits of kinship than anywhere else in Europe in this era - were the distinguishing features in the North. The chief virtue in the South, by contrast, was the imposition of hierarchy and order on latent anarchy."

The concept of social capital in the political science literature is tilted in favour of generalized trust and reciprocity, a set of civic values present in the communities where individuals voluntarily cooperate, ensuring accountability and law-abidingness. Albeit underlining its "group" dimension, and having a clear empirical counterpart, this definition lacks a clear mechanism of investment.

Social capital in economics

As previously stated, all non market socio-economic frictions, such as social capital or culture, have been ignored by economists until recently with the exception of a particular facet, namely, trust, which can be easily modelled and incorporated in standard models through a probabilistic definition. As suggested by Gambetta (1988), trust is

> "a particular level of the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action, both before he can monitor such action (or independently of his capacity ever to be able to monitor it) and in a context in which it affects his own action."

Unfortunately, trust is not by itself a "good" cultural trait:

> "if there is any society among robbers and murderers, they must at least (...) abstain from robbing and murdering one another (Smith, 1759)."

Thus, trust *per se* it is not enough as we will see in next section.

1.1.2 A new definition of social capital

Multiplicity of definitions is suggestive of the main problem of social capital, i.e. its definition, starting from the fact that term "capital" is something possessed by someone, while, according to the generally accepted attributes of social capital, it exists only in relationships with people (Bowles, 1999).

The debate on the definition reached a turning point with Solow (1995):

> "if social capital is to be more than a buzzword (...) there needs to be an identifiable process of investment that adds to the stock, and possibly a process of 'depreciation' that subtracts from it. The stock of social capital should somehow be measurable, even inexactly."

Thus, according to Solow, any definition of social capital has to satisfy at least 2 conditions:

1. a well defined investment/depreciation process;
2. a clear measurable empirical counterpart.

However this might be not enough, as pointed out by Bordieu (1977), Gambetta (1988) or Portes (1998): vagueness of the definition, especially if referring to "social norms" without any sound restrictions, could easily lead to either bad outcomes or questionable behaviours, as when interpreted in terms of exclusive relations (Banfield, 1958; Woolcock, 1998).

Durlauf (1999) states that

> "to the extent that social capital is appropriately regarded as a set of mechanisms in which groups implicitly enforce certain behaviours among their members, it is clear that any presumption concerning its virtues is questionable."

Strong group ties or any situation with group coordination above a certain level may favour entry barriers penalizing outsiders. Moreover, in the American setting, rich of community and group associations, usually ethnically and economically segregated, there is a serious risk of an increase in intergroup hostility.

Thus, a further assumption is required:

3. it does not envisage a negative outcome.

This last requirement excludes all situations in which values and beliefs might cause a negative economic pay-off, such as in the case of cooperation leading to monopolies or gangs/Mafia syndicates. Indeed, in this case, less (but different from zero) cooperation is necessary to increase competition:

> "even to compete, in a mutually non-destructive way, one needs at some level to trust one's competitors to comply with certain rules (Gambetta, 1988)."

In line with the most recent economic literature, Guiso et al. (2011) introduce a specific definition of social capital, naming it "civic capital" as:

> "those persistent values and shared beliefs, which allow a group to overcome the free rider problem in the pursuit of socially valuable activities."

Unlike human capital, civic capital is the result of a social process of investment and requires individual values and beliefs to be shared by other members of the community. Moreover, by definition, civic capital excludes negative outcomes and negative social norms. They also present some empirical counterpart which can be measured and a model focusing on cultural transmission. Thus, civic capital fully satisfies Solow's criteria. We discuss some possible models of accumulation/de cumulation of social capital in section 1.3, postponing the discussion on existing empirical counterparts to chapter 2. We conclude this brief review which served the purpose of proving multidisciplinary interest in social capital. In the following, we will attempt to summarize the copious literature exploring the link between social capital and economic growth.

1.2 Social capital and economic development

1.2.1 General discussion

> "As every employer knows, the lack of *coscienziositá* (i.e. conscientiousness) of the labourers of such countries, for instance Italy as compared with Germany, has been, and to a certain extent still is, one of the principal obstacles to their capitalistic development." (Weber, 1905)

The relationship between social capital and economic development lies at the root of the interest for social capital. The idea that, once netted out of human and physical capital and, somehow,

technological progress, growth differentials might be explained by other, undefined, socio-economic covariates, is not recent. Indeed, even though not explicitly mentioning social capital, Weber (1905) underlines the role of specific values and beliefs (attributed to Protestantism) as the ultimate explanation for the relative economic success of some countries; Smith (1776) reinforces this argument:

> "it is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest. We address ourselves, not to their humanity, but to their self-love, and never talk to them of our own necessities, but of their advantages."

However we should be aware that the relationship between social capital and economic growth is plagued by concerns of reverse causality. Are values and beliefs, such as generalized trust, affecting economic growth or does a more prosperous society lead people to be more confident? A nation with a lively community development environment prefers a more equal distribution of income, or a skewed distribution changes preferences (and policy)?

These issues have been at the heart of the considerations of several classical authors such as Adam Smith, John Stuart Mill, and more recently, Max Weber or Karl Polanyi, mostly arguing that direction of causality from values to economic growth. For Weber and Polanyi, in a change of economic regime (such as the passage from a feudal society to a society based on the middle class) the economic incentives are not enough for entrepreneurs to win against initial barriers, thus the role of religion, especially protestantism according to Weber (1905), posing the pursuit of wealth as a moral duty.

On the opposite side, Karl Marx believed that as the hand-mill produced a feudal society (with its correspondent set of values and beliefs, such as respect for hierarchy), the steam-mill generated capitalism. Eventually, according to Marx, the economic structure shapes the society and social interactions. A lively debate on this topic started around WWII, but then, as previously mentioned, economists lost ground:

> "as economic theory increased its mathematical sophistication and the set of tools at its disposal expanded, no need was felt to introduce other potential explanatory variables that, on top, were hard to measure. Not only did economics lose any interest in its relation with culture, but, as it became more self-confident in its own capabilities, it moved to explain culture as a mere outcome of economic forces." (Guiso et al., 2006)

This rational approach, mostly Marxian in spirit, is associated with the so-called *"Chicago school"* where people' beliefs, tastes, and values are the rational choices of individuals and society, with the price system as a way to solve any imbalances (Guiso et al., 2006). Indeed, many authors (e.g. de Soto, 2003; Zingales, 2012) suggest that, for example, incorporating property rights of squatters induces changes in preferences, such as having pro-market beliefs (Di Tella et al., 2007). Becker (1996) points out that some cultural traits such as race, family history or ethnicity are given and inherited, compared to values and beliefs which are instead the result of an accumulation process. This sustains a direction of causality from economics towards culture, although experiments proved that individuals might voluntarily choose not to cooperate even though beneficial (Binmore and Dasgupta, 1986). In practice, this endogeneity problem is usually solved recurring to instrumental variables, with all the known issues related to the exogeneity and strength of the instruments.

1.2.2 From social capital to growth

There are several identified channels through which social capital might affect economic growth. A non definitive list includes: crime, corruption, trust, thriftiness, productivity, ethnicity, religion and, last but not least, migration. In the following, we will briefly review the main results according to the identified channels.

As for crime, a measure of social interactions is the only covariate explaining more variance in crime rates across space than differences in economic performance (Glaeser et al., 1996). de Blasio and Nuzzo (2010) find that higher social capital is associated with higher productivity, entrepreneurship and women employment rate. In Italy, Ichino and Maggi (2000) report that preferences for shirking on the job are driven by the place of birth (proxy of cultural heritage), with southern migrants more likely to cheat. To the extent preferences for redistribution are involved, Alesina and La Ferrara (2005) show that beliefs in a society providing equal opportunities are more averse to income redistribution, with Alesina and Angeletos (2005) framing a model supporting this idea. Guiso et al. (2006) find significant and sizeable effects of social capital, measured by thriftiness: a 10 percentage points increase in the share of people who think thriftiness should be taught to children, increases the national saving rate by 1.3 percentage points. Indeed, Trigilia (2011) suggests that the cultural component of social capital could be used as an argument in favour of state intervention:

the lack of specific values (such as trust or thriftiness) could be fixed through greater education or socialization, leading to an increase in those values required for inclusive institutions (see also section 1.2.4). Using within country data in Italy, Giordano and Tommasino (2011) find that a higher degree of political engagement, as proxy of social capital, increases the efficiency of public service. Guiso et al. (2008b) find that one standard deviation increase in social capital implies a jump of per capita income by 70 percent. Other possible channels might be ethnicity and religion. In fact, ethnic diversity, which is associated to the different sets of values and beliefs, reduces people's willingness to support public good provision (Dahlberg et al., 2012) and makes people less likely to support redistribution (Alesina et al., 1999). As for religion, according to Guiso et al. (2003) protestants support income inequality, on the grounds that it spurs personal competition and commitment, whilst Roman Catholics (and much more muslims) prefer a more equal distribution.

The role of trust

An important role is given to trust, particularly relevant when transactions involve some unknown counterpart, when the transaction takes place over a period of time rather than being completed on the spot, and when the legal protection is imperfect.

Alesina and La Ferrara (2002) show that income inequality reduces trust, using evidence from the General Social Survey in the US. In a cross-country exercise, La Porta et al. (1997) find that the larger the share of trusting people, the smaller the associated inflation rate. Moreover, greater trust increases judicial efficiency and reduces government corruption. Indeed, generalized trust is required to lower transaction costs (Fukuyama, 1995), overriding situations characterized by prisoner's dilemma and allowing transactions otherwise impossible, even in the presence of an advanced legal system. As suggested by Arrow (1972),

> "virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time."

Moreover, he adds

> "much of the economic backwardness in the world can be explained by the lack of mutual confidence."

Through better coordination and sustanaibility of vertical delegation, trust shapes a comparative advantage for some firms, with sizeable and significant effects relative to average firm size (Cingano and Pinotti, 2012). Knack and Keefer (1997) and Knack and Zac (2001) report cross-countries regressions of trust on economic growth finding significative positive effect. In Italy, the divide between areas with higher levels of trust vs. areas with lower levels (notably, North vs. South), explains higher households' investments in stocks, use of bank checks and less recourse to informal credit, while northern firms are more likely to have multiple shareholders (Guiso et al., 2004). More generally, lower growth rates in former soviet countries of central and eastern Europe are mainly attributed to lack of trust in institutions and social capital (Raiser, 1997, 1999).

Trust is favoured by past experiences, as proved by a cash-conditional game (Attanasio et al., 2009). Interestingly, it looks like if there is some sort of asymmetry in the accumulation process of trust: is hard to accrue but easy to lose (such as in the case of scandals - Zingales, 2012). However, it is necessary to pay attention to the difference between personalized and generalized trust. Indeed, personalized trust is a belief of trustworthiness regarding only certain people or groups (establishing bonding social capital or strong ties) whether generalized trust refers to unknown people, thus to the whole society (linking social capital). It follows that institutions and markets need generalized trust, not personalized trust, which is essential for ensuring the financial development of a community (Guiso et al., 2008c) while its lack could result in giving power to Mafia syndicates [3].

The role of migration

A particular note should be dedicated to migration, as a "'carrier"' of values and beliefs. Indeed, migration is a promising field in order to understand social capital: migrants bring new values and beliefs in the communities of incumbents. Understanding the characteristics of communities assimilating migrants and which migrants preserve their cultural identity has interested several scholars such as Cavalli-Sforza and Feldman (1981), Boyd and Richerson (1985) or Bisin and Verdier (2001). Indeed, focusing on migrants, Luttmer and Singhal (2011) observe that preferences for redistribution are affected by the social preferences of the origin country, showing also persistence across generations. Using data on European immigrants in the US, Giuliano (2007) attributes the

[3] *"I don't trust society to protect us, I have no intention of placing my fate in the hands of men whose only qualification is that they managed to con a block of people to vote for them"* says Michael Corleone, in *The Godfather* - Puzo, 1969.

different living arrangements among young migrants to the sexual revolution of the 70s and its different impact across Europe. Algan and Cahuc (2010) exploit the values of second-generation Americans as proxy of previous generations' endowment, finding that trust has a significant causal impact on economic activity, mainly through total factor productivity and accumulation of physical and human capital. Fernandez et al. (2004) and Fernandez and Fogli (2009) point out to the role of social capital in the fertility choices of American women.

LeSage and Ha (2012) consider how migration affects social capital mainly through two channels: either influencing the existing stock of trust and cooperation of natives or by importing migrants' inherited social norms. Indeed, they underline how the relational nature of social capital often leads researchers to consider it as *place-based*, hence, its measurement in terms of associational activity, voting in elections and referenda, decennial census response rate, presence of tax-exempt non-profit organizations. Thus, the role of migration seems reduced. On the other hand, migration may involve members of a society with higher levels of human capital and higher propensity to participate in social and civic organizations. If migrants maintain these attitudes even in the new country, they are likely to affect positively the social capital of their hosting community.

Geography may also play a role in terms of distance: if short-distance migration is consistent with maintaining strong ties, on the opposite long-distance migration should imply weak ties. In terms of trust, longer distance migration may also imply that the destination community is culturally more distant making migrants less trusting. The opposite would be true for close-distance migration. Empirical evidence in the US shows that it takes several generations for migrants to adapt to the new set of values and beliefs of their new fatherland (Uslaner, 2008; Guiso et al., 2009). Moreover, trusting attitudes against specific countries (and their citizens) are influenced by history of past conflicts (Guiso et al., 2006). LeSage and Ha (2012) consider a social capital index, based on associational density and civic participation, for US counties and apply spatial regression methods to investigate the impact of migration on social capital. They find evidence of a positive effect of migration on social capital, concluding that that social capital cannot be considered just as *place-based*. Aleksynska (2011) finds evidence of active participation by immigration, increasingly with duration of speed. However, she finds that the speed of assimilation is different for each group and, for example, it is more difficult for muslims. According to Luttmer and Singhal (2011), preferences for redistribution are influenced by the receiving community/country.

1.2.3 Confounding factors I: human capital and culture

Sometimes, to the extent social capital is interpreted as network, it has been dismissed on the grounds of being overlapping with the concept of human capital. The problem of confounding factors, specifically human capital, culture and institutions, is being discussed in the following. Indeed, Cipolla (1974) states that at the heart of the differences between developed and less developed countries lies the "human factor":

> "the problem of a less developed country (...) is the poor quality of the human factor: a less developed country has worthless businessmen, workers that worth less, unqualified professors, lazy students, policy-makers not able to rule and citizens without civicness. Thus the country is less developed. The lack of capitals and technology and clerical backwardness are somehow more consequences than causes[4]

Thus, the human factor is not human capital but some set of moral attitudes as clearly stated by the use of moral adjectives (worthless, lazy). He later adds:

> "education is an important element to increase the quality of human capital. But education is not enough. For a working society requires the existence of some psychological and ethical attributes, such as cooperation spirit, honesty, tolerance, sacrifice and entrepreneurial spirit, perseverance and so on[5]."

As for education, the differences between culture and social capital are blurred. Both social capital and culture capture values and beliefs, thus similar empirical counterparts. As a matter of example, Giuliano and Spilimbergo (2009) identify an effect of adverse economic shocks (i.e. recessions) on beliefs, with increased support for redistribution, more scope for luck (with respect to

[4]Original text in Italian: *"Il guaio di un paese sottosviluppato non sta tanto nella mancanza di capitale o nell'arretratezza delle conoscenze tecnologiche quanto nella povera qualità dei suo fattore umano: un Paese sottosviluppato ha imprenditori che valgono poco, operai che valgono meno, professori incompetenti, studenti che studiano poco, governanti che non sanno governare e cittadini senza senso civico. Per questo il Paese resta sottosviluppato. La mancanza di capitali e l'arretratezza tecnologica e amministrativa in certo senso sono piu conseguenze che cause del fenomeno dell'arretratezza."*"

[5]Original text in Italian: *L'istruzione é un elemento importante nel migliorare la qualità del capitale umano. Ma l'istruzione non basta. Per il buon funzionamento di una società occorre la presenza di qualità psichiche ed etiche, quali lo spirito di collaborazione, il senso di onestà, la tolleranza, lo spirito di sacrificio e di iniziativa, la perseveranza, la curiosità intellettuale e sperimentale, ecc."*

effort) and less trust in public institutions. However, this is related to individual cultural characteristics, lacking the community dimension. Guiso et al. (2006) restrict culture to a specific set of values and beliefs, provided that these are inherited from previous generations. This is indeed the same identification strategy of Tabellini (2010) for whom culture and social capital are overlapping: values and beliefs shared by communities, with a clear empirical counterpart and (dis)investment process. Thus, in this specific context, culture and social capital are perfect substitutes. Moreover, this definition of social capital/culture, focused on the intergeneration transmission of values, sheds some light on the apparently great persistence of values and beliefs. Indeed, despite common sense will likely dismiss the idea that something happened 500 years may still affect current life, empirical evidence (Guiso et al., 2008a) supports Putnam's idea. A lively debate whether social capital is the result of a long term accumulation process or not is under way: focusing on African regions which have been heavily raided during the slave trade, Nunn and Wantchekon (2009) find that descendants exhibit less trust in neighbours, relatives, and their local government. Guiso et al. (2008a) test Putnam's hypothesis in Italy finding positive evidence that past free city experience in the Middle Ages account for 50% of nowadays social capital gap between the North and the South Italy.

1.2.4 Confounding factors II: institutions

The relationship between social capital and institutions is a close one. Indeed beliefs, also defined as mental models,

> *"are the internal representations that individual cognitive systems create to interpret the environment; institutions are the external (to the mind) mechanisms individuals create to structure and order the environment."* (North, 1990)

Similarities are not over: the concept of institutions is, unfortunately, as vague as that of social capital:

> "the human economy (...) is embedded and enmeshed in institutions, economic and non-economic. The inclusion of the non-economic is vital. For religion or government may be as important to the structure and functioning of the economy as monetary institutions or the availability of tools and machines themselves that lighten the toil of labour" (Polanyi et al., 1957)

Following North (1990), institutions may be considered as the rules of the game, a set of self-imposed constraints with influences on any social, political and economic interactions. There is a rich taxonomy regarding institutions: formal vs. informal, fast vs. slow changing, exogenous vs. endogenous, political vs. economic, inclusive vs. extractive, and so on.

Indeed,while the idea of formal institutions is usually associated to the current set of laws and norms, informal institutions belong to the broader set of social norms whose social capital may be part of. Following Roland (2004), institutions may be classified according to their attitude to change: slow and continuously changing institutions (such as values and beliefs) are opposed to fast and irregularly changing ones (such as political institutions which may change even overnight). Institutions may be exogenously given or endogenously generated, as a result of repeated games or contingencies (Acemoglu and Robinson, 2012). However, in both cases, institutions can't be easily enforced and are not a datum: democracy cannot be exported nor it can be taken for granted (e.g. France and Napoleon); inefficient institutions may survive for a long time because of vested interests by specific lobbies or running elites: sometimes only an exogenous shock may induce a change (such as the Glorious Revolution or the French Revolution did, respectively, in England and France) where nothing was going to change. Finally, Acemoglu and Robinson (2012) talk of inclusive economic institutions that allow participation in economic activities, such as secured private property rights, a fair legal system or no barriers to the entrance of new firms. It follows that to be inclusive, these institutions should be available not just for an elite but for a broad base of citizens. Opposite to these, such as in today's North Korea or in the Latin America of the past century,economic institutions are "extractive", because they allow a minority in power to extract income and wealth from the majority (such as the *"nomenklatura"* in North Korea or the Spaniards in Latin America). In the end, inclusive political and economic institutions work together:

> "there is an intimate connection between economics and politics, that only certain combinations of political and economic arrangements are possible, and that in particular, a society which is socialist cannot also be democratic, in the sense of guaranteeing individual freedom" (Friedman, 1962).

Indeed, the interactions between institutions seems complex but in reality it can be made easier by focusing on the broader picture:

> "institutional systems are generally not modular constructions where one module can be

> replaced easily by another. If this were so, institutional shopping would be nearly as easy as supermarket shopping. Institutions generally form a system in the sense that each institution in the system is complemented by others, achieving a certain systemic consistency. The existence of complementarities among institutions suggests that analysts should examine systems of institutions, and that countries can be classified accordingly such as predatory vs development systems" (Acemoglu et al., 2001).

However, it should be clear now, that formal rules are easy to change, whilst it takes longer for informal/social norms changes, as they need to be shared voluntarily by the majority within a community (Zingales, 2012), thus it is not so simple to export working informal institutions to other countries. Education in southern states of the USA was effectively restricted to whites due to Jim Crow laws until mid '60s, long after the abolition of slavery. Moreover, the same institution in another country may not work because of the lack of other complements. Indeed,

> "to the extent that the culture and local experiences had produced diverse institutions and belief systems with respect to the gains from such cooperation, the likelihood of creating the necessary institutions to capture the gains from trade of more complex contracting varied. In fact most societies throughout history got stuck in an institutional matrix that did not evolve into the impersonal exchange essential to capturing the productivity gains that came from the specialization and division of labour that have produced the Wealth of Nations." (North, 1990)

Social capital and institutions intersect: Licht et al. (2007) report that countries which emphasize values such as autonomy, egalitarianism and control over life, exhibit higher rule of law, less corruption, and more democratic accountability. They use a very interesting instrumental variable, focused on the use of personal pronouns in the languages: the compulsory use (such as in English), suggests a cultural bias in favour of autonomy, whereas a language in which they can be omitted suggests the opposite. According to Aghion et al. (2010) societies endowed with higher levels of trust require lighter legal systems, while individuals from low trusting countries prefer higher regulation in order to feel safer, even taking into account higher risks of corruption, leading to multiple equilibria. Similarly, Pinotti (2011) observes that countries where opportunistic behaviour is frequent are more likely to have tight regulations, even above the efficient level. Knack and Keefer (1997) find that social norms are stronger in countries with working formal institutions. Taken together, this implies great difficulties in separating social capital from institutions.

Institutions and growth

The role of institutions for economic growth, such as limits to the power of the executive or securing property rights, is an *old adagio*:

> "in all countries where there is tolerable security [of property], every man of common understanding will endeavour to employ whatever [capital] stock he can command ... In those unfortunate countries. . . where men are continually afraid of the violence of their superiors, they frequently bury and conceal a great part of their [capital] stock. . . in case of their being threatened with any of those disasters to which they consider themselves as at all times exposed". (Smith, 1776)

Until recently, the neoclassical school initiated by Jevons and Walras, which developed an institutions-free world, has been dominant (Alesina, 2006). Starting from the 90s instead, a new line of research has been focusing on the effect of institutions on economic growth. Nowadays, a lively debate has started on how institutions work and affect/are affected by past and current economic activity.

One (dominant) line of research may be summarized by the idea that historical institutions affect economic development, *via* current institutions, thus theorizing a legacy of history. Some authors suggest that building institutions is a lengthy process (Hall and Jones, 1999), dating back to colonial times (Acemoglu et al., 2001) or even to the first stages of urbanism (Cipolla, 1974; Putnam, 1993). North (1993) remarks that institutions are resilient even to important exogenous and endogenous shocks, such as revolutions or wars, at least in the short run while Acemoglu and Robinson (2012) say shocks are sometimes the only way to change. Building on the existing literature of comparative economics (which traditionally compared socialism vs. capitalism), Djankov et al. (2003) suggest the importance of the existing institutional framework, as

> "government interventions that are appropriate in richer countries, which have high levels of public accountability and transparency, may be inappropriate for the less developed economies".

Mauro and Pigliaru (2013) analyse public good provision and social capital: public money can be captured by rent-seekers but with probability inversely proportional to the level of social capital through the working of the local institutions. The diverted resources (iceberg costs) are affected by the control of the decision-making process: centralized decision making is influenced by the average

level of social capital, while decentralized-decision making by local endowments of social capital. Thus, in regions with higher endowments there would be less iceberg costs and viceversa. It follows that heterogeneity in social capital drives economic divergence. Their model suggests a way to mitigate the effects of low endowments of social capital, through appropriate allocation of authority between government levels (i.e. reduction of autonomy in communities poorly endowed of social capital). Indeed, the process of decentralization in lagging regions causes the low levels of social capital to become a binding constraint for growth, providing empirical evidence supporting the idea that decentralization ended the convergence process. Moreover, there are serious concerns that vast amounts of public funds in cities with low levels of social capital may become pray of vested interests or even Mafia (Barone and Narciso, 2013). Thus, decentralization should proceed at different speeds across territories.

A slightly different approach, suggested by Tabellini (2010), identifies a different channel: historical institutions affects "culture", defined as a narrow subset of values and beliefs, which in turns shapes economic growth. Over the course of history social capital helped shaping not only formal institutions at the national level, but also informal ones at the local or community level. In turn, this process may help explaining different economic outcomes even under the same current institutional framework, with interesting applications in regional sciences, as potential explanation of regional divides. This theory attempts to explain the persistence of underdevelopment of some European regions, controlling for the same national political and legal institutions, focusing on informal institutions and weak rule of law.

1.3 Determinants of social capital and transmission models

> "It is necessary to dismantle the rationality assumption underlying economic theory in order to approach constructively the nature of human learning. History demonstrates that ideas, ideologies, myths, dogmas, and prejudices matter"' (North, 1993)

Traditional analysis of cultural transmission is based on evolutionary selection mechanisms, which are based on genetic transmission, i.e. preferences are inherited from parents (Bisin and Verdier, 2005). On the opposite side, an active role in the cultural transmission mechanisms, defined as "socialization process", transmitting values across generations, influencing personal beliefs and values. This may happen through languages, customs, taboos, myths, providing cultural continuity

via intergenerational transfer. Assuming reproduction success monotonically increasing in economic pay-off, it follows a natural selection towards "dominant" cultural traits. However, the empirical evidence of heterogeneous distribution of cultural traits in the population, suggests a different story. Indeed, albeit theories and models conjectured that in the US and some Western Europe countries a "melting pot" was under way, the reality proved different. Persistence of heterogeneous distribution of cultural traits, even in second or more generations of immigrants is widely reported: Orthodox Jews worldwide, Basques and Catalans in Spain, Quebecois in Canada and many more. Cavalli-Sforza and Feldman (1981) and Boyd and Richerson (1985) model a selection mechanism in which there is a socialization process, either from parents (direct) or society (indirect). It follows that the transmission of preferences, beliefs and norms, is the result of genetic evolution and social interactions (also known as *nature/nurture*). The idea behind the cultural transmission mechanism is that parents assess children's actions and following outcomes, exerting some sort of socialization, i.e. they instill those values they think are worthy. Unfortunately, as pointed out by Bisin and Verdier (2001) parents' assessment is imperfect, as they use their own preferences to select values and beliefs (and forecasting the outcomes), not children's ones. This filter is called *imperfect empathy*. Indeed, as already suggested by North (1993),

> "the rational choice framework assumes that individuals know what is in their self interest and act accordingly. That may be correct for individuals making choices in the highly developed markets of modern economies but it is patently false in making choices under conditions of uncertainty - the conditions that have characterized the political and economic choices that shaped (and continue to shape) historical change."

This could result for example in parents' educating children to be over-confident or the opposite, according to their personal experience. Indeed, as noted by Butler et al. (2010) *"highly trustworthy individuals tend to form overly optimistic beliefs, to assume too much social risk and to be cheated more often"*, thus the importance of considering the role of indirect socialization. In what follows, we will review some interesting models of cultural transmission.

1.3.1 Bisin and Verdier model

In several contributions Bisin and Verdier (2001, 2005, 2011), try to understand the conditions inducing heterogeneity in the long run distribution of preferences in the population. Bisin and

Verdier (2001) find that if direct socialization acts as cultural substitute for indirect socialization, than a long run equilibrium with heterogeneous population is globally stable. Indeed, let's consider two cultural traits, i and j; families are made of one parent and one child (i.e. reproduction is asexual); q^i, is the share of individuals in the population of type i; finally, direct socialization occurs with probability $d^i(q^i)$. The model assumes that if child is not directly socialized by his/her parents, he/she picks the cultural trait of a random person from the population, which, according to the Law of large numbers, occurs with probability equal to q^i or $1 - q^i$. Let's define the probability for a child from a family of type j of having cultural trait i, as P^{ij}. Conversely, the probability of a child from family type i to have cultural trait i as P^{ii}. From what previously stated it follows that:

$$P^{ii} = d^i(q^i) + \left[1 - d^i(q^i)\right] q^i \tag{1.1}$$

$$P^{ij} = \left[1 - d^i(q^i)\right] (1 - q^i) \tag{1.2}$$

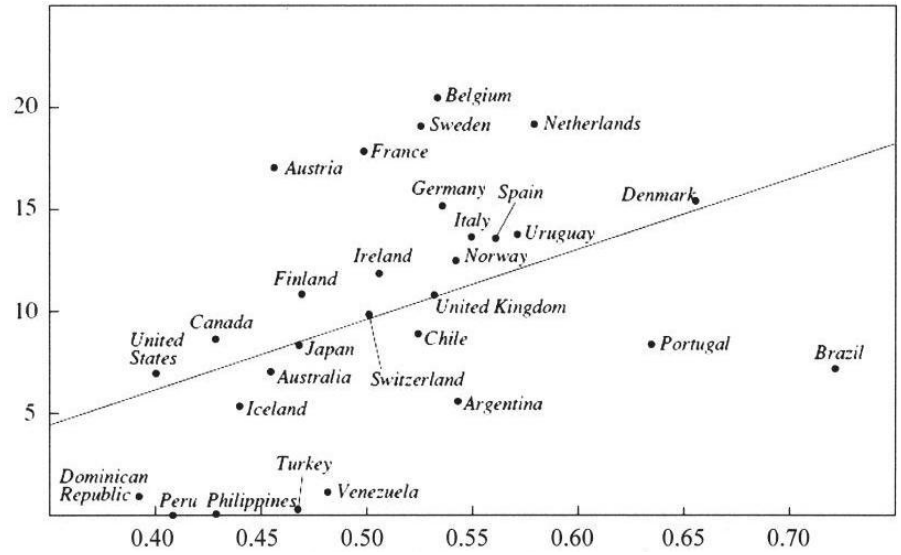
The rule that governs the dynamics of the population is:

$$\dot{q}^i = q^i(1 - q^i) \left[d^i(q^i) - d^j(1 - q^i)\right] \tag{1.3}$$

Under some specific conditions, it is possible to guarantee that the population will converge to a globally stable and non-degenerate equilibrium (i.e. excluding the extremes 0 or 1), so that heterogeneity of cultural traits is preserved. Moreover, the model allows a formal definition of cultural substitution: direct and indirect socialization processes are cultural substitutes if $d^i(q^i)$ is continuous and strictly decreasing in q^i. Furthermore, $d^i(1) = 0$. Indeed, direct socialization effort of minorities will be greater than that of majorities (formally, $d^i(0) > d^i(1)$). Up to this point the model assumes that parents' contribution, through direct socialization, is exogenous: each parent of group i exerts the same effort and can't determine the amount. Bisin and Verdier (2001) treats also the endogenous case, whereas parents can decide the optimal level of effort. Indeed, each agent takes some economic and social decision, x, that maximizes its utility. The utility for parent of type i of having a child of type j , is V^{ij} , and it follows that each parent maximizes the following expected utility:

$$u^i(x) + \left[P^{ii}V^{ii} + P^{ij}V^{ij}\right] \tag{1.4}$$

Figure 1.1: Social spending/GDP vs. belief that luck determines income



Source: Alesina et al. (2001); Social spending/GDP on Y axis; belief on X axis

As previously stated, parents are able to anticipate, using their own utility function, the choice a child with specific cultural trait will make (*imperfect empathy*). As a direct consequence, they prefer their children to be socialized to their same cultural trait, or $V^{ii} > V^{ij}$, otherwise stated as $\triangle V^i = V^{ii} - V^{ij} > 0$.

At this point we can introduce the production function of direct socialization as $d^i = D(\tau^i, q^i)$ where τ^i is a vector of inputs (e.g. time spent with child, cultural homogeneity of the chosen neighbourhood - see Patacchini and Zenou, 2007), with socialization incurring costs, $C(\tau^i)$, so that the agent maximizes the following expression w.r. to τ^i:

$$u(x) - C(\tau^i) + \left[P^{ii}V^{ii} + P^{ij}V^{ij}\right] \tag{1.5}$$

The argmax is a continuous map $d^i = d(q^i, \triangle V^i)$. Bisin and Verdier (2001) prove that under some regularity conditions (if $\frac{\partial D(\tau^i, q^i}{\partial q^i} \leq 0$), then $d(q^i, \triangle V^i)$ satisfies the cultural substitution property. Thus, the solution to the maximization problem guarantees cultural substitution and hence heterogeneity in the cultural traits among the population in the long run.

Table 1.1: The world in Guiso, Sapienza and Zingales model

	"honest" world prior prob=($\hat{\pi}$)	"cheaters" world (prior prob=$1-\hat{\pi}$)
% trustworthy individuals	q_1	q_2
% cheaters	$1-q_1$	$1-q_2$

Source: Guiso et al. (2008a)

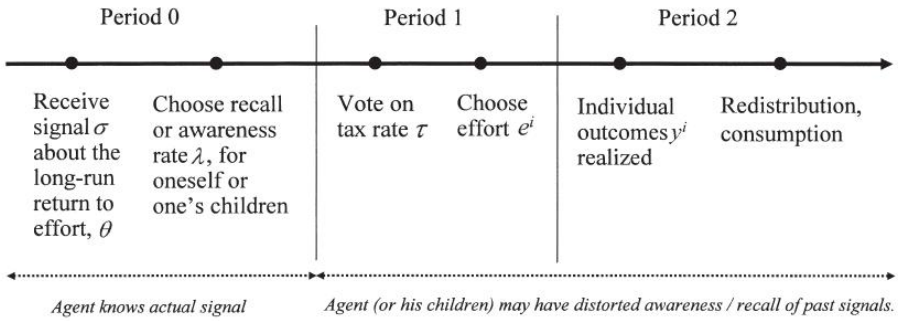
1.3.2 Benabou and Tirole model

An alternative way to frame emergence and persistence of collective beliefs is the model of Benabou and Tirole (2006). The authors cross plot social spending (as percentage of GDP) against beliefs of the role of luck in determining income (see figure 1.1): while the majority of Europeans believes that luck is the main determinant of income rather than effort, the opposite is true only for most of the Americans.

This positive correlation between social spending and belief on the role of luck is the result of rational choices according to Benabou and Tirole (2006), with 2 equilibria: a *"european"* and an *"american"* one. Moreover, several psychologists and sociologists have documented the need of many individuals to believe in a just world, where effort is rewarded, despite empirical evidence providing the opposite (a phenomenon known in psychological literature as *cognitive dissonance*). This belief in the willpower has important effects on the support of redistributive policies in the US: *"the general view (is) that success is a triumph of the will and a reflection of ability"* (Lane, 1959). This idea is well known in the psychological literature as the "fundamental attribution error" or illusion of control, i.e. the tendency to explain any events excluding luck or circumstances, as if life was totally under one's control (at least in the US).

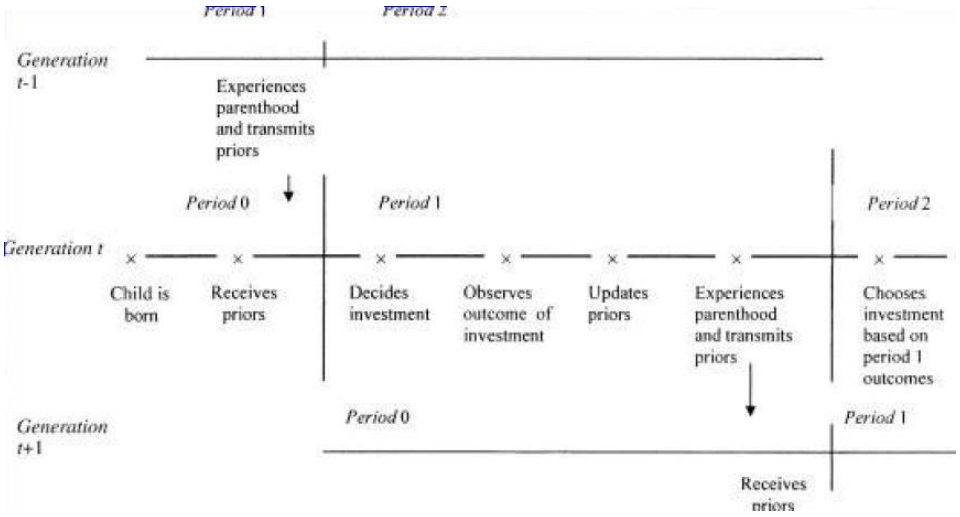
Indeed, according to the authors, beliefs about the role of luck might be the result of three processes: "horizontal", "top-down" (capitalists brainwashing workers) and "bottom-up" (the authors' prospective).

Figure 1.2: Timing of Benabou and Tirole model



Source: Benabou and Tirole (2006)

Figure 1.3: Timing of Guiso, Sapienza and Zingales model



Source: Guiso et al. (2008a)

1.3.3 Guiso, Sapienza and Zingales model

Guiso et al. (2008a) start from Putnam's paradox, i.e. the high persistence of social capital across centuries.The authors provide empirical evidence in support of this paradox while their model explains values persistence through an overlapping-generations setting. The economy has two types of agents, trustworthy and non-trustworthy. As there is uncertainty on the share of both types of individuals, each agent has a prior on the distribution. Indeed, with prior probability $\hat{\pi}$, the agent lives in a world where the share of trustworthy agents, q_1 is the majority, whereas with probability $1 - \hat{\pi}$ in a world where non-trustworthy are the majority, with trustworthy being a share q_2 of population with $0 \leq q_2 < 1/2$. Thus, we have two environments/worlds, (see table 1.1), an "honest" world, where trustworthy individuals are the majority, and a "cheaters" world where cheaters are the majority.

The model is an overlapping generation model where every agent lives 3 periods (see figure 1.3): in the first, she receives priors from her parents (ignoring indirect socialization); then in period 1 she can invest her whole endowment (the investment can't be fractioned), x, in a trust game (Fehr et al., 2003) where the amount she obtains is influenced by an independent player, the receiver. She either receives Rx, with $R \gg 1$, a positive return, or Lx, with $L \ll 1$, a loss. After she observes the outcome she updates her prior and transmits the updated prior to her child. Parents transmit conservative priors to their children because they do not weight the future the same way as their children do. To this extent, the model does not coincide with an infinitely living agent model. She faces another investment choice in period 2, after which she dies. The model assumes that after the investment, the agent knows perfectly whether the share of trustworthy individuals is q_1 or q_2. It follows that if in period 1 she does not invest, she will not be aware of the share of trustworthy individuals, thus she will not invest even in period 2. If the receiver is drawn from the "honest" world, the expected return from the investment is $A = q_1R + (1 - q_1)L$ whereas if the receiver is a "cheater", the return is $B = q_2R + (1 - q_2)L$. It follows that the pay-off for the first period is $\hat{\pi}Ax + (1 - \hat{\pi})Bx$ and, considering that each period she can invest twice the initial endowment (or save both if she decides not to invest), the net expected pay-off from investing over the two periods will be

$$P(\hat{\pi}, R, L, q_1, q_2) = 2\left[\hat{\pi}Ax + (1-\hat{\pi})Bx\right] - 2x$$

The authors show that there exists a value of $\hat{\pi}$, the prior distribution,m, defined by

$$P(m, R, L, q_1, q_2) = 0,$$

such that she will invest if and only if

$$\hat{\pi} \geq m(R, L, q_1, q_2).$$

The model defines the optimal prior that parents will instill in their children. Indeed, denoting with π the parents' updated prior about the state of the world, the child net expected utility from investing in one period, as perceived by her parents, is

$$P_p(\pi, R, L, q_1, q_2) = \pi Ax + (1-\pi)Bx - x$$

The parent will be indifferent about her child choices if his prior, π , will be equal to m_p, defined by

$$P_p(m_p, R, L, q_1, q_2) = 0.$$

Eventually, the teaching strategy will be

$$\begin{cases} \hat{\pi} \geq m_p & \text{if } \pi \geq m_p \\ \hat{\pi} \leq m_p & \text{if } \pi < m_p \end{cases}$$

i.e., if $\pi \geq m_p$, he will transmit a prior that is as optimistic as his ($\hat{\pi}$) and viceversa. In the other case, his child will not invest, transmitting this unfavourable prior to the next generation, ending in a *"no trust-no trade"* equilibrium, a pessimist trap for the society. To this extent, the model explains the path dependency of social capital, accounting for Putnam's puzzle. A positive shock to the benefits of cooperation may help escaping the pessimist trap having permanent effects, although, according to the authors, it takes at least 2/3 generations to be effective. This also explains why second generations immigrants preserve their ancestors beliefs and values (it takes time to modify their priors). One of the key problems with the model is that it ignores indirect socialization.

Table 1.2: Prisoner's dilemma in Tabellini's model

	C	NC
C	c, c	$h-l, c+w$
NC	$c+w, h-l$	h, h

Source: Tabellini (2008b)

Moreover, the learning process is discrete (either you invest or not) and can happen just twice: smaller investments, as it happens in reality dealing with someone the first time, will increase the speed of learning and reduce the cost of making wrong choices.

1.3.4 Tabellini's model

Why people cooperate? The traditional answer is reputation: incentives to cooperate are linked to repeated games and temptation to cheat, the higher the benefits from repeated games, which require sustained cooperation, the lower the probability of deviation/cheating and viceversa. Tabellini (2008b) argues that the traditional approach ignores people whose behaviour internalize specific social norms. Thus, the problem becomes to identify the origin of values and beliefs and transmission models. Using standard tools in economics (namely individual optimization and equilibrium analysis), he focuses on values' endogenous evolution and their interaction with economic incentives. Adapting a model previously defined by Dixit (2007), individuals are randomly matched with others to play a one-shot prisoner's dilemma game, excluding repetitions and so the role of reputation. It follows that cooperation might be sustained also by values, not only reputation. Building on Banfield (1958) and his "amoral familism" concept, he distinguishes between limited and generalized morality, i.e. social norms that apply only to close/strong ties (such as their own kind) vs. norms that apply to all. In this respect, generalized morality sustains cooperation over a larger range of situations (e.g. generalized trust, required in order to sustain financial transaction - see Guiso et al., 2004). In order to model cultural transmission, Tabellini builds on Bisin and Verdier (2001),

assuming imperfect empathy, thus equilibrium is both backward (because parents' values influence

children education) and forward looking (because parents adapt their educational choices according to expectations of their future environment). This model also points out a particular role of space: indeed, generalized morality is hurt by local enforcement of cooperation and weaker with more distant transactions. To this extent, good legal institutions, protecting unrelated individuals, breed good values. There is a continuum of one-period living agents uniformly distributed on a circle of diameter S, the maximum distance between two agents; each individual is randomly matched with probability $g(y)$, where y is the distance (geographical but also socio-economical such as religion, ethnicity, education..). When two agents are matched, they play a prisoner's dilemma game as indicated in table 1.2, where $c > h$, $w > 0$ and $l \geq w$. When both agents play cooperatively, they both get c, while in case of deviations, the non-cooperative player takes $c + w$ while the cooperative takes less $(h - l)$. Up to now, this is standard economic incentive based mechanism. However, the author assumes a non-economic pay-off granted to the cooperative player, irrespective of what the other agents play (e.g. moral-religious benefit of playing C), d, which decays with distance y according to a parameter θ; thus the non-economic benefit, $de^{-\theta y}$, is greater within a circle of connected individuals. There are two types of players ("trustworthy" and "not trustworthy") which differ according to the decay of the non-economic benefit; indeed, not trustworthy individuals have parameter $\theta^0 > \theta^1$, so non-economic benefit decays faster. In the first part of the model the share of trustworthy individuals, n, is exogenously determined () but it is later treated as endogenous. Denoting with $\pi(y)$ the probability that the other agent will play cooperatively, the net expected material benefit from playing NC is

$$T(\pi(y)) = [l - \pi(y)(l - w)] > 0 \tag{1.6}$$

Notably, if $l > w$, the net material benefit is strictly decreasing in $\pi(y)$, i.e. if you cheat ($\pi(y)$ decreasing), I cheat ($T(\pi(y))$), the net benefit from playing NC, increases). Thus, the game entails strategic complementarity while assuming the opposite, $w > l$, it would have been strategic substitution. This holds for anybody, but cooperative agents compare T($\pi(y)$) with the non-economic pay-off $de^{-\theta y}$. Thus, the agent will be in equilibrium if $T(\pi(\bar{y}^k)) = de^{-\theta \bar{y}^k}$, i.e. there is a threshold,

$$\bar{y}^k = \left\{ ln\left\{d\right\} - ln[(w - l)\pi(\bar{y}^k) + l] \right\} / \theta^k$$

such that (considering that $de^{-\theta y}$ is decreasing in y),

$$\begin{cases} T(\pi(\bar{y}^k)) < de^{-\theta\bar{y}^k} & \text{(play C) if } y < \bar{y}^k \\ T(\pi(\bar{y}^k)) > de^{-\theta\bar{y}^k} & \text{(play NC) if } y > \bar{y}^k. \end{cases}$$

In the extreme case of a "bad" agent (θ^0), sure that his/her opponent will always cooperate ($\pi(y) = 1$), there would be a certain threshold, Y^0, such that until the distance is $Y < Y^0$ he will cooperate; the good player realizes that the bad player will cooperate up to that distance and plays C until Y^0, NC otherwise. The "good" agent instead knows that up to $Y < Y^0$ bad will play C, while for $Y > Y^0$ it depends on the share of good individuals in society, n. It follows that a good player cooperates up to $\bar{y}^1 = \{ln\{d\} - ln[(w-l)n + l]\}/\theta^1$. As Y^0 might be smaller or greater than $\bar{y}^1$, it follows that the upper threshold for the good player is given by

$$Y^1 = max(\bar{y}^1, Y^0).$$

The model has some simple implications:

1. cooperation is easier to sustain if players are "close", which results not from repeated games (indeed, game is one-shot) but from internalization of norms of good conduct;

2. a more heterogeneous society (i.e. the larger the diameter S) implies less frequent cooperation.

It can be noticed that Y^0 rises if benefits of cheating (w) falls, if non economic benefit of cooperation rises and if norms of good conduct decay more slowly (such as with good agent). Y^1 depends on the same variables but it also decreases if l, the loss from being cheated, increases, and it increases with the share of good agents, n. This is a result of imperfect information and reflects strategic complementarity: individuals are more willing to cooperate the higher the probability they will be matched with good agents. Moreover, w and l, the reward from cheating and loss from being cheated respectively, depend on institutions: better enforcement reduces benefits from cheating and reduces loss from being cheated, resulting in higher values of Y^0 and Y^1 i.e. larger scope for cooperation. In the second part, Tabellini models the endogenous evolution of the share of "good" agents, which was previously assumed to be fixed. Individuals live two periods: in the first, they acquire education by their parents and play the trust game as before. In the second period, they become lone parents and they spend all the time educating their child, a costly activity (with costs assumed to be a quadratic cost function, $(1/2\varphi)f^2$, where f is parent's effort and φ is a measure

of the rate of marginal costs. The probability that a child becomes good is equal to $\delta + f$, with $0 < \delta < 1$ randomly determined, i.e. the parent is not fully in charge of determining the type of child he will have. The values transmitted will be assessed through the parent's eyes (imperfect empathy). After the education process is completed, the child observes his own type and plays the trust game. Let V_t^{pk} be the expected utility in equilibrium of child k type as assessed by his parent p, or:

$$V_t^{pk} = U_t^k + d \int_0^{Y_t^k} e^{-\theta^p z} g(z) dz \tag{1.7}$$

where U_t^k is the material pay-off of type k child, and the other expression is the non-economic pay-off, as evaluated by the parent, θ^p. If the values of the kid coincide with those of the parent (which happens with probability equal to $\delta + f$), then the relevant threshold is the same, Y_t^k. Indeed, Tabellini proves a Lemma stating that a parent always prefers to have a child with his same values ($V_t^{pp} \geq V_t^{pk}$). As education is costly, only good parents exert the effort while the bad parents exert no effort at all. It follows that the fraction of good players at time t, n_t, is

$$n_t = n_{t-1}(\delta + f) + (1 - n_{t-1})\delta = \delta + n_{t-1} f$$

The optimal choice of effort is calculated comparing the marginal costs of education to the expected net marginal benefits of effort, or

$$f/\varphi = (U_t^1 - U_t^0) + d \int_{Y^0}^{Y_{1_t}} e^{-\theta^1 z} g(z) dz \tag{1.8}$$

The parent perceives a trade-off between the (negative) material pay-off and the (positive) non-economic pay-off. Overall, the net benefits exceed the costs, thus the effort is positive. Moreover, $f = F(Y_t^1)$ is strictly increasing in Y_t^1, i.e. if scope of cooperation (as captured by Y_t^1) increases, so does the effort, entailing a (second) strategic complementarity: when parents anticipate other parents are investing more in education, the scope of cooperation increases and so they exert more effort (a self fulfilling prophecy). An interesting result arises when we focus on external enforcement (which increases the scope of cooperation), particularly on the share of good agents; indeed previous literature found that better external enforcement (i.e. better formal institutions) hurt informal institutions, weakening reputation. Tabellini, which focuses on values, not on reputation, finds a

different result, modelling better enforcement as higher probability of detecting cheating $(1 - q(y))$ thus reducing the gains from cheating and the loss from being cheated. Indeed, better distant enforcement (i.e. formal institutions) increases the scope of cooperation leading parents to exert more effort (as the environment improves), so better enforcement contributes to the diffusion of good values, or, there is strategic complementarity, not substitution as previously stated. On the opposite side, better local enforcement (i.e. informal institutions such as reputation) reduces the scope for education, destroying good values. Thus, while an increase in law enforcement induces higher investments in education and diffusion of generalized morality, improvements in local enforcement reduces it, especially in the presence of weak formal institutions, something that explains the path-dependence of Southern Italy (where feudalism was abolished in the 19th century).

1.4 Wrap up of the chapter

In section 1.1 we summarized the literature concerning social capital, starting from its definitions across sociology, political science and economics: in sociology is perceived either as a personal resource or in terms of ties and networks (bonding, bridging and linking - see Rutten et al. 2010); in political science is the idea of amoral familism and civicness introduced by Banfield (1958), Putnam (1993) and Fukuyama (1995), focusing on values and beliefs favouring cooperation and accountability; economists have long ignored the concept up to the 90s, likely because of the difficulties of integration into standard theoretical frameworks (Manski, 2000), with the notable exception of a particular facet, trust, which can easily be incorporated in standard models. The main problem of social capital, its definition, is the subject of section 1.1.2 where we build on the contribution of Solow (1995) whose suggestion of two requirements represents a turning point in the debate; these suggestions are: a well defined investment/depreciation process and a clear measurable empirical counterpart. Taken at face value, Guiso et al. (2011) elaborate the concept of "civic capital" as *"those persistent values and shared beliefs, which allow a group to overcome the free rider problem in the pursuit of socially valuable activities"*, which should be robust to the main criticisms.

In section 1.2 we investigate the channels through which social capital affects economic growth. A decisive role is given to trust, particularly relevant when transactions involve some unknown counterpart, when the transaction takes place over a period of time rather than being completed on the spot, and when the legal protection is imperfect. However, it is necessary to pay attention to

the difference between personalized and generalized trust, as the former is a belief of trustworthiness regarding only certain people or groups whether generalized trust refers to the whole society. Geography may also play a role in terms of distance: if short-distance migration is consistent with maintaining strong ties, on the opposite, long-distance migration should imply weak ties. This has repercussions on social capital as longer distance migration may also imply that the destination community is culturally more distant making migrants less trusting. There are serious issue in the identification of social capital due to the presence of specific confounding factors, namely human capital, culture and institutions which are analysed and discussed in sections 1.2.3 and 1.2.4. Indeed only if culture is defined as values and beliefs shared by communities, with a clear empirical counterpart and (dis)investment process, it can be considered a perfect substitute of social capital while the relationship between social capital and institutions is a close one. Following North (1990), institutions may be considered the rules of the game, self-imposed constraints with influences on any social, political and economical interactions.

Building on this definition we present (see section 1.3) four models of cultural transmission by Bisin and Verdier (2001, 2005, 2011), introducing the concept of direct and indirect *socialization*, i.e. the influence of parents and environment in defining children's values, and *imperfect empathy*, i.e. parents' assessment of children's welfare through their own view. Benabou and Tirole (2006) frame a model on values composition and transmission where two equilibria exist: a "European" one where luck is perceived as determinant to income and an "American" one where the opposite is true, influencing policy-maker on welfare allocation. Starting from Putnam's claim that on the persistence of social capital, Guiso et al. (2008a)'s model suggest a way parents' *imperfect empathy* might result in a pessimistic trap of no generalized trust nor trade for generations, consistently with Putnam's claim. Finally, Tabellini (2008b) builds a model where cooperation is fostered by values and beliefs, not reputation, which are transmitted and nurtured according to geographical distance.

Chapter 2

Measuring social capital

Once narrowed down the definition of social capital, there are still several problems related to its measurement, as remarked by Fukuyama (2000): *"one of the greatest weaknesses of the social capital concept is the absence of consensus on how to measure it"*. Sestito (2011) states that it is not possible to get satisfaction with an idea of social capital as *"intangible when present, necessary when it is not present"*. Indeed, facing the profusion of empirical measures of social capital, there is the need for a reasoned overview of the existing measures (section 2.1). A particular attention will be dedicated to the link between space and social capital (section 2.2) and to the necessary tools of spatial statistics and econometrics. Finally, to the extent social capital is a multidimensional concept, Principal component analysis, a way to handle complex datasets, is discussed in section 2.3.

2.1 Available measures

At the end of 90s the World Bank launched a Social Capital Thematic Group (Dasgupta and Serageldin, 1999) which, starting from the idea that the complexity of social capital cannot be fully represented by one single variable, broke it down to five dimensions, with their correspondent empirical counterparts:

1. groups and networks - collections of individuals that promote and protect personal relationships improving welfare;

2. trust and solidarity - elements of interpersonal behaviour which fosters greater cohesion and more robust collective action;

3. collective action and cooperation - ability of people to work together toward resolving communal issues;

4. social cohesion and inclusion - mitigates the risk of conflict and promotes equitable access to benefits of development by enhancing participation of the marginalized;

5. information and communication - breaks down negative social capital and also enables positive social capital by improving access to information.

Righi and Scalise (2013) distinguish between a structural component of social capital (e.g density of civic associations, voter turnout), and a cognitive component, measured by values and beliefs. While the former is quantitative and easily estimated, the latter is more qualitative and complicated to measure. This approach is rich and detailed but requires either a multivariate regression or the use of synthetic indicators (such as principal components or factor analysis). In the following, we will review three categories of available empirical measures: survey data, experiments and outcome based measures.

2.1.1 Survey data

Surveys attempt to measure directly those values (such as tolerance, respect for others, autonomy) and beliefs (such as trustworthiness or fairness) that are shared voluntarily by the majority of the community (Zingales, 2012). Bertrand and Mullainathan (2001),Durlauf (2002) and Guiso et al. (2011) advocate greater use of experiments and survey data as a better route to increase our understanding of social capital.

Along these lines, Tabellini (2010) extracts the principal components from four measures of values and beliefs of the World Value Survey (WVS) and the European Value Study (EVS); Tabellini (2008a) uses the US General Social Survey (GSS) to study the trusting attitudes of third-generation immigrants; Albanese et al. (2013) use Banca d'Italia *Survey on Household Income and Wealth* (SHIW) to study generalized and personalized trust where the former is traditionally measured using the following question: *"Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?"*. The same question has been maintained

intact across many surveys, such as the World Value Survey, the European Value Study or the European Social Survey (ESS) As for the answers, with some exceptions, they are usually binary: either *'Most people can be trusted'* or *'Need to be very careful'*. It follows that the share of people answering *'Most people can be trusted'* is usually taken as a measure of generalized trust in the population, although the intensity of the belief is missed. However, the ESS and Banca d'Italia SHIW allow a 10 points range of possible answers to the same question, with *'Most people can be trusted'* or *'Need to be very careful'* at the extremes.

The European Commission Eurobarometer (EB) collects information about trusting and trustworthiness used by, among others, Guiso et al. (2009), who find positive correlation in the nordic countries. In Italy, the *Indagine multiscopo* led by Istat has several interesting questions used by Righi and Scalise (2013) and Albanese et al. (2013). A legitimate doubt about people's comprehension of the trust question has been tested in the 2003 Dutch National Bank Household survey which posed the following experimental question:

> "Suppose that a random person you do not know personally receives by mistake a sum of 1000 euros that belong to you. He or she is aware that the money belongs to you and knows your name and address. He or she can keep the money without incurring in any punishment. According to you what is the probability (a number between zero and 100) that he or she returns the money."

The results show positive correlation between the experimental and the survey question, thus reducing this problem. The validity and reliability of the trust question has been objected (Reeskens and Hooghe, 2008) on the grounds of being:

1. rather imprecise (the respondents have the choice between trust and caution and not between trust and distrust or between cautious and incautious behaviour);
2. that the possible answers are not mutually exclusive;
3. that only one item is not considered to be a reliable measure (Yamagishi et al., 1999; Glaeser et al., 2000).

Naef and Schupp (2009) take into account these criticisms defining a new measure of trust, extracting the principal components of the answers to the following four statements:[1]

[1]The possible answers on a four point rating scale to the first two statements were *"disagree strongly"*, *"disagree*

1. *"in general, you can trust people;"*
2. *"nowadays, you can't rely on anybody;"*
3. *"how much do you trust strangers you meet for the first time;"*
4. *"when dealing with strangers, it's better to be cautious before trusting."*

Other important issues should be considered using survey data: the ordering and number of questions matters (people try to be consistent over the answered questions but they can also be tired with long surveys), as well as the chosen wording. Moreover, there are issues of social desirability and cognitive dissonance. Indeed, Bertrand and Mullainathan (2001) suggest to avoid using survey data directly as dependent variable, but only as explanatory variable. Moreover, as pointed out by Faiella (2010),

> "many statistical methods are developed assuming that sample information comes from a population model where the sampling scheme plays no role."

To this extent, the European Social Survey administrators spent a considerable amount of time and effort to define proper design effects and weights. The former are a measure of the departure of the survey design with respect to Simple Random Sampling (SRS). Design effects are instead crucial in order to ensure precision of the estimators, especially in case of cross country survey. For example, in some countries there are complete population registers, so that researches can draw a sample directly, while in other countries this is not possible, paving the way to multi-stage sample designs. If all the elements of the population have the same probability of inclusion and the sample size is fixed, then the unweighted estimator of a mean is unbiased. However, this is far from being usual, as units in the sample usually have unequal probability of inclusion. Indeed, statisticians correct for this possible source of bias using a *sampling weight* for each observation, usually the inverse of the sampling fraction. Moreover, the rate of non-responses and auxiliary information about the population, such as newer estimates of the percentage of adult population, are all ex post considered in a process known as *calibration*. Finally, the use of techniques such as clustering or stratification could lead to inaccurate estimation of the variance. The impact of these three factors

somewhat", *"agree somewhat"*, or *"agree strongly"*; *"no trust at all"*, *"little trust"*, *"quite a bit of trust"*, and *"a lot of trust"* for the third question and *"disagree strongly"*, *"disagree somewhat"*, *"agree somewhat"*, or *"agree strongly"* for the last question.

(weighting, clustering and stratification) lead to different results and it should be clearly understood by a careful analysis of the survey documentation.

2.1.2 Experiments

Experiments are another way to directly measure values and beliefs, as in the case of the sender-receiver game to study trust and reciprocity (Berg et al., 1995). Using two experiments and survey data, Glaeser et al. (2000) find that trustworthiness is strongly predicted by attitudinal survey questions about trust (not trustworthiness), while experimental measure of trust is not predicted by standard survey questions but by past behaviour (they suggest to ask specific questions about past behaviour). Cassar and Wydick (2010) carry out a rare cross country exercise, with experiments involving 1554 participants in Armenia, Guatemala, Kenya, India, and the Philippines, finding that societal trust positively and significantly influences group loan contribution rates. Naef and Schupp (2009) provide a review of studies which confirm the finding of Glaeser et al. (2000), i.e. that the standard trust question is not correlated with trusting behaviour, together with several papers finding the opposite. Fehr (2009) underlines the connection between survey measures of trust and altruistic behaviours, via preferences and expectations: I behave altruistically whether I'm confident I will not be the only one. Indeed, people fear more to be cheated than to be unlucky, something known as *"betrayal aversion"* (Bohnet et al., 2008). One of the main advantages of experiments derives from imposing a well-defined structure, facilitating interpretations and reducing measurement errors and bias, which can also be made incentive compatible. The main troubles with this approach is the lack of external validity as samples are generally not representative: usually they are made of graduate students, behaving differently from non-students, or even economics students who behave differently from other students. Particularly, according to Naef and Schupp (2009) students are more trusting than non-students. Eventually also experiments may suffer from the desire to please the experimenters (Levitt and List, 2007).

2.1.3 Outcome based measures

Another approach to measure social capital is based on indirect estimation by observing its effects. For example, studying Italy, Putnam (1993) uses the number of voluntary associations, newspaper readers, tax compliance, littering and queuing as proxy of social capital; Ichino and Maggi (2000)

use absenteeism rate in a large Italian bank while Licht et al. (2007) use a linguistic variable. Focusing on NUTS-3 regions in Italy (so called *"province"*) Guiso et al. (2004, 2009) use blood and organs donations as extreme measures of valuing common good (since there is no compensation). Fisman and Miguel (2006) use parking violations by United Nations officials (who are protected by diplomatic immunity) in New York. Several authors use voter turnout albeit Sestito (2011) suggests to use referenda, as higher voter turnout might be the result of pork barrel politics. A promising field relates to the use of information stored in social networks (e.g. Facebook, Twitter), which could provide easy and cheap access to a sound map of social interactions. Unfortunately, these data are hardly accessible.

One of the main advantages of outcome based measures are the availability of long time series (e.g. voter turnout), across country and spatial representativeness at sub national level. Unfortunately, there are also serious issues of endogeneity (*"social capital becomes tautologically present whenever a good outcome is observed"* Durlauf 1999) and/or measurement errors. Indeed, in order to be a good proxy of social capital, the outcome measures and social capital should have a stable relationship, unaffected by other factors.

2.2 Social capital, space and spatial econometrics

2.2.1 Social capital and space

The traditional utility/profit maximization approach is a-spatial (*"A merchant, it has been said very properly, is not necessarily the citizen of any particular country"* - Smith, 1776). However, several authors point to the role of spatial agglomeration in spurring development. Cipolla (1974) stresses the role of cities in the 11th century: up to that point, people looked for protection under feudalism. On the contrary, thanks to urbanism, people started to develop groups and associations in order to self protect against tyranny, increasing their revenue and leading the way to the creation of a middle class. Guiso et al. (2008b) find evidence that the further from the sea or being at the crossroad of Roman roads, the higher the values of social capital. Moreover, under the assumption that the determinants of location advantages are the same in the North, Center and South, they identify a set of southern Italian cities which would have likely been independent, if there were not the Normans. Then, they compare the level of social capital (as measured by the number of no-profit

associations, referenda turnout and organs donations) of free city states in the Center-North and potential free city states in the South, using the difference in social capital between not free cities in the Center-North and unlikely free city states in the South as a control for generic differences between North and South. A likely-independent city in the South has 35 percent less social capital than a free city of the North, vindicating Putnam's conjecture. Almost half of the gap in social capital between North and South is thus explained by the lack of the free city experience. In German there is a specific word, *"volksgemeinschaft"*, which specifies the situation when people feel a sense of "in-group" commonality with their countrymen. To the extent that the formation of cultural traits will depend on human interactions, the strength of these ties will depend on transaction costs, which are typically increasing with distance. As a consequence, since social relations are spatially sticky, so are norms and values. Rutten et al. (2010) for example, underline how agglomeration forces also imply a concentration of people with more similar cultural traits. Moreover, they underline how maintaining ties over long distances requires large benefits over time. Ties at shorter distances can be maintained in the presence of smaller benefits, so that proximity should imply denser social relations and transmission of cultural values. Interestingly, they also note how the spatial dimension of social capital requires consideration for both *space* and *time*. The relationship between space and social capital can occur in a horizontal continuous space marked by distance, a horizontal discontinuous space marked by borders and a hierarchical space with discontinuities due to multiple levels of markets and governance. This particular interpretation allows a role for geography in mapping values and beliefs across communities as a function of proximity. Hence, the importance to assess the relationship between space and cultural ties, monitoring this relationship over time and being reminiscent of the first law of geography: "*everything is related to everything else, but near things are more related than distant things*" (Tobler, 1970).

Barriers and discontinuities should promote bonding social capital but limit the formation of bridging social capital. The existence of hierarchies should imply that the civic capital of a community may depend on the influence of international, national and regional factors. After all, trust is a community value:

> *"it is necessary not only to trust others before acting cooperatively, but also to believe that one is trusted by others.*" (Gambetta, 1988)

de Dominicis et al. (2013) construct a measure of social capital extracting the principal compo-

nent of indicators of opinion leadership, daily newspaper readership, life satisfaction and trust taken from the Eurobarometer. They find evidence that both social capital and geographical proximity are important determinants of European regions innovative output. Basile et al. (2012) instead find empirical evidence of the importance of social proximity for knowledge spillovers.

2.2.2 Space and measurement

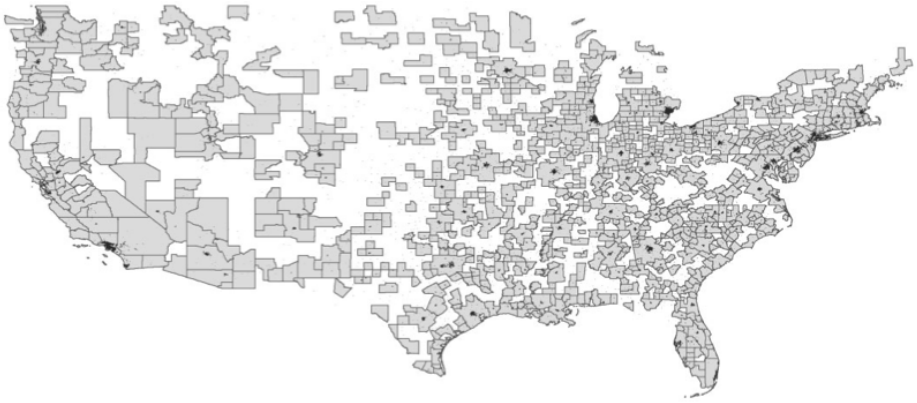
Thirty years ago countries were considered the unit of reference in cross section analysis. Better sampling methods and costs' reduction in data collection made easier access to data at sub national levels. This richness obliged researchers to face the problem of within country variability as they face several administrative divisions and the choice of the spatial unit is often arbitrary (but not indifferent). The seminal paper by Gehlke and Biehl (1934) reports differences in correlation coefficients conditional on the spatial unit used. Indeed, there is difference whether we consider the same variable at country, regional, city or even neighborhood level especially as we are focusing on social interactions and ties. To this extent, we should be aware of the Modifiable Areal Unit Problem (MAUP),

> "a challenge that occurs during spatial analysis of aggregated data in which the results differ when the same analysis is applied to the same data, but different aggregation schemes are used" (ESRI, GIS dictionary).

As observed by Openshaw and Taylor (1979) and Openshaw (1984), MAUP refers to two distinct problems, namely, scale and shape. The former appears whether variation in results is obtained just by simply aggregating the units of observations in larger units (e.g. cities in regions, regions in countries) and viceversa. The shape problem instead refers to any situations whenever, given the number of units, variation arises simply changing the way units are grouped (i.e. the shape). So the MAUP relates to the identification of the "right" number of units or the aggregation we need to perform our analysis. As remarked by Menon (2012), is

> "the whole process of taking points on a map and allocating them to units in a box, that is arbitrary and likely to introduce a spurious component in the results. This happens because our boxes are generally not regular nor homogeneous in both shape and size. Furthermore, in the process we lose all the spatial information embedded in the data, and distance is collapsed to a binary variable in/out."

Figure 2.1: Example of functional area: Core Based Statistical Areas in the US



Source: Menon (2012)

This problem can be solved through theory, considering whether the phenomenon we are observing has some economic sense at that territorial level. Evidence provided by Briant et al. (2010) in France seems to suggest that the MAUP induces smaller distortions than misspecification. There has been a considerable effort by national statistical agencies in order to define functional regions, areas that capture a local labour market beyond the existing administrative boundaries, which can solve any problems related to MAUP. In UK there are the *"travel to work areas"*; in Italy the *"sistemi locali del lavoro"*; in France the *"zones d emploi"* while in the US there are the *"Core Based Statistical Areas"* (CBSAs - see figure 2.1).

Sample size and spatial data

An important issue when using data at disaggregated spatial level is the sample size. Indeed, most of the time, surveys were not designed to perform inference at sub national level (and sometimes even to infer more than simple frequency or average values). This is potentially a serious issue with respect to social capital. Indeed, in order to gauge the effect of MAUP on the survey data commonly used, we reviewed all the attached documentation of the European Social Survey, looking for the

maximum territorial level (referring to Eurostat' NUTS coding[2]) at which we can correctly make statistical inference. Indeed the first two waves (2002 and 2004) do not provide this information thus we report only the maximum territorial disaggregation available (e.g. data for Czech Republic in 2002 was available at NUTS 1, 2 and 3 level, so we report "3" - see table 2.1). Starting from the third wave (2006), the documentation also indicates the maximum disaggregated level to make significant inference. We report this level, indicated by a star. We summarized all these pieces of information in column *"Mixed"* where we suggest the territorial level that should be considered in order to use all the waves for a specific country. We extract some standard measures of values and beliefs associated to social capital (namely, generalized trust, both from the European Value Study and the European Social Survey, control over life, obedience and respect) and we compute Global Moran's I, the standard measure of spatial autocorrelation, under 3 spatial regimes: NUTS 1, NUTS 2 and our *"Mixed"* (see table 2.2). As we can see, with respect to spatial autocorrelation, it seems there is no particular difference between using data at NUTS 2 level or our *"Mixed"* measure. This is an important result as it suggests that, with respect to the spatial correlation, we could easily approximate our estimations using data at NUTS 2 level, reducing the MAUP.

2.2.3 A brief introduction to the relevant Spatial Statistics and Econometrics methods

Spatial statistics toolbox

We introduce some basic tools of spatial analysis, precisely Exploratory space data analysis (ESDA) techniques, starting from the definition of the weighting matrix $W_{i,j}$ as

$$W_{i,j} = \begin{cases} 1 & if\ i\ and\ j\ are\ contiguous \\ 0 & otherwise \end{cases}$$

In particular, let's consider Global Moran's I (Anselin, 1993), a measure of spatial correlation:

[2]In Europe, Eurostat, the European Commission statistical agency, has divided the territory of the EU in a hierarchical system, calledNomenclature of Territorial Units for Statistics (NUTS). The current NUTS classification valid from 1st January 2012 until 31th December 2014 lists 97 NUTS 1 regions, 270 NUTS 2 regions and 1294 NUTS 3 regions.

Table 2.1: List of available sub national levels for statistical inference

Country	2002	2004	2006	2008	Mixed	Country	2002	2004	2006	2008	Mixed
Austria	2	2	2*	n.a.	2	Luxem.	3*	3*	n.a.	n.a.	2
Belgium	1	1	1*	1*	1	Netherl.	3	3	3*	3*	2
Czech Rep	3	3	n.a.	2*	2	Poland	2	2	2	2	1
Denmark	3	3	3*	2*	2	Portugal	2	2	2	2	2
France	1	1	1	1*	1	Slovakia	n.a.	3	3*	3*	2
Germany	1	1	1*	1*	1	Slovenia	3	3	3*	3*	2
Hungary	2	2	2*	2	1	Spain	2	3	2*	2	1
Italy	2	2	n.a.	n.a.	1(+)	Suisse	2	2	2*	2*	2

Source: authors' analysis based on the documentation of the ESS waves. From the 2006 wave, * denotes the NUTS representativeness reported by ESS documentation. (+) indicates a special aggregation for Italy, as suggested in the documentation.

Table 2.2: Global spatial autocorrelation by NUTS level

	1999			2008		
Variable name	Mixed	NUTS 1	NUTS 2	Mixed	NUTS 1	NUTS 2
G. Trust (EVS)	$0,67^{***}$	$0,44^{***}$	$0,63^{***}$	$0,51^{***}$	$0,17^{**}$	$0,51^{***}$
G. Trust (ESS)	$0,68^{***}$	$0,13^{*}$	$0,66^{***}$	$0,71^{***}$	$0,43^{***}$	$0,68^{***}$
Control	$0,44^{***}$	$0,42^{***}$	$0,52^{***}$	$0,47^{***}$	$0,43^{***}$	$0,47^{***}$
Obedience	$0,62^{***}$	$0,61^{***}$	$0,68^{***}$	$0,49^{***}$	$0,50^{***}$	$0,49^{***}$
Respect	$0,53^{***}$	$0,36^{***}$	$0,52^{***}$	$0,48^{***}$	$0,24^{***}$	$0,48^{***}$

Note: queen contiguity weighting matrix; *** p<0.01, ** p<0.05, * p<0.1
using 999 permutations and pseudo p-value. Data for ESS in 1999 refers to 2002

$$I = \frac{\sum_i \sum_j w_{ij}(x_i - \overline{x})(x_j - \overline{x})}{m_2 \sum_i \sum_j w_{ij}} \tag{2.1}$$

where $w_{ij} = 1$ if region i is *contiguous* to region j; $\overline{x}$ is the average of the target variable, x_i and $m_2 = \sum_i (x_i - \overline{x})^2/n$ is the second moment. There are several definitions of contiguity[3], the most famous being *"queen contiguity"* (two regions are considered *'neighbours'* if they share at least one border or a vertex) or *'rook contiguity'* (only shared borders are considered - see figure 2.2). The elements of the weighting matrix are usually row standardized, i.e. each element is divided by the row sum, such that each row of the new standardized matrix sums to one and so a spatially lagged variable, $WX = \sum_{j=1}^{n} w_{ij}x_j$, is just the average of the neighbouring units.

Global Moran's I gives a first measure of the overall degree of linear association between variable x and the neighbouring values, indicating whether the observed spatial pattern is clustered, dispersed or random. Positive values of Global Moran's I indicate positive spatial correlation, or clustering, while negative values indicate dispersion [4]. In a second step, it is possible to compute the Local Indicators of Spatial Association (LISA), which allow the decomposition of Global Moran's I at level of each unit of observations, and consider its graphic counterpart, the so-called Moran's scatterplot.

[3]Other types of weighting matrices, including inverse distance and socio-economic weighting matrices, could be applied. The choice of weighting matrix usually depends on the research question.

[4]The expected value of Global Moran's I is $-1/(n-1)$ for zero spatial correlation, where n is the number of spatial units.

Local Moran's I for observation i may be defined as:

$$I_i = \frac{(x_i - \overline{x})}{m_2} \sum_j w_{ij}(x_j - \overline{x}). \tag{2.2}$$

Clearly, Local and Global Moran's I are linked; Anselin (1993) shows that the sum of Local Moran's I is proportional to Global Moran's I; the numerator of (2.1) is the sum of (2.2) across i, while the denominator is equal to the factor of proportionality γ, or

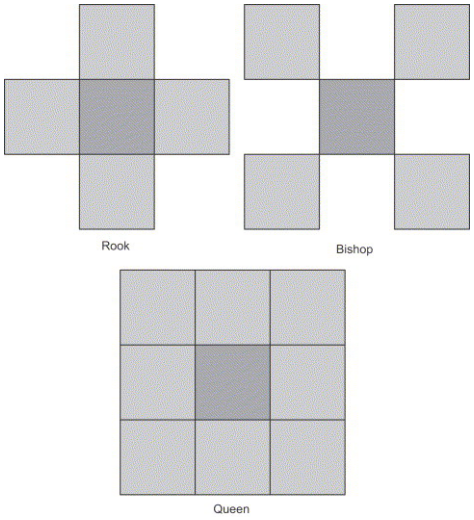
$$\gamma = m_2 \sum_i \sum_j w_{ij}. \tag{2.3}$$

Moran's scatterplot cross-plots the values of region i against the values of its neighbors. Based on position, four classes are available: in the 1st quadrant (North-East) are located regions with high values of X surrounded by neighbors with high values of X (High-high or HH quadrant); in the 2nd quadrant (North-West) are located regions with low levels of X surrounded by neighbors with high values of X (Low-High or LH quadrant); in the 3rd quadrant (South-West) are positioned regions with low levels of X surrounded by neighbors with similarly low levels of X (Low-Low or LL quadrant); finally, in the 4th quadrant (South-East) are found regions with high values of X surrounded by neighbors with low values of X (High-Low or HL quadrant). Under positive spatial association, the mass of points will be concentrated on the 1st and 3rd quadrants (HH and LL) and, under standardization, the slope of the linear interpolation of the points on a Moran's scatterplot is the Global Moran's I (see figure 2.3).

Cluster analysis

If positive, Local Moran's I indicates a region surrounded by neighbours with similar high or low values, thus the existence of a cluster while a negative value indicates a region surrounded by dissimilar neighbouring features, an outlier. There is a formal test, based on the null H_0 of Complete Spatial Randomness (CSR), for the existence of spatial clusters; indeed, we can compute the standardized value of Local Moran's I, the so-called "z-score", z_i, or

Figure 2.2: Examples of spatial contiguity



Source: Grubesic (2008)

Figure 2.3: An example of Moran Scatterplot

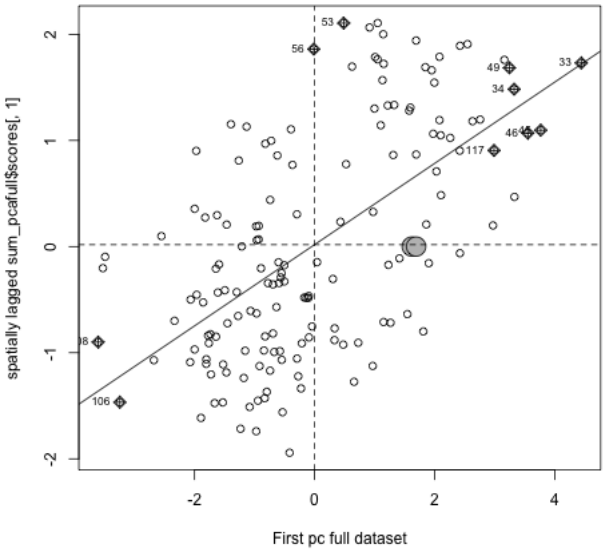
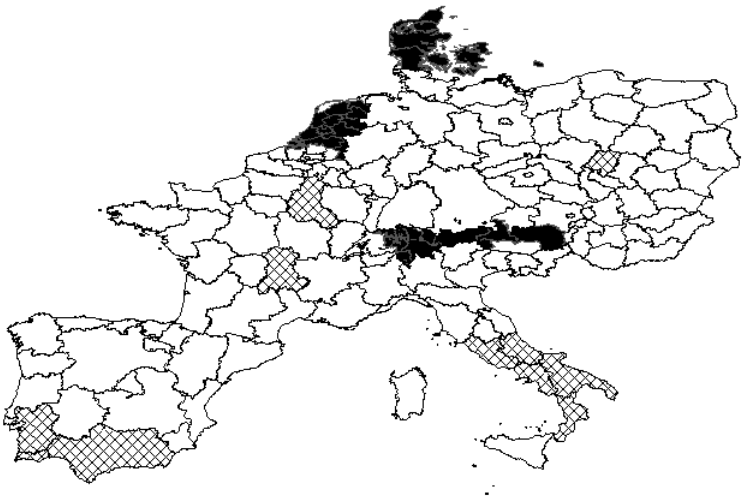


Figure 2.4: Example of cluster map



$$z_i = \frac{I_i - E(I_i)}{\sqrt{V(I_i)}} \tag{2.4}$$

and the corresponding p-value for H_0; a positive z-score suggests we have more similarities between our features/regions (i.e. all positive or negative values) than we would expect in a spatial random allocation; on the opposite, a negative z-score identifies a situation with dissimilar regions, i.e. we are in the presence of an outlier. If we reject the null, we can state that we are in presence of some underlying spatial process at work. A cluster map using Local Moran's I (see an example in figure 2.4) can be constructed by selecting only values which are statistically significant at 5 percent. Classification is based according to the sign of Local Moran's I and with respect to the mean. If I_i is positive and values of X for both region i and neighbours are above mean value, they all belong to a cluster "High-High" (HH). On the opposite, if region i and its neighbours have values that are below the mean, they belong to a "Low-Low" (LL) cluster. If the value of I_i is negative while the values of X are above (below) the mean while its neighbours are below (above) the mean, they belong to a cluster "High-Low" ("Low-High").

Introducing space in our standard regression framework points out to a misspecification problem. Indeed, let's consider a simple cross-sectional model where space is missing:

$$Y = \beta X + u \tag{2.5}$$

where β is a $K + 1$ vector. If, for any reason, the error term is correlated with any covariate, the estimates are biased. In the case of spatially correlated data (such as housing prices, depending on the values of the neighbours), we are likely facing endogeneity without a proper data generating process (DGP). Thanks to the seminal works by Cliff and Ord (1973, 1981) (thus the name *"Cliff-Ord models"*) but also Paelinck and Klassen (1979) or Anselin (1988), *spatial econometrics* allows analysis of spatially correlated data. We can consider a model, with a spatial lag in our dependent variable, Wy, where $Wy = \sum_{j=1}^{n} w_{ij} y_j$ which captures the effect of agglomeration and spatial spillovers, also known as *spatial autoregressive model* or SAR:

$$y = \alpha + X\beta + \lambda W y + u. \tag{2.6}$$

Clearly, we cannot estimate equation 2.6 with OLS as our dependent variable is now correlated with the error term, u. In another setting we could have spatial autocorrelation in the error term, as in the *Spatial error model* or SEM:

$$\begin{cases} y = X\beta + u \\ u = \rho W u + \nu \end{cases} \tag{2.7}$$

In this case, standard estimation methods provide consistent, albeit inefficient, estimates, thus the need to use spatial econometric tools to increase precision. Finally, we could consider models where there is spatial correlation both in the dependent variable and in the error term (*Spatial autoregressive model with a spatial autoregressive disturbance - SARAR* - eq. 2.8) or in the dependent and independent variables (*Spatial Durbin model* - see eq. 2.9)

$$\begin{cases} y = \delta W y + X\beta + u \\ u = \rho W u + \nu \end{cases} \tag{2.8}$$

$$y = \alpha + X\beta + \lambda W_1 y + \delta W_2 X + u \tag{2.9}$$

It follows that the appropriate model depends on the research question and theory.

2.2.4 Exploratory Space-Time Data Analysis (ESTDA)

Exploratory space data analysis techniques give a static representation of the degree of spatial association of our variables of interest. However, important questions arise with respect to the spatial dynamics of social capital and the probability of spatial change. For example, consider just one facet of social capital, generalized trust. It will be of interest monitoring how regions change their trusting attitudes in relation to the trusting attitudes of neighbours, controlling for country fixed effects. This is the essence of an Exploratory Space Time Data Analysis (ESTDA). Following Rey et al. (2011), the LISA for location i at time t is:

$$L_{i,t} = \frac{z_{i,t} \sum_j w_{i,j} z_{j,t}}{\sum_i z_{i,t}^2} \tag{2.10}$$

where $z_{i,t}$ is the value of our target variable at location i at time t, expressed in terms of deviations from the mean. The approach can be best understood by looking at, for example the trusting attitude of regions and their neighbours in successive Moran scatterplots, i.e. the transitions of points between the four quadrants (High-High, High-Low, Low-High, Low-Low), as represented in figure 2.5. Changes in the neighbours' level of trust with no changes in own values, will be reflected by vertical shifts (red lines in figure 2.5) from the 2nd to the 3rd quadrants or from the 1st to the 4th (and viceversa). Changes in regional values of trust with no changes in neighbouring regions' values will be reflected in horizontal shifts (blue lines), from 2nd to the 1st quadrant or from the 4th to the 3rd (and viceversa). Instead, changes in both region i and its neighbours, will be associated with movements along the diagonals (green lines). These transitions can be associated to a matrix of Markovian probabilities,P^n, where the ijth entry, $p_{ij}^{(n)}$, is the probability that the Markov chain starting in state i will be in state j after n steps. Each element of the matrix will give the probability of a movement type associated with the possible transitions between quadrants of the Moran's scatterplot. Values on the main diagonal of this matrix will indicate the probability of no spatial change. Off-diagonal values will reflect the probability of regional spatial change. These movements can be used to classify regions whether they are improving or worsening compared

to their neighbours. The ESTDA analysis can be extended to consider spatial markov transition probabilities conditional on neighbours belonging to different quartiles of the distribution of social capital in order to make a sounded comparison.

Fazio and Lavecchia (2013) employ ESTDA techniques using the European social survey (ESS). They compute the unconditional (with respect to national boundaries or waves) LISA transition probabilities using the first four waves of the ESS (the 5th wave was not yet available), using a spatial markov approach, conditional on the distribution of the trusting attitudes. The authors are aware of the trade-off between short time span (8 years, in the context of a very persistent phenomenon such as social capital) and statistical significance at regional level (ESS is the only survey which ensures, to some degree, data quality at sub national level), and choose to focus on statistical inference. Later on, they also apply country and wave fixed effects (separately and together) as controls, by taking the residuals[5] of regressions of regional trust on wave and country dummies, as follows:

$$x_{it} = \alpha_0 + \alpha_i + \alpha_t \delta_t + \varepsilon_{it},$$

where $t = 2002, 2004, 2006\, and\, 2008$, δ_t and α_i are the fixed effects, and ε_{it} is white noise. In order to better capture the spatial dynamics of trust, they consider 4 waves of the ESS at NUTS 2 level. Unfortunately, this comes at the cost of losing two countries (Luxembourg and Italy), which did not participate at the 3rd and 4th wave of the ESS, reducing the number of regions to 161 (from 182). Table 2.3 presents the LISA transition probabilities together with the ergodic probabilities. The latter refer to the steady state probability for a regular transition matrix and indicate the likely probability whenever the process has reached an equilibrium. They also give an indication about how likely a transition is in the long run. The analysis is replicated for the data without controls and after controlling for wave fixed effects and wave and country fixed effects together. This allows to gauge the role of country effects beyond that of wave effect. First, looking at the LISA probabilities without controls, they note the high probabilities on the main diagonal, indicating a high degree of spatial "stickiness". In general, there is very little probability of spatial change: regions with high (low) levels of trust will be close to regions with high (low) levels of trust, consistently with the positive values of the Global Moran's I (0.42 in 2002 and 0.65 in 2008). This is also confirmed

[5]Residuals are rescaled to avoid negative numbers.

by the higher ergodic probabilities associated to the HH and LL columns. Very small probabilities are associated with spatial change, i.e. off-diagonal elements of the matrix. Results are largely similar controlling for wave effects as probabilities on the main diagonal are always larger than probabilities off-diagonal. There is also a moderate increase in the probabilities associated with the main diagonal of a Moran scatterplot, i.e. staying in HH or LL, and a moderate decrease in the probabilities associated with the secondary diagonal, i.e. staying in LH or HL, indicating that these regions are now more likely to be in transition. With respect to the substantial increase in off-diagonal probabilities, it seems that starting from a position such as LH, a region is more likely to stay in LH or, alternatively, equally likely to become a high trusting region (move to HH) or see a decline in the neighbours' trust (move to LL). If a region is in HL, it faces similar probabilities of staying in HL, of becoming less trusting (LL) or seeing neighbours become more trusting (HH). In all cases, controlling for wave effects, off-diagonal probabilities are always smaller than the long run steady-state, as indicated by the ergodic probabilities. Interestingly, controlling for both wave and country effects seems to dramatically reduce probabilities on the main diagonal, increasing the probability of spatial change (the off-diagonal elements). In some instances, these probabilities are larger than the ergodic steady-state probabilities. This result implies that controlling for the effects of national borders, the possibility of spatial change substantially increases. In other words, national borders (and the forces they synthesize, such as formal and informal institutions) seem to apply some degree of resistance to regional spatial change. Removing these reduces the probability of staying in the same cluster. However, this effect is at work not only on HH clusters, but also on LL clusters. They conclude that while the first can be considered a positive effect of national borders (as regions endowed with higher trusting attitudes will likely keep these levels), the second clearly is not. From a European integration perspective, national borders (proxy of formal and informal national institutions) seem to prevent the spreading of similar values and beliefs, and trust in this example.

Figure 2.5: Interpretation of spatial transitions

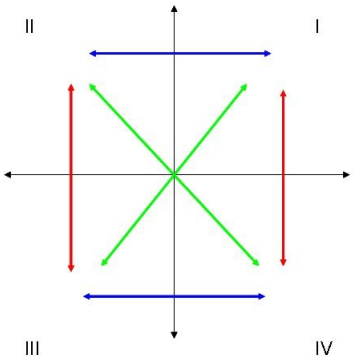


Table 2.3: LISA transition probabilities

	No Controls				Wave Controls				Country and Wave Controls			
	HH	LH	LL	HL	HH	LH	LL	HL	HH	LH	LL	HL
HH	0.75	0.09	0.04	0.12	0.85	0.05	0.04	0.07	0.47	0.16	0.15	0.21
LH	0.17	0.67	0.16	0	0.23	0.50	0.25	0.02	0.26	0.38	0.29	0.07
LL	0.02	0.10	0.75	0.12	0.05	0.06	0.80	0.08	0.18	0.18	0.48	0.15
HL	0.13	0	0.17	0.70	0.30	0.06	0.32	0.32	0.32	0.08	0.30	0.30
ss	0.27	0.17	0.32	0.24	0.45	0.10	0.36	0.09	0.31	0.20	0.31	0.18

Analysis on 4 waves of the European Social Survey (2002, 2004, 2006 and 2008)

2.3 Principal component analysis

As stated at the beginning of the chapter, principal component analysis (PCA), a technique to reduce multidimensionality of a dataset to just few variables, seems to be appropriate in the context of social capital. Indeed, a multidimensional approach sounds the most reasonable way to solve the vagueness of definitions plaguing social capital. As pointed out by the European Commission (Annoni and Dikjstra, 2013):

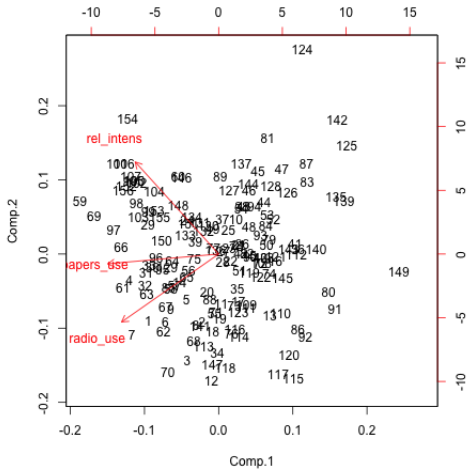
> "among multivariate methods, PCA is particularly suitable for statistically summarizing data in a parsimonious way. It is in fact a dimensionality reduction technique which is designed to capture all relevant information into a small number of transformed dimensions. The usefulness of PCA in composite developing is easy to understand: each dimension in a composite is designed to describe a particular aspect of the latent phenomenon to be measured"

As explained by the reference book of Jolliffe (2002), PCA transforms the old dataset into a new set of variables, uncorrelated, retaining the greatest variation present in the original dataset. It is a way to dramatically reduce the number of variables involved, easing the interpretation. A technique firstly employed by Pearson in 1901, the principal components derive from the following constrained optimization problem regarding the variance of the dataset x times the vector α_1:

$$\max var[\alpha_1^{'}x] = \alpha_1^{'}\Sigma\alpha_1,$$

usually (albeit not necessarily) under the constraint $\alpha_1^{'}\alpha_1 = 1$. Indeed, α_1 is the eigenvector associated to the largest eigenvalue of Σ, the covariance matrix, and $\alpha_1 x$ is the first principal component. More generally, $\alpha_k x$ is the $k-th$ Principal Component (PC) associated to, respectively, the $k-th$ largest eigenvector and eigenvalue, α_k and λ_k. The eigenvector α_k is also known as *loading*. Alternately, the vector of principal components z, can be obtained by $z = Ax^*$ where A is a matrix of eigenvectors of the correlation matrix, instead of covariance matrix, and x^*, some standardized variables. There are several advantages related to the use of the correlation rather than covariance matrix, such as that principal components based on covariance matrices are sensible to the units of measure of each element of x. Jolliffe (2002) makes the following example: let's consider two variables, x_1 and x_2, the first measuring the length of something, the second measuring the weight. When x_1 is measured in centimetres, the correlation matrix is Σ_1 while if measured in millimetres (thus just multiplying by 10), the correlation matrix is Σ_2 or

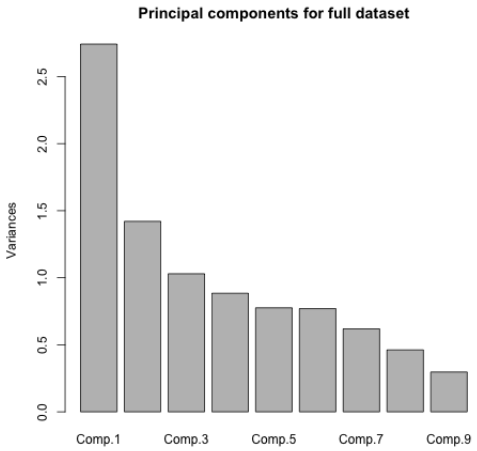
Figure 2.6: Example of biplot



$$\Sigma_1 = \begin{array}{|c|c|}\hline 80 & 44 \\ \hline 44 & 80 \\ \hline \end{array} \qquad \Sigma_2 = \begin{array}{|c|c|}\hline 8000 & 44 \\ \hline 44 & 8000 \\ \hline \end{array}$$

A small difference leading to very distinct outcomes: indeed the first principal component using Σ_1 is $0.707x_1 + 0.707x_2$ (i.e. both variables have equal weight) while using Σ_2 is $0.998x_1 + 0.055x_2$, i.e. the first variable drives almost entirely the first principal component! Also, the variance explained increases: the first principal component accounts for 77.5 percent of the variance, but 99.3 in the second case. In the end, Jolliffe (2002) recommends not to use covariance matrix unless the variables share all the same units of measure and have similar variances (otherwise one will dominate). The main drawback of using the correlation matrix is related to the statistical inference and the interpretation of the results; indeed, the obtained coefficients refer to the standardized variables and thus they have to be divided by the standard deviation of the corresponding variable in order to interpret PCs in terms of original variable (keeping in mind that they are not the PC of the original dataset). It should be noted that the sign of any PC is completely arbitrary and that regarding the use of discrete/dichotomous variables, Jolliffe (2002) remarks that apart from inferential purposes, there is no particular requirement. A graphical interpretation is given by *biplots* that simultaneously plot the relative positions of the p variables and the n observations involved in two dimensions (the first and second PC - see figure 2.6). An important issue is related to the choice of the "correct"

Figure 2.7: Example of screeplot



number of PCs. There is no silver bullet, but three rules of thumb:

1. retrieve only up to the $m-th$ PC whose eigenvalue is greater than 1 (Kaiser, 1960) - this works only with the correlation matrix;
2. given this, achieve the greatest explained variance;
3. the analysis of the so-called "scree" plot, i.e. a graph of the eigenvalues (which are automatically ordered by size) vs. the corresponding PC, retaining only those components above the point of inflection (Cattell, 1966) (see figure 2.7 for an example).

In the end, PCA is a very useful data reduction technique but requires caution in its use.

2.4 Wrap up of the chapter

Section 2.1 reviews three categories of available empirical measures: survey data, experiments and outcome based measures. *Surveys* attempt to measure directly those values (such as tolerance, respect for others, autonomy) and beliefs (such as trustworthiness or fairness) usually associated to communities with high level of social capital. Several international surveys are available, such

as the World Value Survey, the European Value study or Eurobarometer, just to mention some, ensuring harmonized estimates of values and beliefs across countries. There are concerns about the reliability of answers due to issues of social desirability (i.e. the desire to please the interviewer), cognitive dissonance or lack of mutually exclusive answers (which could distort the answers) but standardized questions and several research on this topic have reduced the concern about their use. Alternatively, one could resort to *experiments*, whose main advantage derives from imposing a well-defined frame, easing interpretations and reducing measurement errors and bias, creating situations which are incentive-compatible. The main problem with this approach is the lack of external validity as samples are generally made of graduate students. Eventually, the most used approach is based on indirect estimation, by observing the effects of social capital, the so called *"outcome based measures"*. Advantages are the availability of longer time series (e.g. voter turnout), comparability across country and statistical representativeness at sub national level. Unfortunately, they are also serious issues of endogeneity and/or measurement errors.

Eventually, there is a role for space regarding social capital, as we argue in section 2.2.1, being reminiscent of the first law of geography: *"everything is related to everything else, but near things are more related than distant things"*(Tobler, 1970). Indeed, to the extent that the formation of cultural traits will depend on human interactions, the strength of these ties will depend on transaction costs, which are typically increasing with distance. As a consequence, since social relations are spatially sticky, so are norms and values. Space has several dimension which should be considered; indeed the relationship between space and social capital can occur in an horizontal continuous space marked by distance, an horizontal discontinuous space marked by borders and a hierarchical space with discontinuities due to multiple levels of markets and governance. Space has long being ignored by economists because of its difficult mathematical tractability. However, after 30 years of research, there are now techniques able to identify and overcome the specific issues of spatial data, such as the Modifiable Areal Unit Problem (MAUP), or statistical inference at sub national level, which are exposed in section 2.2.2. A discussion on spatial statistics and econometrics has been presented (section 2.2.3), with details on statistics of global and local spatial autocorrelation (Moran's I), weighting matrices, definition of contiguity and spatial clusters. Then, in order to study space and time dynamics jointly, Exploratory space-time data analysis (ESTDA) techniques have been exposed in section 2.2.4, with an applied exercise for 161 european regions; indeed, after computing

the probability of staying in the same spatial cluster, there is evidence that national borders (proxy of formal and informal institutions) affect the way values and beliefs (specifically, generalized trust) are spread across space.

Finally, in section 2.3, a description of the Principal component analysis, a technique to achieve data reduction, is reported, in order to face the issues of multidimensionality of social capital.

Chapter 3

A new measure of social capital

To the extent social capital is a multidimensional concept, has suggested by theory, and ignored by most of the empirical literature, there is the need to encapsulate all the available pieces of information into synthetic indicators[1]. Starting from nine measures presented in chapter 3, new syntethic measures of social capital are presented in section 3.1, aiming at testing the difference between a structural and cognitive component of social capital. An analysis on the presence of clusters of similar values in Europe is the object of section 3.2·

3.1 A multidimensional approach to measure civic capital

3.1.1 Data description

We select nine variables at regional level, typically used in empirical studies on social capital, across Europe. Five of these can be referred to the so-called *"structural component"* of civic capital (Righi and Scalise, 2013) and include voter turnout at parliamentary elections (Putnam, 1993; Nannicini et al., 2010), relational intensity, and "media use" as of Newspapers,Radio and TV (Putnam, 1993; de Dominicis et al., 2013). The remaining variables refer to the so called *"cognitive component"*

[1]This chapter has been drafted as the result of the paper "Social capital across european regions" joint with Giorgio Fazio under the auspices of the project *"Social capital, institutions and behaviours" sponsored by Banca d'Italia. We would like to thank Paolo Sestito, Guido de Blasio and Guglielmo Barone for their precious comments.* sponsored by Banca d'Italia between 2012 and 2013.

of civic capital and consider the perception of norms, values and beliefs. Here, in line with the literature on civic capital, we consider variables that should capture the attitude of individuals towards the community, such as the perception of one's control over life, the importance of respect for the others as a value to teach your children, the extent of generalized trust and autonomy (see table 3.1 for a taxonomy). Details about the construction of the dataset are provided in section 3.3. Our data sources include: two issues of the Eurobarometer (European Commission, 2004a,b), a survey implemented since 1973 by the European Commission to monitor public opinion in the Member States; its Swiss counterpart, MOSAiCH (*"Measures and Sociological Observation of Attitudes"* in Switzerland - Mosaich, 2005, 2009), which mimics some part of the Eurobarometer; the European Election Database (EED) of the Norwegian Social Science Data Services (NSD) for the Parliamentary voter turnouts around 2008 (NSD-EED, 2013); finally, the 4th wave (2008) of the European Value Study (EVS) for the variables referring to norms, values and beliefs (EVS, 2011). [2]

In terms of the territorial units involved, we refer to the *Nomenclature of Territorial Units for Statistics* (NUTS) of Eurostat, and mostly consider NUTS 2 regions, corresponding to Italian *regioni*, french *departments* or Spanish *Comunidades y ciudades autonomas*, which is also the level typically considered by EU cohesion policies, with the notable exception of Germany, where data refer to the NUTS 1 level, corresponding to the German *lander*. Eventually, our dataset includes a total of 16 countries and 156 regions at the NUTS 2 level (NUTS 1 for Germany - see table 3.13). [3]

3.1.2 Structural vs cognitive measures of civic capital

As discussed above, civic capital should be considered in its multidimensional nature. Here, to capture such "multidimensionality", we exploit the information embedded in the nine variables described above. As a first step, table 3.2 presents the matrix of correlations between these variables (for descriptive statistics see table 3.14). Some interesting information already emerge from this table. First of all, since these variables are typically associated to social capital, we would expect

[2]The European Value Study (EVS) is a large-scale, cross-national longitudinal research program on basic human values running every 9 years with focus on European countries. The study covered ten countries in its first wave in 1981 and 26 nations in its fourth wave in 2008.

[3]Following the Eurobarometer, we merged 6 Italian regions into 3 new regions: Piemonte and Valle d'Aosta, Abruzzo and Molise, Puglia and Basilicata.

Table 3.1: Taxonomy of social capital measures

Structural component	**Cognitive component**
Media Use: Newspapers	Respect for others
Media Use: TV	Control of your life
Media Use: Radio	Autonomy
Relational intensity	Generalized Trust
Voter turnout	

them to be to a large extent collinear. However, while there is some correlation structure in the data, not all variables are positively or significantly correlated. This seems to be the case even if the variables related to the structural and cognitive components of social capital are considered separately. For example, with respect to the former, relational intensity is correlated with only two of the four measures of the structural component and with three measures of the cognitive component (control of your life, generalized trust and autonomy). Voter turnout, another common measure of the structural component, is correlated with the use of newspapers and TV, but also with two measures of values and beliefs (respect and generalized trust). Reading newspapers and listening to the radio are positively and significantly correlated among each other, but are also linked with three cognitive measures: control, generalized trust and autonomy. As mentioned above, TV use is not generally correlated with any other variable but control of your life (albeit statistical significance is low). As for the cognitive measures, they appear moderately correlated. Respect, for example, is correlated with generalized trust, but not with the sense of control of your life or autonomy. Control, instead, is associated with generalized trust and autonomy. Interestingly, generalized trust is correlated with all the others cognitive measures, and all but one, structural measures (TV Use). Greater autonomy is associated with three structural measures (relational intensity, newspaper and radio use) and two cognitive measures (control and generalized trust).

The correlation analysis seems to suggest that the representation of civic capital may be more complex than typically postulated and corroborates the need for a multidimensional approach. Next, we try to encapsulate the information from the above variables into synthetic indicators, which should capture the many dimensions of civic capital. Obviously, the process of condensing

Table 3.2: Correlations matrix of the involved variables

	Relational int.	VoterT	NewsUse	TvUse	RadioUse	Respect	Control	G.Trust	Autonomy
Relational intensity (Rel)	1.00								
Voter Turnout (VoterT)	-0.01	1.00							
Newspapers Use (NewsU)	0.41***	0.26***	1.00						
Tv Use (TvU)	-0.03	0.20***	0.02	1.00					
Radio Use (RadioU)	0.19**	-0.01	0.53***	0.06	1.00				
Respect (R)	0.10	0.20***	0.09	0.13	-0.02	1.00			
Control (C)	0.32***	-0.07	0.27***	-0.14*	0.32***	0.09	1.00		
Generalized trust (GT)	0.45***	0.25***	0.45***	-0.01	0.26***	0.19**	0.34***	1.00	
Autonomy (Aut)	0.19**	0.04	0.39***	-0.02	0.22***	-0.01	0.27***	0.38***	1.00

Pearson correlation, *** p<0.01, ** p<0.05, * p<0.1.

complex phenomena into single indicators presents both positive and negative aspects. On one side, it provides easy to understand summary information, thus allowing ease of interpretation. On the other, it may oversimplify the complexity of the problem under scrutiny and the obtained synthesis may be sensible to the procedure of data aggregation. One popular way to achieve variables reduction is to employ Principal component analysis (see section 2.3). The PCA identifies common patterns by drawing orthogonal vectors across the data, known as "principal components" (PCs). These are constructed as optimally weighted linear combinations, after assigning each observation a "score" and each variable a loading factor. Once the first component is identified, the following step is to maximize the residual variation,iterating the process, keeping all components orthogonal to each other. The number of components should be selected to maximize the explained variance of the data. A logical first step in our analysis is to refer to the taxonomy of table 3.1 and perform separate PCAs over the two sets of structural and cognitive measures of civic capital. The PCA over the structural component variables in table 3.3 suggests that the first two principal components are sufficient to explain most of the variation in the data. The loading coefficients seem to highlight a precise structure where a subset of three variables (relational intensity, newspaper and radio use) dominates the first principal component and another subset (voter turnout and TV use) dominates the second. Similarly, for the cognitive component, the PCA results in table 3.4 show that the first two principal components capture most of the variation in the data. While the first PC is dominated by the subset of control, generalized trust and autonomy, the second relates mostly to the importance of respect for others. These results highlight how, even when homogeneous sets of variables are chosen, the multidimensional nature of civic capital emerges. In order to obtain more synthetic measures with respect to the two separate components of civic capital, we concentrate on the first component of each PCA and try to maximize their informational content by repeating the PCA over restricted sets of variables; precisely, we exclude from the new PCA those variables linked to the second component. Tables 3.5 and 3.6 report on this analysis and show how the *refined* first components alone now account for almost 60 percent of total variance and the associated eigenvalues are well above one. The loadings seem to suggest that none of the selected variables prevails on the others. This is also more clearly explained by the biplots in figure 3.1.

Table 3.3: PCA of the structural component of civic capital

	Components					Loadings		
	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Variable	Comp.1	Comp.2
						Relational intensity	0.46	0.28
Eigenvalues	1.8	1.2	0.9	0.8	0.3	Voter Turnout	0.22	-0.68
Prop. of variance	0.36	0.24	0.17	0.16	0.07	Newspapers Use	0.66	0.01
Cumulative prop.	0.36	0.60	0.77	0.93	1.00	TV Use	0.09	-0.67
						Radio Use	0.54	0.14

Table 3.4: PCA cognitive component of civic capital

	Components				Loadings		
	Comp.1	Comp.2	Comp.3	Comp.4	Variable	Comp.1	Comp.2
					Respect	0.23	0.92
Eigenvalues	1.7	1.0	0.7	0.6	Control	0.53	-0.07
Prop. of variance	0.43	0.25	0.18	0.14	G.trust	0.61	0.07
Cumulative prop.	0.43	0.68	0.86	1.00	Autonomy	0.54	-0.39

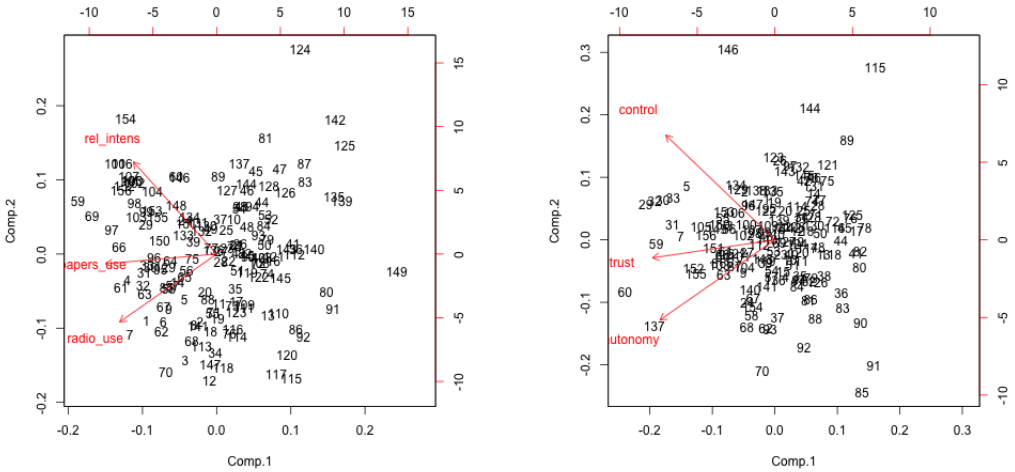
Table 3.5: PCA of the *refined* structural component of civic capital

	Components			Loadings	
	Comp.1	Comp.2	Comp.3	Variable	Comp.1
Eigenvalues	1.7	0.8	0.4	Relational intensity	-0.49
Prop. of variance	0.59	0.27	0.14	Newspapers Use	-0.65
Cumulative prop.	0.59	0.86	1.00	Radio Use	-0.57

Table 3.6: PCA of the *refined* cognitive component of civic capital

	Components			Loadings	
	Comp.1	Comp.2	Comp.3	Variable	Comp.1
Eigenvalues	1.7	0.7	0.6	Control	-0.54
Prop. of variance	0.55	0.25	0.20	G.trust	-0.61
Cumulative prop.	0.55	0.80	1.00	Autonomy	-0.57

Figure 3.1: Biplots for the *refined* structural and cognitive components



Refined structural component

Refined cognitive component

3.1.3 Full set of variables

We now consider the full set of variables, looking for a synthetic indicator for the whole dataset. Results in table 3.7 show how the first component for the whole dataset accounts for almost one third of the total variation in the data, with the associated eigenvalue equal to 2.7, and the second component accounts for an extra 16 percent, with eigenvalue equal to 1.4. This is not surprising as, consistently with what previously observed in tables 3.3 and 3.4, voter turnout, TV use and respect for others (highlighted in bold in table 3.8) appear to behave differently from the other measures (either structural or cognitive) of civic capital. Indeed, they have smaller loadings in the first principal component, while they largely drive the second component. The third component has an eigenvalue of just one and would increase the explained variation by a mere 11 percent, therefore we focus only on the first two.

Inspection of the biplots in panel a) of figure 3.2 confirms this analysis and allows the visualization of the multidimensional nature of civic capital across European regions. The PCA for the full set

of variables shows how the first PC is dominated by control, autonomy, generalized trust, relational intensity and use of newspapers and radio. TV use, voter turnout and respect have little relation with the first component, but dominate the second principal component of the data. To get a more precise measure of the first principal component, as before we exclude the set of variables linked to the second principal component and repeat the PCA over the six remaining variables (*refined* dataset). Results in table 3.9 show how the first principal component now explains on its own 45 percent of the total variance, with an eigenvalue of 2.7. The second component adds an extra 15 percent to the explained variance, but has an eigenvalue of just 0.9. Overall, the contribution of the six variables to the significant first principal component is balanced, with newspapers use and generalized trust being the most relevant. The biplot in panel b) of figure 3.2 allows a visual inspection of the evidence in table 3.9 and further allows observing how a couple of variables, specifically radio use and relational intensity, may have a "complex" structure, with large, albeit with different signs, loadings also on the second component. Recall, however, that the latter explains too little data variation and it is not going to be considered in subsequent analysis.

Given that the subset of structural and cognitive measures do not necessarily uniquely represent civic capital (as our previous results seem to suggest), in the rest of the analysis we focus on the full set of variables. Specifically, we consider the first and second components identified by the PCA over the full set of nine variables and, for robustness, also the more precise first principal component obtained by running the PCA over the *refined* set of six variables, exploring the spatial distribution of civic capital across European regions.

Table 3.7: PCA of the full set of variables

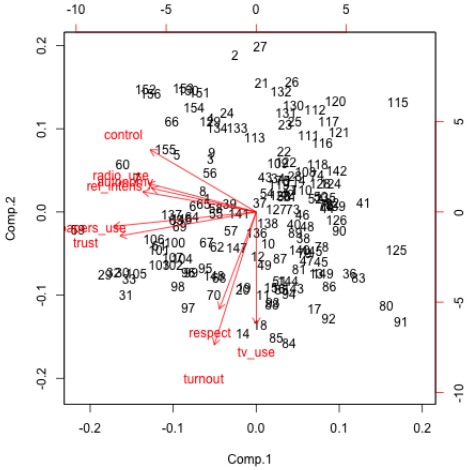
	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6	Comp.7	Comp.8	Comp.9
Eigenvalues	2.7	1.4	1.0	0.9	0.8	0.7	0.6	0.5	0.3
Prop. of variance	0.30	0.16	0.11	0.10	0.09	0.09	0.07	0.05	0.03
Cumulative prop.	0.30	0.46	0.58	0.67	0.76	0.85	0.92	0.97	1.00

Table 3.8: Loadings of the first and second principal components of the full set of variables

	Comp.1	Comp.2
Relational intensity	-0.38	0.09
Voter Turnout	-0.14	**-0.62**
Newspapers Use	-0.48	-0.07
TV Use	0.00	**-0.52**
Radio Use	-0.36	0.13
Respect	-0.12	**-0.45**
Control	-0.36	0.29
G. Trust	-0.46	-0.11
Autonomy	-0.35	0.11

Figure 3.2: Biplots for the full and refined set of variables

Panel a) Full set of variables



Panel b) Refined set of variables

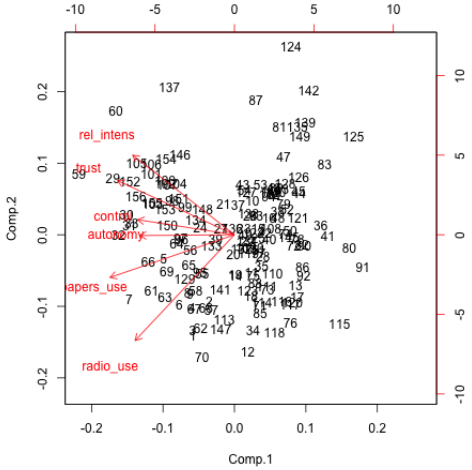


Table 3.9: PCA of the *refined* dataset

	Components						Loadings	
	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6	Variable	Comp.1
							Relational intensity	-0.39
Eigenvalues	2.7	0.9	0.8	0.7	0.5	0.4	Newspapers Use	-0.48
Prop. of variance	0.45	0.15	0.14	0.12	0.08	0.06	Radio Use	-0.38
Cumulative prop.	0.45	0.60	0.74	0.86	0.94	1.00	Control	-0.37
							G. Trust	-0.45
							Autonomy	-0.36

3.2 The spatial dimension of civic capital in Europe

3.2.1 Maps of civic capital

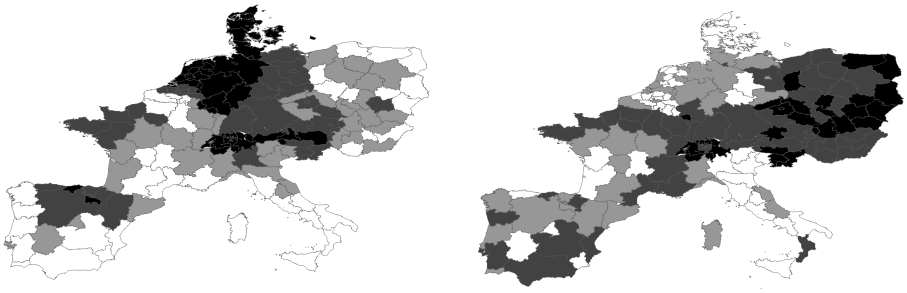
Figures 3.3 and 3.4 show the quartile distribution of our measures of civic capital. Figure 3.3 reports the first and second principal components of the PCA over the full set of variables. Some interesting evidence is worth mentioning. First, from panel a) a clear heterogeneity seems to emerge across European regions in terms of the endowment of social capital. While regions in Denmark, Belgium and Austria seem to be the most endowed of social capital, the South of Italy and parts of Portugal,France, Spain and Poland seem to be the least endowed. Similar evidence of spatial heterogeneity emerges looking at the second component in panel b) even if with a different pattern identified with respect to the first component. Figure 3.4 reports on the first principal component obtained from a PCA over the six variables (the so called *refined* dataset - see table 3.9). This figure now sharpens the evidence obtained in panel a) of the previous figure, identifying even more clearly the geographical patterns of high or low levels of our civic capital measure. Overall, the geographic heterogeneity of social capital seems to be more complex than the usually hypothesized North-South dichotomy. Rather, the distribution of social capital seems to vary a lot within each country and in some cases similar values are shared by regions at the border of different countries. The next subsection further explores the spatial distribution of social capital using Exploratory Spatial Data Analysis methods.

3.2.2 Spatial autocorrelation and Local Indicators of Spatial Association (LISA)

Next, we perform an exploratory spatial data analysis (ESDA) that allows detecting patterns of data similarity related to proximity. While there could be alternative definitions of proximity (e.g. geographic, economic, institutional socio-economic and so on), here we keep things as simple as possible and we choose simple geographical proximity (see section 2.2); indeed, we define two regions as neighbours if they share either a border or a vertex (also known as "first order queen contiguity"). We can define a weighting matrix, W, such that:

Figure 3.3: Quartile distributions of the full set of variables

(a) *First principal component .* **(b)** *Second principal component .*



Notes: Darker colours denote higher quartiles

$$W = \begin{cases} 1 & \text{if i and j are neighbours} \\ 0 & \text{otherwise} \end{cases} \tag{3.1}$$

i.e. a n $\times$ n matrix whose ij-th element is equal to 1 if and only if the two regions are contiguous. Following common practice, we consider the row standardized version of the matrix (i.e. where $\sum_i w_{ij} = 1$, or each element of row i is divided by the sum of the row). Our sample consists of 156 regions (see table 3.13) and includes two islands (Sicily and Sardinia), which according to our contiguity definition, are clearly neighborless (see table 3.15 in section 3.3 for the distribution of connections). [4]

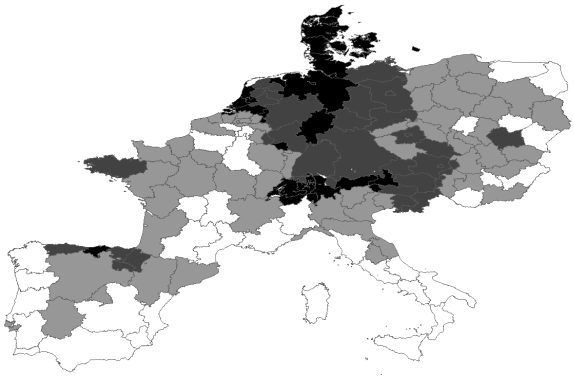
In order to provide an overall measure of spatial correlation in the data we calculate the Global Moran's I, or I (see Anselin, 1993):

$$I = \frac{\sum_i \sum_j w_{ij}(x_i - \overline{x})(x_j - \overline{x})}{m_2 \sum_i \sum_j w_{ij}}$$

where $\overline{x}$ and $m_2 = \sum_i (x_i - \overline{x})^2/n$ are, respectively, the mean and variance of the target variable, x_i. I gives a first indication of the degree of linear association between the values of x for region i and its neighbours. Table 3.10 reports evidence of positive spatial autocorrelation for all the principal components extracted in the previous section. The first and second principal components extracted

[4]Eurobarometer does not include any information about Corsica, while we dropped the Spanish isles (Balears and Canarias).

Figure 3.4: Quartile distributions of of the *refined* set of variables)



First principal component

Notes: Darker colours denote higher quartiles

from the full set of variables exhibit a strong degree of spatial autocorrelation with Moran's I of respectively 0.69 and 0.58. A similar degree of spatial correlation emerges if the first principal component of the two subsets of variables are considered, with the structural component displaying a slightly larger degree of correlation, and for the first PC of the refined set. Running a simulation with 1000 repetitions suggests that result are robust. The degree of spatial autocorrelation can also be observed looking at the "Moran's scatterplots" (see Anselin, 1993 and section 2.2) of the values of variable X of a region against the values of its neighbours, WX. Panel a), b) and c) of figure 3.5 all indicate a strong degree of regional spatial association in the identified measures of civic capital.

Next, we calculate the Local Indicators of Spatial Association (LISA), which allow the decomposition of Global Moran's I at the regional level, and a cluster map. The LISA analysis is performed over the principal components of the full set of variables and the refined set of variables. Figure 3.6 reports on the analysis for the first and second principal components of the full dataset (see table 3.8). Regions coloured in black belong to HH clusters (i.e. regions with high values surrounded by similarly high values), while grid pattern regions belong to LL clusters (i.e. regions with low values surrounded by neighbours with low values). Clearly, the two components identify different dimensions of civic capital and also different clusters. Panel a) of the figure 3.6 shows how HH clusters for the first component typically are located in Switzerland and part of Austria and in the northern European belt identified by Denmark, the northern regions of Germany, the Netherlands

Table 3.10: Global spatial autocorrelation of the proposed measures of social capital

	First PC	Second PC
Full set of variables dataset	0.69^{***}	0.58^{***}
Refined set of variables	0.68^{***}	-
Structural component	0.66^{***}	-
Cognitive component	0.51^{***}	-

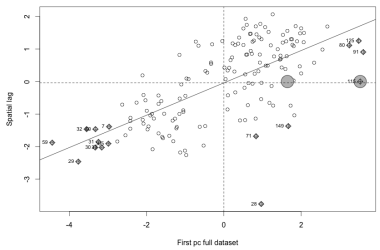
Global Moran's I

Pseudo p-values: *** p<0.01, ** p<0.05, * p<0.1

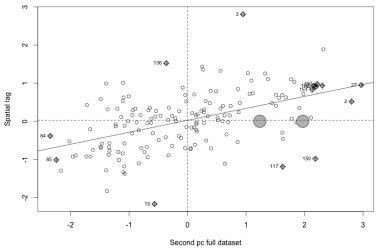
Note: First order, row standardized, queen contiguity weighting matrix

and Belgium. LL clusters are (from left to right) in Portugal and Spain, some French regions and the south of Italy. The LISA of panel b), pertaining to the second principal component, shows a very different picture, with HH clusters in part of Switzerland, Poland and Slovenia. Recall, however, than the second components represents a much smaller proportion of the total variance of the data. For robustness, we have perform the PCA over the *refined* set of variables entering just the first principal component of the full set of variables. Evidence in figure 3.7 shows that removing the variables tied to the second component, just confirms the pattern emerging from panel a) of figure 3.6.

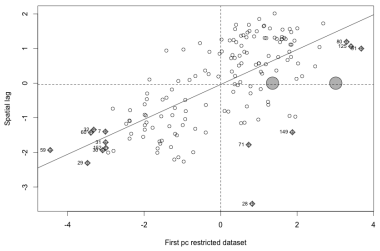
The LISA analysis seems to confirm what was already hinted by figures 3.3 and 3.4. There seems to be a tendency for regions with higher or lower levels of civic capital to cluster together. Interestingly, these clusters do not necessarily coincide with national borders. In some cases, they identify part of a country, but often they are located across national borders. This evidence seems to suggest that patters of similar values may not entirely depend on national borders. Also, it suggests that breaking vicious circles of low social capital may more difficult when regions are located in a low social capital trap.



(a) *Panel a) - First pc of the full dataset.*



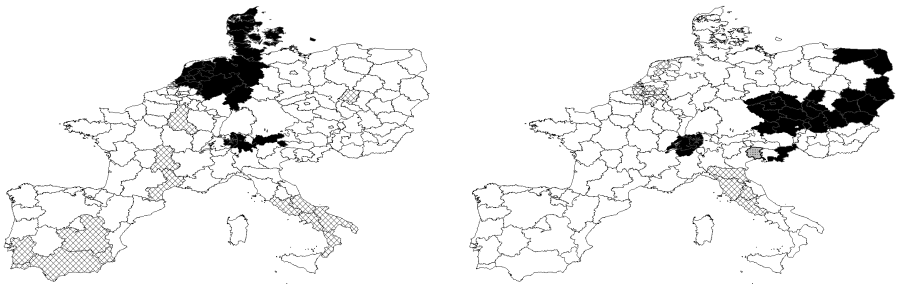
(b) *Panel b) - Second pc of the full dataset.*



(c) *Panel c) - First pc of the restricted dataset.*

Figure 3.5: Moran Scatterplots

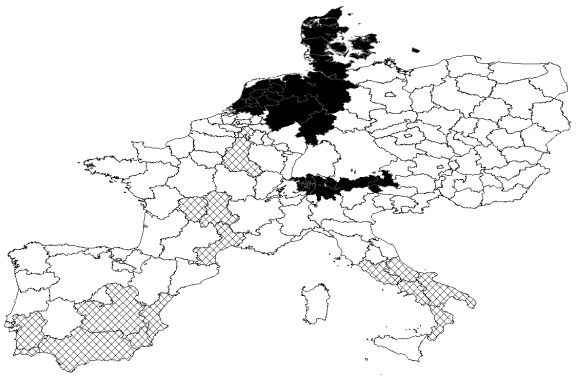
Figure 3.6: Cluster maps of the full set of variables



a) First principal component b) Second principal component

Dark regions: HH clusters; grid pattern: LL clusters

Figure 3.7: Cluster map of the *refined* set of variables



First principal component

Dark regions: HH clusters; grid pattern: LL clusters

3.3 Wrap up of the chapter

Social capital is of critical importance for economic development. However, its quantitative assessment often depends on the specific definition adopted and empirical studies often explore only part of the complexity embedded in the concept of social capital. The objective of this chapter has been to empirically investigate the distribution of social capital across European regions. In order to perform this investigation, capturing the multiple dimensions of social capital, Principal component analysis has been used (see section 3.1); nine indicators typically used as proxies of social capital, particularly in its declination in terms of civicness, have been condensed in less variables. The selected variables can be broadly divided into a subset capturing the structural component of social capital in a community, based on the degree of actual engagement of people with society, and a subset capturing its cognitive component, based on the individual attitude in terms of norms, values and believes that should help overcome the free riding problems of society. The PCA allows us to "condense" the information of these variables into synthetic indicators, which are then used to look at the spatial distribution of social capital across European regions (section 3.2). More specifically, the extent of spatial association of social capital across regions is considered using exploratory spatial data analysis tools. Even though the theory would suggest that all our variables are associated with social capital, our empirical analysis confirms that these variables may capture

different aspects of the same phenomenon. Also, the traditional distinction between the structural and the cognitive component seems to be blurred. In order to synthesize these aspects, we consider the first principal components of the two subsets of variables, the full set of variables and a refined set as robustness check. These synthetic indicators seem to indicate some degree of heterogeneity in the distribution of social capital across European regions, especially within larger countries, such as Italy, France, Poland and Spain, and with higher values usually characterizing smaller countries (Belgium, Denmark, Netherlands). In some of these cases, similar values seem to display a tendency to cluster, irrespective of the national border. In order to assess whether these clusters are spatially significant, we calculate Global and Local Moran's I statistics which show some degree of spatial association in the data and highlight the spatial clustering of regions with similar high or low levels of social capital. This analysis confirms that these clusters are not necessarily "national", suggesting that the forces of geography may overcome national borders when it comes to cultural identities.

Data Appendix

Our dataset includes the following variables:

A) Structural component of civic capital

1) Relational intensity

Data for relational intensity comes from Eurobarometer 62.2 (question QD5, 2004) for all countries, except Switzerland, where we had to rely on MOSAiCH. The survey asks the following question: *"How often do you meet socially with friends?"* We drop *"don't know"* - *DK* answers. As there is no perfect correspondence between EB and MOSAiCH, we propose a new variable, matching the available answers as indicated in table 3.11. We are aware of the trade-off between loosing an entire variable (as without Switzerland we should exclude the whole variable) and some information (precisely, we reduce the range of possible answers from 6 to 4) and we opt in favour of keeping the variable. For Denmark and Slovenia we had to merge data up to NUTS 2 level: the territory of Denmark was divided in 13 counties ("amt") up to 2006 which where lately refined to five NUTS 2 regions. Also Slovenia underwent a major change, reducing the number of NUTS 2 regions from 12 to only 2 in 2006. All changes were made following the instructions on "History of NUTS" available on the Eurostat website [5].

2) Voter turnout

Data for voter turnout have been collected from the European Election Database of the Norwegian Social Science Data Services (NSD) and refers to parliamentary election between 2002-10. Precisely, we collect data for the following countries (and years): Austria (2008), Belgium (2007), Czech Republic (average 2002, 2006, 2010), Denmark (2007), France (2002), Germany (2005), Hungary (average 2006 and 2010), Italy (2008), Luxembourg (2009), the Netherlands (2010), Poland (2007), Portugal (2009), Slovakia (2010), Slovenia (2008), Spain (2008), Switzerland (2007).

3-5) Media use

Data for "media use" have been collected from Eurobarometer 62.2 (questions QA18_1-3, may 2006) and MOSAiCH 2009 for Switzerland. The core question is "*About how often do you... watch television news programmes/ read the news in daily newspapers / listen to radio news programmes?*" The range of possible answers is similar in Eurobarometer and MOSAiCH (see table 3.12). We drop DK and rescale such that value 1 corresponds to the answer "never" and 5 to "Every day". Then

[5] http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/history_nuts)

we take the regional mean (using the available sample weights reported), creating the variables "newspapers", "TV" and "radio". For Denmark and Slovenia we had to merge up to NUTS 2 level[6].

B) Cognitive component of social capital

6-9) Norms, values and beliefs

Norms, values and beliefs, measured in the European Value Study (EVS), are widely used in the literature. Following Tabellini (2010), we select four values: generalized trust, control, respect and obedience. Generalized trust is measured through the question

> "Generally speaking, would you say that most people can be trusted or that you can be too careful in dealing with people?" There are two possible answers: 1 'Most people can be trusted" or 2 'You can't be too careful".

The variable *"G. trust"* is the regional percentage of people who answer that "most people can be trusted" over the total number of responses. Another value measured is *"control"* of life:

> "Some people feel they have completely free choice and control over their lives, and other people feel that what they do has no real effect on what happens to them. Please use the scale to indicate how much freedom of choice and control you feel you have over the way your life turns out?"

The variable is coded with response from 1 to 10, where 1 means "no control" and 10 "a great deal". The variable *"control"* is built as regional weighted average (times 10). As for *"respect"* and *"obedience"*, they both refer to the following question:

> Here is a list of qualities which children can be encouraged to learn at home. Which, if any, do you consider to be especially important?"

The possible answers include respect for others and obedience. The variables *"respect"* and *"obedience"* are then the weighted percentage of people who mentioned these values as qualities that should be taught to children over the total number of respondents. With respect to *"obedience"*, Tabellini (2010) suggests this is a negative value, as it is the basis of hierarchical societies, a

[6]Same remarks as for "relational intensity" apply

Table 3.11: Variable *"Relational intensity"*

Proposed solution	Eurobarometer (EB)	MOSAiCH
Several times a week (4)	Several times a week (6)	At least once a day (5)
		Several times a week (4)
Several times a month (3)	Once a week (5)	Several times per month (3)
	Two or three times a month (4)	
Less than once a month (2)	Once a month (3)	Several times per year or less (2)
	Less than once a month (2)	
Never (1)	Never (1)	Never (1)

Answer and value in parentheses

Table 3.12: Question on Media use

Media use: "about how often do you watch/read/listen...TV/newspapers/radio?

Eurobarometer (EB)	MOSAiCH
Everyday (5)	Everyday (5)
Several times a week (4)	3-4 day a week (4)
Once or twice a week (3)	1-2 days a week (3)
Less often (2)	Less than 1-2 days a week (2)
Never (1)	Never (1)
DK	DK

Answer and value in parentheses

coercive cultural environment stifling individuals initiative and cooperation (thus we expect a negative impact). Thus, taking this into account, we have rescaled the variable so that a higher value of *"obedience"* (which is considered as bad) means less people consider *"obedience"* as something should be taught, transforming in the new variable *"autonomy"*. Precisely, *"autonomy"*= 100 - the percentage of people mentioning *"obedience"* as something should be taught".

Islands and merges

Eurobarometer does not include any pieces of information about the french island of Corsica while we dropped the Spanish islands (Balearic and Canarias). Instead we have data about Sicily and Sardinia, the greatest Italian islands.

Table 3.13: Countries and regions involved

Country name	Number of regions	Type
Austria	9	NUTS 2
Belgium	11	NUTS 2
Czech Republic	8	NUTS 2
Denmark	5	NUTS 2
France	21	NUTS 2
Germany	16	NUTS 1
Hungary	7	NUTS 2
Italy	17	NUTS 2
Luxembourg	1	NUTS 2
Netherlands	12	NUTS 2
Poland	16	NUTS 2
Portugal	5	NUTS 2
Slovak Republic	4	NUTS 2
Slovenia	2	NUTS 2
Switzerland	7	NUTS 2
Total	156	NUTS 1/2

Table 3.14: Descriptive statistics of the dataset

	Min	1st Q	Median	Mean	3rd Q	Max	n. obs	range
Relational intensity	2.5	2.9	3.1	3.1	3.2	3.7	156	[1-4]
Voter turnout	45.5	62.6	71.3	70.3	78.7	94.2	156	[0 - 100]
Newspapers use	2.0	3.0	3.4	3.4	3.9	4.5	156	[1- 5]
TV use	3.7	4.3	4.4	4.4	4.6	4.9	156	[1- 5]
Radio use	1.8	3.2	3.6	3.5	3.9	4.5	156	[1- 5]
Respect	32.0	67.9	77.5	75.5	85.6	100	156	[0 - 100]
Control	44.4	62.0	65.8	65.7	69.2	84.0	156	[0 - 100]
G. trust	0.0	22.2	33.5	36.3	45.8	100	156	[0 - 100]
Autonomy	23.2	64.0	72.5	72.7	81.7	100	156	[0 - 100]

Table 3.15: Distribution of connections in the weighting matrix

n. neighbours	0	1	2	3	4	5	6	7	8	9	10	11	12
n. regions	2	9	7	16	28	41	25	15	8	2	1	1	1

Chapter 4

Social capital and growth: a *within* Europe perspective

As seen before, a wide range of studies emphasizes the role of social capital as driver of economic development. While many focus on cross-country variations, Tabellini (2010) proposes a within-country perspective, where historical institutions affect current culture (intended as civic, social and economic behaviour), instead of contemporary institutions, which in turn affect economic growth. However one of the instruments chosen by Tabellini is likely suffering from weak correlation with the (endogenous) measure of social capital. In this chapter, after a general discussion (section 4.1), we will formally test the strength of the chosen instrumental variables, trying to overcome the problem with the spatial lag of the existing instruments (section 4.2). Then, as suggested by LeSage and Fischer (2008) we will move to a spatial regression approach (see section 4.3).

4.1 The role of culture

Following the strain of literature that identifies two channels for social capital formation, namely *parents* or *direct socialization* (i.e. transmission of specific values and beliefs) and *socio-economic environment* or *indirect socialization*, Tabellini (2010) estimates the following equation:

$$Y = \alpha + \delta C + \beta Y_0 + \gamma X + e \tag{4.1}$$

where Y is average per capita GDP over the period 1995-2000, adjusted for purchasing power and expressed as percentage of the EU-15 average (variable *yp9500* in table 4.1); Y_0 is past economic development (approximated by urbanization rate at 1850, variable *urb_180*) while X are controls such as the gross enrolment rate in primary and secondary school in 1960[1] (variable *school*) and country dummies (proxy of current political institutions), which should proxy current social interactions.

As for C, culture, following Banfield (1958), Tabellini (2010) extracts the principal components (PC) of four variables from two waves of the European Value Study - EVS (1990 and 1999): generalized trust, respect for others, control over life and obedience. In this context, culture is a proxy of social capital. The first PC is named *pc_culture*; the PC from the three *"positive values"* (g. trust, respect and control) is *pc_culture_pos* and the first PC regarding values to be taught to children (respect and obedience), *pc_children*. To the extent social capital is a multidimensional concept (see section 1.1.2) and following *Solow's critique* we propose two additional measures of social capital, *pc1* and *pc1_val* which are the results of the analysis reported in chapter 3[2] and an update of *pc_culture* respectively. Overall, the dataset encompasses 8 western European countries (France, West Germany, the UK, Italy, the Netherlands, Belgium, Spain and Portugal) and 69 regions.

In table 4.2 we report the results from the OLS estimation, with robust standard errors in square brackets since the Breusch-Pagan tests reject the null of homoskedasticity for all specifications. In columns 1 to 3 we have results very similar to those found by Tabellini (2010), even if in our sample 6 regions (out of 69) are dropped[3] (the islands - see figure 4.2). All the measures of social capital are positive and statistically significant at 5 percent and results are also sizable: one standard deviation in the first measure of social capital (*pc_culture*) results in an increase of 17.5 points of per capita GDP (expressed with respect to the EU-15 average), and similarly for *pc_culture_pos*

[1] Including a measure of education reduces the risk that social capital might become a proxy of human capital - see section 1.2.3

[2] Variable *pc1* is the first PC from variables obedience, control, respect and generalized trust of the latest (2008) wave of the EVS, plus the share of blood donations, people using TV/Radio or newspapers as source of info and voter turnout around 2008. Variable *pc1_val* is the first PC for the aforementioned values and beliefs from the latest (2008) EVS (see Appendix of chapter 3 for further details)

[3] To the extent we want to use our new measures of social capital, *pc1* and *pc1_val*, as there is no available data for Madeira, the Azores, Baleares or Canarias isles, we had to drop these observations. Moreover, as we want to perform a spatial analysis in the following, we drop also Sicily and Sardinia, in order to keep only contiguous regions.

Table 4.1: Descriptives statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Dep. Variable (Y)					
yp9500	63	97.33	30.46	50.17	215.33
Covariates (X,Y_0)					
school	63	73.52	11.55	51.55	95.48
urb_rate1850	63	11.66	13.64	0	57.43
Measures of social capital (C)					
pc_culture	63	-1.09	30.12	-56.69	57.22
pc_children	63	-0.49	23.90	-57.62	58.28
pc_culture_pos	63	-2.25	25.00	-49.99	39.47
pc1	63	0	1.54	-3.50	3.35
pc1_val	63	0	1.21	-2.30	4.51
Instrumental variables (Z)					
pc_institutions	63	0.06	2.00	-2.09	3.58
literacy	63	55.98	25.52	14.6	96.5

and *pc_children*. In columns 4 and 5 instead we have the two new measures; in the case of *pc1* we have a positive and significant coefficient with an order of magnitude greater than the previous measures. Using instead the same variables as in *pc_culture* but from the latest wave of the EVS (2008), our *pc1_val* measure, we have a coefficient which is almost twentyfold. Of course, in the latter cases, the greater magnitude is explained by looking at the descriptives of table 4.1. Indeed, an increase of one standard deviation of *pc1* or *pc1_val*, results in an increase of almost 15 points of per capita GDP (again, with respect to the EU-15 average).

Table 4.2: OLS estimates [with robust s.e.]

VARIABLES	yp9500				
school	0.54	0.79	0.62	0.32	0.50
	(0.53)	(0.52)	(0.54)	(0.58)	(0.55)
	[0.31]*	[0.30]**	[0.37]*	[0.37]	[0.38]
urb_rate1850	0.63	0.70	0.63	0.65	0.51
	(0.21)***	(0.21)***	(0.22)***	(0.23)***	(0.23)**
	[0.18]***	[0.17]***	[0.17]***	[0.21]***	[0.21]**
pc_culture	0.58				
	(0.15)***				
	[0.13]***				
pc_culture_pos		0.71			
		(0.18)***			
		[0.17]***			
pc_children			0.61		
			(0.18)***		
			[0.20]***		
pc1				9.70	
				(3.43)***	
				[3.40]***	
pc1_val					11.9
					(3.66)***
					[3.76]***
Observations	63	63	63	63	63
R-squared	0.62	0.62	0.60	0.57	0.59
Breusch-Pagan chi2	0.00	0.00	0.01	0.00	0.00
Jarque-Bera chi2	0.00	0.00	0.00	0.00	0.00

[Robust] Standard errors in parentheses. *** p<0.01, ** p<0.05,* p<0.1.
Breusch-Pagan tests the null of homoskedasticity. Jarque-Bera tests normality
Country dummies are included.

4.2 Addressing endogeneity

Results in table 4.2 suggest a significant role for social capital in explaining different economic performances at regional level. However results are likely biased by the endogeneity of culture (see section 1.2.1). It follows the need to modify the identification strategy, on the grounds that culture is determined by contemporaneous social interactions and inherited cultural traditions. Tabellini (2010) postulates the following model for social capital accumulation:

$$C = a + dC_0 + bY_0 + cX + u \tag{4.2}$$

where C_0 is (unobserved) culture of ancestors, while X is a proxy of contemporary interactions. As C_0 cannot be estimated, iterating the argument it is possible to obtain a stochastic process for current culture:

$$C = \lambda_1 + \lambda_2 X_0 + \lambda_3 Y_0 + \lambda_4 X + v \tag{4.3}$$

where X_0 is the historical counterpart of X i.e. the literacy rate in 1880 (variable *literacy*) and political institutions in the past (*pc_ institutions*[4]), measured by constraints on the executive in the countries between 1600-1885. These variables have been chosen by Tabellini as instrumental variables for C in eq.4.1, under a rather strong exclusion restriction, i.e. that past social interactions, summarized by X_0, do not affect current ones, although this is mildly mitigated by controls for education and past economic development/urbanization rate.

In addressing the endogeneity problem we should pay attention to the two fundamental requirements of instrumental variables techniques:

1. exclusion restrictions hold (i.e. instruments are exogenous);

2. the instruments are strongly correlated with the endogenous variable;

As a first step, we substite C with the instruments into eq.4.1, a way to test the exclusion restriction, the so called *reduced form*. Indeed, the instruments should affect Y only *via* the endogenous variable, not directly. This is performed, either in the case of homoskedastic or non-spherical

[4]The variable is computed by Tabellini as the principal component of five measures of constraints on the executive at five points in time (1600, 1700, 1750, 1800 and 1850), using the POLITY IV database and the work by Acemoglu and Robinson (2012).

Table 4.3: Reduced form and first stage regression estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Reduced form			*First-stage*				
VARIABLES	*yp9500*			pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
school	0.76	0.60	0.56	0.31	-0.14	0.24	0.05**	0.02
	(0.56)	(0.53)	(0.52)	(0.39)	(0.31)	(0.37)	(0.02)	(0.02)
urb_rate1850	0.65***	0.57**	0.51**	0.04	-0.12	0.08	0.01	0.01*
	(0.23)	(0.22)	(0.22)	(0.16)	(0.13)	(0.16)	(0.01)	(0.01)
pc_institutions	9.93**		6.73*	10.2***	10.4***	8.08***	0.038	0.48***
	(3.99)		(3.80)	(2.87)	(2.24)	(2.74)	(0.15)	(0.13)
literacy		0.94***	0.82***	0.51**	0.43***	0.28	0.03***	0.01
		(0.25)	(0.25)	(0.19)	(0.15)	(0.18)	(0.01)	(0.01)
Constant	30.5	-17.6	-1.61	-89.3**	-32.6	-52.4	-6.49***	-2.94*
	(50.4)	(47.6)	(47.5)	(35.8)	(28.0)	(34.2)	(1.89)	(1.64)
Observations	63	63	63	63	63	63	63	63
R-squared	0.56	0.61	0.63	0.79	0.81	0.69	0.77	0.73
F	6.64	8.21	8.06	17.2	20.1	10.5	15.9	12.3

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country dummies included.

Table 4.4: Reduced form and first stage regression estimates (robust s.e.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Reduced form			*First-stage*				
VARIABLES		*yp9500*		pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
school	0.76*	0.60*	0.56	0.31	-0.14	0.24	0.048**	0.023
	(0.40)	(0.35)	(0.35)	(0.32)	(0.24)	(0.27)	(0.02)	(0.02)
urb_rate1850	0.65***	0.57**	0.51**	0.04	-0.12	0.08	0.01	0.01
	(0.19)	(0.26)	(0.23)	(0.16)	(0.13)	(0.13)	(0.01)	(0.01)
pc_institutions	9.93**		6.73	10.2***	10.4***	8.08***	0.04	0.48***
	(4.35)		(4.45)	(3.12)	(2.68)	(2.47)	(0.13)	(0.17)
literacy		0.94***	0.82***	0.51***	0.43***	0.28	0.03***	0.01
		(0.24)	(0.24)	(0.16)	(0.10)	(0.17)	(0.01)	(0.01)
Constant	30.5	-17.6	-1.61	-89.3***	-32.6	-52.4**	-6.49***	-2.94*
	(34.4)	(31.6)	(30.7)	(29.8)	(21.3)	(25.9)	(2.21)	(1.54)
Observations	63	63	63	63	63	63	63	63
R-squared	0.56	0.61	0.63	0.79	0.81	0.69	0.77	0.73
F	35.7	31.1	27.7	25.2	28.4	25.4	35.6	24.0

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country dummies included.

errors, in the *reduced forms* (see tables 4.3 and 4.4), at first each by itself (columns 1 and 2), then together (column 3). Apart from variable *school*, results are similar to those in Tabellini (2010); as we can see, each instrumental variable taken alone has explanatory power over the dependent variable. However, taken together, only *literacy* remains significant, while *pc_ institutions* is at best weakly significant (consistently with Tabellini). This evidence from the reduced form rules against *literacy* as instrumental variable. Columns 4-8 report the result of the *first stage regressions* where it can be observed that both instruments have jointly predictive power with respect to *pc_ culture* and *pc_ culture_ pos* while *urb_ rate1850* and *school* are not significant with any proposed measure of social capital (except *pc1* for *school*). This is good as it sustains the identification strategy (i.e. culture is explained by specific channels, X_0). It should be noted that in the case of *pc_ children* and *pc1_ val* the instrument *literacy* is not significant (*pc_ institutions* in the case of *pc1*). In the next section we will deal with instrumental variable estimation but first, we introduce some theoretical considerations on weak instruments.

4.2.1 A weak instruments problem?

Let's consider the following regression equation

$$Y = X\beta + \Gamma \tag{4.4}$$

where Y and X are T x 1 vectors of observations of the dependent and independent variables, β is the coefficient of the regressor and Γ is a T x 1 vector of i.i.d. errors. If X is an endogenous regressor, the *reduced form* equation for X is

$$X = Z\Pi + V \tag{4.5}$$

where Z is a T x K_2, with $K_2 \geq 1$, matrix of the exogenous instrumental variables (IVs), Π is a K_2 x 1 vector of coefficients and V is a T x 1 vector of i.i.d. $N(0, \sigma_v)$ errors.

If the correlation of the instruments with the endogenous variable is weak, the IV estimator is biased in the direction of the ordinary least squares (OLS) estimator and its distribution is non-normal (Bun and de Haan , 2010). Moreover, as pointed out by John Bound and Baker (1995) in an experiment with more than 329.000 observations, weak instruments is not just a small-sample problem. Unfortunately there is still no consensus on a formal test for the strength of the IVs but

only rules of thumb such as that proposed by Staiger and Stock (1997), i.e. to consider with caution IVs whose first-stage F statistic is below 10. A promising novelty is represented by Stock and Yogo (2002) test based on the Cragg and Donald (1993) statistic, g_{min}, the minimum eigenvalue of matrix G_T defined as

$$G_T = \hat{\Sigma}_{VV}^{-1/2'} Y' P_z Y' \hat{\Sigma}_{VV}^{-1/2} / K_2 \tag{4.6}$$

with $\hat{\Sigma}_{VV}^{-1/2} = \frac{Y^{'} M_Z Y}{T-K_1-K_2}, P_z = Z(Z'Z)^{-1}Z' and M_Z = (I - P_z)$. G_T is the concentration parameter/matrix, i.e. the matrix analogue of the F-statistic from the first-stage regression of Two stage least squares (2SLS). To the extent that the approximate bias of IV estimator depends on the concentration parameter and the number of instruments (Bun and de Haan , 2010), G_T can be used to test the strength of IVs. Originally g_{min} was designed to test the null of under identification, which happens when G_T is singular. Instead, Stock and Yogo (2002) use it to test whether G_T is non-singular but still sufficiently small such that IVs are *"weak"*.

In particular, we have weak instruments if at least one of the following is verified:

1. the relative bias of the IV estimator with respect to OLS, exceeds a certain threshold b (usually 10 percent);

2. the actual size of the conventional α-level Wald test based on IV statistics exceeds a certain threshold r (usually 10 percent with a 5 percent power).

The disadvantage of the test based on relative bias is the requirement of at least 3 instruments, which excludes the application in our case. Stock and Yogo (2002) provide critical values for *k-class estimators* such as IV, LIML and Fuller's modified LIML estimator, under the assumption of homoskedasticity. Kleibergen and Paap (2006) provide a robust version of the Cragg-Donald, namely the *Kleibergen-Paap* rk statistic which can be used with the tabulated critical values (under homoskedasticity) with a considerable degree of caution, as suggested by Drukker et al. (2011). To the extent that there are no specific values for GMM (either under the two step estimator form - GMM TSE - or as continuous updating estimator - GMM CUE), following Baum et al. (2007) we know that:

1. under the null of homoskedasticity, we can use the critical values of IV and LIML, as they can be considered specific cases of, respectively, GMM-TSE and GMM-CUE;

Table 4.5: Critical values for weak instruments

	Threshold value, r			
	10%	15%	20%	25%
IV (also GMM-TSE)	19.93	11.59	8.75	7.25
LIML (also GMM-CUE)	8.68	5.33	4.42	3.92

1 endogenous regressors (n) and two instrumental variables (K_2)

2. LIML and GMM-CUE are more robust estimators in case of weak instruments (Hahn et al., 2004).

In the specific case of interest (one endogenous variable and two instruments), the specific critical values for the IV/GMM-TSE and LIML/GMM-CUE case are available in table 4.5. As we can see, with a maximum rate of rejection of 10 percent of the Wald test (i.e. the greatest rate of rejection we want to tolerate) the critical values of the Cragg-Donald statistic ranges between 8.68 (under LIML/GMM-CUE) and 19.93 (under IV/TSLS/GMM-TSE).

4.2.2 Instrumental variable estimates

Table 4.6 reports the results from 2SLS estimation. As for the exogeneity of the IVs we can notice that only the last specification (column 5 - variable *pc1_ val)* rejects the null of exogeneity of instruments at the 5 percent level (so called *Sargan-Hansen* test). As for the strength of the instruments, the F statistic are all above 10. However, the Cragg-Donald statistic suggests the weakness of all specifications, with the (feeble) exception of the second (*pc_ culture_ pos*), whose coefficient has increased by almost 50 percent with respect to the OLS specification. A Pagan-Hall[5] test rejects at the 10 percent the null of homoskedasticity, thus we perform the same analysis using robust standard errors. Results are available in the same table in square brackets. Similarly, the last specification, which uses as measure of social capital *pc1_ val*, rejects the null of exogeneity of the instruments at 5 percent. Again, first stage F statistic is above 10 but, according to the the robust version

[5]In the case of heteroskedasticity, standard Breusch-Pagan or Cook-Weisberg tests are generally not usable in an IV setting, thus the Pagan-Hall test.

of the Cragg-Donald statistic, the *Kleibergen-Paap* rk, only *pc_ culture_ pos* seems to have strong instruments. As a final remark, in the fourth specification the coefficient of the first-stage F (and its robust counterpart) is high although both the Cragg-Donald and the Kleibergen-Paap statistics are not. This remarks the importance of not relying only on first stage F statistic as a way to test weak instruments. Endogenous variable *pc1_ val)* rejects the null of exogeneity of instruments at the 5 percent level (so called *Sargan-Hansen* test). As for the strength of the instruments, the F statistic are all above the value indicated as rule of thumb (10). However, the Cragg-Donald statistics suggest the weakness of all specifications, with the exception of the second (*pc_ culture_ pos* as proxy of social capital), whose coefficient has increased by almost 50 percent with respect to the OLS specification. A Pagan-Hall[6] test rejects at the 10 percent the null of homoskedasticity, thus we perform the same analysis using robust standard errors, whose results are available in the same table in square brackets. Similarly, the last specification, which uses as measure of social capital *pc1_ val* rejects the null of exogeneity of the instruments at 5 percent. Again, first stage F statistic are above 10 but, according to the the robust version of the Cragg-Donald statistic, the *Kleibergen-Paap* rk, only *pc_ culture_ pos* seems to have strong instruments. As a final remark, in the fourth specification the coefficient of the first-stage F is high although both the Cragg-Donald and the Kleibergen-Paap statistics are not. As previously stated, under homoskedasticity, 2SLS and limited information maximum likelihood estimation (LIML) estimators are special cases of the Generalized method of moments (GMM) and, particularly, of GMM-TSE and GMM-CUE, respectively. However, under heteroskedasticity this no longer holds while Hahn et al. (2004) suggest that LIML and GMM-CUE perform better than 2SLS or GMM-TSE in presence of weak instruments. In table 4.7 we report the results from the estimation of GMM-TSE and GMM-CUE under heteroskedasticity. We know that Hansen J, test for the exogeneity of the instruments, is consistent under heteroskedasticity and it follows that apart from the 9-th specification (*pc1_ val* under GMM-TSE), all the others do not reject the null of exogeneity of the instruments at 5 percent. As for the strength of the instruments, remembering that the critical values for GMM-CUE are different (and lower - see table 4.5), results point to the specification with *pc_ culture* (only GMM-CUE) and *pc_ culture_ pos* (both GMM-TSE and GMM-CUE), with GMM-CUE preferred because of its robustness to weak IV. With respect to the first OLS specification (see table 4.2) the coefficient of *pc_ culture* is almost twofold while

[6]In the case of heteroskedasticity, standard Breusch-Pagan or Cook-Weisberg tests are generally not usable in an IV setting, thus the Pagan-Hall test.

pc_ culture_ pos is now 60 percent larger (considering the estimation with GMM-CUE).

4.3 A spatial approach

To the extent social interactions type and strength matter in order to share values, social capital is clearly related to space, requiring specific estimation procedures. Anselin and Arribas-Bel (2011) indeed point out that the use of spatial fixed effects could lead to spurious results, while spatial heterogeneity should be properly treated. LeSage and Fischer (2008), building on previous work by LeSage and Pace (2008), prove that under two conditions, a linear regression relationship can lead to a Spatial Durbin Model (SDM), a spatial autoregressive model (SAR) or a spatial error model (SEM - see section 2.2.3). The circumstances that have to be verified are: 1) the existence of an omitted explanatory variable; 2) spatially correlated OLS residuals. The analysis in the previous section rules in favour of the first requirement. As for the second, remembering that rejection of the null of Global Moran's I suggests the existence of spatial autocorrelation in the residuals (thus the model is misspecified), additional tests, namely *LM Lag* and *LM Error* (and their robust counterparts), help understanding what type of spatial model should be used. Indeed, once determined spatial correlation in the residuals, in case of rejection of the null of *LM Lag* and *LM Lag robust*, a SAR model is suggested while in case of rejection of *LM Error* and *LM Error robust*, a SEM seems more appropriate. In table 4.8 we report the results from the five spatial tests on the residuals of the OLS regressions of table 4.2, assuming a first order queen contiguity weighting matrix, W[7]. Let's define the *spatial lag* of variable X as W^qX with $q = 1, 2, ..n$ (usually bounded at $q = 2$), with $WX = \sum_{j=1}^{n} w_{ij}x_j$ for $i \neq j$. Imposing row normalization of matrix W, values of WX for a specific region i represents the average of the neighbouring regions. Results indicate that only the specification with *pc_ culture* and *pc_ children* reject the null of no spatial autocorrelation of the residuals and both seems to go in the direction of a SEM model. It follows that both conditions suggested by LeSage and Pace (2008) hold for these variables, thus, justifying recourse to a spatial

[7]According to first order queen contiguity criterion, two regions are neighbours if they share either a vertex or a border. With 63 regions (and no islands) we have 254 links with an average of 4 links per region, a minimum of 1 link and a maximum of 10 links.

Table 4.6: Two stage least square (2SLS) estimation [with robust s.e.]

	(1)	(2)	(3)	(4)	(5)
VARIABLES			yp9500		
school	0.28	0.76	0.30	-0.90	0.14
	(0.53)	(0.48)	(0.59)	(0.87)	(0.58)
	[0.31]	[0.27]	[0.38]***	[0.66]	[0.38]
urb_rate1850	0.52	0.67	0.44	0.40	0.25
	(0.21)**	(0.20)***	(0.25)*	(0.29)	(0.27)
	[0.19]***	[0.16]***	[0.20]**	[0.25]	[0.31]
pc_culture	1.02				
	(0.26)***				
	[0.27]***				
pc_culture_pos		1.04			
		(0.25)***			
		[0.30]***			
pc_children			1.38		
			(0.40)***		
			[0.43]***		
pc1				30.6	
				(9.91)***	
				[9.34]***	
pc1_val					23.5
					(7.16)***
					[10.7]**
Observations	63	63	63	63	63
Sargan's stat. p-value	0.17	0.08	0.09	0.25	0.02
Hansen J stat. p-value	0.20	0.10	0.10	0.13	0.03
F	17.2	20.1	10.5	15.9	12.3
F [robust s.e.]	25.2	28.4	25.4	35.6	24.0
Cragg-Donald stat.	13.3	19.9	7.24	5.21	8.84
Kleibergen-Paap rk	12.1	22.9	5.48	7.21	8.32

[Robust] Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Sargan (Hansen J) tests the null of exogeneity. Cragg-Donald (Kleibergen-Paap) tests the presence of weak iv with critical values by Stock and Yogo (2002)

Country dummies included.

Table 4.7: Generalized method of moments (GMM) estimation (with robust standard errors)

	(1) TSE	(2) CUE	(3) TSE	(4) CUE	(5) TSE	(6) CUE	(7) TSE	(8) CUE	(9) TSE	(10) CUE
VARIABLES						yp9500				
school	0.29	0.25	0.82***	0.82**	0.35	0.41	-1.17*	-1.31*	0.11	-0.20
	(0.31)	(0.34)	(0.27)	(0.40)	(0.38)	(0.34)	(0.64)	(0.78)	(0.38)	(0.75)
urb_rate1850	0.54***	0.52**	0.71***	0.65***	0.54***	0.56***	0.31	0.29	0.24	-0.11
	(0.19)	(0.21)	(0.15)	(0.18)	(0.19)	(0.18)	(0.25)	(0.30)	(0.31)	(0.68)
pc_culture	1.02***	1.14***								
	(0.27)	(0.31)								
pc_culture_pos			1.09***	1.64***						
			(0.30)	(0.43)						
pc_children					1.21***	1.17***				
					(0.42)	(0.38)				
pc1							38.3***	40.8***		
							(7.86)	(8.62)		
pc1_val									26.2**	58.7**
									(10.6)	(23.7)
Constant	77.4***	84.2***	38.7**	55.7*	67.1**	62.4**	208***	221***	80.5***	136**
	(25.2)	(28.4)	(18.1)	(28.7)	(29.7)	(26.0)	(51.4)	(59.4)	(30.1)	(57.2)
Observations	63	63	63	63	63	63	63	63	63	63
F	25.2	25.2	28.4	28.4	25.4	25.4	35.6	35.6	24.0	24.0
Hansen J p-value	0.20	0.23	0.10	0.18	0.10	0.14	0.13	0.23	0.03	0.17
Kleibergen-Paap rk	12.1	12.1	22.9	22.9	5.48	5.48	7.21	7.21	8.32	8.32

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Hansen J tests the null of exogeneity. Kleibergen-Paap tests the presence of weak iv with critical values by Stock and Yogo (2002) (For 10 percent max size= 19.93 (GMM-TSE) or 8.68 (GMM-CUE))

regression framework. Indeed, attempts to use directly the spatial lags of the proposed instrumental variables, *literacy* or *pc_ institutions*, did not produce satisfactory results in terms of strength of the instruments (see table 4.9), so in the following, considering also the results of the spatial tests and following LeSage and Fischer (2008), we will estimate a *Spatial autoregressive model with spatial autoregressive disturbances* - SARAR), a SEM and a Spatial Durbin Model.

Following Kelejian and Prucha (1998) and Postiglione and Piras (2012) a *spatial-autoregressive model with spatial autoregressive disturbances* (SARAR), is defined as:

$$y_i = \lambda \sum_{j=1}^{n} w_{ij} y_j + \sum_{p=1}^{k} x_{ip} \beta_p + u_i \tag{4.7}$$

$$u_i = \rho \sum_{j=1}^{n} m_{ij} u_j + \epsilon_i \tag{4.8}$$

which could be written in vector form as

$$y = \lambda W y + X\beta + u \tag{4.9}$$

$$u = \rho M u + \epsilon \tag{4.10}$$

where y is a n x 1 vector of observation, W and M are n x n spatial weighting matrices, X is a n x k matrix of k exogenous regressors. Overall, the model has 4 parameters, $\theta = \left[\lambda, \rho, \beta, \sigma^2\right]$ and SAR and SEM are just particular cases of SARAR (respectively, when $\rho = 0$ or $\lambda = 0$). The innovation term, ϵ, is usually assumed to be normally distributed with a general covariance matrix Ω, $\epsilon \sim N(0, \Omega)$, which could allow for heteroskedasticity. We assume the simplest case, homoskedasticity, i.e. $\epsilon \sim N(0, \sigma^2)$, with the same weighting matrix, W, in both eq. 4.7 and 4.8. In what follows, we will estimate first a SARAR(1,1), then a SEM, using a Generalized Spatial Two Stage Least Square (GS2SLS)[8].

[8]GS2SLS is a four-steps procedure: in the first step it runs 2SLS to estimate $\tilde{\delta}$, where $\delta = [\lambda, \beta']'$. Then GMM to estimate $\tilde{\rho}$. In the third and fourth steps these estimates are reused to obtain efficient estimates. As instruments, GS2SLS uses the linearly independent columns of (X_f, WX_f, W^2X_f) for SARAR, (X_f, WX_f) for SEM, where X_f is the matrix of all the excluded exogenous variables. In what follows we will call these linearly independent columns the *"standard instruments"* of any GS2SLS regression. For further information on GS2SLS we refer to Drukker et al. (2011).

Finally, to the extent that our measure of social capital is endogenous, we will add as instruments the previously discussed *literacy* and *pc_ institutions* to matrix X_f[9] for the SARAR(1,1) and SEM specification. We will also estimate a Spatial Durbin Model defined as:

$$y = \alpha + X\beta + \lambda W_1 y + \delta W_2 X + u \tag{4.11}$$

Unfortunately the interpretation of the results of spatial models is not clear cut, as a change in a single explanatory variable in region i has a direct impact on region i but also an indirect impact on other regions. LeSage and Pace (2009) suggest the computation of the Average total direct impact (ATDI) and the average total impact (ATI). ATDI is the average effect of 1 unit change of variable x_{ik} in region i (applied sequentially to each region). The ATI instead is the impact of a simultaneous change in all regions of 1 unit in the variable of interest. Results from the SARAR model (see table 4.10), using a GS2SLS estimator with *standard instruments*, indicate in all cases significant spatial lags of the dependent variable and the error term, with all the measures of social capital significant, although the coefficients are now smaller compared to OLS. The ATDI and ATI, expressed in percentage points of average GDP, are positive (i.e. 1 unit increase in social capital results in a positive increase in average GDP) and not negligible (1 unit increase in *pc_ culture* results in an increase of 1.3 percentage points, with respect to the average of GDP[10]). As for the SEM (table 4.11), we can observe an increase in the precision of the estimates with respect to OLS, but the coefficient of the spatial lag of the error term is significant only in the second specification, with *pc_ culture_ pos*, while, following the results in table 4.8 we were expecting the first and third specification to be significant.

These first results suggest a scope for a spatial regression approach. However, even in this case the results may be biased by the potential endogeneity of our measures of social capital. We add two groups of instrumental variables to the GS2SLS estimator: the first group includes the same instruments proposed by Tabellini (2010), i.e. *literacy* and *pc_ institutions*; in the second group we add these variables and their spatial lags, $W^q X$, with $q = 1, 2$ depending on the specification ($q = 2$ for the SARAR(1,1), $q = 1$ for the SEM). We want to investigate whether the inclusion of

[9] See previous note

[10] Results for *pc1* are likely a computational error since the values of ρ and λ should be bounded between -1 and 1. As these routines are still under development, it seems plausible.

these instruments might reduce the endogeneity problem. We present results in table 4.12, 4.13 and 4.14. Results for the SARAR(1,1) estimation (table 4.12) report positive and significant coefficients of social capital, albeit smaller than in the OLS specification. We have evidence of significant spatial autocorrelation of both the dependent variable and the error term, with the exception of *pc_culture_pos*. As for the strength of the instruments, unfortunately the routines implementing GS2SLS are are still under development and miss some important features such as the first-stage F statistic (which we had to compute manually), let alone the Cragg-Donald or the Kleibergen-Paap statistics. To the extent we want to test the strength of our instruments, we have to rely only the first-stage F statistic. As before (see tables 4.6 and 4.7) it seems that only the specification with *pc_culture_pos* as proxy of social capital has *"good"* properties in terms of strength of the instruments, as we have first-stage F close to 10 with both groups of instruments, slightly larger including the spatial lags of the original IVs. ATDI and ATI are similar, albeit smaller, compared to previous estimation, with the exception of the two new measures of social capital, *pc1* and *pc1_val*. As for the SEM (table 4.13), the coefficients of the spatial lag of the error term are significant only in the case of *pc_culture_pos* which is also the only one with first stage F statistic above 10. Overall, results point towards the specification with *pc_culture_pos* with a spatial lag of the error term. ATI and ATDI (table 4.14) again are positive and sizable. Finally, table 4.15 reports on the Spatial Durbin model, suggesting all the measures of social capital are positive and significant, although only the specification with *pc_children* and *pc1* have significant spatial lags.

4.4 Wrap up of the chapter

In this chapter we replicate Tabellini (2010) work on social capital and growth of european regions whose logic is that historical institutions affect nowadays culture (intended as civic, social and economic behaviour), instead of contemporary institutions, which in turn has effect on economic growth. We followed the estimation strategy described in figure 4.1, at first estimating eq. 4.1 *via* OLS, introducing two new measures of social capital. Then resorting to instrumental variable estimation. Results are consistent with Tabellini (2010). However, following Stock and Yogo (2002),

Table 4.8: Spatial tests: p-values

Test/OLS Specification	*pc_culture*	*pc_culture_pos*	*pc_children*	*pc1*	*pc1_val*
Moran's I	0.06	0.53	0.05	0.60	0.97
LM Error	0.23	0.93	0.19	0.98	0.67
LM Lag	0.87	0.84	0.90	0.98	0.76
LM Error *robust*	0.12	0.74	0.05	0.99	0.76
LM Lag *robust*	0.32	0.71	0.13	0.99	0.99

Moran's I null: no spatial autocorrelation. LM Error/Lag null: OLS specification

Table 4.9: Two stage least square (2SLS) estimation [with robust s.e.] with new instruments

	(1)	(2)	(3)	(4)	(5)
VARIABLES			yp9500		
school	0.26	0.75	0.37	-0.87	0.12
	(0.53)	(0.49)	(0.55)	(0.81)	(0.58)
	[0.32]	[0.28]	[0.35]	[0.63]	[0.38]
urb_rate1850	0.52**	0.66***	0.49**	0.40	0.23
	(0.22)	(0.20)	(0.23)	(0.28)	(0.27)
	[0.19]	[0.16]	[0.18]	[0.25]	[0.31]
pc_culture	1.05				
	(0.24)***				
	[0.24]***				
pc_culture_pos		1.13***			
		(0.25)			
		[0.30]			
pc_children			1.20***		
			(0.32)		
			[0.28]		
pc1				30.1***	
				(8.44)	
					[9.63]
pc1_val					24.3***
					(6.79)
Observations	63	63	63	63	63
Sargan's stat. p-value	0.22	0.18	0.066	0.61	0.06
Hansen J stat. p-value	0.56	0.49	0.44	0.35	0.05
Cragg-Donald stat.	4.89	7.10	3.42	2.32	3.24
Kleibergen-Paap rk	4.89	7.69	3.65	3.79	3.24

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Sargan [Hansen J] tests the null of exogeneity. Cragg-Donald [Kleibergen-Paap] tests the presence of weak iv. List of instruments: $literacy$, $pc\_institutions$, $W * literacy\_spl$, $W^2 * literacy\_spl2$, $W * pc\_institutions$, $W^2 * pc\_institutions$

we identified a likely problem of weak instruments, with the exception of the specification with *pc_ culture_ pos* as measure of social capital. Introducing a concept of neighbourhood based on first order queen contiguity, summarized by matrix W, we computed the spatial lags of the instruments previously used. However, attempts to resolve the weak instruments problem by using the spatial lags as additional instruments were unsatisfactory. All in all, jointly with spatial autocorrelation of the residuals, we were induced to consider a spatial regression framework, as suggested by LeSage and Fischer (2008). Results from SARAR(1,1), SEM and Spatial Durbin model, point to a spatial specification of eq. 4.1 although results are mixed. In SARAR(1,1) and SEM estimations considering the endogeneity of social capital, preliminary results (as the computational routines are still under development) point towards the specification based on *pc_ culture_ pos* with a spatial lag of the error term. Eventually, we are able to extend the work of Tabellini in a number of directions:

1. use of new measures of social capital;
2. focus on the problem of weak instruments;
3. use of a spatial regression framework;
4. use of a spatial regression considering an endogenous regressor.

Results from tests and regressions suggest that spatial regression models are necessary and can help improving the estimation. However, further research may be necessary in order to identify the exact spatial specification. However, the significative effect of contiguity is suggestive of the need to adopt policies favouring the adoption of specific institutions creating the required values and beliefs necessary to growth. Indeed, to the extent that social capital is spatially sticky, as we have seen, EU Cohesion policy could consider targeted programs for clusters of regions instead of each region *per se*. Given the size of the allocated resources (366.8 EUR billions for the period 2014-20), small amounts could be diverted to specific inter-regional programs fostering social capital, studying the effects in the successive EU policy cycles.

Table 4.10: SARAR(1,1) regression

VARIABLES	yp9500				
school	0.36	0.58*	0.4	-0.08	0.29
	(0.35)	(0.35)	(0.36)	(0.39)	(0.33)
urb_rate1850	0.78***	0.81***	0.77***	0.81***	0.65***
	(0.18)	(0.17)	(0.18)	(0.17)	(0.18)
pc_culture	0.32**				
	(0.14)				
pc_culture_pos		0.49***			
		(0.17)			
pc_children			0.33*		
			(0.17)		
pc1				5.32**	
				(2.54)	
pc1_val					9.30***
					(3.27)
λ	0.74***	0.60***	0.82***	1.08***	0.82***
	(0.21)	(0.22)	(0.19)	(0.15)	(0.16)
ρ	-0.87***	-0.87***	-0.84***	-1.02***	-0.92***
	(0.25)	(0.24)	(0.25)	(0.19)	(0.21)
Observations	63	63	63	63	63

GS2SLS estimator with *standard instruments*. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Average direct and total impact (ATDI/ATI)

	pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
ATDI	0.41	0.55	0.46	2.01	12.96
ATI	1.25	1.22	1.82	-70.43	51.27
	as percentage of average GDP				
ATDI	0.4	0.6	0.5	2.1	13.3
ATI	1.3	1.3	1.9	-72.4	52.7

As a remainder: average GDP growth between 1995-2000: 97.3

Table 4.11: Spatial error model (SEM)

VARIABLES	yp9500				
school	0.64	0.92**	0.69	0.33	0.6
	(0.45)	(0.4)	(0.48)	(0.53)	(0.47)
urb_rate1850	0.66***	0.75***	0.63***	0.66***	0.51**
	(0.2)	(0.19)	(0.2)	(0.21)	(0.22)
pc_culture	0.61***				
	(0.13)				
pc_culture_pos		0.79***			
		(0.13)			
pc_children			0.62***		
			(0.16)		
pc1				9.83***	
				(3.1)	
pc1_val					13.0***
					(3.34)
ρ	-0.29	-0.48**	-0.12	-0.074	-0.23
	(0.25)	(0.23)	(0.23)	(0.18)	(0.23)
Observations	63	63	63	63	63

GS2SLS estimator with *standard instruments*. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4.12: SARAR(1,1) with additional instruments

	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
VARIABLES						yp9500				
school	0.38	0.35	0.63*	0.64*	0.45	0.42	0.07	0.017	0.26	0.09
	(0.38)	(0.39)	(0.36)	(0.37)	(0.41)	(0.38)	(0.45)	(0.42)	(0.35)	(0.38)
urb_rate1850	0.74***	0.72***	0.79***	0.78***	0.71***	0.74***	0.82***	0.81***	0.57***	0.60***
	(0.19)	(0.19)	(0.18)	(0.18)	(0.2)	(0.19)	(0.17)	(0.18)	(0.2)	(0.21)
pc_culture	0.46**	0.54***								
	(0.2)	(0.18)								
pc_culture_pos			0.63***	0.70***						
			(0.24)	(0.21)						
pc_children					0.55**	0.44*				
					(0.27)	(0.24)				
pc1							5.47*	6.28**		
							(3.32)	(2.79)		
pc1_val									13.0**	11.1*
									(5.14)	(6.08)
λ	0.53**	0.47**	0.45*	0.39	0.55**	0.69***	0.88***	0.85***	0.68***	0.97***
	(0.25)	(0.23)	(0.26)	(0.24)	(0.25)	(0.22)	(0.15)	(0.14)	(0.2)	(0.26)
ρ	-0.73**	-0.70**	-0.80***	-0.77***	-0.63**	-0.74***	-0.90***	-0.88***	-0.87***	-0.91***
	(0.29)	(0.3)	(0.26)	(0.26)	(0.3)	(0.28)	(0.2)	(0.21)	(0.23)	(0.22
First-stage F	8.48	7.67	9.78	9.81	5.42	4.71	6.55	6.65	5.31	6.05
Observations	63	63	63	63	63	63	63	63	63	63

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (1) instruments used: *standard instruments* plus *literacy* and *pc_institutions*. (2) instruments used: *standard instruments* plus *literacy*, *pc_institutions*, $W * literacy\_spl$, $W * pc\_institutions$, $W^2 * literacy$ $W^2 * pc\_institutions$.

Table 4.13: Spatial error model (SEM) with additional instruments

	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
VARIABLES						yp9500				
school	0.39	0.43	0.86**	0.88**	0.48	0.56	0.13	0.18	0.44	0.44
	(0.48)	(0.47)	(0.4)	(0.4)	(0.54)	(0.51)	(0.58)	(0.56)	(0.48)	(0.47)
urb_rate1850	0.59***	0.60***	0.74***	0.74***	0.47*	0.51**	0.63***	0.64***	0.37	0.36
	(0.21)	(0.21)	(0.19)	(0.19)	(0.24)	(0.23)	(0.21)	(0.21)	(0.24)	(0.24)
pc_culture	0.94***	0.89***								
	(0.18)	(0.17)								
pc_culture_pos			0.95***	0.91***						
			(0.17)	(0.16)						
pc_children					1.34***	1.17***				
					(0.29)	(0.26)				
pc1							13.2***	12.4***		
							(4.75)	(4.13)		
pc1_val									19.7***	20.6***
									(5.36)	(4.87)
ρ	-0.33	-0.34	-0.53**	-0.53**	-0.3	-0.29	-0.12	-0.11	-0.43	-0.46*
	(0.29)	(0.29)	(0.24)	(0.23)	(0.3)	(0.29)	(0.19)	(0.19)	(0.27)	(0.27)
First-stage F	8.62	9.95	11.33	10.55	5.28	5.28	8.67	8.86	6.12	6.25
Observations	63	63	63	63	63	63	63	63	63	63

S.e. in parentheses.*** p<0.01, ** p<0.05, * p<0.1. (1) instruments used: *standard instruments* plus *literacy*,*pc_institutions*.

(2) instruments used:*standard instruments* plus *literacy*, *pc_institutions*, $W * literacy\_spl$, $W * pc\_institutions$.

Table 4.14: Average direct and total impact (ATDI/ATI): GS2SLS SARAR(1,1)

SARAR(1,1) estimation with first group (1) of instruments

	pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
ATDI	0.51	0.67	0.61	8.63	15.50
ATI	0.97	1.15	1.22	44.47	40.74
			as percentage of average GDP		
ATDI	0.5	0.7	0.6	8.9	15.9
ATI	1.0	1.2	1.3	45.7	41.9

SARAR(1,1) estimation with second group (2) of instruments

	pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
ATDI	0.58	0.74	0.53	9.31	29.55
ATI	1.03	1.15	1.44	42.16	324.19
			as percentage of average GDP		
ATDI	0.6	0.8	0.5	9.6	30.4
ATI	1.1	1.2	1.5	43.3	333.1

As a remainder: average GDP growth between 1995-2000: 97.3

(1) instruments used: *standard instruments* plus *literacy*, *pc_institutions*.

(2) instruments used: *standard instruments* plus *literacy*, *pc_institutions*, $W * literacy\_spl$, $W^2 * literacy\_spl2$, $W * pc\_institutions$, $W^2 * pc\_institutions$.

Table 4.15: Spatial Durbin

	(1)	(2)	(3)	(4)	(5)
VARIABLES			yp9500		
yp9500_spl	0.07	-0.25	0.14	-0.32	-0.36
	(0.21)	(0.22)	(0.20)	(0.20)	(0.25)
school	0.36	0.60	0.39	-0.23	0.50
	(0.56)	(0.56)	(0.56)	(0.60)	(0.61)
urb_rate1850	0.47**	0.66***	0.49**	0.86***	0.59***
	(0.22)	(0.21)	(0.21)	(0.22)	(0.22)
school_spl	-0.31	-0.44	-0.16	-3.05**	-1.06
	(0.99)	(0.95)	(0.97)	(1.23)	(0.97)
urb_rate1850_spl	0.34	0.74*	0.30	1.30***	0.59
	(0.37)	(0.40)	(0.35)	(0.41)	(0.37)
pc_culture	0.65***				
	(0.16)				
pc_culture_spl	-0.41				
	(0.36)				
pc_culture_pos		0.64***			
		(0.18)			
pc_culture_pos_spl		0.42			
		(0.47)			
pc_children			0.76***		
			(0.20)		
pc_children_spl			-0.86**		
			(0.36)		
pc1				11.9***	
				(3.28)	
pc1_spl				19.8**	
				(8.47)	
pc1_val					10.0***
					(3.43)
pc1_val_spl					11.8
					(8.77)
Observations	63	63	63	63	63

Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

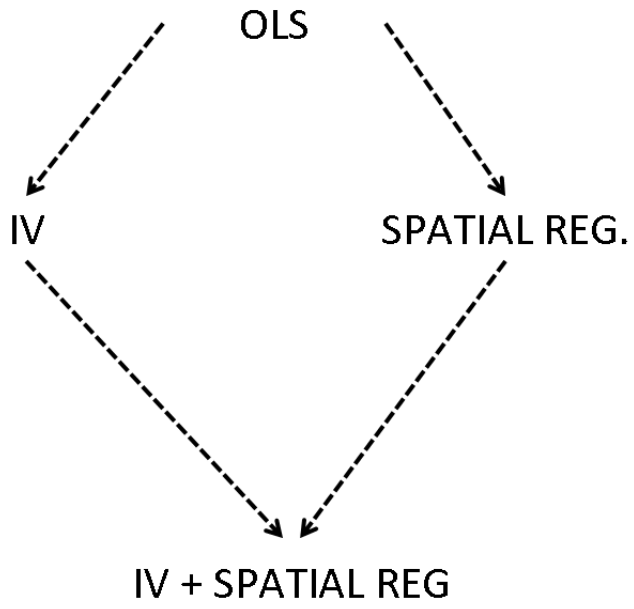


Figure 4.1: Overview of the identification strategy

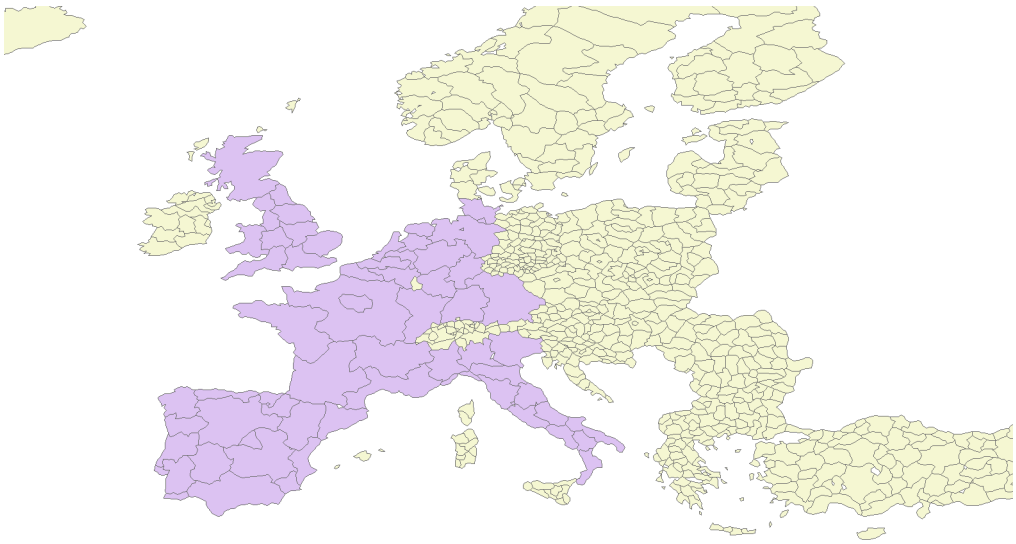


Figure 4.2: Map of the area of analysis

Darker colour for the involved regions

Final remarks

Social capital is an incredibly popular research topic in the social sciences. Much have been said and many studies have been drafted, and yet the subject still seems to require refinement in terms of concept, empirical measures and theoretical framework. For this reason, in this thesis we have first summarized the existing literature on the definition and measurement of social capital. Then, we have proposed a Principal component analysis (PCA) to derive new measures of social capital and considered their distribution across space and time. Finally, we have considered the role of social capital in spurring economic growth at regional level in Europe.

In particular, in Chapter 1 we have summarized the literature concerning social capital, starting from its definitions across social sciences such as sociology, political science and economics. While in sociology social capital is perceived either as a personal resource or in terms of ties and networks; in political science it is rooted in the idea of values and beliefs determining the fate of a community, such as the *amoral familism* of Banfield (1958) or the *civicness* of Putnam (1993) and Fukuyama (1995). Economists, on the other hand, have long ignored the concept up to the 90s, most likely because of the difficulties of integrating non-market interactions into standard theoretical frameworks (Manski, 2000). The main problem of social capital, its definition, is the subject of section 1.1.2 where we build on the contribution of Solow (1995) whose two requirements represent a turning point in the debate; these suggestions are: a well defined investment/depreciation process and a clear measurable empirical counterpart. Taking these issues into account Guiso et al. (2011) develop the concept of "civic capital" (*"those persistent values and shared beliefs, which allow a group to overcome the free rider problem in the pursuit of socially valuable activities"*).

Also, we investigate the channels through which social capital affects economic growth with respect to a non-comprehensive list that includes: crime, corruption, trust, thriftiness, productivity,

ethnicity, religion and, last but not least, migration. A non-exhaustive review of the empirical literature for each channel is presented. In this literature, the decisive role of trust seems to emerge, a value particularly relevant when transactions involve some unknown counterpart, over a period of time and when the legal protection is imperfect. However, as suggested by Righi and Scalise (2013), it is necessary to pay attention to the difference between personalized and generalized trust, as the former is a belief of trustworthiness regarding only certain people or groups whether generalized trust refers to the whole society.

Recent empirical literature has also highlighted the role of space in terms of strength of ties and type of migration: while short-distance migration may be consistent with keeping strong ties, on the opposite, long-distance migration should imply weak ties. This has repercussions on social capital as longer distance migration may also imply that the destination community is culturally more distant, making migrants less trusting. Therefore the need to study the spatial distribution of social capital. Unfortunately there are serious issue of identification due to the presence of specific confounding factors, namely human capital, culture and institutions. Sections 1.2.3 and 1.2.4 analyse and discuss these issues in order to shed some light. Keeping in mind Solow's critique, we select and present (see section 1.3) four models of cultural transmission which capture the dynamics of (dis)investment of social capital, focusing on the role of parents and of the socio-economic environments. Moreover, some of these models provide an explanation for values persistence and impact on policy.

In particular, Bisin and Verdier (2001, 2005, 2011), introduce the concept of direct and indirect *socialization*, and *imperfect empathy*. Benabou and Tirole (2006), derive a model with multiple equilibria on beliefs of luck and effect on welfare system. Guiso et al. (2008a) model suggest social capital persistence. Finally, Tabellini (2008b) builds a model where cooperation is fostered by values and beliefs, not reputation, based on geographical distance between individuals.

We have faced the operative problems of its measurement in Chapter 2. In section 2.1 we review the available empirical measures by type of data source: survey data, experiments and outcome based measures. *Surveys* attempt to measure directly those values and beliefs usually associated to communities with high level of social capital. Alternatively, the use of *experiments*, whose main advantage derives from imposing a well-defined structure, easing the task of interpreting results and minimizing measurement errors. Eventually, the most used approach is based on indirect estimation, by observing the effects of social capital, the so called *"outcome based measures"*. Advantages are

the availability of longer time series (e.g. voter turnout), comparability across country and statistical representativeness at sub national level. Unfortunately, they are also serious issues of endogeneity and/or measurement errors. To the extent social relationships are grounded in space, there is a role for space regarding social capital, as argued in section 2.2, being reminiscent of the first law of geography: *"everything is related to everything else, but near things are more related than distant things"*(Tobler, 1970). Since social relations are spatially sticky, so are norms and values, with several dimension of space that should be considered.

Sections 2.2.2 and 2.2.3 present some distinctive trait of spatial statistics and econometrics, such as the Modifiable Areal Unit Problem (MAUP), introducing Exploratory space data analysis (ESDA) techniques. In the context of standard measures of social capital in Europe, and to the extent the focus is on spatial autocorrelation, we have proven that MAUP is a milder concern. In section 2.2.4 we further explore the link between space and social capital in a dynamic context, with an Exploratory space-time data analysis (ESTDA) at regional level in Europe. Similar values seem to display a tendency to cluster, irrespective of the national border (and the forces they synthesize, such as formal and informal institutions). In order to assess whether these clusters are spatially significant, we have calculated Global and Local Moran's I statistics which show some degree of spatial association in the data and highlight the spatial clustering of regions with similar high or low levels of social capital. Removing these reduces the probability that regions stay in the same cluster. However, this effect is at work not only on clusters of regions with high level of social capital, but also on clus ters of regions with low levels of social capital. While the first can be considered a positive effect of national borders (as regions endowed with higher trusting attitudes will likely keep these levels), the second clearly is not, as national borders (proxy of formal and informal institutions) seem to prevent the spreading of similar values and beliefs, and trust in this example.

Finally, section 2.3 reports a primer on Principal component analysis, a technique to achieve data reduction, a priority issue in order to deal with multidimensionality of social capital.

Building on previous considerations, in Chapter 3 we have defined new measures of social capital at sub national level in Europe, based on nine variables previously used in the literature. Five of these can be referred to the so-called *"structural component"* of social capital (see Righi and Scalise 2013) and include: voter turnout at parliamentary elections (Putnam, 1993; Nannicini et al., 2010),

relational intensity, and "media use" of Newspapers, Radio and TV (Putnam, 1993; de Dominicis et al., 2013) as a way to achieve information. The remaining variables refer to the so called *"cognitive component"* of social capital and consider the perception of norms, values and beliefs. Here, in line with the literature on social capital, we consider variables that should capture the attitude of individuals towards the community, such as the perception of one's control over life, the importance of respect for the others as a value to teach your children, the extent of generalized trust and autonomy. The correlation analysis of the variables involved seems to suggest that the representation of social capital may be more complex than typically postulated and corroborates the need for a multidimensional approach. Next, we try to encapsulate the information from the above variables into synthetic indicators, which should capture the many dimensions of civic capital. Obviously, the process of condensing complex phenomena into single indicators presents a clear trade-off: on one side, it eases the burden of the researcher on the interpretation of several results jointly; on the other, it may oversimplify the complexity of the problem under scrutiny, while the synthetic measures obtained may be questioned on the grounds of the aggregation procedure used. Being aware of this trade-off, we have achieved variables' reduction thorough PCA. Our empirical analysis has confirmed that these variables may capture different aspects of the same phenomenon. Also, the distinction between the structural and the cognitive component seems to be blurred. We consider the first principal components of the two subsets of variables, the full set of variables and a refined set as robustness check. These synthetic indicators seem to indicate some degree of heterogeneity in the distribution of social capital across European regions, especially within larger countries, such as Italy, France, Poland and Spain, and with higher values usually characterizing smaller countries (Belgium, Denmark, Netherlands). This analysis confirms previous findings that these clusters are not necessarily "national", suggesting that the forces of geography may overcome national borders when it comes to cultural identities.

In the last chapter, building on Tabellini (2010), which states that historical institutions affects current economic growth *via* social capital (defined as *"culture"*), we proceed differently with respect to a more traditional line of research identifying contemporary institutions as the channel. The estimation strategy is described in figure 4.1: as first step, eq. 4.1 is estimated with OLS, introducing the new measures of social capital discussed in chapter 4. As second step, following the likely endogeneity of social capital, the use of instrumental variable estimation. Results are consistent

with Tabellini (2010). However, following Stock and Yogo (2002), we identified a plausible problem of weak instruments, i.e. weak correlations of one of the instrument with the endogenous variable, with the exception of the specification focusing only on "'positive"' values that should be taught to children (*pc_culture_pos*) as measure of social capital. Introducing a concept of neighbourhood based on first order queen contiguity, summarized by matrix W, we computed the spatial lags of the instruments previously used. However, attempt to resolve the weak instruments problem by using the spatial lags were unsatisfactory. All in all, jointly with spatial autocorrelation of the residuals, this evidence induced to consider a spatial regression approach, as suggested by LeSage and Fischer (2008). Results from a *Spatial autoregressive model with spatial autoregressive disturbances* (SARAR), a Spatial error model (SEM) and a Spatial Durbin model (SDM), confirm the need for a spatial approach in dealing with eq. 4.1 although it did not emerge any clear indication on which specification should be used. It's possible to specify the endogeneity of the measures of social capital although the results are necessarily preliminary as the computational routines are still under development; overall the results of the spatial specifications point towards the specification based on *pc_culture_pos* with a spatial lag of the error term. Eventually, the contribution with respect to Tabellini (2010) pertains to:

1. use of new measures of social capital;
2. focus on the problem of weak instruments;
3. use of a spatial regression framework;
4. use of a spatial regression considering an endogenous regressor.

Results from tests and regression suggests that spatial regression models are indeed suggested despite being necessary further research in order to identify the exact spatial specification. However, the significative effect of contiguity is suggestive of the need to adopt policies favouring the adoption of specific institutions creating the required values and beliefs necessary to growth. Indeed, EU Cohesion policy could consider targeted programs for clusters of regions instead of each region *per se*. Considered the amount of resources available, a small part could be diverted to study the effects of specific inter-regional programs promoting social capital.

Within the limits and the scope of this thesis, this conclude our journey across the domain of social capital: from the theoretical issues related to the definition, across a review of empirical

measures, defining new measures later used in a within country analysis. Clearly, there are still several issues open regarding measurement, spatial inference at sub national level, identification (with particular reference to institutions) and cultural transmission models. We endeveour to make these issues the object of future research.

Bibliography

Acemoglu, Daron and James A. Robinson, *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*, Crown Business, 2012.

_ , Simon Johnson, and James A. Robinson, "The colonial origins of comparative development: an empirical investigation," *American economic review*, 2001, *91*, 1369–1401.

Aghion, Philippe, Yann Algan, Pierre Cahuc, and Andrei Shleifer, "Regulation and Distrust," *The Quarterly Journal of Economics*, August 2010, *125* (3), 1015–1049.

Albanese, Giuseppe, Guido de Blasio, and Paolo Sestito, "Trust and preferences: evidence from survey data," Temi di discussione (Economic working papers) 911, Bank of Italy, Economic Research and International Relations Area April 2013.

Aleksynska, Mariya, "Civic participation of immigrants in Europe: Assimilation, origin, and destination country effects," *European Journal of Political Economy*, September 2011, *27* (3), 566–585.

Alesina, Alberto, "The choice of institutions," Working Paper, Munich Lectures 2006 2006.

_ and Eliana La Ferrara, "Who trusts others?," *Journal of Public Economics*, August 2002, *85* (2), 207–234.

_ and _ , "Preferences for redistribution in the land of opportunities," *Journal of Public Economics*, 2005, *89(5)*, 897–931.

_ and George Angeletos, "Fairness and Redistribution," *American Economic Review*, September 2005, *95* (4), 960–980.

_ , **Edward L. Glaeser, and Bruce Sacerdote**, "Why Doesn't the US Have a European-Style Welfare System?," NBER Working Papers 8524, National Bureau of Economic Research, Inc October 2001.

_ , **Reza Baqir, and William Easterly**, "Public goods and ethnic divisions," Policy Research Working Paper Series 2108, The World Bank May 1999.

Algan, Yann and Pierre Cahuc, "Inherited Trust and Growth," *American Economic Review*, December 2010, *100* (5), 2060–92.

Annoni, Paola and Lewis Dikjstra, "EU Regional Competitiveness Index 2013," Technical Report, European Commission 2013.

Anselin, Luc, *Spatial econometrics. Methods and models*, Kluwer, Dordrecht, 1988.

_ , "The Moran scatterplot as an ESDA tool to assess local instability in spatial association," Research Paper 9330, Regional Research Institute West Virginia University 1993.

_ **and Daniel Arribas-Bel**, "Spatial Fixed Effects and Spatial Dependence," GeoDa Center Working Papers 1045, GeoDa Center for Geospatial Analysis and Computation 2011.

Arrow, Kenneth, "Gifts and Exchanges," *Philosophy and Public Affairs*, 1972, *1*, 343–362.

_ , *The Limits of Organization*, New York W. W. Norton, 1974.

_ , "Observations on social capital," in "Social capital : a multifaceted perspective" 1999.

Attanasio, Orazio, Luca Pellerano, and Sandra Polania Reyes, "Building Trust? Conditional Cash Transfer Programmes and Social Capital," *Fiscal Studies*, 06 2009, *30* (2), 139–177.

Banfield, Edward C., *The moral basis of a backward society*, New York:free press, 1958.

Barone, Guglielmo and Gaia Narciso, "The effect of organized crime on public funds," Temi di discussione (Economic working papers) 916, Bank of Italy, Economic Research and International Relations Area June 2013.

Basile, Roberto, Roberta Capello, and Andrea Caragliu, "Technological interdependence and regional growth in Europe: Proximity and synergy in knowledge spillovers," *Papers in Regional Science*, November 2012, *91* (4), 697–722.

Baum, Christopher F., Mark E. Schaffer, and Steven Stillman, "Enhanced routines for instrumental variables/GMM estimation and testing," Boston College Working Papers in Economics 667, Boston College Department of Economics May 2007.

Becker, Gary, *Accounting for tastes*, Harvard University Press: Cambridge, 1996.

Benabou, Roland and Jean Tirole, "Belief in a just world and redistributive politics," *Quarterly Journal of Economics*, 2006, *121(2)*, 699–746.

Berg, Joyce, John Dickhaut, and Kevin McCabe, "Trust, Reciprocity, and Social History," *Games and Economic Behavior*, July 1995, *10* (1), 122–142.

Bertrand, Marianne and Sendhil Mullainathan, "Do People Mean What They Say? Implications for Subjective Survey Data," *American Economic Review*, May 2001, *91* (2), 67–72.

Binmore, K.G. and Partha Dasgupta, *Economic organizations as games*, Oxford: Basil Blackwell, 1986.

Bisin, Alberto and Thierry Verdier, "The Economics of Cultural Transmission and the Dynamics of Preferences," *Journal of Economic Theory*, 2001, *97*, 298–319.

_ **and** _ , "Cultural transmission," Text prepared for the New Palgrave Dictionary of Economics 2nd edition, NYU 2005.

_ **and** _ , "The Economics of Cultural Transmission and the Dynamics of Preferences," *Handbook of Social Economics*, 2011, *1A*, 340–407.

Bohnet, Iris, Fiona Greig, Benedikt Herrmann, and Richard Zeckhauser, "Betrayal Aversion: Evidence from Brazil, China, Oman, Switzerland, Turkey, and the United States," *American Economic Review*, March 2008, *98* (1), 294–310.

Bordieu, Pierre, *Outline of a Theory of Practice*, Cambridge University Press, 1977.

_ , "The forms of capital," in "Handbook of theory and research for the sociology of education" 1986.

Bound, David A. Jaeger John and Regina M. Baker, "Where You Stand Depends Upon Where Your Grandparents Sat:The Inheritability of Generalized Trust," *Journal of the American Statistical Association*, 1995, *90* (430), 443–450.

Bowles, Samuel, "Social Capital' and Community Governance," *Focus*, 1999, *20*, 6–10.

Boyd, Robert and Peter J. Richerson, *Culture and the evolution process*, University of Chicago Press, 1985.

Briant, A., P.-P. Combes, and M. Lafourcade, "Dots to boxes: Do the size and shape of spatial units jeopardize economic geography estimations?," *Journal of Urban Economics*, May 2010, *67* (3), 287–302.

Bun, Maurice J.G. and Monique de Haan , "Weak instruments and the first stage F-statistic in IV models with a nonscalar error covariance structure," UvA-Econometrics Working Papers 10-02, Universiteit van Amsterdam, Dept. of Econometrics March 2010.

Butler, Jeffrey, Paola Giuliano, and Luigi Guiso, "The right amount of trust," Working paper 61, Fondazione Eni Enrico Mattei 2010.

Cassar, Alessandra and Bruce Wydick, "Does social capital matter? Evidence from a five-country group lending experiment," *Oxford Economic Papers*, 2010.

Cattell, Raymond B., "The scree test for the number of factors," *Multivariate Behavioral Research*, 1966, *1*, 629–637.

Cavalli-Sforza, Luigi and Marcus Feldman, *Cultural Transmission and Evolution: A Quantitative Approach*, Princeton University Press, 1981.

Cingano, Federico and Paolo Pinotti, "Trust, Firm Organization and the Structure of Production," Working Papers 053, "Carlo F. " Centre for Research on Social Dynamics (DONDENA), Universita Commerciale Luigi Bocconi September 2012.

Cipolla, Carlo M., *Storia economica dell'europa pre-industriale*, Societa editrice Il Mulino, Bologna, Italia, 1974.

Cliff, Andrew D. and J. Keith Ord, *Spatial autocorrelation*, Pion, London, 1973.

_ and _ , *Spatial Processes, Models and Applications.*, Pion, London, 1981.

Coleman, James, *Foundations of social theory*, Harvard University Press, Cambridge, 1990.

Cragg, John G. and Stephen G. Donald, "Testing Identifiability and Specification in Instrumental Variable Models," *Econometric Theory*, April 1993, *9* (02), 222–240.

Dahlberg, Matz, Karin Edmark, and Helene Lundqvist, "Ethnic Diversity and Preferences for Redistribution," *Journal of Political Economy*, 2012, *120* (1), 41 – 76.

Dasgupta, Partha and Ismail Serageldin, *Social capital : a multifaceted perspective*, Washington, D.C. : The World Bank., 1999.

de Blasio, Guido and Giorgio Nuzzo, "Historical Traditions Of Civicness And Local Economic Development," *Journal of Regional Science*, 2010, *50* (4), 833–857.

_ **and Paolo Sestito**, *Il capitale sociale*, Donzelli editore, 2011.

de Dominicis, Laura, Raymond J.G.M. Florax, and Henri L.F. de Groot, "Regional clusters of innovative activity in Europe: are social capital and geographical proximity key determinants?," *Applied Economics*, June 2013, *45* (17), 2325–2335.

de Soto, Hernando, *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere*, Basic Books, 2003.

Di Tella, Rafael, Sebastian Galiant, and Ernesto Schargrodsky, "The Formation of Beliefs Evidence from the Allocation of Land Titles to Squatters," *The Quarterly Journal of Economics*, 02 2007, *122* (1), 209–241.

Dixit, Avinash K., *Lawlessness and Economics: Alternative Modes of Governance*, Princeton: Princeton University Press, 2007.

Djankov, Simeon, Edward L. Glaeser, Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer, "The new comparative economics," *Journal of Comparative Economics*, December 2003, *31* (4), 595–619.

Drukker, David M., Hua Peng, Ingmar Prucha, and Rafal Raciborski, "SPPACK: Stata module for cross-section spatial-autoregressive models," Statistical Software Components, Boston College Department of Economics February 2011.

Durlauf, Steven, "The Case Against Social Capital," *Focus*, 1999, *20*, 1–5.

_ , "On the empirics of social capital," *Economic Journal*, 2002, *112*, 459–479.

European Commission, "Eurobarometer 62.2," 2004. GESIS Data Archive 4231.

_ , "Eurobarometer 65.2," 2004. GESIS Data Archive 4506.

EVS, "European Values Study 2008: Integrated Dataset (EVS 2008)," 2011. GESIS Data Archive, Cologne. ZA4800 Data file version 3.0.0, doi:10.4232/1.11004.

Faiella, Ivan, "The use of survey weights in regression analysis," Working paper 739, Banca d'Italia, Economic research department 2010.

Fazio, Giorgio and Luciano Lavecchia, "Social capital formation across space: proximity and trust in European regions," *International Regional Science Review*, 2013, *36(3)*, 296–321.

Fehr, Ernst, "On The Economics and Biology of Trust," *Journal of the European Economic Association*, 04-05 2009, *7* (2-3), 235–266.

_ , Urs Fischbacher, Jurgen Schupp, Bernard von Rosenbladt, and Gert G. Wagner, "A Nationwide Laboratory Examining Trust and Trustworthiness by Integrating Behavioural Experiments into Representative Surveys," CEPR Discussion Papers 3858, C.E.P.R. Discussion Papers April 2003.

Fernandez, Raquel, Alessandra Fogli, and Claudia Olivetti, "Mothers and Sons: Preference Formation and Female Labor Force Dynamics," *Quarterly Journal of Economics*, 2004, *119(4)*, 1249–1299.

_ **and** _ , "Culture: an Empirical Investigation of Beliefs," *American Economic Journal: Macroeconomics*, 2009, *1*, 146–177.

Fisman, Raymond and Edward Miguel, "Cultures of Corruption: Evidence From Diplomatic Parking Tickets," NBER Working Papers 12312, National Bureau of Economic Research, Inc June 2006.

Friedman, Milton, *Capitalism and Freedom*, IBL Libri, 1962.

Fukuyama, Francis, *Trust: the social virtues and the creation of prosperity*, New York:free press, 1995.

_ , "Social Capital and Civil Society," IMF Working Papers 00/74, International Monetary Fund March 2000.

Gambetta, Diego, *Trust: making and breaking cooperative relations*, Oxford: Basil Blackwell, 1988.

Gehlke, C. E. and Katherine Biehl, "Certain effects of grouping upon the size of the correlation coefficient in census tract material," *Journal of the American Statistical Association Supplement*, 1934, *29*, 169–170.

Giordano, Raffaela and Pietro Tommasino, "Public sector efficiency and political culture," Temi di discussione (Economic working papers) 786, Bank of Italy, Economic Research and International Relations Area January 2011.

Giuliano, Paola, "Living Arrangments in Western Europe: Does Cultural Origin Matter?," *Journal of the European Economic Association*, 2007, *5*, 927–952.

_ **and Antonio Spilimbergo**, "Growing Up in a Recession: Beliefs and the Macroeconomy," IZA Discussion Papers 4365, Institute for the Study of Labor (IZA) August 2009.

Glaeser, Edward L., Bruce Sacerdote, and Jose A. Scheinkman, "Crime and Social Interactions," *The Quarterly Journal of Economics*, May 1996, *111* (2), 507–48.

_ **, David Laibson, Jose A. Scheinkman, and Christine L. Soutter**, "What is Social Capital? The Determinants of Trust and Trustworthiness," NBER Working Papers 7216, National Bureau of Economic Research, Inc July 1999.

_ **, David Liabson, Jose A. Scheinkman, and Christine L. Soutter**, "Measuring trust," *Quarterly Journal of Economics*, 2000, *115(3)*, 811–846.

Granovetter, Mark S., "The Strength of weak ties," *American Journal of Sociology*, 1973, *78(6)*, 1360–1380.

Grubesic, Tony H., "Zip codes and spatial analysis: Problems and prospects," *Socio-Economic Planning Sciences*, 2008, *42* (2), 129 – 149.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales, "People's opium? Religion and economic attitudes," *Journal of Monetary Economics*, January 2003, *50* (1), 225–282.

_ , _ , **and** _ , "The Role of Social Capital in Financial Development," *American Economic Review*, 2004, *94*, 526–46.

_ , _ , **and** _ , "Does Culture Affect Economic Outcomes?," *Journal of Economic Perspectives*, 2006, *20*, 23–48.

_ , _ , **and** _ , "Alfred Marshall Lecture Social Capital as Good Culture," *Journal of the European Economic Association*, 04-05 2008, *6* (2-3), 295–320.

_ , _ , **and** _ , "Long Term Persistence," EIEF Working Papers Series 0810, Einaudi Institute for Economic and Finance (EIEF) 2008.

_ , _ , **and** _ , "Trusting the Stock Market," *Journal of Finance*, 2008, *63*, 2557–60.

_ , _ , **and** _ , "Cultural Biases in Economic Exchange?," *The Quarterly Journal of Economics*, August 2009, *124* (3), 1095–1131.

_ , _ , **and** _ , "Civic capital as the missing link," Chapter 10 in Handbook of social economics, North Holland 2011.

Hahn, Jinyong, Jerry Hausman, and Guido Kuersteiner, "Estimation with weak instruments: Accuracy of higher-order bias and MSE approximations," *Econometrics Journal*, 2004, *7* (1), 272–306.

Hall, Robert E. and Charles I. Jones, "Why do some countries produce much more output per worker than others?," *Quarterly Journal of Economics*, 1999, *114*, 83–116.

Hanifan, L. J., "The Rural School Community Center," *Annals of the American Academy of Political and Social Science*, 1916, *67*, 130–138.

Ichino, Andrea and Giovanni Maggi, "Work environment and individual background: explaining regional shirking differentials in a large italian firm," *Quarterly Journal of Economics*, 2000, *115(3)*, 1057–1090.

Jacobs, Jane, *The Death and Life of Great American Cities*, New York: Vintage., 1961.

Jolliffe, Ian, *Principal component analysis*, Springer, 2002.

Kaiser, Henry F., "The application of electronic computers to factor analysis," *Educational and Psychological Measurement*, 1960, *20*, 141–151.

Kelejian, Harry H. and Ingmar R. Prucha, "A generalized spatial two stage least squares procedure for estimating a spatial autoregressive model with autoregressive disturbances," *Journal of Real Estate Finance and Economics*, 1998, *17*, 99–112.

Kleibergen, Frank and Richard Paap, "Generalized reduced rank tests using the singular value decomposition," *Journal of Econometrics*, July 2006, *133* (1), 97–126.

Knack, Stephen and Paul J. Zac, "Trust and growth," *Economic Journal*, 2001, *111*, 295–321.

_ **and Philip Keefer**, "Does social capital have an economic pay-off? A cross country investigation," *Quarterly Journal of Economics*, 1997, *112*, 1251–1288.

La Porta, Rafael, Florencio Lopez de Silane, Andrei Shleifer, and Robert W. Vishny, "Trust in Large Organizations," *American Economic Review*, May 1997, *87* (2), 333–38.

Lane, Robert E., "Fear of equality," *American Political Science Review*, 1959, *LIX*, 35–51.

LeSage, James and Manfred Fischer, "Spatial Growth Regressions: Model Specification, Estimation and Interpretation," *Spatial Economic Analysis*, 2008, *3* (3), 275–304.

_ **and Robert Kelley Pace**, *Introduction to spatial econometrics*, CRC press, 2009.

LeSage, James P. and Christina L. Ha, "The Impact of Migration on Social Capital: Do Migrants Take Their Bowling Balls with Them?," *Growth and Change*, 03 2012, *43* (1), 1–26.

_ **and Kelley R. Pace**, "Spatial econometric modeling of origin-destination flows," *Journal of Regional Science*, 2008, *48* (5), 941–967.

Levitt, Steven and John List, "What do lavoratory experiments measuring social preferences reveal about the real world?," *Journal of Economic Perspectives*, 2007, *21(2)*, 153–174.

Licht, Amir N., Chanan Goldschmidt, and Shalom H. Schwartz, "Culture rules: The foundations of the rule of law and other norms of governance," *Journal of Comparative Economics*, December 2007, *35* (4), 659–688.

Loury, Glenn C., "A Dynamic Theory of Racial Income Differences," in P. Wallace and A. LaMond, eds., *Women, Minorities, and Employment Discrimination*, Lexington, MA: Lexington Books, 1977.

LSE, "Social Cohesion, Trust and Participation: Social Capital, Social Policy and Social Cohesion in the European Union and Candidate Countries," Monitoring Report prepared by the European Observatory on the Social Situation - Social Capital Network, London School of Economics 2007.

Luttmer, Erzo F.P. and Monica Singhal, "Culture, Context, and the Taste for Redistribution," *American Economic Journal: Economic Policy*, February 2011, *3* (1), 157–79.

Manski, Charles F., "Economic analysis of social interactions," *Journal of Economic Perspectives*, 2000, *14(3)*, 115–136.

Mauro, Luciano and Francesco Pigliaru, "Decentralization, Social Capital and Regional Convergence," Working Papers 2013.57, Fondazione Eni Enrico Mattei June 2013.

Menon, Carlo, "The bright side of MAUP: Defining new measures of industrial agglomeration," *Papers in Regional Science*, 03 2012, *91* (1), 3–28.

Mosaich, "Mosaich 9286," 2005. Mosaich.

_ , "Mosaich 9948," 2009. Mosaich.

Naef, Michael and Jurgen Schupp, "Measuring Trust: Experiments and Surveys in Contrast and Combination," IZA Discussion Papers 4087, Institute for the Study of Labor (IZA) March 2009.

Nannicini, Tommaso, Andrea Stella, Guido Tabellini, and Ugo Troiano, "Social Capital and Political Accountability," Working Papers 2010.58, Fondazione Eni Enrico Mattei May 2010.

North, Douglass C., *Institutions, institutional change and economic performance*, Cambridge, Cambridge University Press, 1990.

_ , "Economic Performance through Time," Nobel Prize in Economics documents 1993-2, Nobel Prize Committee December 1993.

NSD-EED, "Norwegian Social Science Data Services - European Election Database," 2013. NSD.

Nunn, Nathan and Leonard Wantchekon, "The Slave Trade and the Origins of Mistrust in Africa," NBER Working Papers 14783, National Bureau of Economic Research, Inc March 2009.

Openshaw, Stan, "The modifiable areal unit problem," Working paper 38, CATMOG 1984.

_ **and Peter Taylor**, "A million or so correlation coefficients: Three experiments on the modifiable areal unit problem," in "Statistical applications in the spatial sciences" 1979.

Paelinck, Jean and L. Klassen, *Spatial econometrics*, Saxon house, Farnborough, 1979.

Patacchini, Eleonora and Yves Zenou, "Intergenerational Education Transmission: Neighborhood Quality and/or Parents involvement?," IZA Discussion Papers 2608, Institute for the Study of Labor (IZA) February 2007.

Pinotti, Paolo, "Fiducia regolamentazione e fallimenti del mercato," in "Il capitale sociale" 2011.

Polanyi, Karl, Conrad Arensberg, and Harry Pearson, *Trade and Market in the Early Empires: Economies in History and Theory*, Chicago: Henry Regnery Company, 1957.

Portes, Alejandro, "Social Capital: Its Origins and Applications in Modern Sociology," *Annual Review of Sociology*, 1998, *24*, 1–24.

Postiglione, Paolo and Gianfranco Piras, "Una rassegna del software per la stima di modelli di econometria spaziale," 2012. NSD.

Putnam, Robert, *Making democracy work*, Princeton University Press, 1993.

Puzo, Mario, *The Godfather*, Penguin Books Ltd, London, 1969.

Raiser, Martin, "Informal institutions, social capital and economic transition: reflections on a neglected dimension," Working paper 25, European Bank for Reconstruction and Development 1997.

_ , "Trust in transition," Working paper 39, European Bank for Reconstruction and Development 1999.

Reeskens, Tim and Marc Hooghe, "Cross-cultural measurement equivalence of generalized trust. Evidence from the European Social Survey (2002 and 2004)," *Social Indicators Research*, February 2008, *85* (3), 515–532.

Rey, Sergio, Alan Murray, and Luc Anselin, "Visualizing regional income distribution dynamics," *Letters in Spatial and Resource Sciences*, March 2011, *4* (1), 81–90.

Righi, Alessandra and Diego Scalise, "New evidence on social capital endowments in Italy," mimeo, Banca d'Italia 2013.

Roland, Gerard, "Understanding Institutional Change: Fast-Moving and Slow-Moving Institutions," *Studies in Comparative International Development*, 2004, *38*, 109–131.

Routledge, Bryan R. and Joachim von Amsberg, "Social capital and growth," *Journal of Monetary Economics*, January 2003, *50* (1), 167–193.

Rutten, Roel, Hans Westlund, and Frans Boekema, "The Spatial Dimension of Social Capital," *European Planning Studies*, June 2010, *18* (6), 863–871.

Sestito, Paolo, "I diversi concetti di capitale sociale," in "Il capitale sociale" 2011.

Smith, Adam, *The theory of Moral sentiments*, BUR Rizzoli, Milano, 1759.

_ , *An Inquiry into the Nature and Causes of the Wealth of Nations*, Univ. of Chicago Press, Chicago, IL (reprinted versione, 1976), 1776.

Solow, Robert, "Trust: the social virtues and the creation of prosperity (Book review)," *The New Republic*, 1995, *213*, 36–40.

Staiger, Douglas and James H. Stock, "Instrumental Variables Regression with Weak Instruments," *Econometrica*, May 1997, *65* (3), 557–586.

Stock, James H. and Motohiro Yogo, "Testing for Weak Instruments in Linear IV Regression," NBER Technical Working Papers 0284, National Bureau of Economic Research, Inc Nov 2002.

Tabellini, Guido, "Institutions and culture. Presidential address," *Journal of the European Economic Association*, 2008, *8(4)*, 677–716.

_ , "The Scope of Cooperation: Values and Incentives," *The Quarterly Journal of Economics*, August 2008, *123* (3), 905–950.

_ , "Culture and Institutions: Economic Development in the Regions of Europe," *Journal of the European Economic Association*, 06 2010, *8* (4), 677–716.

Tobler, Waldo R., "A computer movie simulating urban growth in the Detroit region," *Economic Geograph*, 1970, *46(2)*, 234–240.

Trigilia, Carlo, "Capitale sociale tra economia e sociologia," in "Il capitale sociale" 2011.

Uslaner, Eric M., "Where You Stand Depends Upon Where Your Grandparents Sat:The Inheritability of Generalized Trust," *Public opinion quarterly*, 2008, *72* (4), 725–740.

Weber, Max, *The Protestant Ethic and the Spirit of Capitalism*, Routledge Classic, London, 1905.

Woolcock, Michael, "Social capital and economic development: toward a theoretical synthesis and policy framework," *Theory and Society*, 1998, *27*, 151–208.

Yamagishi, Toshio, Masako Kikuchi, and Motoko Kosugi, "Trust, gullibility, and social intelligence," *Asian Journal of Social Psychology*, 1999, *2(1)*, 145–161.

Zingales, Luigi, *A capitalism for the people: Recapturing the Lost Genius of American Prosperity*, Basic books, 2012.