Corso di dottorato di ricerca in:

"Scienze Manageriali e Attuariali"

in convenzione con Università di Trieste

Ciclo 31°

Titolo della tesi

"Vertical Integration and Social Capital: Theory and Empirics"

Dottorando
Marco Castellani

Supervisore
prof. Stefano Comino

Co-supervisore
prof.ssa Michela Battauz

Anno 2019

Introduction

The aim of the thesis is to study how cultural variables, specifically social capital, affect the industrial structure of countries. The literature has focused mainly on the impact of cultural traits on macroeconomic variables, such as the growth rate of GDP and unemployment (Gorodnichenko and Roland, 2017; Yang and Lester, 2000). Little attention has been devoted to the study of cultural traits within the field of industrial organization. In this thesis we focus on how social capital affects a specific aspect of the organization of an industry, namely the degree of vertical integration. Our main hypothesis is that by promoting trust, trustworthiness and reciprocity, social capital reduces vertical integration. In the thesis we provide both empirical evidence of the impact of social capital on vertical integration and a theoretical model explaining in greater detail how this mechanism works. In doing so we do not just add to the literature on industrial organization, but also shed light on one additional channel trough which social capital affects economic performance of countries: *via* the industrial structure. The thesis is divided into three papers: a literature review, an empirical paper and a theoretical-one. The first paper is a literature review dealing with the impact of different cultural traits on economic variables. The contributions in the field of culture and economics have grown rapidly in the last decade. The paper tries to highlight the main topics in the related literature and represents the starting point for my subsequent research. According to the review of the literature, equality of opportunities coupled with a strong emphasis on individual effort represent the backbone of flourishing economies. The survey also highlights that the effects of culture on the industrial structure of countries has been poorly investigated. That is why the remainder of the thesis analyses one possible impact of culture on industrial organization, that of social capital on procurement decisions. The second paper empirically investigates the impact of social capital on vertical integration in manufacturing. The main hypothesis is that social capital reduces vertical integration. Social capital is taught to induce reciprocal behavior and to limit opportunism. By doing so it reduces transaction costs and it leads firms to rely more on market transactions than on internal provision of inputs. The hypothesis that social capital reduces vertical integration is confirmed using a sample of 974 manufacturing sectors belonging to 30 European countries. Furthermore, the empirical evidence shows that this effect is stronger in industries characterized by low

We thank Stefano Comino, Michela Battauz, Clara Graziano, Fabio Pieri, Danilo Cavapozzi, Bob Gibbons, Avner Ben Ner, Roberto Frega, David Pérez-Castrillo, Inés Macho Stadler and Jernej Čopič for valuable comments.

levels of R&D, than in R&D intensive ones. Because of the high degree of the input's complexity, in these industries firms do not rely too much on the fairness of their transaction counterparts. The third paper contains a theoretical model explaining in greater detail the mechanism linking social capital to vertical integration. We model the procurement relationship as a principal-agent problem. The principal is a downstream firm that needs an input which is produced by a better informed upstream firm-agent. The characteristics of this input are not known ex-ante and the downstream firm must decide whether to delegate the decision of this characteristics to the upstream firm or to produce the input internally. If the upstream firm is interested only in its material payoff, then it may be optimal for the downstream firm to produce the input internally (vertical integration). We model social capital in terms of reciprocity. A player is said to be reciprocal if it is prepared to give-up part of his material payoff to reward/punish a kind/unkind counterpart. We show that reciprocity makes market transaction more likely. Furthermore, reciprocity increases the freedom granted to the upstream firm in deciding the characteristics of the input to be produced.

Does Culture Matter for the Economic Performance of Countries? An Overview of the Literature*

Marco Castellani

Abstract

From the point of view of economic development the world is far from being homogeneous. Among the possible causes of such uneven evolution, culture is starting to attract the attention of a growing number of scholars. The present paper surveys some of the most important contributions on culture and economics, with a particular focus on the definition and measurement of culture and on the impact of different cultural traits on economic variables. According to the review of the literature, cultures emphasizing individual effort while providing equal opportunities to everyone are more likely to lead to sustained economic growth.

JEL Classifications: Z10, Z12, O10, O17.
Keywords: cultural economics, religion, economic development, institutional arrangements.

1 Introduction

What determines the huge differences in economic conditions worldwide? Why poorer countries do not simply replicate what richer-ones are doing? Why individuals often behave differently from what economic theory predicts? The economic literature has grouped the answers to these questions in three main categories. The first one focuses on the role of institutions (Acemoglu, 2008); the second one highlights the importance of psychological factors (Rabin, 1993; Thaler, 1985). The third answer is that culture plays a major role here (Alesina and Giuliano, 2015). As far as differences in economic conditions are concerned, governments do not operate in a cultural vacuum, so that policies aimed at fostering economic growth must be tailored to the prevailing culture to be effective (Greif, 1994; Fukuyama, 1995; Thomas and Mueller, 2000;

*A shorter version of this paper is currently in press on Journal of Policy Modeling (2018), DOI:10.1016/j.jpolmod.2018.06.006.

Glaeser et al., 2004; Minkov and Blagoev, 2009; Tabellini, 2010).
Furtermore, not all cultures are equally favorable for economic growth. A famous example is represented by the underdevelopment of some African countries (Barro, 1991). According to Platteau (2000), some tribal societies in Africa consider economy a zero-sum game (the so-called limited good syndrome), in which every private gain is obtained at the expense of the collectivity and determined by luck, fraud or witchcraft. Moreover, Schwartz (2004) reports that in sub-Saharian Africa, individuals find meaning in life trough protecting the traditional order and are thus discouraged to pursue social and economic success. In the same way, many Native American cultures discourage individuals from distinguishing themselves and emerging as better than others (Lester, 1997). In such cultural environments it is almost impossible to start a new entrepreneurial or innovation activity, to accumulate and invest wealth and, thus, to spur economic growth (Mokyr, 2016).
Culture, in particular strong family ties, can also lead family firms not to behave in an optimizing way, since they cause firm's objectives to merge with those of the family and thus not to respond to profit-maximizing conditions hypothesized in theoretical models (Bertrand and Schoar, 2006). Even when individuals are rational utility maximizers, culture can explain behaviors that neoclassical economists would label as puzzling (Papamarcos and Watson, 2006).
Until recent years, however, economists disregarded culture in their analyses of economic phenomena, leaving the field to sociologists, anthropologists, political scientists and organization scholars (Minkov and Blagoev, 2009; Maridal, 2013). This has not always been the case: classical economists were well aware of the important role played by culture in shaping both the society and the economy. Back in the eighteenth century, Adam Smith pointed out the pivotal role played by trust in essentially every market transaction. Then, in the nineteenth century, John Stuart Mill recognized that under certain conditions there is a primacy of cultural constraints over the pursuit of personal interest (Mill, 1843). In his oft-cited book, *The Protestant Ethic and the Spirit of Capitalism*, Weber (1905) states that by encouraging individuals to pursue their own wealth, the Protestant Reformation was one of the main forces behind the development of capitalism (Weber, 1905). In a similar fashion, Sombart (1951); Bellah (1957); Ooms (1985); Hofstede and Bond (1988); Landes (1998), document that also other religions possess a work ethic that made it possible for capitalism to develop. On the other hand, Karl Marx (1859) was convinced that it is the economic structure, with its underlying technology that determines the prevailing culture. Marx' and Weber's contrasting views suggest that an important issue in the field of culture and economics deals with the direction of causality: is it culture that affects the economic conditions of countries or *vice versa*?

The contribution of these early proponents, however, fell on deaf ears for many years, since economists felt no need to introduce in their models new and fuzzy variables, like cultural ones. This lack of interest was mainly due to the absence of a clear definition of culture (Guiso et al., 2006; Weil, 2013; Roland, 2015). Furthermore, cultural explanations were at great risk of been interpreted as products of intellectual laziness, gathering all the factors that traditional models were unable to capture (Fukuyama, 2001; Roland, 2015). Culture was, at best, considered a selection mechanism between different equilibria (Greif, 1994).

The way in which culture finally managed to enter the economic discourse was trough the work and ideas of non-economists. The most important contributions are those by Banfield (1958) and Putnam et al. (1994). In *The Moral Basis of a Backward Society*, Banfield reports that in Montegranaro, a small city in the South of Italy, individuals act to maximize the short-run material advantage of their nuclear family and assume that all others will do the same. This selfish behavior, labeled amoral familism, is a good candidate in explaining the development gap between Northern and Southern Italy. Putnam et al. (1994), instead, investigate how localized social capital affects the performance of institutions in Italy and conclude that more altruistic societies tend to have better institutions. Between the end of the twentieth and the beginning of the twenty-first century, the idea that including culture could enrich the understanding of economic phenomena begun to attract a growing number of scholars and the problem of how to do it was clearly on the table. Of course, the availability of larger datasets measuring cultural values and the improvement of statistical tools both played a major role in this shift of attention towards culture.

It deserves to be noticed that more business-oriented scholars recognized the importance of cultural factors well before other economists. In the late twentieth century cultural explanations were already commonly accepted in subfields like strategy, management and organization theory (Kirkman et al., 2006; Papamarcos and Watson, 2006). The oft-cited example of the importance of cultural factors in management is the one about Toyota and the impracticability to simply blind copy its organization in the Western world, because of the impossibility to replicate the cultural setting that sustains the so-called just in time production technique (Liker, 2004). Culture is also widely used to explain motivations that drive entrepreneurs (Basu and Altinay, 2002). However, in a certain sense, economists have always built their theories relying on cultural norms. In the typical market transaction there is an implicit assumption that individuals will behave 'correctly' and not rob or murder one another because cultural norms, and not formalized-ones, require so (Fukuyama, 2001). Individuals can ignore formal rules, unless strongly motivated to follow them

(Greif, 2006; Salmon and Serra, 2017). Culture can provide individuals with such motivation. Thus, the literature on culture and economics is just a tentative to explicitly assert what has been implicitly already stated in classical economic literature.
The vast majority of the empirical contributions reviewed in the present paper are country level analyses. Individual and regional level studies are rare because of data availability. Publicly available datasets are usually employed for cross-country studies. Sometimes they provide data defined at a more dis-aggregated level (usually regional level), but the number of observations for each unit are too low to perform reliable analyses. Studies at a more dis-aggregated level thus rely on specific data, usually collected using *ad-hoc* surveys.
The rest of the paper is structured as follows. First of all the concept of culture must be clarified, that is why Section 2 provides the reader with some definitions of culture. Section 3 deals with measurement issues, presenting the three most commonly employed approaches to data collection: surveys (3.1), epidemiological studies (3.2) and experiments (3.3). A fourth data source, which is still an emerging-one, big data, is briefly mentioned in Section 3.4. Section 4 lists the most studied cultural traits: trust (4.1), individualism (4.2), importance of family ties and generalized morality (4.3), attitudes toward work and the perception of poverty (4.4). Section 5 focuses on the most common issues cultural economics is dealing with: those of causality (5.1), persistence (5.2) and economic outcomes (5.3). Cultural consequences on countries' institutions (5.3.1), economic performances (5.3.2), financial (5.3.3) and labor markets (5.3.4), as well as innovation (5.3.5) represent the core of this paper. Section 6 summarizes the main findings from the review of the literature. Section 7 is devoted to conclusions, suggestions for future research and recommendations.

2 Defining culture: an intriguing task

The literature is rich with definitions of culture, which differ depending on the field they are applied to and the aims they are meant to serve. Back in the fifties, Kroeber and Kluckhohn (1952) list over 150 different definitions. They can refer to symbols, (Geertz, 1973), or heuristics (Boyd and Richerson, 1985, 2005), or even artifacts (Kroeber and Parsons, 1958), but most commonly they deal with beliefs and values (at least in the economic literature). Before stating what culture is intended to be by economists, it is useful to say what it is not. Culture is not the same as education or human capital, although it shares some features with these latter (Greif, 1994). Both of them are difficult

to define and to measure and experienced initial skepticism that went along with them in their first attempts to enter the economic debate.
A definition that is gathering a growing consensus among scholars (Alesina and Giuliano, 2015) is the one provided by Guiso et al. (2006, p. 23). They formalize culture "*as those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation*". Beliefs or priors are those rules of thumb that help individuals making decisions when they lack previous experience, while values are preferences of individuals. A slightly different definition can be found in Roland (2015, p. 2): "*Culture is generally defined as the set of values and beliefs people in a given community have about how the world (both nature and society) works as well as the norms of behavior derived from that set of values*". While the definitions seem almost overlapping, they differ in the meaning attached to beliefs. Roland (2015, p. 2) states that: "*Beliefs relate to expectations about natural phenomena and people's behavior or reactions to other peoples' behavior.* Defined in this way, in a game-theoretic framework, beliefs "*can both add new predictions to economic models and eliminate conventional predictions*"(Rabin, 1993, p. 1282). In the one-shot prisoner dilemma, beliefs about fairness and reciprocity can allow the efficient equilibrium to emerge. It is important to notice that while Guiso et al. (2006) clearly point to the fact that culture evolves very slowly ("fairly unchanged"), this is not so clear in the definition provided by Roland (2015). As highlighted in Alesina and Giuliano (2015) not all definitions consider both values and beliefs. Greif (1994, p. 915), for instance, focuses only on beliefs, defining them as "*ideas and thoughts common to several individuals that govern interaction-between these people, and between them, their gods, and other groups-and differ from knowledge in that they are not empirically discovered or analytically proven (and) become... known through the socialization process*". Putting together the contributions by Guiso et al. (2006); Roland (2015); Greif (1994), three main features of culture emerge:

1. culture is common to a group of individuals and is transmitted trough socialization;
2. culture puts informal constraints on human interaction;
3. culture is not the same as knowledge or human capital.

3 Approaches to data collection

Measuring culture is probably the most challenging issue for economists. Definitions like the ones presented in the previous Section tell nothing about what exactly should be measured. Values and beliefs are too vague as concepts in

order to be quantified. Measuring culture *per se* is impossible. Specific cultural traits, like trust or the importance of family ties represent the object of analysis in this field. Cultural traits can be considered both as attributes of the single individual (micro level) or as characteristics of the society at large (macro level). As will be made clearer in the next Sections, some collection techniques are more suitable to collect data for studies at the micro level, while others are more suitable for macro-level studies. According to Alesina and Giuliano (2015), data collection techniques could be grouped into three large categories: surveys, epidemiological studies and experiments. In our view, there is also a fourth approach, whose importance is likely to grow rapidly in the future: big data.

3.1 Surveys

The most common way of measuring culture is through surveys asking respondents to evaluate the importance they attach to a given set of value items. None of the three most famous surveys dealing with culture has been designed by an economist. According to Gorodnichenko and Roland (2011) and Roland (2015), the most popular survey is the World Values Survey (hereafter, WVS), developed by Ronald Inglehart, a political science professor at University of Michigan. It deals with topics like generalized trust, happiness, health and political engagement. By the time of writing the present paper, the sixth wave of the WVS has already been completed and it covers 60 countries worldwide.[1] Another famous attempt is represented by the Schwartz Values Survey, named after Shalom H. Schwartz, a cross-cultural psychologists. His idea is that societies differ in the way they answer three critical issues. The first one concerns the boundaries between the person and the group. Accordingly, societies can be more autonomous or more embedded. In autonomous societies, individuals are expected to cultivate and express their own preferences, ideas and abilities (intellectual autonomy), as well as feelings and pleasure (affective autonomy). On the other hand, embedded societies rely on respect for tradition and tend to suppress any action that may compromise the maintenance of the *status-quo*. The second problem is how to preserve the 'social fabric', *i.e.* how to induce individuals to behave responsibly towards others. The two polar answers to this problem are labeled egalitarianism and hierarchy. Egalitarianism rests on the idea that all individuals are human beings and must be treated equally.

[1] Other examples of databases measuring cultural values in a way similar to the WVS include: the International Social Survey Programme, The General Social Survey for the USA, the European Social Survey, the European Values Study and a series of so-called barometers, like the Afro-, Latino-, Asian- and Euro-ones.

Hierarchy, on the other hand, is based on systems of ascribed rules to ensure responsible behavior of individuals. Last but not least, societies must also face the problem of how to manage their relations with the natural and social world. Harmony leads at accepting things as they are, while mastery encourages active self-assertion in order to attain personal or group goals. These dimensions are not independent. According to Schwartz, for instance, embeddedness and autonomy are hardly joinly present in the same population, and the same holds true for egaliatarianism and hierarchy or for mastery and harmony. On the other hand, it is possible to find cultures that are simultaneously characterized both by autonomy and mastery or by hierarchy and embeddedness. Data for the construction of these dimensions are obtained by a dedicated survey, the so-called Schwartz Values Survey, which is based on answers to questions submitted to K-12 schoolteachers and college students, in which they are asked to state the importance of 56-57 value items as guiding principles in their lives.
Last but not least Geert Hofstede surveyed IBM's marketing department employees worldwide (Hofstede, 2001).[2] From this data he was able to construct four basic cultural indicators. The first and most important one is individualism (Roland, 2015), which measures the relative importance of the individual and his goals over the group and the conformity to it. Its opposite being collectivism.[3] The second dimension, power distance, refers to the extent to which less powerful individuals in organizations and institutions not only accept, but also expect that power is unequally distributed. The third dimension, masculinity, relates to the dominance of male and male's values (like competitiveness) over female and female's values.[4] Last but not least, uncertainty avoidance measures a society's tolerance for situations with uncertain outcomes. Many later works highlight the fact that dimensions identified by Hofstede and Schwartz are overlapping to a certain extent: Hofstede's individualism is positively correlated with both types of Schwartz's autonomies and with WVS's measure of generalized morality and negatively correlated with Schwartz's embeddedness dimension (Schwartz, 2004; Gorodnichenko and Roland, 2017, 2011; Alesina and Giuliano, 2015; Roland, 2015). Surprisingly,

[2]As anticipated earlier in the paper, neither he is an economicst. In fact Geert Hofstede is a psychologist.

[3]The literature is still disputing whether individualistic and collectivist traits can coexist within a given culture, or they are mutually exclusive (Papamarcos and Watson, 2006). Hayek (1960), for instance, points out that liberty and responsibility go together, since only if freedom is constrained by a strong sense of responsibility for others, 'free' societies can survive and flourish.

[4]This is probably the most misunderstood of Hofstede's dimensions: too often femininity is confounded with feminism (Papamarcos and Watson, 2006). Hofstede labeled this dimension masculinity/femininity, since it was the only dimension where men and women scored significantly different.

individualism correlates positively also with egalitarianism (Schwartz, 2004) and negatively with hierarchy (Gorodnichenko and Roland, 2011), and power distance correlates positively with embeddedness (Schwartz, 2004). A major difference between the three surveys mentioned above is that while Hofstede and Schwartz propose composite indicators based on their raw data, the WVS does not.

Since it is difficult to design detailed large-scale questionnaires, survey data are usually employed to construct cultural variables at the country level. However, there are some exceptions of *ad-hoc* designed surveys used in micro analyses, like in Guiso et al. (2008).

There are many contradictions in using surveys to study the cultural traits of countries (OECD, 2017). To begin with, translation of questionnaires in different languages is not a simple task as it may seem. Secondly, conditions in which individuals find themselves to live may affect answers they give to questionnaires, the so-called framing effect (Roland, 2015). Last but not least, respondents may answer to questions according to what they think the interviewer expects from them, rather than manifesting their true opinion (Bertrand and Mullainathan, 2001).

3.2 Epidemiological studies

A second way to measure cultural traits is the so-called epidemiological approach in which the units of observation are immigrants in a host country. Firstly developed in medicine, epidemiological studies were aimed at disentangling the genetic origin of some diseases from the environmental and lifestyle-related causes. When applied to economics they allow to study how immigrants from different countries behave when they face a common institutional and socioeconomic environment (Fernàndez, 2011). Since it is difficult to imagine that newcomers immediately adapt their habits to those of the country of settlement, differences in behavior between immigrants and natives probably stem from different cultural backgrounds they have inherited from their ancestors in the home country (Hofstede, 2001; Vinogradov and Kolvereid, 2007). Examples of epidemiological studies include preferences for redistribution (Luttmer and Singhal, 2011), trust (Guiso et al., 2006), fertility (Fernàndez and Fogli, 2006, 2009) living arrangements (Giuliano, 2007) and labor markets (Alesina et al., 2015). Since epidemiological studies tend to consider immigrants as a homogeneous group, they are usually employed in macro level analyses. The literature is almost unanimous in pointing at second-generation immigrants as the most suitable sample. This is due to a limited impact of confounding factors, like the selection due to migration mechanism or the inability of newly-arrived immigrants to speak the host country language (Fernàndez,

2011). The idea behind the selection due to migration mechanism is that immigrants may not be a representative sample of individuals in their country of origin: they may well have decided to leave their home environment specifically because they do not feel part of it and thus their culture may differ from the one prevailing in their home country. This, along with the fact that parents are not the only source of cultural transmission and that by "*looking at immigrants, we are not seeing culture in its purest form*"(Weil, 2013, p. 424), causes the epidemiological approach to be biased toward findings that culture is not important (Fernàndez, 2011). The epidemiological approach is quite new in economics, since until the sixties, when evidence of the resilience of ethnic and religious traits became undeniable, many social scientist were convinced that the assimilation of immigrants into a cultural melting pot is a fast process (Bisin and Verdier, 2005). Still, there is evidence that, as time goes by, differences in behavior between immigrates and native-born citizens tend to decline (Carroll et al., 1994).

3.3 Experiments

The third way to measure culture and test whether it affects economic outcomes is *via* experiments, typically ultimatum, trust and public good games (Paldam and Svendsen, 2000). According to Roth (1995); Henrich (2000), ultimatum games clearly point to the fact that players' behavior undeniably deviates from the predictions of game theory, not only in that individuals offer more and tend to have higher rejection rates than expected, but also in that they play the game differently according to the society they belong to. An indigenous population of the Peruvian Amazon, the Machiguenga are reported to offer less than subjects in more developed societies and this is probably due to the fact that they are not accustomed at cooperation (and thus at sharing its outcomes) outside the family. Trust games reveal that individuals tend to offer more than predicted by game theory (Ho and Weigelt, 2005). As far as public good experiments are concerned, Castro Finocchiaro (2008) reports that British subjects tend to contribute significantly more than Italians, when they know that the other members of the group are compatriots. This could be due to different levels of trust prevailing in the two countries: Britain is characterized by higher level of interpersonal trust than Italy. This, in turn may cause British individuals to free-ride less, since they expect that also other subjects involved in the game will behave in the same way (Inglehart, 2000). The number of participants in an experiment is usually small compared to surveys. Detailed information on individual level characteristics of participants such as age, gender etc. can be easily collected. Experiment are thus suitable also for analyses at the individual level.

As highlighted in Alesina and Giuliano (2015), a major source of potential weakness of experiments is the external validity of results obtained in very specific contexts.

3.4 Big data

There is also a fourth way to study culture, which is not mentioned in Alesina and Giuliano (2015), probably because it's importance is still marginal, but it is easy to imagine that it will grow in the next future: big data. According to Snijders et al. (2012, p. 1), "*Big Data is a loosely defined term used to describe data sets so large and complex that they become awkward to work with using standard statistical software*". Usually they come from the Internet, are unsolicited and do not suffer from the already mentioned framing effect (Curini et al., 2015). They can be particularly helpful for young researches at the beginning of their careers, because of low costs and quick availability (Edelman, 2012). Internet data have already been used in several economic subfields, spanning from microeconomics to history of economic thought (Edelman, 2012) and they are starting to find their way in the field of culture and economics. According to Edelman (2012) also experiments can be conducted online. Varian (2014), however, points to the fact that because of some peculiarities of big data, like their jumbo dimension, one must be especially careful in selecting the appropriate statistical tools. Information overload, a situation in which the quantity of information greatly exceeds human cognitive processing capacity, requires new, *ad-hoc* designed methodologies, as for example text mining to handle such huge datsets (Feldman and Sanger, 2007). Recently, a new stream of research, labeled culturomics has emerged (Michel et al., 2011). Based on a quantitative analysis of words and phrases, it is aimed at extrapolating cultural trends from digital sources, like Google Books. Murrell and Schmidt (2011), for instance, analyze the number of occurrences of words like 'freedom'and 'liberty'in books and pamphlets in English printed in England between 1559 and 1714 to study how culture and formal institutions coevolve. Following their approach, one can identify words or phrases that are thought to be related to a given cultural trait and use the number of occurrences in e-books, newspapers and social media as proxies for the cultural trait under analysis. For instance one can proxy the importance of family ties with the number of times the word 'nepotism'appears in the most read newspapers in a given country for a given year. Dividing the number of occurrences by, say, the number of articles published in the same year, one can study both how the importance of family ties differs across countries and how it evolves over time. The field is still in its infancy, probably because such an analysis requires specialists from different fields to work together: linguists, anthropologists,

computer scientists, economists etc. So far Big Data have been employed for studies at the macro level, given that individual-level observation are usually shield by privacy law.

4 Reviewing the literature: the most studied cultural traits

From the review of the literature and following Alesina and Giuliano (2015), we have identified some cultural traits that have been studied more often than others and have established themselves as cornerstones in the field of culture and economics. All these traits can be defined both at the micro and at the macro level. Trust, for instance, can be considered both as a feature of the single individual as well as a characteristic of the whole society. When citing empirical contributions we will generally clarify if they refer to the micro (individual) or to the macro (country) level.

4.1 Generalized trust

Generalized trust can be defined as the degree of trust a person has towards another (Guiso et al., 2008) and is the most studied and often considered the most important cultural trait (Roland, 2015). As already stated in the introduction, the idea that trust plays a major role in market transactions dates back at least to the eighteenth century and Adam Smith. In the nineteenth century, Mill (1848, p. 132) identifies the lack of individuals who are supposed to be trusted as the major "*impediment to conducting business concerns on a large scale*". The term generalized refers precisely to the fact that trust should not be intended as circumscribed to family members only, but extended also toward strangers (Marini, 2004). If trust is instead referred only to familiy members and close friends, it could result in negative outcomes for the society at large, as envisioned by Banfield (1958). In the twentieth century, Arrow (1972, p. 357) wrote that "*Virtually every commercial transaction has within itself an element of trust*". If there is a lack of trust in the economy, agents will spend a great amount of resources (time) in verifying others' actions and build external enforcement of contractual agreements, thus reducing the amount of inputs for the production process, as well as benefits from the division of labor and gains from trade (Zak and Knack, 2001; Dixit, 2004; Tabellini, 2010). At the macro level, Guiso et al. (2009) find that bilateral trust between European countries rises trade of goods, financial assets and direct investments. The literature on social capital often refers to trust as one of its two components,

the other usually being a measure of how much individuals are engaged in the civic society (Nahapiet and Ghoshal, 1998; Beugelsdijk and Van Schaik, 2005). It is thus everything but surprising that trust positively affects also the quality of institutions (La Porta et al., 1999). One may then conclude that trust positively affects the economy, but this is not necessarily true at the individual level. Butler et al. (2016), for instance, report that the relationship between trust and individual income is hump-shaped. Too-much trusting individuals may engage in highly-risky businesses with extremely volatile outcomes.
When dealing with trust a major problem arises: how to distinguish culturally-based beliefs from rational expectations (Guiso et al., 2006). The available empirical evidence suggests that trust does not depend much on life experiences and it is hardly developed *via* repeated social interactions (Alesina and Glaeser, 2004; Castro Finocchiaro, 2008; Uslaner, 2008).
Generalized trust is usually measured using survey data. The most employed item comes from the WVS and asks respondents whether most people can be trusted. The percentage of individuals responding that most people can be trusted has been used by several authors as a measure of trust (La Porta et al., 1997; Gorodnichenko and Roland, 2011). A less trodden path to measure trust is trough experiments, in particular trust games.

4.2 Individualism

Cross-cultural psychologists often consider the individualism-collectivism cleavage as the 'profound structure' of cultural differences (Triandis et al., 1988; Triandis and Suh, 2002; Heine, 2015; Gorodnichenko and Roland, 2017; Roland, 2015). Gorodnichenko and Roland (2011) empirically confirm its importance in shaping long-run growth. Restating what has already been written in Section 3, the primacy of the individual over the group characterize individualistic societies. The opposite holds true in collectivistic ones (Triandis, 1995). The impact of the individualism-collectivism dualism on economic variables is analyzed in greater detail in Section 5.3. While individualism has a positive effect on innovation and *per capita* income, it makes collective action more difficult and can lead to opportunistic behaviours, such as free riding (Greif, 1994; Chen et al., 2002; Etzioni, 1988; Alesina and Giuliano, 2015). Furthermore, individualists are more prone to harm the collectivity if this provides them with an advanatge, even more in tasks where individual effort is difficult to determine (Earley, 1989; Wagner, 1995; Chen et al., 2002). On the other hand, individualistic cultures are characterized by anonymous transactions, which lead to a greater number of possible trading partners and thus to a larger extent of the market, compared to collectivistic societies (Greif, 1994). As long as the division of labor is induced by the dimension of the market, individualistic so-

cieties are more likely to experiment sustained long-run growth. Individualism is usually assessed relying both on Hofstede's measure of individualism and Schwartz's mastery dimension.

4.3 Family ties and Generalized morality

Although it is a common sense to perceive cohesive family groups as something positive, the economic outcomes of societies based on strong family ties are less so. While promoting codes of good conduct within small circles of related persons, such societies tend to consider selfishness outside the family as something acceptable or, worse, normal (Banfield, 1958). This, in turn, erodes generalized trust (Alesina and Giuliano, 2010, 2014). The idea that too-strong family ties could harm economic development dates back at Weber (1905). Accordingly, capitalism needs individualistic forms of entrepreneurship and the absence of nepotism in order to emerge and prosper. Strong family ties, instead, are conducive to nepotism which generates negative incentives and erodes trust when promotion decisions in family firms are determined by consanguinity rather than by merit (Zak and Knack, 2001; Bertrand and Schoar, 2006; Bloom and Van Reenen, 2007). Furthermore, Fukuyama (1995) reports that on the one hand, causing distrust to reign outside family boundaries, strong family ties impede the development of formal institutions. On the other hand, they favor the born and rise of suboptimal economic organizations, not able to respond properly to market challenges (McClelland, 1961).
Closely related to the importance of family ties there is another cultural dimension: generalized, as opposed to limited morality. The distinction between the two types of morality rests on the extension of the group individuals are prone to cooperate with. Limited morality refers to situations in which individuals tend to cooperate only with immediate family members, while generalized morality indicates situations where cooperation is extended toward the whole society. At the macro level, limited morality, interpreted as a lack of respect both for other members of the community and for the *res publica*, may cause public good provision to be inadequate and corruption, as well as nepotism, to emerge (Tabellini, 2010). According to Fukuyama (2001, p. 3133): "*Early Protestantism enjoined its members to behave morally... toward all human beings*"and not just toward fellow believers, as many other religions did. This, in turn, increased the number of potential trading partners and thus the benefits deriving from the division of labor. Measures of the strength of family ties and of morality do not convey the same message and are usually treated separately, as in Alesina and Giuliano (2015). Nevertheless from a theoretical point of view they can be considered jointly, since both deal with the importance of the family relative to the broadest society.

The WVS is, once again, the principal tool used to construct cultural dimensions, both for the strength of family ties (questions regarding the importance of family), and for generalized morality (questions regarding respect for others).

4.4 Attitudes toward work and the perception of poverty

Some societies see hard work as the main driving force of success, while other believe that luck is the primary source of it. Such cultural diversity can lead to substantially different economic outcomes (Weber, 1905). As highlighted in Tabellini (2010) and Weil (2013), if individuals believe that success stems from their individual effort rather than from luck, they will probably work harder, have greater propensity to invest, to innovate and to start new economic activities. At the macro level, Minkov and Blagoev (2009) empirically demonstrate that countries in which individuals consider leisure important, tend to perform poorly in terms of GDP, its growth rate, as well as saving and investment rates.

Accepting the idea that hard work is likely to pay off probably leads to consider poverty as one's fault, and therefore to reduce the level of income redistribution by public authorities. At the macro level, the luck-hypothesis is typically associated with a generous welfare state. Alesina and Glaeser (2004) and Alesina and Angeletos (2005) report that in cross country comparisons the proportion of people who believe that luck determines income is positively correlated with spending in social welfare compared to GDP.

Also here the WVS is the primary source of data: there are questions regarding both the relevance of hard work versus luck in determining success in life and laziness and bad luck in determining poorness.

Before concluding this section, it is important to stress two points. To begin with, cultural dimensions analyzed so-far have been treated separately. This does not mean that they are not interconnected, but rather, that culture is decomposable (Mokyr, 2016). Secondly, the vast majority of cultural measures are aggregated at the national level (Schwartz, 2004). However, within countries there can be substantial heterogeneity based on age (see Section 5.2), gender and ethnic group (Levie, 2007). The psychological literature dealing with personality theory suggests that there is a gender difference in cultural traits. Women, for instance, tend to trust more and be more altruistic than men do. Furthermore, this gender differences seem to be persistent over the life-cycle of individuals and to be present in counties at different stages of economic development. Women tend also to score higher than men on extraversion

(Feingold, 1994), although many studies questioned this particular difference (Chapman et al., 2007). Such differences are usually ascribed to different pressures that men and women have faced during the history of humanity. Other traits, like openness to new ideas do not seem to vary consistently between genders. For an overview of the topic, see the introductory section in Chapman et al. (2007). The economic literature has generally ignored gender differences in cultural traits, probably because it is difficult to map psychological traits into cultural ones. The heterogeneity of cultural traits at the county level is precisely what whetted the interest of early scholars (Banfield, 1958; Putnam et al., 1994) and underlies the epidemiological approach.

5 Culture and economics: main issues

Although only in its infancy (Gorodnichenko and Roland, 2017), the literature on culture and economics has developed itself around four main research questions, those of causality, persistence and impact on economic variables. Addressing the issues of causality and persistence are typically preparatory tasks, which, if disregarded, cause the legitimacy of culture as a determinant of institutional and economic outcomes to be questionable.

5.1 Causality

So far, implicitly, it has been taken for granted that culture can account for differences in economic outcomes between countries. However, the possibility that causality flows from economic variables to cultural ones must be taken into account. Inglehart and Baker (2000); Fernàndez (2011) believe that it is economic development which has a powerful impact on cultural values, rather than the other way round. This thesis is empirically confirmed by Henrich et al. (2001). Performing the canonical ultimatum game in 15 not-industrialized small-scale societies, they find substantial deviations both from the textbook prediction of the *homo economicus* and from the behavior of individuals in industrialized societies, due to the different structure of production and market integration prevailing within this societies. Individuals that are accustomed at cooperating in their everyday production activity, will offer higher stacks and the same holds true if they are more familiar with anonymous market transactions. Such evidence strongly claims in favor of Marx's suggestion that the structure of production influences culture and economic relations (Guiso et al., 2006). In a similar fashion, Alesina and Fuchs-Schündeln (2007) and Inglehart and Baker (2000) both provide evidence of the effect that a particular political regime, namely Communism, had on culture of individuals living under it.

The possibilities of reverse and simultaneous causality are clearly on the table and they must be addressed with appropriate statistical tools. The canonical ordinary least squares regression does not allow to isolate the impact of the independent variable on the dependent one, leaving aside the (theoretically plausible) effect of this dependent variable on the independent one. A common solution to this problem is represented by the Two Stages Least Squares (2SLS) or Instrumental Variables (IV) approach. Accordingly, the first thing to do is to find one or more variables, labeled instruments, which are correlated with the cultural trait whose effect is under investigation, and are supposed to impact the dependent variable only trough the cultural trait. The IV procedure can be divided in three steps: first, run a regression in which the cultural trait is the dependent variable and the instruments (plus the controls of the original regression) are the independent ones (first-stage regression); second, compute the predicted values for the instrumented variable from this regression; third, use this predicted values, rather than the original ones, as regressor in the original regression model (second-stage regression). The coefficients in the second-stage regression will capture only the effect of the dependent variable on the independent-one, filtering out any shadow of reverse causality (Guiso et al., 2006; Verbeek, 2017; Hill et al., 2017; Gorodnichenko and Roland, 2017). Since instruments must be exogenous to the relationship under analysis, they are usually taken from other disciplines, like linguistics (Licht et al., 2007) and genetics (Guiso et al., 2004; Gorodnichenko and Roland, 2017).

5.2 Cultural persistence and transmission

One of the most debated issues in contemporary literature is whether it takes centuries for cultural traits to change or if this is a fast process. Scholars are almost unanimous in stating that culture does change (Weber, 1905; McGrath et al., 1992b; Hofstede, 2001; Schwartz, 2004; Inglehart and Welzel, 2005; Tabellini, 2010).[5] What is less clear is whether culture is fast- or slow-moving. In this second case culture is said to be persistent or resilient. On the one hand, McGrath et al. (1992b); Glaeser et al. (2000); Hofstede (2001); Wennekers et al. (2007) document strong persistence of culture. On the other hand, there are also some defenders of the fast-moving hypothesis, like Fukuyama (2001); Mokyr (2016). Stating the support for one of the two possibilities is not an end in itself, since only persistence allows to use culture in explaining long-run phenomena.

In principle one can think of cultural traits as 'public goods'. Consider, for in-

[5]Exception to the mainstream idea can be found in Sowell (1994); Kohn and Schooler (1983); Putnam et al. (1994): they all claim that culture is almost unmodifiable, even in the long run.

stance, trust: it is non rival and non-excludable (Paldam and Svendsen, 2000). Thus there seem perfectly logic that one can change its level of trust whenever he deserves. If this is not the case, there must exist some barriers or switching costs, that prevent such changes to occur (Ramsay, 1996). According to Guiso et al. (2006) there are three complementary causes of cultural persistence.

The first one is that culture is, by and large, transmitted from parents to children, *i.e.*, vertically, as opposed to horizontally and obliquely, *via* social imitation and learning (Berry et al., 2011; Roland, 2015). Parents will naturally tend to teach their children what they have learned from their own parents, so that beliefs and values are transmitted "*fairly unchanged from generation to generation*"(Guiso et al., 2006, p. 23). Fernàndez et al. (2004); Farré and Vella (2013), document the important role played by mothers in transmitting to their sons attitudes favoring both women's participation in the labor market and their higher education. Dohmen et al. (2012) document that also trust and attitudes toward risk are transamitted from parents to children. Epidemiological studies are based precisely on the assumption of the existence of a vertical component in the process of cultural transmission. However, immigrants can decide to let their children horizontally learn from their peers in the recipient country, if they believe that this could be useful (Bisin and Verdier, 2005). The typical example is language adoption, which could help the integration in the labor market (Reimers, 1985). Thus, it seems that individuals have some control over what they decide to transmit to their sons (Fernàndez, 2011). Contrarywise, sons are undeniably tied to their parents' culture, even when they pretend to have broken with the past (Sowell, 1994; Guiso et al., 2003). This suggests that at least something of what one has learned as a child, remains imprinted in her/his mindset, possibly unconsciously (Rokeach, 1968, 1973; Inglehart, 1977, 1997; Hofstede, 1980b,a; Schuman and Scott, 1989; Newton and Norris, 2000; Mueller and Thomas, 2001; Pinillos and Reyes, 2011) and could generate what Roland (2015) labels core beliefs and values. Accordingly, while core beliefs and values represent the pillars of one's world view and are therefore more persistent, peripheral beliefs and values are more easily subject to change. This is an interesting way of merging the fast- and slow-moving hypothesis which could explain why there is still disagreement about the speed of cultural change (Bertrand and Schoar, 2006).

Secondly, there are some organizations, like the state, the church, and the academia, that might get a rent from current beliefs and values, and are therefore interested in maintaining the cultural *status-quo* (Guiso et al., 2006; Pinillos and Reyes, 2011; Weil, 2013). Moreover, cultural values and beliefs are so deeply rooted within social institutions that they are continuously reinforced (Greif, 1994; Inglehart and Baker, 2000; Hofstede, 2001; Tabellini, 2008).

Last but not least, cultural norms might remain widespread diffused in the

population even if their outcomes are, from an economic point of view, inefficient (Guiso et al., 2006). Such cultural norms may well have been efficient when introduced and they simply continue to be taught by parents because they have become a sort of tradition (Grusec and Kuczynski, 1997) . Salamon (1992), for instance, documents how the labor-intensive, low profitable Illinois' German-Catholic descendant's crop farming was functional to their high fertility, since it guarantees an employment to their children.
As far as inter-generational cultural change is concerned, within countries there are differences in cultural values between different age cohorts. They are mainly due to the macroeconomic conditions that characterize their childhood and tend to be persistent during the rest of their life. Using WVS data, Inglehart and Baker (2000) show that cohort born in periods of economic and social prosperity trust more and place greater value on self-expression and tolerance than those born during periods of economic and social decline. When the economic and social system of countries experience a collapse (as former Communist countries did when their political system start to decline), the authors observe that survival is of great importance to people. When improved living conditions allow people to take survival for granted, they start developing trust and open-mindedness. In contrast, when survival is at risk, people try to avoid the unknown and are thus less opened to new ideas. These effects of economic and social conditions interact with the three main causes of cultural persistent listed above. The complex interplay of these forces made cultures move on parallel trajectories rather than converging: different cultures can respond in a similar way to the same change in macroeconomic conditions, but given that their starting point is different, they are not moving toward a unique worldwide culture.

5.3 Culture and economics

As mentioned in the introduction, in recent years a growing number of economists are trying to shed light on the potential economic effects of culture. Some of this relations are already well established, like the positive effect of trust on investments (Zak and Knack, 2001; Guiso et al., 2008), while in other cases the evidence is still mixed, e.g. trust and economic growth (Bertrand and Schoar, 2006; Maridal, 2013). The review of the literature reveals at least five economic domains on which culture may impact: institutions, economic growth, financial markets, labor markets and innovation. In an attempt to be as clear as possible in what follows they are treated separately, but not independently. Not all the papers here reviewed deal with the causality issue. For those that do, this section provides the reader also with some basic information about the identification strategy employed.

5.3.1 Culture and (formal) institutions

Since institutions[6] are set up by individuals, it is reasonable to expect them to be shaped according to beliefs and values that individuals hold (Berger and Luckmann, 1966; Meyer, 1986; Greif, 1994; Mokyr, 2016). Consider contemporary United States: it is well-known that beside federal laws, there are state-level laws which may differ substantially from state to state. The origins of this asymmetry can be traced as back as the seventeenth and eighteenth century, when different parts of the US where colonized by different waves of settlers, each with its own culture (Fischer, 1989). However, one may well argue that immigrants' culture was, in turn, shaped by the institutional environment in which they grew up before moving to the US and so causality goes both ways: from institutions to culture in the home country, and then from culture to institutions in the US (Scott, 1995). The idea that institutions generate culture is in sharp contrast with the evidence of cultural heterogeneity within national boundaries at the regional level (Putnam et al., 1994; Alesina and Giuliano, 2015). There are several examples of minorities that survive, along with their languages and cultures, in spite of political states which do not recognize their ethnic and religious diversity: Basques, Catalans, Corsicans and Irish Catholics, to cite some of them (Bisin and Verdier, 2005). Moving to the empirical literature, Licht et al. (2007), show that at the macro level, societies emphasizing autonomy exhibit better institutions than collectivism. Intuitively one would probably said the opposite. The main point here is that autonomy goes along with better institutions because it needs them. Professing the primacy of individuals' goals over those of the collectivity, these societies exhibit a greater demand for individual freedom, clearly defined rights and stronger constraints to the power of the authorities. Licht et al. (2007) handle the causality issue employing a 2SLS procedure and two different instruments in two separate regressions. First of all, they employ a dummy variable taking value one if the language spoken in the country allows to drop person-indexing pronouns ("I", "you", etc.) in sentences and zero otherwise, adopted from Kashima and Kashima (1998). The rational is that culture and language coevolve and dropping the person-index pronoun is related to less emphasis on the single individual. [7] Then, based on the empirical evidence that Hofstede's individualism and Schwartz's autonomy are strongly correlated, the second instrument is a lagged value (30 years prior) of the Hofstede's individualism dimension.

[6] The term institutions must be intended in a broad sense (Acemoglu, 2008), encompassing political as well as legal and regulatory institutions, alongside with the welfare state.

[7] A detailed theoretical justification for this instrument is out of the scope of the present paper. We refer to Licht et al. (2007) for all the details.

In the same fashion, Schwartz (2004) documents the positive relationship between autonomy and democracy. In line with theoretical predictions by Fukuyama (1995), La Porta et al. (1997) find that at the macro level, trust positively affects several measures of quality of institutions.

5.3.2 Gross Domestic Product

Economic growth and the level of GDP are usually associated with positive attitudes toward hard work, saving and education (Minkov and Blagoev, 2009). Culture can play a role in shaping all of them. Gorodnichenko and Roland (2017) find that individualism has a positive impact on economic growth both directly and indirectly, through the effect it has on innovation activity. The paper deals with the causality issue relying on a 2SLS procedure: individualism is instrumented with the pronoun drop dummy taken from Licht et al. (2007) as well as with several alternative measures of genetic differences between populations, taken from Cavalli-Sforza et al. (1994); Spo (2009); Chiao and Blizinsky (2009); Way and Lieberman (2010), Red Cross and similar agencies. The theoretical justification for using genetic variables as instruments for cultural variables is the consideration that both are transmitted from parents to children and that indeed, culture may be, to some extent, determined by genes.
Moving to trust, Helliwell (1996); Inglehart and Baker (2000) report its positive impact on GDP. Bertrand and Schoar (2006) question this relationship: using WVS data they first show the existence of a strong positive correlation between trust and GDP *per capita*, but then they show how this correlation disappears once a measure of the strength of family ties (based on WVS data) is included in their regressions model.
Using WVS data, Maridal (2013) tries to identify which cultural traits have the largest and most significant impact on economic performance, measured as percentage level of GDP growth, PPP adjusted, for a sample of low and medium income countries. The data show that teaching independence and thriftiness to children, striving for excellence and being honest, all have a positive and statistically significant impact on economic growth. Their interpretation is that the first three variables constitute the so-called achievement orientation, which is important in the production stage of the economy (Fukuyama, 1995). Honesty, on the other hand, plays an important role in the exchange stage of the economy. By reducing opportunistic behaviors, honesty breeds trust, which in turn lowers transaction costs and enlarge markets. Large markets are the key to the division of labor and thus to productivity gains (Smith, 1776). Both achievement orientation and honesty are required for economic growth (Marini, 2004; Maridal, 2013).

Liñán and Fernandez-Serrano (2014) find that in European countries, cultures emphasizing autonomy and egalitarianism are more conducive to economic growth than those based on the unconditional acceptance of the prevailing societal order.
Following the ideas of Weber, McCleary and Barro (2006) try to assess whether religion can explain differences in *per capita* real GDP growth rates in a sample of 41 countries. Their results suggest that religion overall does not play a pivotal role in shaping growth patterns of nations. This is due to the fact that positive effects in terms of honesty, work ethic, thriftiness and openness to strangers are offset by the resources that the religion sector absorb in order to produce them. Moreover, doctrines and prescriptions of different religions are so heterogeneous, that it's almost impossible to assess a general effect of religion on behavior, the clearest example being Weber's theory on Protestantism (Marini, 2004). McCleary and Barro (2006) deal with the causality issue by instrumenting religiosity variables (monthly attendance at formal religious services and belief in hell) with different exogenous variables that are thought to affect religiosity: dummy variables for state religion and state regulation of religion; a religious pluralism indicator and religion adherence shares among persons adhering to some religion. Data on religiosity and on the instruments are taken mainly from the WVS and similar surveys. The interested reader should refer directly to the paper for more information.
Last but not least, Gorodnichenko and Roland (2011) analyze the impact of culture on economic performance in roughly 70 countries and find that individualism, autonomy and egalitarianism all have a positive and significant impact on output *per capita*. Conversely, power distance and embeddedness negatively affect economic performance. The identification strategy employed is 2SLS and the cultural dimensions are instrumented using the Euclidean distance of frequencies of blood types (A-type and B-type) between a given country and the country with the largest value of that specific cultural dimension. The primary source of data on blood frequencies is Cavalli-Sforza et al. (1994).
Finally, putting together what already told in Section 5.3.1 about culture and institutions, with the evidence provided by Barro (1991); Acemoglu et al. (2002, 2001), that institutions play an important role in explaining long run growth, one can state that there is also an indirect impact of culture on the economy: *via* institutions (North, 1990b,a).

5.3.3 Financial markets

Recalling from Section 4.1 what Smith (1776) and Arrow (1972) wrote about the role of trust in essentially every market transaction, it is everything but

surprising to find that trusting individuals are more involved in financial markets than non-trusting ones (Guiso et al., 2004, 2008). Using data from an Italian bank customer survey, Guiso et al. (2008) find that also trust in the financial institution one is relying on for investments plays a role, both in the decision to invest or not and in the quantity invested. The same results hold true in cross-country comparisons. Trust impacts also on the decision of entrepreneurs to list their companies: low-trusting investors can be attracted in the stock market only if the returns are disproportionately high compared with the risks they bear. This, in turn, will discourage entrepreneurs from listing their companies. In order to invest, one must firstly spare some money, so that savings are the prerequisite of investments. Guiso et al. (2008) and Minkov and Blagoev (2009) report that also savings are influenced by culture: the highest the share of individuals who think that teaching thriftiness to children is important, the highest the fraction of national savings compared to GDP. At the macro level, Bertrand and Schoar (2006) document both the negative impact of strong family ties on the dimension of a national stock market (number of listed firms) and on its concentration (share of market capitalization controlled by top 5 families), while Guiso et al. (2004) show that trust, measured at the community level, positively affects the probability of signing checks. Greif (1994) states that a particular cultural trait, namely, individualism has significantly contributed to the development of financial markets. Looking at late-medieval Italian city of Genoa, he claims that strong individualism caused firms to emerge and then to sell their shares to non-family members, giving birth to stock markets.

5.3.4 Labor markets

Culture is usually taught to affect labor markets through the impact it has on female participation (Fernàndez and Fogli, 2009). Culture affects wives' labor participation in two ways. Directly, influencing the allocation of time between home and market work by women with the same characteristics and indirectly, through its impact on women's characteristics, *i.e.*, on education, number of children (Reimers, 1985; Fernàndez and Fogli, 2009). According to Papamarcos and Watson (2006) changes in female labor participation have far-reaching effects on family, workplace, etc (introduction of family-friendly polices) and the economy (greater talent pool). Culture, however, may well have an impact also on the participation of males in the labor market. At the macro level, Yang and Lester (2000) analyze the overall unemployment rate and find that for their sample of 18 industrialized countries, a high level of extraversion (lack of socialization) implies that the country will have a high unemployment rate, since information about job opportunities flows easily

within well-socialized societies (Weil, 2013). This, together with the evidence reported in Feingold (1994), that women tend to score higher than men on extraversion, suggests that extraversion may ultimately account different employment levels by men and women. There is also another way in which culture can affect the labor market, namely its impact on the decision of being an employee or a self-employed (McGrath et al., 1992a; Mueller and Thomas, 2001; Basu and Altinay, 2002; Vinogradov and Kolvereid, 2007). Culture operates through two channels, shaping both an environment which can be more or less supportive for entrepreneurial activity and individual attitudes consistent with entrepreneurship (Mueller and Thomas, 2001; Liñán and Fernandez-Serrano, 2014). Guiso et al. (2006), for instance, find that at the individual level, trust positively affects the probability of becoming an entrepreneur. The authors employ a 2SLS and instrument trust with dummy variables for religious denomination and ethnic origin of individuals. Conversely, Bertrand and Schoar (2006), find that at the macro level more trust is associated with less self-employment, unless a measure of the strength of family ties is included in the regression.

5.3.5 Innovation

Innovation, through its impact on productivity, could play an important role in explaining why nations differ so widely in terms of income and development. In order to test this theoretical prediction, Gorodnichenko and Roland (2017) develop an endogenous growth model and find that individualism provides strong incentives to innovate and thus spurs long-term growth. At the same time, collectivism, although generating static efficiency gains, has no growth effect. From a historical point of view, Greif (1994) reports that the late-medieval city-State of Genoa was known both for its strong emphasis on the individual and its innovation activity, thus claiming a causal link between them. Every innovation has, indeed, a component of risk. Accordingly, Shane (1992) reports that innovation activity is more frequent in low-uncertainty avoidance countries. Akçomak and Ter Weel (2009); Laursen et al. (2012) believe that there exists a causal link also between trust/social capital and propensity to innovate. Circumscribing their analysis to Italian regions, Laursen et al. (2012) find that firms based in regions with higher levels of localized social capital are more likely to innovate their products. The paper deals with the causality issue by implementing 2SLS and using as instruments for trust historical (lagged) data on literacy rates, universities (periods od existence and density, *i.e.* numer of universities per 100.00 inhabitants) and formal institutions (constraints on the executive).

6 A short summary of the major findings

For what has been said so far, culture can influence both institutions and the economy in several ways. Previous sections provide the reader with numerous examples of such impacts, but they require some time and effort to be fully understood. In order to simplify the main results of the review of the literature and to present them in an effective way, we have decided to display them graphically in Appendix 1. The aim is to show schematically how culture affects the economy, leaving aside all measurement and methodological issues. In this section we do not distinguish between analyses at the micro and at the macro level. Since different authors label and measure similar concepts in different ways (Atkinson and Butcher, 2003), we have decided to merge both cultural traits and institutional/economic outcomes into a limited number of elements, so that what is lost in terms of accuracy is gained in terms of handiness.

Our idea is that there are two macro cultural traits that can shape the development of a country (square boxes in Figure 1) and that they can have consequences on five domains (ellipses is Figure 1). Arrows are aimed at showing the existence of a positive impact of the cultural trait on the specific outcome it is connected to and list contributions that empirically demonstrate the existence of such causality.[8] Designed this way, the diagram is useful both for a schematic representation of cultural consequences on the economy and institutions and for the identification of the relevant literature.

The first cultural trait displayed in Figure 1 deals with the importance of the individual within the society, of his effort in reaching his own goals, and his continuous attempts to strive for excellence. The other one groups traits like respect for others, trust, social capital and equality of opportunities for all. These two traits impact on the level of economic activity, financial and labor markets as well as innovation and institutions. The two cultural traits may seem two polar ends of the same trait, but, in our view, they are not: the importance of the individual and respect for others are not antithetical. In fact, the literature suggests the opposite: they are simultaneously needed for economic development. In the same manner, equality of opportunities is rather a prerequisite of the importance of individual effort, than a negation of the same. In conclusion, it seems plausible to say that economic and institutional development are built upon a society in which individuals are not discriminated by status, sex and ethnicity, they behave 'correctly' and are expected to

[8]There are some papers, like Yang and Lester (2000) documenting a negative impact of the lack of socialization on unemployment. In such situations we have considered that socialization (intended as part of social capital) positively affects the labor market.

do so (trust). At the same time they are also encouraged to pursue their own goals and to do it at the best of their possibilities. Notably, Fukuyama (1995) recognizes the importance both of achievement orientation in the production stage of the economy and of trust in the exchange stage.

7 Conclusions, suggestions for future research and recommendations

In recent years culture has finally found its way to enter the economic debate and it is nowadays hard to deny its importance. If culture can improve the reliability of economic models, then it leads them to be more useful both in the comprehension of present and past events and in forecasting future-ones (Mueller and Thomas, 2001). Understanding how culture interacts with institutions may help policy-makers to design more effective policies (Papamarcos and Watson, 2006; Gorodnichenko and Roland, 2017; Pinillos and Reyes, 2011). Nevertheless one must always consider that there is a trade-off between accuracy and handiness: only cultural traits with high explanatory power should be included in economic models.

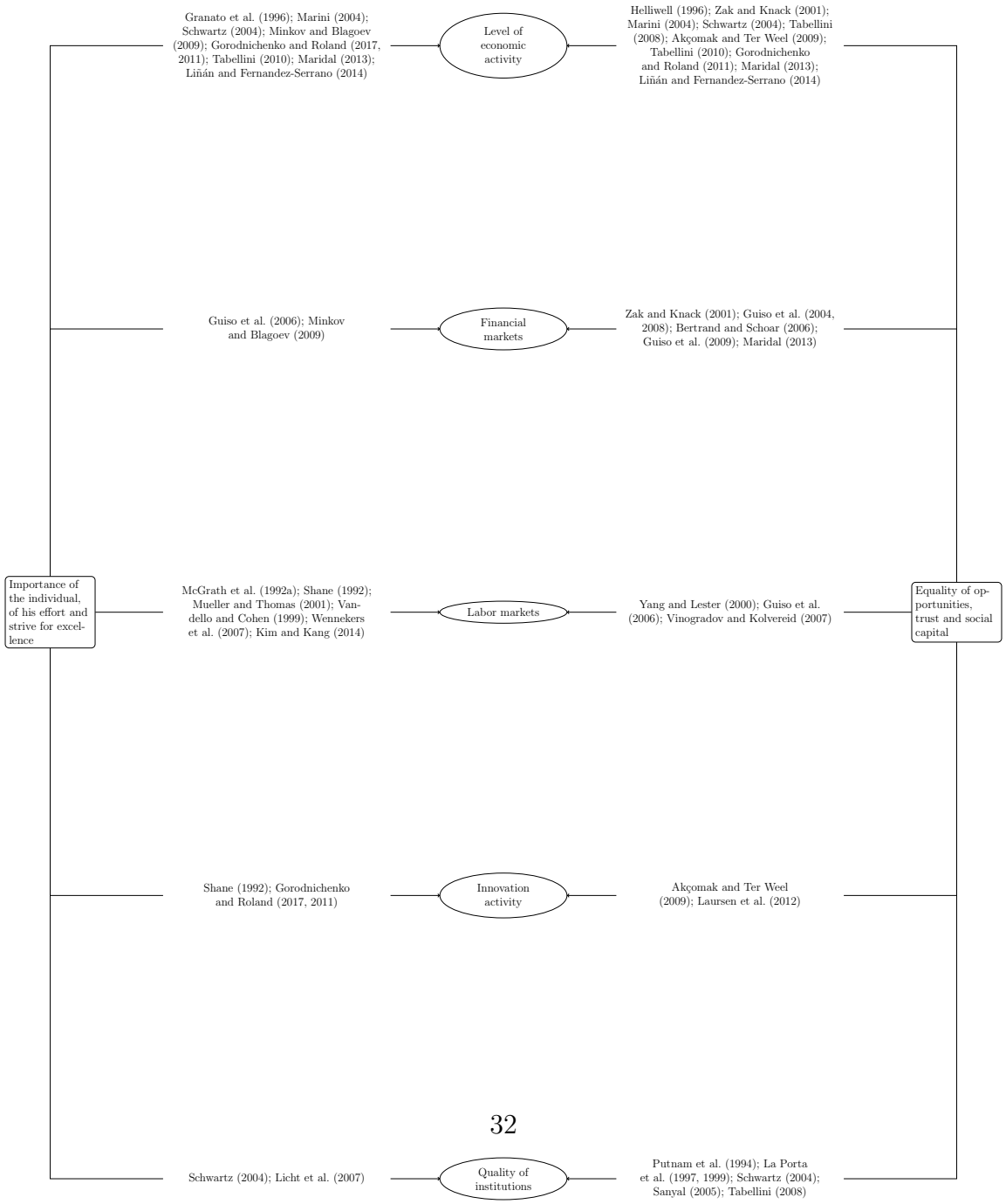
At the same time, many things are still to be done. Mechanisms that govern cultural change must be unveiled, as well as reasons why there are such cultural diversities around the word (Mokyr, 2016). Saying that cultural differences are due to asymmetric cultural evolutionary trajectories is not enough, the reasons why trajectories have differed must be studied and understood. Fincher et al. (2008); Chiao and Blizinsky (2009); Way and Lieberman (2010), for instance, document strong correlations between genetic variables and the individualist-collectivist nature of a society. Up to now the prevalent idea is that where individuals are at great risk to suffer from stress and depression due to genetic predisposition, they tend to develop collectivist societies, which are more conducive to psychological support in stressful situations. Roland (2015); Galor and Özaka (2016) state that another possible cause could be found in geographic endowment. Accordingly, Minkov and Blagoev (2009) suggest that in the past, individuals in warm climates were not accustomed at preserving food, due to its abundance. Because of that, this societies do not develop the concept of putting resources aside for future periods (Weil, 2013), which lead them to have lower saving rates today. For what concerns cultural change, it may well be a result of cultural adaptation to technological change (Fernàndez, 2011), contact with other cultures, increasing wealth, new problems that may arise as time goes by (Schwartz, 2004) and changes in the environment (Giuliano and Nunn, 2017).

In spite of all the efforts, we still lack a clear model of culturally-driven economic growth (Mokyr, 2016), that could challenge the already established ones, like the Solow-Swan-Ramsey model.
Next, the issue of interaction between cultural traits must be addressed, and may help to explain why certain traits affect the economy in one way in some instances, and in a completely different way in others (Gorodnichenko and Roland, 2011).
Although culture and education are not synonyms they exhibited similar difficulties in entering the economic discourse, mainly due to problems in measuring them. One possible path for future research in cultural economics could then be the inclusion of distributional traits of cultural traits into economic models. Weil (2013) suggests that cultural heterogeneity within the same country could severely harm growth.
Another interesting issue that deserves attention is whether the increased globalization and the fast exchange of information made possible by the development of the ICT, would lead to a convergence of world cultures. As stated in Boli and Lechner (2001); Akçomak and Ter Weel (2009), globalization forces are not new, since they date back to the travels of Christian missionaries. According to modernization theory, economic development should promote the adoption of 'modern' values and beliefs in all societies, like tolerance and self-expression. Yet, Inglehart and Baker (2000) provide evidence that the trend toward modern values is not inevitable, nor irreversible. Rather than converging, societies seem to move on parallel trajectories (Inglehart and Welzel, 2005). Borrowing from geomorphology, one can think of modern values as of a new cultural stratus, overlaying on previous cultural strata, so that the final result depends also on what lays 'below' (Massey, 1995; Inglehart and Welzel, 2005).
Furthermore, since authors label differently similar cultural traits, the literature would certainly benefit from the adoption of a clear and unified language.
Next, given the leading role played by firms in production, it is surprising that the relation between culture and market structure has not yet attracted greater attention.
Lastly, we would like to highlight the fact that the field of culture and economics is as fascinating as risky. The temptation of ranking different cultures according to economic efficiency criteria is always around the corner which is not wrong *per se*, but should never result in attaching value judgments to different cultures (Gorodnichenko and Roland, 2017; Weil, 2013). Cultures fostering savings, investments and output are not better than others, they are just more conducive to economic growth (MacIntyre, 1988). Identifying those cultural traits that boost economic growth is easier said than done. According to Fukuyama (1995) achievement orientation is needed in the production

stage of the economy. On the other hand, social virtues that create trust are required in the exchange stage. As shown in the diagram in Appendix 1, both are important for economic growth (Maridal, 2013). The idea that culture is not completely under control of individuals, suggests that poor and slow-growing countries will never improve their conditions. This is not necessarily true, if one considers that a particular set of cultural values doesn't need to generate the same economic consequences in all time periods and all environments (Papamarcos and Watson, 2006). Technological change, for instance, can cause some cultural values to fade away as boosters of growth and others to emerge (Minkov and Blagoev, 2009). Within this framework, culture may also account for the so-called growth miracles (Marini, 2004; Weil, 2013). What makes the framework even more complex is the so-called observer bias (Weil, 2013) or 'Halo effect' (Rosenzweig, 2007): a situation in which the observer will naturally tend to assess as positive cultures of rich countries, and as negative those of poor countries, without a full assessment of other possible explanations. Mill (as reported in Weil, 2013) was convinced that cultural attributes necessary for economic growth are, actually, distasteful.

Appendix 1: Schematic representation of culture's consequences on the economy

Figure 1: Figure 1: Schematic Representation of Culture's Consequences on the Economy.



References

(2009). The diffusion of development. *The Quarterly Journal of Economics*, 124(2):469–529.

Acemoglu, D. (2008). *Introduction to Modern Economic Growth*. Princeton: Princeton University Press.

Acemoglu, D., Johnson, S., and Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review*, 91(5):1369–1401.

Acemoglu, D., Johnson, S., and Robinson, J. A. (2002). Reversal of fortune: Geography and institutions in the making of the modern world income distribution. *The Quarterly Journal of Economics*, 107(4):1231–1294.

Akçomak, I. S. and Ter Weel, B. (2009). Social capital, innovation and growth: Evidence from Europe. *European Economic Review*, 53(5):544–567.

Alesina, A., Algan, Y., Cahuc, P., and Giuliano, P. (2015). Family values and the regulation of labor. *Journal of the European Economic Association*, 13(4):599–630.

Alesina, A. and Angeletos, G.-M. (2005). Fairness and redistribution. *American Economic Review*, 95(4):960–980.

Alesina, A. and Fuchs-Schündeln, N. (2007). Good-bye Lenin (or not?): The effect of communism on people's preferences. *American Economic Review*, 97(4):1507–1528.

Alesina, A. and Giuliano, P. (2010). The power of the family. *Journal of Economic Growth*, 15(2):93–125.

Alesina, A. and Giuliano, P. (2014). Family Ties. In Aghion, P. and Durlauf, S. N., editors, *Handbook of Economic Growth*, volume 2, chapter 4, pages 177–215. Elsevier.

Alesina, A. and Giuliano, P. (2015). Culture and institutions. *Journal of Economic Literature*, 53(4):898–944.

Alesina, A. and Glaeser, E. L. (2004). *Fighting Poverty in the US and Europe: A World of Difference*. Oxfrod: Oxford University Press.

Arrow, K. J. (1972). Gifts and exchanges. *Philosophy & Public Affairs*, 1(4):343–362.

Atkinson, S. and Butcher, D. (2003). Trust in managerial relationships. *Journal of Managerial Psychology*, 18(4):282–304.

Banfield, E. C. (1958). *The Moral Basis of a Backward Society*. New York: Free Press.

Barro, R. J. (1991). Economic growth in a cross section of countries. *The Quarterly Journal of Economics*, 106(2):407–443.

Basu, A. and Altinay, E. (2002). The interaction between culture and entrepreneurship in London's immigrant businesses. *International Small Business Journal*, 20(4):371–393.

Bellah, R. N. (1957). *Tokugawa Religion: The Values of Pre-Industrial Japan*. Illinois.: Free Press.

Berger, P. L. and Luckmann, T. (1966). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. New York: Anchor Books.

Berry, J. W., Poortinga, Y. H., Segall, M. H., and Dasen, P. R. (2011). *Cross-Cultural Psychology: Research and Applications*. Cambridge: Cambridge University Press, 3rd edition.

Bertrand, M. and Mullainathan, S. (2001). Do people mean what they say? Implications for subjective survey data. *American Economic Review*, 91(2):67–72.

Bertrand, M. and Schoar, A. (2006). The role of family in family firms. *Journal of Economic Perspectives*, 20(2):73–96.

Beugelsdijk, S. and Van Schaik, T. (2005). Differences in social capital between 54 Western European regions. *Regional Studies*, 39(8):1053–1064.

Bisin, A. and Verdier, T. (2005). Cultural transmission. In Durlauf, S. N. and Blume, L. E., editors, *The New Palgrave Dictionary of Economics*. 2nd edition.

Bloom, N. and Van Reenen, J. (2007). Measuring and explaining management practices across firms and countries. *The Quarterly Journal of Economics*, 122(4):1351–1408.

Boli, J. and Lechner, F. (2001). Globalization and world culture. In Smelser, N. J. and Baltes, P. B., editors, *International Encyclopedia of the Social & Behavioral Sciences*, pages 6261 – 6266. Oxfrod: Pergamon.

Boyd, R. and Richerson, P. J. (1985). *Culture and the Evolutionary Process*. Chicago: The University of Chicago Press Books.

Boyd, R. and Richerson, P. J. (2005). *The Origin and Evolution of Cultures*. Oxford: Oxford University Press.

Butler, J. V., Giuliano, P., and Guiso, L. (2016). The right amount of trust. *Journal of the European Economic Association*, 14(5):1155–1180.

Carroll, C. D., Rhee, B.-K., and Rhee, C. (1994). Are there cultural effects on saving? Some cross-sectional evidence. *The Quarterly Journal of Economics*, 109(3):685–699.

Castro Finocchiaro, M. (2008). Where are you from? Cultural differences in public good experiments. *The Journal of Socio-Economics*, 37(6):2319–2329.

Cavalli-Sforza, L. L., Menozzi, P., Cavalli-Sforza, L., Piazza, A., and Cavalli-Sforza, L. (1994). *The history and geography of human genes*. Princeton university press.

Chapman, B. P., Duberstein, P. R., Sörensen, S., and Lyness, J. M. (2007). Gender differences in five factor model personality traits in an elderly cohort. *Personality and Individual Differences*, 43(6):1594 – 1603.

Chen, C. C., Peng, M. W., and Saparito, P. A. (2002). Individualism, collectivism, and opportunism: A cultural perspective on transaction cost economics. *Journal of Management*, 28(4):567–583.

Chiao, J. Y. and Blizinsky, K. D. (2009). Culture–gene coevolution of individualism–collectivism and the serotonin transporter gene. *Proceedings of the Royal Society of London B: Biological Sciences*, 277(1681):529–537.

Curini, L., Iacus, S., and Canova, L. (2015). Measuring idiosyncratic happiness through the analysis of twitter: An application to the Italian case. *Social Indicators Research*, 121(2):525–542.

Dixit, A. K. (2004). *Lawlessness and Economics: Alternative Modes of Governance*. Princenton: Princeton University Press.

Dohmen, T., Falk, A., Huffman, D., and Sunde, U. (2012). The intergenerational transmission of risk and trust attitudes. *The Review of Economic Studies*, 79(2):645–677.

Earley, P. C. (1989). Social loafing and collectivism: A comparison of the United States and the People's Republic of China. *Administrative Science Quarterly*, 34(4):565–581.

Edelman, B. (2012). Using internet data for economic research. *Journal of Economic Perspectives*, 26(2):189–206.

Etzioni, A. (1988). *Moral Dimension: Toward a New Economics*. New York: The Free Press.

Farré, L. and Vella, F. (2013). The intergenerational transmission of gender role attitudes and its implications for female labour force participation. *Economica*, 80(318):219–247.

Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological bulletin*, 116:429–456.

Feldman, R. and Sanger, J. (2007). *The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data*. Cambridge: Cambridge University Press.

Fernàndez, R. (2011). Does culture matter? In Benhabib, J., Jackson, M. O., and Bisin, A., editors, *Handbook of Social Economics*, volume 1A, pages 481–510. North Holland.

Fernàndez, R. and Fogli, A. (2006). Fertility: The role of culture and family experience. *Journal of the European Economic Association*, 4(2-3):552–561.

Fernàndez, R. and Fogli, A. (2009). Culture: An empirical investigation of beliefs, work, and fertility. *American Economic Journal: Macroeconomics*, 1(1):146–177.

Fernàndez, R., Fogli, A., and Olivetti, C. (2004). Mothers and sons: Preference formation and female labor force dynamics. *The Quarterly Journal of Economics*, 119(4):1249–1299.

Fincher, C. L., Thornhill, R., Murray, D. R., and Schaller, M. (2008). Pathogen prevalence predicts human cross-cultural variability in individualism/collectivism. *Proceedings of the Royal Society of London B: Biological Sciences*, 275(1640):1279–1285.

Fischer, D. H. (1989). *Albion's Seed: Four British Folkways in America*. New York: Oxford University Press.

Fukuyama, F. (1995). *Trust: The Social Virtues and the Creation of Prosperity*. New York: The Free Press.

Fukuyama, F. (2001). Culture and economic development: Cultural concerns. In Smelser, N. J. and Baltes, P. B., editors, *International Encyclopedia of the Social & Behavioral Sciences*, pages 3130– 3134. Oxford: Pergamon.

Galor, O. and Özaka, Ö. (2016). The agricultural origins of time preference. *American Economic Review*, 106(10):3064–3103.

Geertz, C. (1973). *The Interpretation of Cultures: Selected Essays*. New York: Basic Books.

Giuliano, P. (2007). Living arrangements in Western Europe: Does cultural origin matter? *Journal of the European Economic Association*, 5(5):927–952.

Giuliano, P. and Nunn, N. (2017). Understanding cultural persistence and change. *National Bureau of Economic Research*, (23617).

Glaeser, E. L., La Porta, R., Lopez-de Silanes, F., and Shleifer, A. (2004). Do institutions cause growth? *Journal of Economic Growth*, 9(3):271–303.

Glaeser, E. L., Laibson, D. I., Scheinkman, J. A., and Soutter, C. L. (2000). Measuring trust. *The Quarterly Journal of Economics*, 115(3):811–846.

Gorodnichenko, Y. and Roland, G. (2011). Which dimensions of culture matter for long-run growth? *American Economic Review*, 101(3):492–498.

Gorodnichenko, Y. and Roland, G. (2017). Culture, institutions and the wealth of nations. *The Review of Economics and Statistics*, 99(3):402–416.

Granato, J., Inglehart, R., and Leblang, D. (1996). The effect of cultural values on economic development: Theory, hypotheses, and some empirical tests. *American Journal of Political Science*, 40(3):607–631.

Greif, A. (1994). Cultural beliefs and the organization of society: A historical and theoretical reflection on collectivist and individualist societies. *Journal of Political Economy*, 102(5):912–950.

Greif, A. (2006). *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. Cambridge: Cambridge University Press.

Grusec, J. E. and Kuczynski, L. E., editors (1997). *Parenting and Children's Internalization of Values: A Handbook of Contemporary Theory*. New York: John Wiley & Sons Inc.

Guiso, L., Sapienza, P., and Zingales, L. (2003). People's opium? Religion and economic attitudes. *Journal of Monetary Economics*, 50(1):225–282.

Guiso, L., Sapienza, P., and Zingales, L. (2004). The role of social capital in financial development. *American Economic Review*, 94(3):526–556.

Guiso, L., Sapienza, P., and Zingales, L. (2006). Does culture affect economic outcomes? *Journal of Economic Perspectives*, 20(2):23–48.

Guiso, L., Sapienza, P., and Zingales, L. (2008). Trusting the stock market. *The Journal of Finance*, 63(6):2557–2600.

Guiso, L., Sapienza, P., and Zingales, L. (2009). Cultural Biases in Economic Exchange? *The Quarterly Journal of Economics*, 124(3):1095–1131.

Hayek, F. A. (1960). *The Constitution of Liberty*. Chicago: The University of Chicago Press Books.

Heine, S. J. (2015). *Cultural Psychology*. New York: Norton & Co., 3rd edition.

Helliwell, J. F. (1996). Economic growth and social capital in asia. In Harris, R., editor, *The Asia Pacific Region in the Global Economy: A Canadian Perspective*. Calgary: University of Chicago Press.

Henrich, J. (2000). Does culture matter in economic behavior? Ultimatum game bargaining among the Machiguenga of the Peruvian Amazon. *American Economic Review*, 90(4):973–979.

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., and McElreath, R. (2001). In search of homo economicus: Behavioral experiments in 15 small-scale societies. *American Economic Review*, 91(2):73–78.

Hill, R. C., Griffiths, W. E., and Lim, G. C. (2017). *Principles of econometrics*. New York: John Wiley & Sons Inc., 5th edition.

Ho, T.-H. and Weigelt, K. (2005). Trust building among strangers. *Management Science*, 51(4):519–530.

Hofstede, G. (1980a). *Culture's Consequences: International Differences in Work-related Values*. London, UK: Sage Publications.

Hofstede, G. (1980b). Motivation, leadership, and organization: Do American theories apply abroad? *Organizational Dynamics*, 9(1):42–63.

Hofstede, G. (2001). *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations*. Thousand Oaks, CA: Sage Publications, 2nd edition.

Hofstede, G. and Bond, M. H. (1988). The Confucius connection: From cultural roots to economic growth. *Organizational Dynamics*, 16(4):5–21.

Inglehart, R. (1977). *The Silent Revolution: Changing Values and Political Styles Among Western Publics*. Princeton: Princeton University Press.

Inglehart, R. (1997). *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*. Princeton: Princeton University Press.

Inglehart, R. (2000). Culture and democracy. In Harrison, L. and Huntington, S. P., editors, *Culture Matters: How Values Shape Human Progress*, pages 80–97. New York: Basic Books.

Inglehart, R. and Baker, W. E. (2000). Modernization, cultural change, and the persistence of traditional values. *American Sociological Review*, 65(1):19–51.

Inglehart, R. and Welzel, C. (2005). *Modernization, cultural change, and democracy: The human development sequence*. New York: Cambridge University Press.

Kashima, E. S. and Kashima, Y. (1998). Culture and language: The case of cultural dimensionsand personal pronoun use. *Journal of Cross-Cultural Psychology*, 29(3):461–486.

Kim, B.-Y. and Kang, Y. (2014). Social capital and entrepreneurial activity: A pseudo-panel approach. *Journal of Economic Behavior & Organization*, 97:47–60.

Kirkman, B. L., Lowe, K. B., and Gibson, C. B. (2006). A quarter century of culture's consequences: A review of empirical research incorporating Hofstede's cultural values framework. *Journal of International Business Studies*, 37(3):285–320.

Kohn, M. L. and Schooler, C. (1983). *Work and Personality: An Inquiry into the Impact of Social Stratification*. Norwood: Ablex Publishing.

Kroeber, A. L. and Kluckhohn, C. (1952). *Culture: A Critical Review of Concepts and Definitions*. Cambridge, MASS: Museum of Archeology & Ethnology Press.

Kroeber, A. L. and Parsons, T. (1958). The concepts of culture and of social system. *American Sociological Review*, 23(5):582–583.

La Porta, R., Lopez-de Silane, F., Shleifer, A., and Vishny, R. W. (1997). Trust in large organizations. *American Economic Review Papers and Proceedings*, 87(2):333–338.

La Porta, R., Lopez-de Silanes, F., Shleifer, A., and Vishny, R. (1999). The quality of government. *The Journal of Law, Economics, and Organization*, 15(1):222–279.

Landes, D. S. (1998). *Wealth and Poverty of Nations: Why Some Are so Rich and Some so Poor*. New York: WW Norton & Company.

Laursen, K., Masciarelli, F., and Prencipe, A. (2012). Regions matter: How localized social capital affects innovation and external knowledge acquisition. *Organization Science*, 23(1):177–193.

Lester, D. (1997). *Suicide in American Indians*. New York: Nova Science Publishers Inc.

Levie, J. (2007). Immigration, in-migration, ethnicity and entrepreneurship in the United Kingdom. *Small Business Economics*, 28(2-3):143–169.

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

Liker, J. K. (2004). *The Toyota Way*. New York: McGraw-Hill.

Liñán, F. and Fernandez-Serrano, J. (2014). National culture, entrepreneurship and economic development: Different patterns across the European Union. *Small Business Economics*, 42(4):685–701.

Luttmer, E. F. and Singhal, M. (2011). Culture, context, and the taste for redistribution. *American Economic Journal: Economic Policy*, 3(1):157–179.

MacIntyre, A. C. (1988). *Whose Justice? Which Rationality?* Notre Dame, IND: University of Notre Dame Press.

Maridal, J. H. (2013). Cultural impact on national economic growth. *The Journal of Socio-Economics*, 47:136–146.

Marini, M. (2004). Cultural evolution and economic growth: A theoretical hypothesis with some empirical evidence. *The Journal of Socio-Economics*, 33(6):765–784.

Marx, K. (1859). *A Contribution to the Critique of Political Economy*. Moscow: Progress Publishers.

Massey, D. B. (1995). *Spatial divisions of labor: Social structures and the geography of production*. Basingstore: Macmillan, 2nd edition.

McCleary, R. M. and Barro, R. J. (2006). Religion and economy. *Journal of Economic Perspectives*, 20(2):49–72.

McClelland, D. C. (1961). *The Achieving Society*. Princeton, IND: Van Nostrand.

McGrath, R. G., MacMillan, I. C., and Scheinberg, S. (1992a). Elitists, risk-takers, and rugged individualists? An exploratory analysis of cultural differences between entrepreneurs and non-entrepreneurs. *Journal of Business Venturing*, 7(2):115–135.

McGrath, R. G., MacMillan, I. C., Yang, E. A.-Y., and Tsai, W. (1992b). Does culture endure, or is it malleable? Issues for entrepreneurial economic development. *Journal of Business Venturing*, 7(6):441–458.

Meyer, J. W. (1986). Myths of socialization and of personality. In Heller, T. C., Sosna, M., and Wellbery, D. E., editors, *Reconstructing individualism: Autonomy, individuality, and the self in Western thought*, pages 208–221. Stanford, CA: Stanford University Press.

Michel, J.-B., Shen, Y. K., Aiden, A. P., Veres, A., Gray, M. K., Pickett, J. P., Hoiberg, D., Clancy, D., Norvig, P., Orwant, J., Pinker, S., Novak, M. A., and Aiden, E. L. (2011). Quantitative analysis of culture using millions of digitized books. *Science*, 331(6014):176–182.

Mill, J. S. (1843). *A System of Logic*. London, UK: Duke Street.

Mill, J. S. (1848). *Principles of Political Economy With Some of Their Applications to Social Philosophy*. London, UK: Longmans, Greenwood and Co.

Minkov, M. and Blagoev, V. (2009). Cultural values predict subsequent economic growth. *International Journal of Cross Cultural Management*, 9(1):5–24.

Mokyr, J. (2016). *A Culture of Growth: The Origins of the Modern Economy*. Princeton: Princeton University Press.

Mueller, S. L. and Thomas, A. S. (2001). Culture and entrepreneurial potential: A nine country study of locus of control and innovativeness. *Journal of Business Venturing*, 16(1):51–75.

Murrell, P. and Schmidt, M. (2011). The coevolution of culture and institutions in seventeenth century england. *SSRN Working Paper Series*.

Nahapiet, J. and Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, 23(2):242–266.

Newton, K. and Norris, P. (2000). Confidence in public institutions. In Aharr, S. J. and Putnam, R. D., editors, *Disaffected Democracies. What's Troubling the Trilateral Countries*, pages 52–73. Princeton: Princeton University Press.

North, D. C. (1990a). A transaction cost theory of politics. *Journal of Theoretical Politics*, 2(4):355–367.

North, D. C. (1990b). *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

OECD (2017). *OECD Guidelines on Measuring Trust*. Paris: OECD Publishing.

Ooms, H. (1985). *Tokugawa Ideology Early Constructs, 1570-1680*. Princeton: Princeton University Press.

Paldam, M. and Svendsen, G. T. (2000). An essay on social capital: Looking for the fire behind the smoke. *European Journal of Political Economy*, 16(2):339–366.

Papamarcos, S. D. and Watson, G. W. (2006). Culture's consequences for economic development: An empirical examination of culture, freedom, and national market performance. *Journal of Global Business and Technology*, 2(1):48–57.

Pinillos, M.-J. and Reyes, L. (2011). Relationship between individualist–collectivist culture and entrepreneurial activity: Evidence from Global Entrepreneurship Monitor data. *Small Business Economics*, 37(1):23–37.

Platteau, J.-P. (2000). *Institutions, Social Norms, and Economic Development*. Amsterdam: Harwood Publishers.

Putnam, R. D., Leonardi, R., and Nanetti, R. Y. (1994). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton: Princeton University Press.

Rabin, M. (1993). Incorporating fairness into game theory and economics. *American Economic Review*, 83(5):1281–1302.

Ramsay, M. (1996). *Community, Culture, and Economic Development: The Social Roots of Local Action*. New York: Suny Press.

Reimers, C. W. (1985). Cultural differences in labor force participation among married women. *American Economic Review*, 75(2):251–255.

Rokeach, M. (1968). *Beliefs, Attitudes and Values: A Theory of Organization and Change*. San Francisco: Jossey-Bass.

Rokeach, M. (1973). *The Nature of Human Values*. New York: Free Press.

Roland, G. (2015). Economics and culture. In Scott, R. A. and Kasslyn, S., editors, *Emerging Trends in the Social and Behavioral Sciences: An Interdisciplinary, Searchable, and Linkable Resource*. New Jersey: John Wiley & Sons Inc.

Rosenzweig, P. (2007). *The Halo Effect and the Eight Other Business Delusions that Deceive Managers*. New York: Free Press.

Roth, A. E. (1995). Bargaining experiments. In Kagel, J. and Roth, A. A., editors, *Handbook of Experimental Economics*, pages 253–348. Princeton, NJ: Princeton University Press.

Salamon, S. (1992). *Prairie Patrimony: Family, Farming, and Community in the Midwest. Chapel Hill: Univ*. London, UK: University of North Carolina Press.

Salmon, T. C. and Serra, D. (2017). Corruption, social judgment and culture: An experiment. *Journal of Economic Behavior & Organization*, 142:64–78.

Sanyal, R. (2005). Determinants of bribery in international business: The cultural and economic factors. *Journal of Business Ethics*, 59(1-2ù):139–145.

Schuman, H. and Scott, J. (1989). Generations and collective memories. *American Sociological Review*, 54(3):359–381.

Schwartz, S. H. (2004). Mapping and interpreting cultural differences around the world. In *Comparing Cultures: Dimensions of Culture in a Comparative Perspective*, pages 43–73. Leiden and Boston: BRILL.

Scott, W. R. (1995). *Institutions and Organizations. Foundations for Organizational Science*.

Shane, S. A. (1992). Why do some societies invent more than others? *Journal of Business Venturing*, 7(1):29–46.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*. London: William Strahan and Thomas Cadell.

Snijders, C., Matzat, U., and Reips, U.-D. (2012). "Big Data": Big gaps of knowledge in the field of internet science. *International Journal of Internet Science*, 7(1):1–5.

Sombart, W. (1951). *The Jews and Modern Capitalism*. Glencoe, ILL: Free Press.

Sowell, T. (1994). *Race and culture: A world view*. New York: Basic Books.

Tabellini, G. (2008). Presidential address: Institutions and culture. *Journal of the European Economic Association*, 6(2-3):255–294.

Tabellini, G. (2010). Culture and institutions: Economic development in the regions of Europe. *Journal of the European Economic Association*, 8(4):677–716.

Thaler, R. (1985). Mental accounting and consumer choice. *Marketing Science*, 4(3):199–214.

Thomas, A. S. and Mueller, S. L. (2000). A case for comparative entrepreneurship: Assessing the relevance of culture. *Journal of International Business Studies*, 31(2):287–301.

Triandis, H. C. (1995). *Individualism & Collectivism*. Boulder, CO: Westview Press.

Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., and Lucca, N. (1988). Individualism and collectivism: Cross-cultural perspectives on self-ingroup relationships. *Journal of Personality and Social Psychology*, 54(2):323.

Triandis, H. C. and Suh, E. M. (2002). Cultural influences on personality. *Annual Review of Psychology*, 53:133–160.

Uslaner, E. M. (2008). Trust as a moral value. In Castiglione, D., Van Deth, J. W., and Wolleb, G., editors, *The Handbook of Social Capital*, pages 101–121. Oxford and New York: Oxford University Press.

Vandello, J. A. and Cohen, D. (1999). Patterns of individualism and collectivism across the United States. *Journal of Personality and Social Psychology*, 77(2):279–292.

Varian, H. R. (2014). Big Data: New tricks for econometrics. *Journal of Economic Perspectives*, 28(2):3–28.

Verbeek, M. J. C. M. (2017). *A guide to modern econometrics*. Hoboken, NJ: John Wiley & Sons Inc., 5$^{\text{th}}$ edition.

Vinogradov, E. and Kolvereid, L. (2007). Cultural background, human capital and self-employment rates among immigrants in Norway. *Entrepreneurship & Regional Development*, 19(4):359–376.

Wagner, J. A. I. (1995). Studies of individualism-collectivism: Effects on cooperation in groups. *Academy of Management Journal*, 38(1):152–173.

Way, B. M. and Lieberman, M. D. (2010). Is there a genetic contribution to cultural differences? Collectivism, individualism and genetic markers of social sensitivity. *Social Cognitive and Affective Neuroscience*, 5(2-3):203–211.

Weber, M. (1905). *The Protestant Ethic and the Spirit of Capitalism*. Reprint: 1992,London: Routledge.

Weil, D. N. (2013). *Economic Growth*. London and New York: Routledge, 3$^{\text{rd}}$ edition.

Wennekers, S., Thurik, R., van Stel, A., and Noorderhaven, N. (2007). Uncertainty avoidance and the rate of business ownership across 21 OECD countries, 1976–2004. *Journal of Evolutionary Economics*, 17(2):133–160.

Yang, B. and Lester, D. (2000). An exploration of the impact of culture on the economy: An empirical study of unemployment. *The Journal of Socio-Economics*, 29(3):281–290.

Zak, P. J. and Knack, S. (2001). Trust and growth. *The Economic Journal*, 111(470):295–321.

Vertical integration and social capital: Evidence from European countries *

Marco Castellani

Abstract

We study the impact of social capital on vertical integration using information at the four-digit level for manufacturing sectors in 30 European countries. According to transaction cost theory, firms buy their inputs in the market rather than produce them internally if they do not fear to be cheated by their suppliers. Since social capital promotes trust and trustworthiness, we expect that the higher the level of social capital, the higher the reliance on external procurement of inputs. This prediction is confirmed by empirical analyses. Furthermore, we show that the impact of social capital is differentiated among industrial sectors.

JEL Classifications: L22, D23, A13.

Keywords: Vertical integration, Social capital, Trust, Transaction costs.

1 Introduction

In neoclassical economic models firms are thought to be completely described by production functions specifying how inputs are transformed into outputs (Kreps, 1990). The only decision that entrepreneurs/managers have to take is to set the quantities produced as to maximize profits (Hart, 1995). Unfortunately this modeling tells nothing about the internal organization of firms and fails to explain why in the real world there are so many different ways of organizing production. As stated in Coase (1937) and Williamson (1989), one of the main problems faced by real-world firms is whether to produce their inputs internally or to buy them in the marketplace. From the point of view of these authors, firms will choose the cheaper option. Markets may be characterized by the presence of opportunistic individuals, who may fail to keep their

*For all the datasets mentioned in the present work, the interested reader must refer directly to the corresponding terms and conditions available online. The calculations and the conclusion are the sole intellectual products of the Author.

promises. The inability of individuals to *ex ante* identify trustworthy counterparts is a major threat for market transactions (Williamson, 1993; Ghoshal and Moran, 1996). In such situations, high-costing contractual enforcement may lead firms to rely on internal production of inputs (Williamson, 1989). If this is the case, it is important to determine which variables cause such costs to vary from situation to situation (Williamson, 1979). There is a long-standing tradition in social sciences pointing at the level of social capital and trust as potential determinants of costs associated with market transactions (Smith, 1776; Mill, 1848; Banfield, 1958). Surprisingly, the literature on transaction costs has generally ignored the role of social capital and trust, while emphasizing opportunistic behavior, which is rarely observed in reality (Granovetter, 1985; Greif, 1994; Husted and Folger, 2004). A partial explanation is that social capital is difficult to measure and until recent years no large datasets were available. Make-or-buy decisions can be also studied using the incomplete contracts framework (for an overview: Holmstrom and Tirole, 1989). According to this literature, ownership of the relevant asset in a transaction should be attributed to the party that makes the most important investment. Also within this framework social capital may reduce vertical integration. By inducing individuals to behave correctly, social capital leads asset ownership to be less relevant and reduces vertical integration. Social capital has proven to be a powerful explanatory variable in many economic domains, spanning from government performance (Putnam et al., 1994) and economic growth (Nahapiet and Ghoshal, 1998) to innovation (Laursen et al., 2012) and participation in financial markets (Guiso et al., 2004). The present paper represents a first attempt to explicitly test the impact of social capital on vertical integration. In doing so, it is an answer to the call in Bromiley and Cummings (1995), that transaction cost economics should extend its research framework to account also for non purely selfish behavior. While there are studies on the impact of dyadic buyer-seller trust on procurement decisions, the novelty of the present paper resides in the inclusion of social capital at the country level as explanatory variable for vertical integration. In what follows, vertical integration is measured as the ratio of value added to turnover, as proposed by Adelman (1955) and employed among others by Laffer (1969) and Pieri (2018). Laffer (1969) studies how vertical integration evolves over time in the U.S.. Pieri (2018), on the other hand, shows how vertical integration affects growth rates of firms in Italy. While most of the classical empirical contributions focus on single industry case studies and on single countries, the present paper considers different manufacturing industries in 30 European countries simultaneously. In the present paper, vertical integration is measured at the four-digit level for industries belonging to Section C - Manufacturing, as defined in the *International Standard Industrial Classification of All Economic*

Activities (ISIC) (United Nations. Statistical Division, 2008). Our results confirm that countries characterized by higher levels of social capital present less integrated industries. This relationship is stronger in industries with low levels of R&D intensity, where the quality of inputs is easy to specify *ex-ante* and to evaluate *ex-post*. Here informal agreements and reliance on counterparts' trustworthiness can sustain or even substitute contractual agreements easily than in industries where inputs are so complex as to generate strong market power for their producers. The paper is structured as follows: Section 2 reviews the literature on vertical integration and on social capital and establishes the link between the two. Section 3 describes the data that are employed in this study. Results are presented in Section 4. Section 5 concludes.

2 Literature review and theoretical background

In neoclassical economic models, firms are seen as 'black boxes', in which inputs are transformed into outputs and the whole production process is perfectly described by a production function, which is in turn determined by the available technology (Jensen and Meckling, 1976; Hart, 1995). The only problem that firms face is the maximization of profits or, equivalently, the minimization of costs at a given production level. One of the major weaknesses of this approach is that it is unable to explain the boundaries of the firm: both a perfectly competitive market and a monopoly are consistent with the neoclassical theory (Coase, 1937; Williamson, 1989; Hart, 1995). Transaction cost theory (Coase, 1937; Williamson, 1975; Klein et al., 1978) arises as a possible response to this shortcoming. The question that transaction cost economics (TCE) tries to answer is why firms decide to procure in the market some of their inputs (buy) and to produce internally (make) others (Coase, 1937). The answer is strikingly simple: firms choose the cheaper option (Coase, 1937; Williamson, 1989). In principle, it is impossible to say that one of the two options is always cheaper than the other. Only a detailed analysis of the single transaction could reveal which of the two is the most profitable for a firm (Williamson, 1976; Gibbons, 2010). If this is the case, it is important to determine why do transaction costs arise. Transaction costs are mainly due to three transaction failures. The first one is the impossibility of individuals to write complete contracts due to their limited rationality or to the prohibitively high costs of writing them. The second-one is the omnipresent opportunism of individuals. Last but not least, in case of disputes between two parties, third parties, like courts, will be unable to dispense justice costlessly (Williamson, 1975,

1989; Perry, 1989; Martin, 2009). Due to transaction failures, there may be incentives for a firm to integrate vertically (Joskow, 1985; Williamson, 1979). While transaction costs are usually associated with specific investments (those for which the value in the relationship for which they were designed greatly exceeds the value outside it), in its original formulation TCE refers generically to specificity and not strictly to specific investments (Williamson, 1975; Gibbons, 2010). Knowing the transaction counterpart, the timing of the performance and learning by doing are enough to characterize a relationship as specific and not easily interchangeable (Williamson, 1975, 1989; Perry, 1989; Masten et al., 1991; Gibbons, 2010). Furthermore, Williamson (1989), describes transaction costs as frictions in the process of exchange, that are separate from production costs (Perry, 1989). Accordingly, economy is fundamentally a science of contract and a firm is hardly seen as a mere production function (Commons, 1934; Buchanan, 1975). Moving to the empirical literature, contributions testing the predictions of TCE on vertical integration have a long standing tradition.[1] Starting from the first attempts on petroleum refiners (Teece, 1976), car manufacturers (Klein et al., 1978; Monteverde and Teece, 1982) and aerospace industry (Masten, 1984), empirical papers have mainly focused on technological determinants of transaction costs. As already mentioned above, however, transaction costs are far from being completely determined by technological factors embedded in specific investments. Building on Coase and Williamson, a series of contributions suggest that integration could arise as a response to contractual incompleteness when specific investments of one of the transaction counterparts are particularly important (Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995). When contracts are incomplete, asset ownership is a source of power in the transaction, since it determines who can exclude the other party from using the asset. Asset ownership is defined in terms of residual rights of control, *i.e.* the right to decide how to use the asset in case of unforeseen contingencies. A party that can be excluded from using an asset will hardly invest on it. Accordingly, ownership should be attributed to the party whose non-contractible, relation-specific investments are more important for the total surplus of the transaction. Also in this theory, as in TCE, the opportunistic behavior of parties plays a critical role in determining the make or buy decision. Because of opportunism, it may be sub-optimal to have a buyer and a seller as stand-alone entities, since they may not have enough incentives to make investments whose benefits accrue also to the other party. In such situations, firms may decide to integrate vertically.

In his seminal contribution, *Transaction-cost economics: the governance of contractual relations*, Oliver Williamson (1979) points at the identification of

[1]For an overview of the early contributions, see Shelanski and Klein (1995).

the dimensions with respect to which transaction costs differ as one of the most interesting developments of his own theory. Many authors, starting from Smith (1776) and Mill (1848) and continuing with Weber (1904); Banfield (1958); Arrow (1972) and Fukuyama (1995), point at the level of trust as at a potential source of variability in the costs of managing a transaction. Also the literature on industrial districts recognizes that trust may influence vertical relationships between firms (see, for instance: Brusco, 1982). As stated in OECD (2017a, p. 17): "*... trust allows people, businesses and organizations to make decisions without having to renegotiate with ... their counterparts at each interaction*". Within economics, trust or, better, generalized trust is usually defined as the degree of trust a person has towards another (Guiso et al., 2008). When applied to make or buy decisions, it is probably more appropriate to consider trust as the willingness of individuals to be vulnerable to others, based on the presumption that they can rely on the word of their counterparts (Mayer et al., 1995; Rousseau et al., 1998). As a matter of fact, non-integrated firms are vulnerable both to their suppliers and to their buyers. It is legitimate, then, to imagine that firms' willingness to be vulnerable will increase as their expectations of not being cheated rises. Globalization is driving enterprises to rely less on long-term relationships and to search continuously for new, more convenient transaction counterparts. Thus, it is not possible to imagine that trust between firms is developed and reinforced trough a long-standing relationship, as assumed by the relational contract literature (Lewicki and Bunker, 1996; Baker et al., 2002). There must be something outside the single relationship that drives the trusting propensity of managers (McKnight et al., 1998). By establishing mutual obligations and informal sanctions, social capital enhances trust, trustworthiness and reciprocity (Putnam et al., 1994; Fukuyama, 1995; Durlauf and Fafchamps, 2005). As a first approximation one can think of social capital as of the productive value of social connections.[2] As such, a widely debated point is whether social capital is an attribute of the single individual or it pertains to the whole society (Bourdieu, 1986; Baker, 1990; Bourdieu and Wacquant, 1992; Putnam et al., 1994; Portes, 1998). In the first case, the social capital of the single individual must be intended as made of networks and resources available trough network's membership. In the second case, social capital is constituted of networks and shared norms. Whichever the case, social capital can both be beneficial for everyone within the society or can lead single individuals or small groups to gain at the expenses of the society (Bourdieu, 1986; Coleman, 1988; Fukuyama, 1995; Inglehart, 1997; Putnam, 2000). Examples of social capital that are harmful for the society at large are those

[2]The term productive must be intended in a broad sense, encompassing both market production and well-being outcomes.

stemming from networks of terrorists or organized criminals, that are characterized by a strong in-group, out-group dynamic (Portes, 1998). Accordingly, Gittell and Vidal (1998) recognize two types of social capital: bonding and bridging.[3] In a more formal way, Woolcock and Narayan (2000, p. 226), define social capital as "norms and networks that enable people to act collectively". A vibrant associational activity is probably the most obvious manifestation of social capital (Paldam and Svendsen, 2000). When individuals interact frequently in different associations, they develop reputation and trustworthiness that are not limited to interactions within the single association, but become characteristics of their everyday life (Putnam et al., 1994; Newton and Norris, 2000; Putnam, 2000; Burt, 2005). When interacting in the market, this individuals may behave correctly up to the point when they give up part of their material payoffs, because they expect to be rewarded or punished for their behavior not only by their transaction counterpart, but also by other members of the society (Guiso et al., 2004). The theory presented in the present paper differs from the canonical TCE approach in that it allows for the possibility that individuals behave correctly, in a non-opportunistic way. Williamson himself admitted this possibility (Williamson, 1973, 1975, 1985, 1989). He also makes a step further in this direction by writing that "*the propensity for opportunism varies among individuals and between cultures*"(Williamson, 1996a, p.50), but did not develop further the topic. Highlighting this shortcoming, Bromiley and Cummings (1995) suggest that individuals are likely to know approximately how trustworthy others are. In our framework the level of social capital provides individuals with an idea about the trustworthiness of others. The inclusion of social capital in the traditional TCE setting can help to explain why it is not necessary for a firm to behave opportunistically when given the opportunity. By reneging a contract a firm may incur two types of costs. On the one hand, by doing so, a firm is signaling itself as not trustworthy and this reputation damage can translate into an economic-one, if other firms will refuse to trade with it in the future (Macaulay, 1963; Ring and Van de Ven, 1992). On the other hand, the owners/managers of the firm may feel uncomfortable by reneging a previous contract. Both effects suggest that when a firm is given the opportunity to cheat, it is facing a trade-off between immediate economic payoff on the one hand and reputation and psychological payoff on the other.[4] Knowing that the counterpart is less likely to cheat, a firm may

[3]This distinction will be made clearer in section Section 4. For the time being it is enough to state that while bridging social capital can be beneficial to the whole society, bonding social capital is beneficial to members of a restricted group and harmful for out-groups. Unless differently specified in what follows we refer to the first type of social capital.

[4]The role played by reputation and economic damages in mitigating opportunism can be explained also without the inclusion of social capital, in a purely utilitarian way. For the purposes

not feel the need to write long, detailed contracts and to rely on third-parties to enforce them (Knack and Keefer, 1997; Paldam and Svendsen, 2000). Furthermore, information flows easily within high social capital societies, causing reputation to be well-known among all actors. All this can be synthesized by saying that social capital reduces transaction costs (Bromiley and Cummings, 1995; Lorenz, 2000). Vertical integration does not completely avoid inefficiencies: internalizing a transaction does not eliminate the transaction; it only changes its nature. Instead of exchanging money for goods, the firm is simply exchanging money for labor services. This new transaction has its own costs, that must be compared with market ones (Williamson, 1971, 1975, 1985, 1996b, 2002; Kreps, 1990; Gibbons, 2005). Since firms are designed precisely to minimize opportunistic behaviors within their boundaries, transaction costs are a major concern for market exchange and less so for exchanges that take place within firms' boundaries (Simon, 1951; Williamson, 1975; Ouchi, 1980).

While our discussion has focused on TCE and the impact of social capital, it deserves to be noticed that our argument falls also in the incomplete contracts framework (Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995). Incompleteness of contracts constitutes a threat for market exchange as long as we assume that individuals behave opportunistically. If this is the case the ownership of the relevant asset in a transaction critically affects the incentives of transacting parties to make transaction-specific, non-contractible investments. If, instead, we allow for other-regarding behavior, a transaction party may invest also in physical assets that it does not own, based on the presumption that the other party is not going to exclude it from using the asset. We thus claim that in countries characterized by higher levels of social capital, ownership of the relevant asset in a transaction is less important than in countries with low social capital and we shall observe less vertical integration. The decision to address vertical integration from the point of view of TCE rests on the idea that the role of social capital in mitigating transaction costs is intuitive and straightforward. Nevertheless, it fits other frameworks.

The discussion so far has focused on the benefits of vertical integration compared to non-integration. However, it is worth pointing out some pros of non-integration, too. To begin with, vertically dis-integrated firms are usually more efficient, because they can focus on their core activities, at which they are more productive (Kogut and Zander, 1996; Pieri and Zaninotto, 2013). Focusing on the Italian automotive sector, Manello et al. (2016) show that total factor productivity is higher in vertically dis-integrated firms than in more integrated ones. Due to their reduced dimension, vertically dis-integrated firms are

of the present paper, we will consider reputation and economic damages as a consequence of the inclusion of social capital and we will not enter this debate.

also able to economize on monitoring and coordination costs (Grossman and Hart, 1986). Lastly, dis-integrated firms are usually more flexible and respond quicker to changes in the environment than large, vertically integrated firms (Kogut and Zander, 1996). Furthermore, markets are more efficient than internal organization, because they provide high-powered incentives to parties and can aggregate demands to realize economies of scale and scope (Williamson, 1989). Vertical integration decision thus requires a complex assessment of all the pros and cons of the different organizational forms. There are some factors that, according to the traditional TCE and incomplete contracts literature reviewed in this section can tip the scales in favor of one of the two solutions. Vertical integration is more likely to be observed when one of the transacting parties makes relational-specific, non-contractible investments in physical or human capital; when the good to be traded is very complex; when there is a lot of uncertainty regarding the environment in which the trade occurs and when the frequency of the transaction is low (Williamson, 1975; Grossman and Hart, 1986). Relational-specific investment are those for which the value inside the relationship greatly exceeds the value outside it. The party that makes such investments is subject to the so-called hold-up problem: the other party can renegotiate the terms of the contract at its own advantage. This is due to the fact that after the investment has been made, it is a sunk cost for the investing party and refusing to renegotiate the contract can lead to even greater financial losses. Anticipating this, the party that must invest refuses to do so. In such a setting, vertical integration may overcome this problem by unifying the two parties under the same ownership (Williamson, 1975; Grossman and Hart, 1986). When the object of the transaction is very complex or there is a lot of uncertainty regarding the environment in which the transaction takes place, it is (almost) impossible to design a contract describing all the details of the good to be traded and considering all possible factors external to the relationship that can modify the terms of trade. For instance, a selfish supplier interested in maximizing its own profits, may reduce its costs by using low-quality materials (if they are not specified precisely in the contract) or claim that external causes (like an increase in the price of raw materials) made its costs to rise. If this is the case, then the buyer may prefer to integrate the production of the input. Lastly, opportunism is of great concern when the transaction is occasional. Contrariwise, if the parties interact frequently, opportunism may be mitigated by the monetary value of future transactions with the same commercial partner (Baker et al., 2002). By inducing market players to behave correctly, social capital downplays the role of these factors. By promoting rules of good conduct, social capital decreases the likelihood that a party will try to renegotiate a contract at the expenses of the other. Likewise, social capital reduces the need to specify every detail of the traded good and

every possible state of the world in a formal contract, since both parties rely on the good faith of the other to solve minor issues that may arise as time goes by. Last but not least, social capital reduces opportunistic behavior even in one-shot interactions. Shelanski and Klein (1995) review empirical contributions in TCE and find that the evidence overall supports the prediction of the theory, but sometimes data fail to support TCE. They report that occasionally market is observed, when theory predicts vertical integration (complex deals, specific investments etc.). Although further analyses are needed to support our hypothesis, we imagine that social capital can help to solve this puzzle. A supplier-buyer relationship which involves, say, the same specific investment may result in vertical integration in a country with low social capital and in market transaction in a country with a high level of social capital. The same hold true for complexity, uncertainty and frequency of the transaction. Thus, holding specificity, complexity, uncertainty and frequency constant, we claim that the organizational form of a supplier-buyer relationship can be influenced by the socio-cultural environment in which it takes place. *Ceteris paribus* we expect to have more market transactions where social capital is high.

There are two papers which are quite close in spirit to our analysis: Gil and Hartmann (2011) and Litvinova and Segnana (2015). In the first paper, the authors analyze the make-or-buy decision of laundries in western Los Angles focusing on the Korean community. They find that laundries belonging to Korean individuals are less likely to integrate vertically. Members of the Korean community can easily gain information about suppliers' trustworthiness from other members of the community and are thus more likely to rely on external provision for their inputs. Our analysis differ from the one in Gil and Hartmann (2011) in a couple of important ways. First of all, we do not limit our attention to one industry. Instead, we investigate the effects of social capital in all manufacturing sectors. Secondly, we are not concerned with one specific ethnicity as Gil and Hartmann (2011) do, but consider social capital at the level of the whole population. Thus, our paper generalizes the findings in Gil and Hartmann (2011) through a more aggregated analysis. Litvinova and Segnana (2015) study vertical integration in transition countries and find that trust reduces vertical integration. There are at least two major differences between their paper and our analysis. To begin with, they focus only on transition countries, while we find that the effect of social capital is not limited to such countries, but applies also in more developed-ones. Secondly, their proxy for trust differs significantly from our measure of social capital. Accordingly, they measure trust using data on the diffusion of prepayments in buyer-seller relationships. Such kind of trust is dyadic in nature and may well be determined by other factors, such as habits or liquidity constraints of the input producer. As it will be made clearer later in the paper, our measure

refers instead to the level of social capital (and trust) prevailing at the level of the broader society.

3 Data

The aim of the analysis is to estimate the impact of social capital on vertical integration. Our dataset includes information on 30 European countries and 46 sectors classified at the four digit level. Since data for every sector are not available in every country, on the whole, our dataset contains 974 observations. The literature has proposed several different methods to measure vertical integration, each with its pros and cons (Perry, 1989; Acemoglu et al., 2009). In our analyses, vertical integration is measured using the Adelman index, adapted to fit the available data. In its original version, the Adelman index is defined as the ratio of value added to sales at the firm level (Adelman, 1955). Due to data availability in the present paper it is measured as the ratio of value added to turnover at the industry level. The index varies between 0 (complete vertical disintegration) and 1 (complete vertical integration) and its value grows with vertical integration. The rationale is that vertically disintegrated firms buy their inputs in the market and thus their contribution to the total value added of their output is lower compared to a situation in which they produce them internally (Pieri, 2018). The Adelman index has been employed in several studies both at the firm level and at the industry level (Laffer, 1969; Levy, 1985; Arrighetti, 1999; Pieri, 2018). Others, like Manello et al. (2016) and Devicienti et al. (2017) employ a similar measure which is computed as the ratio of external costs to total costs. As for the Adelman index, the idea is that the more a firm produces its inputs internally (*i.e.* the more it is vertically integrated), the lower the ratio of external costs to total costs. In the present paper data to construct the Adelman index come from the OECD Structural and Demographic Business Statistics (SDBS)-Business Statistics for Employment Size Class (BSC) for the year 2013. The SDBS-BSC provides data on value added at factor costs and turnover for member countries, at a four-digit ISIC (Rev.4) level. The data are themselves taken from different original sources and then converted to ISIC Rev.4: Eurostat Structural Business Statistics (SBS) database, Turkish Statistical Institute (TurkStat), Istituto Nazionale di Statistica (Istat), Hungarian Central Statistical Office (www.ksh.ku) and Swiss Federal Statistical Office. Data on social capital are taken from the fourth wave of the European Values Study (EVS). In line with previous researches on the topic, social capital is defined in terms of participation in voluntary organizations (Putnam et al., 1994; Knack and Keefer, 1997; Beugelsdijk and Van Schaik, 2005; Kaasa,

2009; Laursen et al., 2012). Since there is no legal or economic incentive to participate in such organizations, membership is driven only by inner motives (Guiso et al., 2004). The precise definition of our primary measure of social capital, Civic Engagement, can be found in Table 1, along with other proxies for social capital, that are used later in the paper to check the robustness of the results. Three of the measures in Table 1 are based on organizational membership[5] and one on trust, fairness and helpfulness, respectively[6]. The literature often distinguishes between two dimensions of social capital (each with its own measures): the structural and the relational-one (Nahapiet and Ghoshal, 1998; Laursen et al., 2012). The structural dimension refers to the presence or absence of network ties between individuals, to their configuration, morphology and extension. The relational dimension refers instead to those assets created and leveraged trough relationships, like trust, trustworthiness and reciprocity. To put it in an informal way, the structural dimension informs us about the existence of a relation (who knows whom), while the relational dimension describes the type of the relation (what the parties expect from each other). Among the measures listed in Table 1, those based on involvement in organizations capture the structural dimension of social capital, while trust, helpfulness and fairness refer to the relational dimension (Putnam et al., 1994; Nahapiet and Ghoshal, 1998; Inglehart, 1997; Paldam and Svendsen, 2000; Helliwell and Putnam, 2004; Beugelsdijk and Van Schaik, 2005; Akçomak and Ter Weel, 2009; Laursen et al., 2012). As it is mainstream in research on social capital, our primary measure of social capital, Civic Engagement, is a proxy for the structural dimension (Coleman, 1988; Putnam et al., 1994; Portes, 1998; Woolcock and Narayan, 2000; Laursen et al., 2012). Measures of the structural dimension of social capital are often considered more suitable that those built on the relational dimension, also because they are based on questions that are less subject to response biases and heuristics (Alesina and La Ferrara, 2002; Laursen et al., 2012; OECD, 2017b). Accordingly, our results show a stronger impact of structural measures on vertical integration.

Table 2 lists the variables collected for the baseline model, their descriptive statistics, the units in which they are expressed, as well as their source, the year to which they refer and whether they are measured at the country level or at the level of industries within countries. The Adelman index of vertical integration, AdT, is measured at the four-digit industry level, while other variables are measured at the country level. Civic Engagement is measured

[5]Since one can argue that powerful trade unions reduce the propensity of firms to grow, both vertically and horizontally, in some robustness check (not included), trade unions were omitted from the list of organizations and the results (available upon request) were basically the same.

[6]For the moment being we leave aside the last two dimensions.

Variable	Source	Wording of the question*	Aggregation measure
Civic Engagement	EVS, 4th wave	"Please look carefully at the following list of voluntary organisations and activities and say which, if any, do you belong to?" (welfare organization; religious organization; cultural activities; trade unions; political parties/groups; local community action; 3w-development/ human rights; environment, ecology, animal rights; professional associations; youth work; sports recreation; women groups; peace movements; voluntary health; other groups)	Percentage of respondents belonging to at least one group
Average org. memb.	EVS, 4th wave	"Please look carefully at the following list of voluntary organisations and activities and say which, if any, do you belong to?" (welfare organization; religious organization; cultural activities; trade unions; political parties/groups; local community action; 3w-development/ human rights; environment, ecology, animal rights; professional associations; youth work; sports recreation; women groups; peace movements; voluntary health; other groups)	Average number of organizations respondents belong to
No org. memb.**	EVS, 4th wave	"Please look carefully at the following list of voluntary organisations and activities and say which, if any, do you belong to?" (none)	1-Percentage of respondents stating that they do not belong to any organization
Active membership	EVS , 4th wave	"Please look carefully at the following list of voluntary organisations and activities and say a) which, if any, do you belong to? b) which, if any, are you currently doing unpaid voluntary work for?" (welfare organization; religious organization; cultural activities; trade unions; political parties/groups; local community action; 3w-development/ human rights; environment, ecology, animal rights; professional associations; youth work; sports recreation; women groups; peace movements; voluntary health; other groups)	Percentage of respondents belonging to and working unpaid for at least one group
Trust	ESS, 6th wave	"Using this card, generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? Please tell me on a score of 0 to 10, where 0 means you can't be too careful and 10 means that most people can be trusted."	Weighted average score from ESS
Helpful	ESS, 6th wave	"Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?" (0(People mostly look out for themselves)-10(People mostly try to be helpful))	Weighted average score from ESS
Fair	ESS, 6th wave	"Using this card, do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?" (0(Most people try to take advantage of me) -10(Most people try to be fair))	Weighted average score from ESS
Bridging Social Capital	EVS, 4th wave	"Please look carefully at the following list of voluntary organisations and activities and say which, if any, do you belong to?" (religious organization; cultural activities; youth work; sports recreation; and women groups)	Percentage of respondents belonging to at least one group
Bonding Social Capital	EVS, 4th wave	"Please say, for each of the following, how important it is in your life." (family; friends and acquaintances)	Percentage of respondents answering that at least one of the two is 'very important'

* Questions are taken from and from European Values Study (2008); European Social Survey (2012).
**Due to inconsistencies in answers provided by respondents, the percentage of individuals responding that they belong to at least one group and the percentage of those saying that they do not belong to any, do not sum up to 100.

Table 1: Description of social capital measures.

Statistic	N*	Mean	St. Dev.	Min	Max	Measurement unit	Source	Year	Level
AdT**	974	0.281	0.131	0.000	1.000	Ratio	OECD SDBS-BSC***	2013	Industry
Civic Engagement	30	0.420	0.223	0.107	0.929	Ratio	EVS	2008	Country
GDPpc	30	33.138	14.905	12.409	79.849	2011 US $ (current PPPs)	Penn World Table	2013	Country
Population	30	19.744	24.866	0.545	80.566	Millions	Penn World Table	2013	Country
EnfC	30	21.173	7.128	9.700	39.900	Ratio	The World Bank - Doing Business	2013	Country
TaxH	30	181.550	82.108	59.000	436.000	Hours/year	The World Bank - Doing Business	2013	Country
Cred	30	95.273	50.168	33.858	253.574	Ratio	The World Bank - WDI****	2013	Country

*Note: The number of observations is 974 for AdT, which is defined at the industry level and 30 for variables at the country level.

**Note: 8 observations were omitted because they did not belong to the closed interval [0,1] and were thus considered as measurement errors.

***Note: The OECD takes the data for the construction of the database from: Eurostat Structural Business Statistics (SBS) database, Turkish Statistical Institute (TurkStat), Istituto Nazionale di Statistica (Istat), Hungarian Central Statistical Office (www.ksh.ku) and Swiss Federal Statistical Office.

**** Note: the WB takes the data for the construction of this variable from: International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.

Table 2: Summary statistics and additional information.

as the percentage of individuals belonging to at least one of the organizations listed in Table 2. Civic Engagement varies significantly from country to country, with Northern-ones characterized by higher levels than Southern-ones. At the country level, the smallest value of the Adelman index can be found in Lithuania (almost 0.15) and the largest in Switzerland (0.34). Furthermore, vertical integration varies significantly also at the level of industrial sectors within countries: the average vertical integration in Sector 1 is lower than in the other two. Sector 1 is made up of traditional sectors (e.g. manufacture of food products, beverages and textiles) compared to the other two. As will be made clearer in Section 4.1, it may be the case that vertical integration goes hand in hand with the complexity of the production technologies involved in a specific industrial sector. Civic Engagement and country level AdT display a positive correlation of 0.313.[7] However, as it will be clear from next sections, once more dis-aggregated data and control variables are taken into consideration, the relationship between this two variables becomes negative. This is a well known problem in the literature, labeled ecological fallacy (Piantadosi et al., 1988). Accordingly, when considering group averages instead of individual observations, the true relationship between variables may be hidden. Furthermore, for vertical integration measures, Acemoglu et al. (2009) document that at the country level, cross-country differences are mainly due to diverse industrial composition.

The regression analyses also include a series of controls. These variables are selected as to reflect those already employed in other studies about the determinants of vertical integration. In detail, Gross Domestic Product *per capita* (in thousands) and Population (in milions) should capture the effects of countries' stage of economic development and dimension on vertical integration (Stigler, 1951; Perry, 1989; Khanna and Palepu, 1997; Acemoglu et al., 2009). The next two variables are aimed at controlling for the complexity of the legal and bureaucratic systems of countries. Many authors interpret vertical integration as a way to avoid costly contractual enforcement (Williamson, 1989). We have thus included in our analyses a measure of how costly it is for firms to enforce contractual obligations. The variable EnfC is defined as the ratio of costs for resolving a commercial dispute through a local first-instance court, over the claim value. The number of hours firms' employees, on average, spend in paying taxes (TaxH) is included as an additional control for the complexity of the bureaucratic system (Acemoglu et al., 2009). Furthermore, if we imagine that the larger a firm, the more fiscal duties it must fulfill, a high average value of TaxH may discourage firms from growing, both horizon-

[7] If we consider AdT at the one-digit level, we get that Sector 1 is negatively correlated with Civic Engagement, while the other two sectors continue to display a positive correlation coefficient.

tally and vertically. Lastly, the domestic credit to private sector expressed as percentage of GDP (Cred) captures the effects of credit markets on vertical integration (Rajan and Zingales, 1998; Acemoglu et al., 2009; Pieri, 2018). Still, there can be substantial difference in the degree of vertical integration between industries, hence dummies for one-, two- or four-digits level industries are included in some of the specifications (Acemoglu et al., 2009, 2010; Pieri, 2018). The sample includes the following European countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.[8]

4 Empirical analyses

As argued above, the aim of the analysis is to evaluate the impact of social capital on vertical integration. Specifically, we estimate the following econometric model:[9]

$$AdT_{ij} = \mu_i + \alpha Social\ capital_j + \beta^\top \mathbf{X}_j + \epsilon_{ij}, \tag{1}$$

where i and j index industrial sectors and countries, respectively. AdT_{ij} is the Adelman index of vertical integration for the i-th sector in the j-th country; $Social\ capital_j$ is a proxy for the level of social capital of a country, X_j is a vector of controls at the country level. The intercept, μ_i, varies at the industry level (Snijders and Bosker, 2012). A first issue is to choose between models with fixed effects and those with random effects for industrial sectors. The Hausman test for fixed effects (p-value 0.9984) for the most complete specification of the model (all controls plus dummies defined at the four-digits level) clearly suggests that a fixed effect model is more suitable to describe our data, compared to one with random effects (Greene, 2018)[10]. Unless differently specified, our models are estimated using Ordinary Least Squares (OLS).

[8] For some variables, data for the United Kingdom were not available and have been computed aggregating those for Great Britain and for Northern Ireland. More information available from the author.

[9] Since the variables employed in the present paper differ in terms of measurement units and magnitude, the regression results refer to standardized variables with zero mean and unit standard deviation.

[10] Models with random intercepts were estimated using Restricted Maximum Likelihood (REML), as described in Pinheiro and Bates (2000) and McCulloch and Searle (2001) and lead to similar predictions. They are omitted for brevity. Results available from the author upon request.

	Dependent variable:						
	AdT						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Civic Engagement	0.089***	−0.035	−0.118**	−0.101*	−0.089*	−0.104**	−0.105***
	(0.032)	(0.050)	(0.053)	(0.053)	(0.049)	(0.042)	(0.039)
GDPpc		0.158***	0.131**	0.089	0.073	0.093**	0.091**
		(0.050)	(0.054)	(0.055)	(0.051)	(0.044)	(0.041)
Population		−0.059*	−0.066*	−0.070**	−0.076**	−0.076***	−0.070***
		(0.034)	(0.034)	(0.034)	(0.031)	(0.027)	(0.025)
EnfC			0.056*	0.059*	0.053*	0.057**	0.061**
			(0.034)	(0.033)	(0.031)	(0.027)	(0.025)
TaxH			−0.159***	−0.119***	−0.108**	−0.110***	−0.111***
			(0.044)	(0.046)	(0.042)	(0.036)	(0.033)
Cred				0.121***	0.118***	0.113***	0.108***
				(0.036)	(0.034)	(0.029)	(0.027)
ISIC	no	no	no	no	1-digit	2-digits	4-digits†
Observations	974	974	974	974	974	974	974
R^2	0.008	0.019	0.037	0.048	0.185	0.413	0.516
Adjusted R^2	0.007	0.016	0.032	0.042	0.178	0.398	0.489
Residual Std. Error	0.997	0.992	0.984	0.979	0.907	0.776	0.715
	(df = 972)	(df = 970)	(df = 968)	(df = 967)	(df = 965)	(df = 948)	(df = 922)
F Statistic	7.735***	6.192***	7.501***	8.148***	27.384***	26.702***	19.288***
	(df = 1; 972)	(df = 3; 970)	(df = 5; 968)	(df = 6; 967)	(df = 8; 965)	(df = 25; 948)	(df = 51; 922)

Note: *p<0.1; **p<0.05; ***p<0.01

Intercepts omitted. Industry dummy variables in columns 5-7 omitted. Models estimated *via* OLS.
†Due to data availability, there is only one sector at the 4-digits level within each sector defined at 3-digits. Models with 3-digits are equivalent to those with 4-digits and are omitted.

Table 3: Baseline regression results.

Table 3 contains the most parsimonious specification in column 1, *i.e.* the one with Civic Engagement as the only dependent variable. The other regressors are included in columns 2-4. Column 2 considers controls for countries' stage of economic development and dimension. Column 3 adds controls for the complexity of the legal and bureaucratic systems of countries. Finally, column 5 controls also for the effect of credit market. Columns 5-7 contain the whole set of regressors, including dummy variables at the industry level defined at the one-,two- and four-digits level, respectively. In column 1 the effect of Civic Engagement on AdT is positive and significant. As can be seen in column 2, once Gross Domestic Product *per capita* and Population are included as controls, the sign associated with Civic Engagement switches from positive to negative, albeit not significant. This switch in sign means that the raw correlation between Civic Engagement and vertical integration ultimately passes trough the positive effect of social capital on GDPpc and of the latter on the Adelman index. When we control for the complexity of the legal and bureaucratic system, Civic Engagement significantively reduces vertical integration. According to TCE, the more costly it is for firms to enforce contracts trough a court, the more likely it is that they opt for vertical integration. By inducing individuals to behave correctly, social capital reduces the likelihood that courts are involved in commercial disputes. Once we control for the different legal and bureaucratic systems of countries, Civic Engagement explains vertical integration on top of EnfC and TaxH. Since a given industrial sector at the four-digit level is nested within a particular sector defined at the three-, two- and one-digit, the structure of the data is a multilevel-one, where the grouping factor is represented by industrial sectors.[11]. Columns 5-7 Table include fixed-effects models for industrial sectors. Once we control for the full-set of regressors, Civic Engagement negatively affects the degree of vertical integration, thus confirming our hypothesis that vertical integration could be interpreted as a way of reducing uncertainty in low-trusting environments. A one standard deviation increase in Civic Engagement reduces the value of the Adelman index by, approximately, one tenth of its standard deviation. As far as control variables are of concern, GDPpc presents a positive coefficient, although not always significant. Smaller countries in terms of population have more vertically integrated firms, probably because there is no room for specialized producers of inputs, in line with Acemoglu et al. (2009). Very expensive enforcement of contractual agreements will rise the incentives to vertically integrate, as predicted by TCE (Acemoglu et al., 2009). The amount of time

[11]Due to data availability, there is only one sector at the four-digits level within each sector defined at three-digits. Models with three-digits are equivalent to those with four-digits and are omitted.

that employees spent paying taxes (TaxH), decreases the degree of vertical integration. This is due to the fact that complex fiscal systems discourage firm's growth, as the administrative burden associated with it grows with firm's size, be it vertical or horizontal. The positive coefficients associated with Cred are in line with previous findings suggesting that vertical integration is more prevalent in countries with highly developed credit markets (Acemoglu et al., 2009). For the more complete models (columns 5-7), the confidence intervals for Civic Engagement at the 0.95 confidence level do not cross the zero in two out of four models (ISIC 2-digits and ISIC 4-digits), suggesting a sound effect of Civic Engagement on vertical integration. In these models, residuals are normally distributed and the assumption of homoscedasticy and linearity of the residuals met. As far as influential cases are of concern and according to the measure proposed by Cook and Weisberg (1982), there are no observations exerting undue influence on the parameters of the model. Furthermore, the VIFs are never greater than 5, so that multicollinearity does not seem to be a problem (Hair et al., 2009).

4.1 Robustness and extensions

To test the stability of the results, we have performed several additional regressions, using different explanatory variables.

To begin with, Table 4 displays OLS estimates obtained using different measures of social capital (for more information on how they have been constructed, see Table 1). All the models include industry fixed-effects. First of all, by looking at the first six columns it is possible to assess that structural measures of social capital show a larger and more significant impact on vertical integration than relational measures.[12] Some authors, like Selle and Strømsnes (2001), have argued that it is not passive membership that matters for social capital and that active involvement is a better proxy for it. Thus, we have constructed a measure of active participation in organization, in line with Beugelsdijk and Van Schaik (2005), but found no statistically significant effect on vertical integration.[13]

The literature often distinguishes between two distinct types of social capital: bridging and bonding (Gittell and Vidal, 1998). Accordingly, while bridging social capital facilitates cooperation and the diffusion of trust, bonding

[12]For an explanation of the difference between the two, see Section 3.

[13]As additional robustness checks, regressions have been run also by omitting non responses to questions on trust, helpfulness and fairness. The same has been done also for data on trust, helpfulness and fairness from the 4^{th} wave of the European Values Study. The results are almost the same and are omitted for brevity. They can be obtained from the author upon request.

	Dependent variable:								
	AdT								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Average org. memb.	-0.099^{***} (0.034)								
No org. memb.		-0.102^{***} (0.030)							
Active membership			0.024 (0.040)						
Trust				-0.088^{**} (0.043)					
Helpful					-0.067 (0.042)				
Fair						-0.101^{***} (0.038)			
Bridging Soc K							-0.086^{**} (0.034)		-0.106^{***} (0.035)
Bonding Soc K								0.066^{*} (0.034)	0.088^{**} (0.034)
GDPpc	0.082^{**} (0.038)	0.083^{**} (0.036)	0.022 (0.042)	0.090^{**} (0.040)	0.080^{**} (0.040)	0.104^{***} (0.040)	0.074^{*} (0.038)	-0.006 (0.036)	0.046 (0.039)
Population	-0.075^{***} (0.025)	-0.085^{***} (0.025)	-0.035 (0.026)	-0.062^{**} (0.024)	-0.056^{**} (0.024)	-0.055^{**} (0.023)	-0.068^{***} (0.025)	-0.048^{**} (0.024)	-0.068^{***} (0.025)
EnfC	0.065^{***} (0.025)	0.079^{***} (0.025)	0.062^{**} (0.026)	0.065^{**} (0.025)	0.062^{**} (0.025)	0.059^{**} (0.024)	0.064^{**} (0.025)	0.043^{*} (0.025)	0.055^{**} (0.025)
TaxH	-0.097^{***} (0.032)	-0.107^{***} (0.032)	-0.056 (0.036)	-0.094^{***} (0.036)	-0.085^{**} (0.035)	-0.089^{***} (0.034)	-0.102^{***} (0.033)	-0.074^{**} (0.032)	-0.094^{***} (0.033)
Cred	0.120^{***} (0.027)	0.104^{***} (0.027)	0.131^{***} (0.029)	0.123^{***} (0.026)	0.124^{***} (0.026)	0.122^{***} (0.026)	0.113^{***} (0.027)	0.095^{***} (0.029)	0.086^{***} (0.029)
ISIC	4-digits	4-digits	4-digits	4-digits	4-digits	4-digits	4-digits	4-digits	4-digits
Observations	974	941	902	963	963	963	974	974	974
R^2	0.517	0.524	0.509	0.525	0.524	0.526	0.516	0.514	0.519
Adjusted R^2	0.490	0.496	0.480	0.498	0.497	0.500	0.489	0.487	0.492
Residual Std. Error	0.714 (df = 922)	0.710 (df = 889)	0.721 (df = 850)	0.699 (df = 911)	0.700 (df = 911)	0.698 (df = 911)	0.715 (df = 922)	0.716 (df = 922)	0.713 (df = 921)
F Statistic	19.335^{***} (df = 51; 922)	19.168^{***} (df = 51; 889)	17.310^{***} (df = 51; 850)	19.704^{***} (df = 51; 911)	19.643^{***} (df = 51; 911)	19.825^{***} (df = 51; 911)	19.245^{***} (df = 51; 922)	19.143^{***} (df = 51; 922)	19.115^{***} (df = 52; 921)

Note: *p<0.1; **p<0.05; ***p<0.01

Measures of social capital are not available for every country, thus the number of observations differ between models.
Intercepts and industry dummy variables omitted. Models are estimated via OLS.

Table 4: Robustness: Alternative measures of Social Capital.

	Dependent variable:					
	AdT					
	(1)	(2)	(3)	(4)	(5)	(6)
KInt	-0.115^{***}					
	(0.032)					
R&D		0.556^{***}				
		(0.063)				
Civic Engagement	-0.107^{**}	-0.176^{***}		-0.092^{**}	-0.136^{***}	-0.453^{**}
	(0.053)	(0.063)		(0.040)	(0.044)	(0.228)
UncA			0.067^{*}	0.037		
			(0.037)	(0.039)		
HumanK					-0.017	
					(0.04)	
GDPpc	0.103^{*}	0.062	0.074^{**}	0.116^{***}	0.123^{***}	0.314^{**}
	(0.056)	(0.053)	(0.037)	(0.042)	(0.046)	(0.146)
Population	-0.069^{**}	-0.077^{**}	-0.058^{**}	-0.071^{***}	-0.111^{***}	-0.134
	(0.034)	(0.033)	(0.024)	(0.024)	(0.031)	(0.090)
EnfC	0.059^{*}	0.048	0.087^{***}	0.078^{**}	-0.013	0.094^{*}
	(0.034)	(0.032)	(0.032)	(0.032)	(0.028)	(0.056)
TaxH	-0.113^{**}	-0.124^{***}	-0.076^{**}	-0.095^{***}	-0.061	-0.204^{**}
	(0.046)	(0.044)	(0.032)	(0.033)	(0.051)	(0.085)
Cred	0.106^{***}	0.117^{***}	0.122^{***}	0.119^{***}	0.146^{***}	0.085
	(0.037)	(0.035)	(0.032)	(0.032)	(0.032)	(0.067)
Civic Engagement× R&D		0.139^{**}				
		(0.062)				
ISIC	no	no	4-digits	4-digits	4-digits	4-digits
Observations	947	974	943	943	743	974
R^2	0.059	0.123	0.524	0.526	0.544	0.474
Adjusted R^2	0.052	0.116	0.496	0.499	0.510	0.445
Residual Std. Error	0.973	0.940	0.688	0.686	0.700	0.745
	(df = 939)	(df = 965)	(df = 891)	(df = 890)	(df=690)	(df=922)
F Statistic	8.477^{***}	16.960^{***}	19.210^{***}	19.031^{***}	15.84^{***}	n.a.
	(df = 7; 939)	(df = 8; 965)	(df = 51; 891)	(df = 52; 890)	(df = 52; 690)	n.a.

Note: *p<0.1; **p<0.05; ***p<0.01

Data on Capital intensity are not available for sector 3320 (Installation of industrial machinery and equipment), because does not belong to manufacturing according to the NAICS classification. Data on Uncertainty avoidance are not available for Cyprus and for Macedonia. Data on Human Capital are not available for Germany, Spain, UK, Croatia, Macedonia, Netherlands and Portugal.

Intercepts and industry-sector dummy variables (where included) omitted. First five models are estimated via OLS. Model 6 is estimated with 2SLS; its standard errors are computed using non-parametric bootstrapping with 10000 replications.

Table 5: Robustness: Capital intensity, R&D, human capital and instrumental variables.

social capital, by promoting rules of good conduct only within narrowly defined circles of relatives and friends, is detrimental to trust (Banfield, 1958; Paxton, 2002). Therefore, while bridging social capital should reduce vertical integration, the opposite holds true for bonding social capital. To see whether this is the case, we have constructed one proxy for each of the two dimensions of social capital, using the measures suggested in Beugelsdijk and Smulders (2003). Data are again taken from the EVS. In detail, bridging social capital is defined as the percentage of individuals that belong to at least one of the following types of organizations: religious, cultural, youth work, sports and women's groups. Bonding social capital is instead proxied using questions on the importance of family and of friends and acquaintances. Our measure of bonding social capital corresponds to the percentage of individuals responding "very important"to at least one of this two questions. Results are reported in the last three columns of Table 4. As expected, bridging social capital, by promoting cooperation and norms of good behavior, reduces the need for vertical integration. On the other hand, bonding social capital, causing distrust to reign in the society, leads firms to rely more on internal production for their inputs.[14]

Table 5 contains some extensions to the baseline results obtained in Table 3. All models are estimated *via* OLS, except from the one in column 6 which is estimated *via* two stage least squares (2SLS). In the first column the regression results are obtained using capital intensity at the industry level instead of dummy variables to control for heterogeneity in industrial sectors. As in Acemoglu et al. (2009), this measure is taken from the NBER-CES Manufacturing Industry Database, as described in Bartelsman et al. (2000).[15] The effect of Civic Engagement on vertical integration continues to be significantly negative also in this specification. Furthermore, the associated coefficient remains almost the same as in previous models. The negative coefficient associated with Capital intensity is a little bit puzzling to us. The theory would have suggested more capital intensive industries to be more integrated (Williamson, 1975; Grossman and Hart, 1986). Our result could be due to the fact that we have data for the US only. Another possibility is that, rather than capturing

[14]Regressions with different proxies also for quality of institutions and for credit market have been estimated. Since the results are the same as in the baseline regression, they have been omitted but are available from the author upon request.

[15]Capital intensity is defined as the ratio of fixed assets to employees. Data are available only for the US, so that we are implicitly assuming that the ratio for the US is valid in all countries, as in Acemoglu et al. (2009). Data on capital intensity in NBER-CES refer to NAICS classification, while those employed in the present paper are built considering the ISIC classification. NAICS industries are transformed into the corresponding ISIC-ones defined in United Nations. Statistical Division (2008). More information available from the author upon request.

asset specificity, our measure simply proxies the capital requirements specific to each sector. The more capital is required in a sector, the more expensive it is to integrate vertically into more phases of production and the less vertically integrated the sector will be.

Column 2, instead investigates whether the effect of social capital is contingent to the R&D intensity of the sector. Sectors characterized by medium, high or medium-high levels of research and development intensity (R&D=1), as defined in Galindo-Rueda and Verger (2016), present higher overall levels of vertical integration[16] and the impact of social capital in this sectors is considerably smaller, compared to those with lower levels of R&D intensity. A one standard deviation increase in Civic Engagement reduces vertical integration by one sixth of its standard deviation in sectors characterized by low R&D intensity and only by less than one twenty-fifth of its standard deviation in R&D-intensive ones. Our tentative interpretation is that in R&D intensive sectors the characteristics of the inputs to be traded may be subject to frequent changes precisely due to high R&D activity, their quality may be difficult to evaluate and this may generate strong market power for the supplier. In such sectors, users may prefer to produce inputs internally and only a huge increase in social capital can reduce vertical integration (Alchian and Demsetz, 1972; Ouchi, 1980; Fama and Jensen, 1983; Levy, 1985; Masten, 1984; Ring and Van de Ven, 1992; Gulati, 1995; Lafontaine and Slade, 2007).[17] Furthermore, a strong emphasis on R&D may cause also the internal organization of firms to change as new technologies become available. Such changes may require that also the inputs are immediately adapted, which may be difficult if the characteristics of the input are to be renegotiated with the transaction counterpart.

If social capital and trust are substitutes for formal contracts, as suggested by Granovetter (1985) and Fukuyama (1995), an increase in the quality of contractual enforcement should have a smaller impact in high-R&D intensity manufacturing sectors than in low-R&D intensity ones for reasons explained above with reference to social capital. Regression results confirm that a reduction in the costs of enforcing contracts (EnfC), will decrease vertical integration more in low-R&D sectors than in high-R&D sectors.[18]

Vertical integration can be also seen as a mean for firms to reduce uncertainty in the market for inputs. To check if the relationship between social

[16]In Section 3 we showed that Sector 1 is less vertically integrated than the other two. According to Galindo-Rueda and Verger (2016), sectors belonging to Sector 1 are also the ones with the lowest level of R&D intensity.

[17]Similar results are obtained also with other taxonomies; results are available from the author upon request.

[18]Regression results omitted, but available from the author upon request.

capital and vertical integration does not ultimately pass trough uncertainty avoidance, a proxy for uncertainty avoidance has been added to the baseline regression, as in Nooteboom et al. (1997). The chosen measure, UncA, is taken from Hofstede and Hofstede (2010). The higher its value, the greater the propensity of people to avoid ambiguous situations. Civic Engagement and UncA are negatively correlated (correlation coefficient= -0.6). As reported in column 3 of Table 5, when we substitute Civic Engagement with UncA in our baseline regression, it has a positive and (weakly) significant impact on AdT. When, instead, we include both Civic Engagement and UncA, the former contiunes to significatively impact AdT, while the latter does not. Furthermore, the inclusion of UncA does not change significatively the coefficient associated with Civic Engagement.[19] Column 5 in Table 5 adds a measure of human capital at the national level to the list of control variables. The proxy chosen is the lower secondary completion rate expressed as percentage of the relevant age group for year 2013, taken from The World Bank (2013d).[20] On the one hand, the literature suggests that social capital contributes to the accumulation of human capital (Coleman, 1988). On the other hand, some authors have proposed to consider the investment in human capital as any other form of specific investment, which makes vertical integration more likely (Klein et al., 1978; Masten et al., 1991). If this is the case, then Human Capital should display a positive regression coefficient, while Civic Engagement should display a negative coefficient, which should be larger (in absolute terms) than in the baseline regression.[21] As can be seen from column 5 in Table 5, the effect of Human Capital on vertical integration is not significantly different from zero. However, we find evidence for the second prediction, that by controlling for Human Capital, the coefficient associated with Civic Engagement grows (in absolute terms).

So far, implicitly, it has been taken for granted that the causality flows from social capital to vertical integration. However, even if the regression results confirm this hypothesis, it is still possible that the causality flows both ways or, worse, only from vertical integration to social capital. The literature usually relies on the instrumental variable approach to deal with this causality issue

[19]Chen et al. (2002) suggests that transaction costs and vertical integration can vary according to the Individualism-Collectivism dimension identified by Hofstede. Still, when adding this dimension to the baseline regression, we found no evidence of such relationship. Results available from the author upon request.

[20]The World Bank itself takes the data from UNESCO Institute for Statistics (http://uis.unesco.org/). We have also run regression with other proxies and get essentially the same results. Results available from the author upon request.

[21]This is due to the fact that we are removing from the coefficient associated with Civic Engagement the positive effect mediated by Human Capital.

(Guiso et al., 2006; Gorodnichenko and Roland, 2011, 2017). Furthermore, the instrumental variable approach helps us to deal with another potential problem of our analyses, namely that the results can be biased due to omitted variables. As a matter of fact, we do not have regressors that vary simultaneously at the industry and at the country country level and we are also abstracting from many country-level characteristics that may influence vertical integration. Instrumental variable approach (IV), known also as two stage least squares estimation (2SLS), requires the identification of new variables, labeled instruments, that are correlated with the problematic (endogenous) regressor (social capital in the present paper), but uncorrelated with the error term of the original regression. Once the instruments have been identified, 2SLS prescribes to regress the endogenous regressor on the instruments (plus the control variables) and compute its predicted values in the first stage. Then, in the second stage, the original values of the endogenous regressor in the initial regression are substituted by the predicted ones. The coefficients obtained from the estimation of this second-stage model do not suffer from problems arising due to simultaneous causality (Stock and Watson, 2007; Greene, 2018). The approach followed in the present paper differs from the canonical 2SLS procedure in the way standard errors are computed. As far as the selection of the appropriate instruments is concerned, the literature suggests that social capital is lower in heterogeneous societies (Glaeser et al., 2000; Alesina and La Ferrara, 2002). Several authors have pointed to the fact that individuals tend to trust more those who are similar to them in terms of race, language, culture and religion, so that the overall level of trust is higher in homogeneous societies (Coleman, 1990; DeBruine, 2002; Guiso et al., 2009; Leigh, 2006). Fractionalization measures (also known as fragmentation measures), correspond to the probability that two randomly picked individuals from a population belong to two different groups. The theoretical maximum value of one is reached when each person belongs to a different group and the minimum value of zero when a population is perfectly homogeneous, *i.e.* when all the individuals belong to the same group.[22]. Following this stream of research, we have collected data on two possible instruments for social capital, selected according to the relevant literature. The first one is a measure of ethnic fractionalization taken from Fearon (2003), and the second one is a measure of religious fragmentation taken from Alesina et al. (2003).[23] Using

[22]Generally, a fractionalization measure is computed as one minus the Herfindahl index of the shares of population belonging to different groups. For instance, if country j has N ethnic groups, then the fractionalization measure, F will be computed as $F_j = 1 - \sum_{i=i}^{N}(s_{ij})^2$, where s_{ij} is the share of the group i in country j.

[23]Germany and Czech Republic, as we know them now, are not present in the dataset by Fearon (2003) and are thus proxied using data on Federal Germany and Czechoslovakia, respectively. Data

both instruments simultaneously we have performed a 2SLS regression analysis. Results are displayed in Table 5, column 6. Due to the multilevel structure of the data employed in the analyses, we were concerned that the standard errors of the estimates in the second stage regression could be underestimated, which translates in an overestimation of coefficients' significance. We have thus decided to compute bootstrapped standard errors using non-parametric bootstrapping with replacement and 10000 replications; p-value's are obtained considering a normal distribution (for more information, see chapter 11 in Cameron and Trivedi (2005)). Diagnostic tests are reported in Table 6. The statistic labeled Weak instruments performs an F-test of the joint significance of the instruments in the first stage regression. Accordingly, we reject the null hypothesis that the instruments are weak (Anderson, 1958; Stock and Yogo, 2005). The Wu-Hausman test informs us about the consistency of the OLS compared to the 2SLS. We reject the null that OLS and 2SLS estimates are equally consistent in favor of 2SLS (Hausman, 1983). Lastly, According to the Saragan statistic (Sargan, 1958), instruments are exogenous (incorrelated with the errors of the second stage regression). Moving to the interpretation of the coefficients, instrumental variable approach confirms that Civic Engagement negatively affects vertical integration. Furthermore, the coefficient is four times larger in absolute terms than in previous regressions. This points to the fact that probably OLS underestimates the true impact of social capital on vertical integration. Last but not least, the IV procedure suggests that our estimates are not biased due to omitted variables.

Diagnostic tests				
	df1	df2	statistc	p-value
Weak instruments	2	921	20.047	3e-09***
Wu-Hausman	1	921	3.491	0.062**
Saragan	1	NA	1.297	0.255
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 6: Diagnostic tests for the 2SLS regression reported in Table 5, column 6.

for Luxembourg are completely missing and are proxied using data on ethnic groups (nationalities) taken from The World Factbook (2017).

5 Limitations, conclusions and suggestions for future research

In the previous sections we have provided some evidence in support of the idea that make-or-buy decisions of firms depend crucially on the social environment in which they operate. The present paper is a first attempt to study the impact of social capital on the degree of vertical integration in manufacturing sectors. As such it suffers from some limitations. To begin with, our measure of vertical integration is defined at the level of industries within countries, while the independent variables are measured at the country level. Further analyses with more dis-aggregated data are required to confirm our results. Due to data availability we have not considered several possible variables influencing vertical integration. This may generate an omitted variable bias that we have tried to wipe out using instrumental variables. We are referring here to proxies for asset specificity, uncertainty and complexity of the production process. We have tried to overcome this shortcoming using data on capital intensity in the US as representative for the whole world or dividing industrial sectors by R&D intensity. However such variables do not vary between countries. Further analyses with more detailed data are needed and will clarify how social capital interacts with classical determinants of vertical integration (asset specificity, uncertainty, complexity etc.). Nevertheless we believe that the present paper provides a new opportunity to understand how the organization of production differs across countries due to socio-cultural factors. The results are promising: as expected, social capital negatively affects vertical integration. In environments characterized by high levels of social capital, firms rely more on the market and less on internal production for their inputs. On the other hand, in environments characterized by low levels of social capital, vertical integration arises as a response to the threat of opportunistic behaviors in the marketplace. Furthermore, the coefficient associated with social capital is robust to different specifications of the model. There are at least two reasons why our results may underestimate the effect of social capital on vertical integration. Firstly, given the abundant evidence showing the impact of both social capital and trust on formal institutions (Knack and Keefer, 1997; Guiso et al., 2006), it is possible that the overall effect of social capital on vertical integration is much larger than the one obtained considering only its direct impact. Secondly, our analysis is based only on European countries, that are quite homogeneous in terms of social capital due to a common history. Enlarging the sample beyond European regions to include also countries with very different levels of social capital, may cause its impact to rise significantly. Although we have focused mainly on TCE, our main hypothesis that social capital reduces

vertical integration fits also other theories, like the incomplete-contracts one.

The analyses described in the previous sections rely on two implicit hypothesis. The first one is that within industries there is substantial homogeneity between firms in the degree of vertical integration. Secondly, countries are considered to be homogeneous in terms of social capital. Both issues are still debated (for what concerns industrial structure: Stigler (1951); Perry (1989); Pieri (2018); for social capital: Puntscher et al. (2016)). Accordingly, one of the next steps in the research agenda could be the replication of the analyses conducted above, but this time using less aggregated data, like regional ones.

Next, one can argue that the same factors that are ultimately responsible for transaction costs, may also explain failures of internal organization (Knight, 1921; Pfeffer, 1981; Williamson, 1971, 1973; Klein et al., 1978; Masten et al., 1991). Gibbons (2010) however, noticed that the majority of empirical studies in TCE simply disregard the costs of internal organization, and contrast costs of non-integration with those of vertical integration.

In conclusion, data employed in this paper have some limitations and the results obtained need to be confirmed in other settings. Nevertheless, at least two facts emerge. To begin with, social capital reduces vertical integration and this result is robust to different specifications of the model. Secondly, social capital has a stronger impact in low-R&D intensity industries than in high-R&D intensity ones due to the different complexity of the traded goods.

References

Acemoglu, D., Griffith, R., Aghion, P., and Zilibotti, F. (2010). Vertical integration and technology: Theory and evidence. *Journal of the European Economic Association*, 8(5):989–1033.

Acemoglu, D., Johnson, S., and Mitton, T. (2009). Determinants of vertical integration: Financial development and contracting costs. *The Journal of Finance*, 64(3):1251–1290.

Adelman, M. A. (1955). Concept and statistical measurement of vertical integration. In *Business Concentration and Price Policy*, NBER Chapters, pages 281–330. National Bureau of Economic Research.

Akçomak, I. S. and Ter Weel, B. (2009). Social capital, innovation and growth: Evidence from europe. *European Economic Review*, 53(5):544–567.

Alchian, A. A. and Demsetz, H. (1972). Production, information costs, and economic organization. *American Economic Review*, 62(5):777–795.

Alesina, A., Devleeschauwer, A., Easterly, W., Kurlat, S., and Wacziarg, R. (2003). Fractionalization. *Journal of Economic Growth*, 8(2):155–194.

Alesina, A. and La Ferrara, E. (2002). Who trusts others? *Journal of Public Economics*, 85(2):207–234.

Anderson, T. W. (1958). *An Introduction to Multivariate Statistical Analysis*, volume 2. New York: John Wiley & Sons Inc.

Arrighetti, A. (1999). Integrazione verticale in Italia e in Europa: tendenze ed ipotesi interpretative. In Traù, F., editor, *La "questione dimensionale"nell'industria italiana*, pages 113–148. Bologna: Il Mulino.

Arrow, K. J. (1972). Gifts and exchanges. *Philosophy & Public Affairs*, 1(4):343–362.

Atkinson, S. and Butcher, D. (2003). Trust in managerial relationships. *Journal of Managerial Psychology*, 18(4):282–304.

Baker, G., Gibbons, R., and Murphy, K. J. (2002). Relational contracts and the theory of the firm. *The Quarterly Journal of Economics*, 117(1):39–84.

Baker, W. E. (1990). Market networks and corporate behavior. *American Journal of Sociology*, 96(3):589–625.

Banfield, E. C. (1958). *The Moral Basis of a Backward Society*. New York: The Free Press.

Bartelsman, E. J., Becker, R. A., and Gray, W. B. (2000). NBER-CES manufacturing industry database.

Beugelsdijk, S. and Smulders, J. (2003). Bridging and bonding social capital: Which type is good for growth? In Arts, W., Hagenaars, J., and Halman, L., editors, *The Cultural Diversity of European Unity. Findings, Explanations and Reflections from the European Values Study*, pages 147–185. Leiden: Koninklijke Brill.

Beugelsdijk, S. and Van Schaik, T. (2005). Social capital and growth in european regions: An empirical test. *European Journal of Political Economy*, 21(2):301–324.

Bourdieu, P. (1986). The forms of capital. In Richardson, J. G., editor, *Handbook of Theory and Research for the Sociology of Education*, pages 241–258. Westport: Greenwood Press.

Bourdieu, P. and Wacquant, L. J. (1992). *An Invitation to Reflexive Sociology*. Chicago: The University of Chicago Press Books.

Bromiley, P. and Cummings, L. L. (1995). Transactions costs in organizations with trust. In Bies, R., Lewicki, R., and Sheppard, B., editors, *Research on Negotiation in Organizations*, volume 5, pages 219–247. Brenwich: JAI Press.

Brusco, S. (1982). The emilian model: productive decentralisation and social integration. *Cambridge journal of economics*, 6(2):167–184.

Buchanan, J. M. (1975). A contractarian paradigm for applying economic theory. *American Economic Review*, 65(2):225–230.

Burt, R. S. (2005). *Brokerage and Closure: An Introduction to Social Capital*. Oxford and New York: Oxford University Press.

Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: methods and applications*. New York: Cambridge University Press.

Chen, C. C., Peng, M. W., and Saparito, P. A. (2002). Individualism, collectivism, and opportunism: A cultural perspective on transaction cost economics. *Journal of Management*, 28(4):567–583.

Coase, R. H. (1937). The nature of the firm. *Economica*, 4(16):386–405.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94:S95–S120.

Coleman, J. S. (1990). *Foundations of Social Theory*. Cambridge: Harvard University Press.

Commons, J. (1934). *Institutional Economics: Its Place in Political Economy*. New York: Macmillan.

Cook, R. D. and Weisberg, S. (1982). *Residuals and Influence in Regression*. New York: Chapman and Hall.

DeBruine, L. M. (2002). Facial resemblance enhances trust. *Proceedings of the Royal Society of London B: Biological Sciences*, 269(1498):1307–1312.

Devicienti, F., Manello, A., and Vannoni, D. (2017). Technical efficiency, unions and decentralized labor contracts. *European Journal of Operational Research*, 260(3):1129–1141.

Durlauf, S. N. and Fafchamps, M. (2005). Social capital. In Aghion, P. and Durlauf, S. N., editors, *Handbook of Economic Growth*, pages 1639–1699. Amsterdam: Elsevier.

ESS Round 6: European Social Survey Round 6 Data (2012). Data file edition 2.4. NSD - Norwegian Centre for Research Data, Norway – Data Archive and distributor of ESS data for ESS ERIC.

European Social Survey (2012). *ESS Round 6 Source Questionnaire*. London: Centre for Comparative Social Surveys, City University London.

European Values Study (2008). *EVS 2008 Master Questionaire*. gesis Leibniz Institute for the Social Sciences.

EVS (2016). *European Values Study 2008: Integrated dataset (EVS 2008)*. GESIS Data Archive, Cologne. Data file Version 4.0.0, doi:10.4232/1.12458.

Fama, E. F. and Jensen, M. C. (1983). Separation of ownership and control. *The Journal of Law and Economics*, 26(2):301–325.

Fearon, J. D. (2003). Ethnic and cultural diversity by country. *Journal of Economic Growth*, 8(2):195–222.

Feenstra, Robert C., R. I. and (2015), M. P. T. (2015). The Next Generation of the Penn World Table. *American Economic Review*, 105(10):3150–3182. available for download at www.ggdc.net/pwt.

Fukuyama, F. (1995). *Trust: The Social Virtues and the Creation of Prosperity*. New York: The Free Press.

Galindo-Rueda, F. and Verger, F. (2016). *OECD Taxonomy of Economic Activities Based on R&D Intensity, OECD Science, Technology and Indutry Working Papers*. Number 04. OECD Publishing, Paris. https://doi.org/10.1787/5jlv73sqqp8r-en.

Ghoshal, S. and Moran, P. (1996). Bad for practice: A critique of the transaction cost theory. *Academy of Management Review*, 21(1):13–47.

Gibbons, R. (2005). Four formal (izable) theories of the firm? *Journal of Economic Behavior & Organization*, 58(2):200–245.

Gibbons, R. (2010). Transaction-cost economics: Past, present, and future? *The Scandinavian Journal of Economics*, 112(2):263–288.

Gil, R. and Hartmann, W. R. (2011). Airing your dirty laundry: Vertical integration, reputational capital, and social networks. *Journal of Law, Economics, & Organization*, 27(2):219–244.

Gittell, R. and Vidal, A. (1998). *Community organizing: Building social capital as a development strategy*. Thousand Oaks: Sage Publications.

Glaeser, E. L., Laibson, D. I., Scheinkman, J. A., and Soutter, C. L. (2000). Measuring trust. *The Quarterly Journal of Economics*, 115(3):811–846.

Gorodnichenko, Y. and Roland, G. (2011). Which dimensions of culture matter for long-run growth? *American Economic Review*, 101(3):492–498.

Gorodnichenko, Y. and Roland, G. (2017). Culture, institutions, and the wealth of nations. *The Review of Economics and Statistics*, 99(3):402–416.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91(3):481–510.

Greene, W. H. (2018). *Econometric Analysis*, chapter Endogeneity and Instrumental Variables Estimation. Upper Saddle River: Prentice Hall, 8th edition.

Greif, A. (1994). Cultural beliefs and the organization of society: A historical and theoretical reflection on collectivist and individualist societies. *Journal of Political Economy*, 102(5):912–950.

Grossman, S. J. and Hart, O. D. (1986). The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of Political Economy*, 94(4):691–719.

Guiso, L., Sapienza, P., and Zingales, L. (2004). The role of social capital in financial development. *American Economic Review*, 94(3):526–556.

Guiso, L., Sapienza, P., and Zingales, L. (2006). Does culture affect economic outcomes? *Journal of Economic Perspectives*, 20(2):23–48.

Guiso, L., Sapienza, P., and Zingales, L. (2008). Trusting the stock market. *The Journal of Finance*, 63(6):2557–2600.

Guiso, L., Sapienza, P., and Zingales, L. (2009). Cultural biases in economic exchange? *The Quarterly Journal of Economics*, 124(3):1095–1131.

Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal*, 38(1):85–112.

Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. (2009). *Multivariate Data Analysis*. Upper Saddle River: Prentice Hall, 7$^{\text{th}}$ edition.

Hart, O. (1995). *Firms, Contracts, and Financial Structure*. Oxford, and New York: Clarendon Press.

Hart, O. D. and Moore, J. (1990). Property rights and the nature of the firm. *Journal of Political Economy*, 98(6):1119–1158.

Hausman, J. (1983). Specification and estimation of simultaneous equation models. In Griliches†, Z. and Intriligator, M. D., editors, *Handbook of Econometrics*, volume 1, chapter 07, pages 391–448. Amsterdam: Elsevier, 1 edition.

Helliwell, J. F. and Putnam, R. D. (2004). The social context of well-being. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 359(1449):1435–1446.

Hofstede, G. and Hofstede, J. G. (2010). *Cultures and Organizations: Software of the Mind. Intercultural Cooperation and its Importance for Survival*. New York: McGaw-Hill, 3$^{\text{rd}}$ edition.

Holmstrom, B. R. and Tirole, J. (1989). The theory of the firm. In Schmalensee, R. and Willig, R., editors, *Handbook of Industrial Organization*, volume 1, chapter 2, pages 61–133. Amsterdam: North-Holland.

Husted, B. W. and Folger, R. (2004). Fairness and transaction costs: The contribution of organizational justice theory to an integrative model of economic organization. *Organization Science*, 15(6):719–729.

Inglehart, R. (1997). *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*. Princeton: Princeton University Press.

Jensen, M. C. and Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4):305–360.

Joskow, P. L. (1985). Vertical integration and long-term contracts: The case of coal-burning electric generating plants. *The Journal of Law, Economics, & Organization*, 1(1):33–80.

Kaasa, A. (2009). Effects of different dimensions of social capital on innovative activity: Evidence from Europe at the regional level. *Technovation*, 29(3):218–233.

Khanna, T. and Palepu, K. (1997). Why focused strategies may be wrong for emerging markets. *Harvard Business Review*, 75(4):41–51.

Klein, B., Crawford, R. G., and Alchian, A. A. (1978). Vertical integration, appropriable rents, and the competitive contracting process. *The Journal of Law and Economics*, 21(2):297–326.

Knack, S. and Keefer, P. (1997). Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics*, 112(4):1251–1288.

Knight, F. H. (1921). *Risk, Uncertainty and Profit*. Reprint: 2006, Mineola: Dover Publications.

Kogut, B. and Zander, U. (1996). What firms do? coordination, identity, and learning. 7(5):502–518.

Kreps, D. M. (1990). *A course in microeconomic theory*. New York: Harvester Wheatsheaf.

Laffer, A. B. (1969). Vertical integration by corporations, 1929-1965. *The Review of Economics and Statistics*, 51(1):91–93.

Lafontaine, F. and Slade, M. (2007). Vertical integration and firm boundaries: The evidence. *Journal of Economic Literature*, 45(3):629–685.

Laursen, K., Masciarelli, F., and Prencipe, A. (2012). Regions matter: How localized social capital affects innovation and external knowledge acquisition. *Organization Science*, 23(1):177–193.

Leigh, A. (2006). Trust, inequality and ethnic heterogeneity. *Economic Record*, 82(258):268–280.

Levy, D. T. (1985). The transactions cost approach to vertical integration: An empirical examination. *The Review of Economics and Statistics*, 67(3):438–445.

Lewicki, R. J. and Bunker, B. B. (1996). Developing and maintaining trust in work relationships. In Kramer, R. and Tyler, T., editors, *Trust in organizations: Frontiers of theory and research*, pages 1114–139. Thousand Oaks: Sage Publications.

Litvinova, M. and Segnana, M. L. (2015). Firm boundaries in transition countries. the influence of technological and institutional links. DEM Working Papers 2015/05, Department of Economics and Management.

Lorenz, E. H. (2000). Neither friends nor strangers: Informal networks of subcontracting in french industry. In Gambetta, D., editor, *Trust: Making and BreakingCooperative Relations, electronic edition*, pages 194–210. New York: Blackwell Publishers.

Macaulay, S. (1963). Non-contractual relations in business: A preliminary study. *American Sociological Review*, 28(1):55–67.

Manello, A., Calabrese, G. G., and Frigero, P. (2016). Technical efficiency and productivity growth along the automotive value chain: evidence from italy. *Industrial and Corporate Change*, 25(2):245–259.

Martin, S. (2009). *Advanced Industrial Economics*. Oxford and Malden: Blackwell Publishers, 2nd edition.

Masten, S. E. (1984). The organization of production: Evidence from the aerospace industry. *The Journal of Law & Economics*, 27(2):403–417.

Masten, S. E., Meehan, J. W., and Snyder, E. A. (1991). The costs of organization. *The Journal of Law, Economics, & Organization*, 7(1):1–25.

Mayer, R. C., Davis, J. H., and Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of Management Review*, 20(3):709–734.

McCulloch, C. E. and Searle, S. R. (2001). *Generalized, linear and mixed models*. Wiley Series in Probability and Statistics. New York: Wiley.

McKnight, D. H., Cummings, L. L., and Chervany, N. L. (1998). Initial trust formation in new organizational relationships. *Academy of Management Review*, 23(3):473–490.

Mill, J. S. (1848). *Principles of Political Economy With Some of Their Applications to Social Philosophy*. Reprint: 1965, Toronto: University of Toronto Press.

Monteverde, K. and Teece, D. J. (1982). Supplier switching costs and vertical integration in the automobile industry. *The Bell Journal of Economics*, 13(1):206–213.

Nahapiet, J. and Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, 23(2):242–266.

Newton, K. and Norris, P. (2000). Confidence in public institutions. In Pharr, Susan, J. and Putnam, Robert, D., editors, *Disaffected Democracies. What's Troubling the Trilateral Countries*, pages 121–148. Princeton: Princeton University Press.

Nooteboom, B., Berger, H., and Noorderhaven, N. G. (1997). Effects of trust and governance on relational risk. *Academy of Management Journal*, 40(2):308–338.

OECD (2017a). How Better Governance Can Help Rebuild Public Trust, OECD Public Governance Reviews, OECD Publishing, Paris, https://doi.org/https://doi.org/10.1787/9789264268920-en.

OECD (2017b). OECD Guidelines on Measuring Trust. OECD Publishing, Paris, https://doi.org/10.1787/9789264278219-en.

OECD (2019). OECD, SDBS Structural Business Statistics, ISIC Rev. 4, in OECD.Stat, accessed on 19/12/2018. https://stats.oecd.org/Index.aspx?DataSetCode=SSIS_BSC_ISIC4&_ga=2.114180615.1288133518.1549277060-1551125518.1530532807.

Ouchi, W. G. (1980). Markets, bureaucracies, and clans. *Administrative Science Quarterly*, 25(1):129–141.

Paldam, M. and Svendsen, G. T. (2000). An essay on social capital: looking for the fire behind the smoke. *European Journal of Political Economy*, 16(2):339–366.

Paxton, P. (2002). Social capital and democracy: An interdependent relationship. *American Sociological Review*, 67(2):254–277.

Perry, M. K. (1989). Vertical integration: Determinants and effects. In Schmalensee, R. and Willig, Robert, D., editors, *Handbook of Industrial Organization*, volume 1, pages 183–255. Amsterdam: North-Holland.

Pfeffer, J. (1981). *Power in Organizations*. Cambridge: Ballinger.

Piantadosi, S., Byar, D. P., and Green, S. B. (1988). The ecological fallacy. *American Journal of Epidemiology*, 127(5):893–904.

Pieri, F. (2018). Vertical organization of production and firm growth. *Industrial and Corporate Change*, 27(1):83–106.

Pieri, F. and Zaninotto, E. (2013). Vertical integration and efficiency: an application to the italian machine tool industry. *Small Business Economics*, 40(2):397–416.

Pinheiro, J. C. and Bates, D. M. (2000). *Mixed-effects models in S and S-Plus*. Statistics and Computing. New York: Springer.

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, 24(1):1–24.

Puntscher, S., Hauser, C., Walde, J., and Tappeiner, G. (2016). Measuring social capital with aggregated indicators: A case of ecological fallacy? *Social Indicators Research*, 125(2):431–449.

Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. New York: Simon & Schuster.

Putnam, R. D., Leonardi, R., and Nanetti, R. Y. (1994). *Making democracy work: Civic traditions in modern Italy*. Princeton: Princeton University Press.

Rajan, R. G. and Zingales, L. (1998). Financial dependence and growth. *American Economic Review*, 88(3):559–586.

Ring, P. S. and Van de Ven, A. H. (1992). Structuring cooperative relationships between organizations. *Strategic Management Journal*, 13(7):483–498.

Rousseau, D. M., Sitkin, S. B., Burt, R. S., and Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of Management Review*, 23(3):393–404.

Sargan, J. D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica*, 26(3):393–415.

Selle, P. and Strømsnes, K. (2001). Membership and democracy: Should we take passive support seriously. In Dekker, P. and Uslaner, Eric, M., editors, *Social Capital and Politics in Everyday Life*, pages 134–147. London and New York: Routledge.

Shelanski, H. A. and Klein, P. G. (1995). Empirical research in transaction cost economics: A review and assessment. *The Journal of Law, Economics, & Organization*, 11(2):335–361.

Simon, H. A. (1951). A formal theory of the employment relationship. *Econometrica*, 19(3):293–305.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*. Reprint: 1976, Oxford: Oxford University Press.

Snijders, T. A. and Bosker, R. J. (2012). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. Thousand Oaks: Sage Publications, 2nd edition.

Stigler, G. J. (1951). The division of labor is limited by the extent of the market. *Journal of Political Economy*, 59(3):185–193.

Stock, J. H. and Watson, M. W. (2007). *Introduction to Econometrics*, chapter Instrumental variables regression. Boston: Addison-Wesley.

Stock, J. H. and Yogo, M. (2005). Testing for weak instruments in linear iv regression. In Andrews, D., editor, *Identification and Inference for Econometric Models*, pages 80–108. New York: Cambridge University Press.

Teece, D. J. (1976). *Vertical Integration and Vertical Divestiture in the US Oil Industry: Economic Analysis and Policy Implications*. Stanford: University of Stanford Research Paper No. 300.

The World Bank (2013a). *Doing Business*. http://www.doingbusiness.org/en/data/exploretopics/enforcing-contracts.

The World Bank (2013b). *Doing Business*. http://www.doingbusiness.org/en/data/exploretopics/paying-taxes.

The World Bank (2013c). *World development indicators: International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates*.

The World Bank (2013d). *World development indicators: UNESCO Institute for Statistics (http://uis.unesco.org/)*.

The World Factbook (2016-2017). *Washington, DC: Central Intelligence Agency*. https://www.cia.gov/library/publications/the-world-factbook/index.html.

United Nations. Statistical Division (2008). International Standard Industrial Classification of All Economic Activities (ISIC), Rev.4. In *Statistical Paper, Series M*, number 4. United Nations Publications.

Weber, M. (1904). *The protestant Ethic and the Spirit of Capitalism*. Reprint: 1930, London: Parsons.

Williamson, O. E. (1971). The vertical integration of production: market failure considerations. *American Economic Review*, 61(2):112–123.

Williamson, O. E. (1973). Markets and hierarchies: some elementary considerations. *American Economic Review*, 63(2):316–325.

Williamson, O. E. (1975). *Markets and Hierarchiess, Analysis and Antitrust Implications : A Study in the Economics of Internal Organization*. New York: The Free Press.

Williamson, O. E. (1976). Franchise bidding for natural monopolies-in general and with respect to catv. *The Bell Journal of Economics*, 7(1):73–104.

Williamson, O. E. (1979). Transaction-cost economics: the governance of contractual relations. *the Journal of Law and Economics*, 22(2):233–261.

Williamson, O. E. (1985). *The Economic Intstitutions of Capitalism: Firms, Markets, Relational Contracting*. New York: The Free Press.

Williamson, O. E. (1989). Transaction cost economics. In Schmalensee, R. and Willig, Robert, D., editors, *Handbook of Industrial Organization*, volume 1, pages 135–182. Amsterdam: North-Holland.

Williamson, O. E. (1993). Opportunism and its critics. *Managerial and Decision Economics*, 14(2):97–107.

Williamson, O. E. (1996a). Economic organization: The case for candor. *The Academy of Management Review*, 21(1):48–57.

Williamson, O. E. (1996b). *The Mechanisms of Governance*. Oxford and New York: Oxford University Press.

Williamson, O. E. (2002). The theory of the firm as governance structure: from choice to contract. *Journal of Economic Perspectives*, 16(3):171–195.

Woolcock, M. and Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank Research Observer*, 15(2):225–249.

Delegation in procurement: A theoretical model of reciprocity

Marco Castellani *

Abstract

We develop a simple model to account for reciprocal behavior in a supplier-buyer relationship. We do so by formalizing a setting in which a downstream firm (the buyer) needs an essential input, but does not know exactly the characteristics of the input that are best suited in the different possible states of the world. This input is purchased from a better-informed upstream firm (the supplier). The preferences of the two firms about which input to trade can be divergent. If not motivated by reciprocity, the supplier produces the input that provides it with the highest profit. When we extend the model to include reciprocity, we show that the supplier may be willing to give-up part of its own profits to reward a kind buyer. This enlarges the set of enforceable contracts and makes it profitable for the downstream firm to extend the scope of delegation to the upstream firm. Furthermore, we show that for some delegation to occur, it is enough that the supplier is moderately reciprocal.

JEL Classifications: L22, D23, D4, D91, A13.

Keywords: Delegation; Vertical integration; Market exchange; Reciprocity; Social capital

1 Introduction

While technological factors shape the boundaries of firms and industries, they are not the sole determinant of the organization of production. Firms and industries differ substantially from country to country in the degree of vertical integration, scope of delegation and other aspects of the organization. The literature has suggested that this could be explained by differences in formal institutions and credit markets. Countries where it is hard to write and enforce long-term contracts due to under-developed institutions are characterized by the presence of more integrated firms (Acemoglu et al., 2009). Vertically

*Part of this research has been developed at Famnit-Univerza na Primorskem, Koper (Slovenija).

integrated firms are also prevalent in countries with highly developed credit markets (Acemoglu et al., 2009). The present paper introduces the idea that the organization of production is determined also by the socio-cultural environment in which firms operate. We develop a simple principal-agent model to show that the inclusion of psychological considerations enriches the set of enforceable contracts, as experimentally confirmed by Fehr et al. (1997). We show that when the agent is motivated by reciprocity, the principal is more likely to delegate the choice of the action. Specifically, we consider a downstream firm (the principal/buyer) that needs an input produced by an upstream firm (the agent/supplier). The characteristics of the input that best suites the needs of the downstream firm are private information of the upstream firm and depend on the state of the world that materializes after the contract has been signed. We thus employ a key assumption of the incomplete-contracts literature, namely that some features of the input/production process can not be contracted upon (Grossman and Hart, 1986). We can imagine a situation in which the true state of the world is observable only to the upstream firm or in which the downstream firm specifies it needs to the upstream firm which then produces the input that, according to its superior knowledge, best suites the needs of the downstream firm. Still another possibility is that it is extremely costly for the downstream firm to acquire information about the state of the world/input and to write/enforce a state-contingent contract, so that it is not profitable to do so. Whichever the case, we are interested in a situation in which the downstream firm is not able to contractually bind the upstream firm to produce the input that best suites it needs.[1] We posit that the downstream firm can propose to the upstream firm two types of contracts. One that specifies exactly the characteristics of the input to be traded and one that leaves the choice of the characteristics to the the upstream firm. We interpret the first contract as an employment relationship (vertical integration) and the second-one as a market transaction. We do so on the basis that the key feature of employment relationship can be identified in the employer's authority to tell an employee exactly what to do (Coase, 1937). If the second contract is offered, an opportunistic upstream firm supplies the input that maximizes its profits, regardless of the consequences on the downstream firm. We show that when the upstream firm is motivated by reciprocity, it may supply the input that best suites the needs of the downstream firm even if this is not its profit-maximizing strategy. In turn, the downstream firm is more likely to delegate the decision about the input to the upstream firm. Therefore a

[1]If the downstream firm is able to write and enforce state-contingent contracts at negligible costs, then the effect of reciprocity is of little interest. This is why we rule out such situations and focus on settings where state-contingent contracts are not enforceable.

relationship which is more similar to a market transaction prevails. Individuals tend to be more concerned with the consequences of their own actions on others when they are embedded in a dense network of social relationships. The literature has labeled this network social capital (Putnam et al., 1994). Social capital promotes trust, trustworthiness and reciprocity among the members of the network (Putnam et al., 1994; Fukuyama, 1995; Durlauf and Fafchamps, 2005). As long as social capital induces reciprocal behavior, our results are in line with the empirical findings in Bloom et al. (2012a,b); Kastl et al. (2013) and Gur and Bjørnskov (2017), that delegation is more likely to be observed when trust and social capital are particularly pronounced. In view of the fact that social capital enriches the set of feasible contracts and reduces unproductive expenses (monitoring, contractual enforcement), our model adds to the literature on the positive effects of social capital on economic performance of countries (Fehr et al., 1997; Huck et al., 2012). The paper is structured as follows. Section 2 reviews the literature. Section 3 presents the basic features of the model. Section 4 develops the baseline model. Section 5 extends the model to account for reciprocal behavior. Section 6 concludes. All the proofs and the solutions of the maximization problems are in the Appendix.

2 Related literature

The literature usually interprets vertical integration as the (only) solution to the risk of being exploited by an unfair transaction counterpart. However, vertical integration is costly. Firms may be cash-constrained and financial markets imperfect, so that vertical integration is not a viable option (Acemoglu et al., 2009). The literature has identified other solutions to the problem of opportunism. Contracts can include monetary incentives that depend on the behavior of the transacting parts. This implicitly requires some degree of verifiability and external enforceability of contracts. In real-world situations it could be difficult to monitor the counterpart and courts may have a hard time in identifying contract breaches. A less demanding possibility is to design payment schemes that are contingent on the performance which may be, however, a poor signal of effort as it may depend on factors external to the transaction (Macho-Stadler and Pérez-Castrillo, 2018). All this solutions rest on the central hypothesis that individuals are purely selfish and do not care for the consequences of their actions on others. The literature has recognized that it is possible to account for non-opportunistic behavior also within the canonical framework of rationality, complete information and utility maximization. Relational contracts models analyze infinitely-repeated games between a seller and a buyer of an input (Baker et al., 2002). These models show that, under

certain conditions, reputation concerns, captured by the discounted monetary value of continuing the relationship, may outweigh monetary benefits from contract breaches. Both relational contracts approach and our reciprocity-based model try to explain why and how purely opportunistic behavior may be mitigated and derive the conditions such that this is the case. However, our approach differs from the literature on relational contacts in at least two important ways. To begin with, the above mentioned literature does not really go beyond the classical profit-maximizing paradigm, as it just modifies the profit function of firms. What we are trying to do is instead to explicitly include non-monetary incentives in the payoff function. Secondly, our model can be used to explain non-opportunistic behavior also in one-shot interactions (spot-market transaction in our setting), while relational contracts require an infinite number of interactions. Another way in which economists have tried to include other-regarding behavior is to assume that individuals may be altruistic and simply care for the well-being (utility) of others (Englmaier and Leider, 2012; Macho-Stadler and Pérez-Castrillo, 2018). Within the framework of industrial relations this assumption seems highly unlikely (Lane and Bachmann, 1996). Furthermore, according to psychological evidence, individuals are far more complex than this. Humans tend to help those who are kind to them and to hurt those who are unkind. Our model is in line with the literature on reciprocity, pioneered by Rabin (1993) for simultaneous-move games and by Dufwenberg and Kirchsteiger (2004) for sequential-move games. A reciprocal individual is prepared to sacrifice part of his own material payoff for the sake of helping/hurting someone who has been kind/unkind to him. A large body of laboratory experiments confirms that it is reciprocity and not pure altruism that guides other-regarding behavior of individuals (McCabe et al., 1998; Dawes and Thaler, 1988). By leveraging on reciprocity, the downstream firm can align the incentives of the upstream firm with its own. Also in our model the *Ally Principle* (Huber and Shipan, 2006) holds: the more the upstream firm is aligned (reciprocal), the more delegated it will be. Our model can also explain why, even if the conditions are favorable for vertical integration (inefficient courts, specific investments, specific inputs), firms continue to rely on market transactions. We apply the framework of Englmaier and Leider (2012) in a contest of delegation of decision rights, where reciprocity may rule-out purely selfish behavior. Another, more technical, difference between our model and the one developed in Englmaier and Leider (2012) is that they consider a static game, with no time dynamic. Since the realization of the state of the world depends on the actions of the agent, in their setting the individual rationality and the incentive compatibility constraint are both solved before the true state of the world materializes. In our model, instead, the upstream firm accepts the contract before the state of the world materializes,

but acts after the state of the world materializes. The paper which is closest in spirit to ours is probably De Chiara and Manna (2018). Also their focus is on the extent of delegation in a principal-agent problem, when the agent can be reciprocal. The main difference with our model rests on how the reciprocal behavior is leveraged. While in De Chiara and Manna (2018) it s the scope of delegation that inactivates a reciprocal behavior by the agent, in our setting it is the more/less generous price proposed by the buyer that induces a more loyal attitude by the seller. The present paper is closely related also to the literature on efficiency-wage models. According to this literature, employers with limited monitoring ability may choose to give to the employee an extra-rent over its outside option to limit shirking. This extra-effort can be simply due to the worker's fear of loosing such a good-payed job or may be a "gift"to a kind employer (Akerlof, 1982).[2] A key difference between our model and the classical efficiency-wage model in Shapiro and Stiglitz (1984) is that our model can be applied also when there is no possibility to punish shirking, while their model requires at least some small probability that shirkers are detected (and punished).

3 The model

We consider a downstream firm D that needs an essential input which is produced by an upstream firm U. The characteristics of the input that are best suited for firm D are *ex-ante* unknown and depend on the state of the world that materializes only once the contract between D and U has been signed. We assume that there are $n \geq 2$ states of the world, $S = \{1, \ldots, n\}$, all equally likely *ex-ante* and that both firms share identical beliefs about the probability distribution of S: $Prob(s = i) = p, \forall i \in [1, n]$, such that $n \times p = 1$. Once the contract is signed, firm U observes the state of the world and chooses the quality/characteristics of the input. We label this different qualities $q_i, i \in [1, m], m \geq n$. The cost to firm U of producing the input q_i is $c(q_i) = c_i, \forall i \in [1, m]$. Without loss of generality we assume that these inputs are ordered from the most to the least expensive: $c_i > c_{i+1}, \forall i \in [1, m-1]$. Firm D uses this inputs to produce an output worth R (high-value output) or r (low-value output), such that $R > r > 0$. We assume the difference $R - r$ to be "large". We specify later in the paper what we mean by "large".[3] The low-value output r can be always produced, no matter the quality of the input employed. The high-value output R can be produced only if the input is

[2] Akerlof and Yellen (1990) review numerous sociological explanations why workers should reduce their effort when they think that they are under-payed.

[3] This assumption rules out cases in which non delegation is trivially optimal for firm D.

tailored to the state of the world that realizes. We refer to this input as the "appropriate-quality input"(or "appropriate input", for brevity). In the state $s = i$, only q_i allows D to produce R, while all other q_j allow D to produce only r, $\forall i \in [1, n]; \forall j \in [1, m]; i \neq j$.More specifically, the timing of the game is as follows (see also Figure 1):

t_0 firm D offers a contract to firm U;

t_1 firm U accepts the contract if it guarantees a payoff greater than its outside option $\underline{U}$ and rejects the contract otherwise;

t_2 Nature chooses the state of the world $\tilde{s} \in S$;

t_3 firm U observes the state of the world $\tilde{s} \in S$ and delivers an input q_i;

t_4 payoffs are realized.

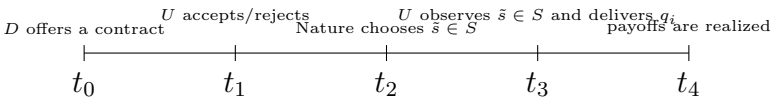


Figure 1: Timing of the game

We assume that the downstream firm can offer only two types of contracts. A contract that specifies exactly the quality of the input that firm U has to deliver, q_i, and the associated price, ω: $\{q_i; \omega\}$, with $i \in [1, m]$. We refer to it as the "binding contract". The second type of contract indicates a fixed price and leaves the upstream firm to be completely free in the choice of the quality it prefers: $\{q_1, \ldots, q_m; \omega\}$. We refer to it as the "delegating contract". We assume that intermediate forms of contracts that specify a limited number of qualities, e.g. two qualities, among which to choose are not feasible. Moreover, for the delegating contract, we assume that the price can not be contingent to the quality that is delivered.[4] We interpret the binding contract as vertical integration and the delegating contract as market transaction. As mentioned in the introductory section, a key difference between vertical organization and market transaction is that in the first case the employer can tell the employees exactly what to do (Coase, 1937). Complete delegation of the characteristics of the input is, indeed, an extreme case which is useful for modeling purposes but we do not expect to observe it in real-world transactions. Still, we think that there are many situations where a buyer describes the general features of the input and then relies on supplier suggestions for some specific characteristics

[4]We discuss this assumption in the concluding section of the paper. For an overview of some reasons why this might be the case, see the introductory section in Alonso and Matouschek (2008).

for which it has superior knowledge. As formalized above, the downstream firm always produces its output, no matter the quality of the input. However, the quality of the input determines the quality (and the value to the downstream firm) of the output. We can thus imagine a situation in which the supplier simply provides the buyer with an input or it can actively try to figure out the needs of the buyer and provides the most appropriate input. Many times inputs are so standardized that it is difficult to justify the assumption of contracts' incompleteness. If it is costly to write contracts, their incompleteness can be purposeful in the sense that a party relies on the good behavior of the other to "complete"the contract (Kőszegi, 2014). If this is the case, our model explains how this completion occurs.

In order to keep the model as simple as possible and to focus on the impact of reciprocal behavior on input procurement, we abstract from some possible determinants of vertical integration. In greater detail, we set the costs of vertical integration equal to zero, both for what concerns the acquisition of machinery and for higher organizational costs stemming from the unification of different production phases under the same ownership. We do so on the basis that acquisition of machinery and organizational costs will have entered the production function of firm D as two constants with negative signs (*i.e.* costs). They will have well reduced the profitability of vertical integration and thus the likelihood that this solution will be observed, but the qualitative results of our model will have remained unchanged. Furthermore, and in line with Grossman and Hart (1986), the fact that a vertically integrated firm has no way to produce a state-contingent input can be explicitly considered a cost associated with that organizational form. Lastly, we assume both firms to be risk-neutral. [5]

4 Benchmark

We solve for the optimal contract from the point of view of firm D when both firms are selfish. In Section 5 we extend the model to allow for reciprocal behavior by firm U.

The payoff of firm U is $\pi_U(q_i) = \omega - c_i, \forall i \in [1, m]$. This payoff function is strictly decreasing in the cost c_i associated to quality q_i. Player D would like firm U to always choose the appropriate quality, but has no way to enforce such a contract. Thus, if firm D proposes the delegating contract, U always chooses the input with the smallest associated cost: q_m. Therefore, in this setting the contract $\{q_1, \ldots, q_m; \omega\}$ is equivalent to the contract $\{q_m; \omega\}$. The

[5]This is a usual assumption of vertical-integration models; see, for instance: Hart and Moore (1990); Baker et al. (2002))

expected payoff of firm D before the state of the world materializes (*ex-ante*) takes the following form:

$$\pi_D(q_i) = \begin{cases} pR + (1-p)r - \omega, & \text{for } q_i, i \in \{1, \ldots, n\} \\ r - \omega, & \text{for } q_i, i \in \{n+1, \ldots, m\} \end{cases} \tag{1}$$

Two cases are considered separately in what follows: $\{q_i; \omega\}, i \in [1, n]$ and $\{q_j; \omega\}, j \in [n+1, m]$. We assume that firm D holds all the bargaining power. This means that D offers a contract that leaves U exactly indifferent between accepting the contract and refusing it.
The optimal contract to induce firm U to choose the quality $q_i, i \in [1, n]$ solves the following maximization problem:

$$\begin{aligned} \max_{\omega} \quad & pR + (1-p)r - \omega \\ \text{s.t.} \quad & \omega - c_i \geq \underline{U} \quad \text{(I.R.)} \end{aligned} \tag{2}$$

The solution is given by $\omega_i^* = \underline{U} + c_i$. Since $\pi_D = pR + (1-p)r - (\underline{U} + c_i)$ is strictly decreasing in c_i and when the contract is proposed, all the states of the world are equally likely to occur, the optimal contract for firm D is $\{q_n; \underline{U} + c_n\}$. In other words, D offers the contract that induces the choice of the least costly quality among those that generate R with positive probability. The *ex-ante* profits of the two firms are: $\pi_U = \underline{U}$ and $\pi_D = pR + (1-p)r - (\underline{U} + c_n)$, respectively.
Analogously, the optimal contract to induce firm U to choose the quality $q_j, j \in [n+1, m]$ solves the following maximization problem:

$$\begin{aligned} \max_{\omega} \quad & r - \omega \\ \text{s.t.} \quad & \omega - c_j \geq \underline{U} \quad \text{(I.R.)} \end{aligned} \tag{3}$$

The solution is given by $\omega_j^* = \underline{U} + c_j$.[6] The optimal contract for firm D is again the one associated with the smallest possible cost: $\{q_m; \underline{U} + c_m\}$. The profits of the two firms are, respectively: $\pi_U = \underline{U}, \pi_D = r - (\underline{U} + c_m)$. Throughout the paper we will assume that from the point of view of firm D the contract $\{q_n; \underline{U} + c_n\}$ is *ex-ante* always (weakly) preferred to $\{q_m; \underline{U} + c_m\}$, which is true as long as as long as:

$$p(R - r) \geq c_n - c_m. \tag{4}$$

[6]Computations omitted for brevity, since they are analogous to those for problem (2).

5 Reciprocity

In this section we extend the model to allow for reciprocal behavior by firm U. We derive the condition under which the delegating contract is offered and determine which delegating contract is optimal for firm D. A reciprocal individual is willing to give up part of his material payoff in order to punish those who treat him unkindly and to reward those who treat him kindly. In our setting the outside option represents the reference point to distinguish between the two cases. If firm D offers a contract that allows firm U to get a payoff which is strictly larger than its outside option, then firm D is perceived as kind, and *vice versa*.[7] If D proposes a contract that leaves U completely indifferent between accepting it or not, then D is not perceived as kind, nor as unkind, and we are back to the setting without reciprocity. We continue to assume that D can propose only two types of contracts, binding and delegating. However, due to reciprocity, by varying ω, in the delegating contract, D can induce U to choose the appropriate quality in more or less states of the world. As will be shown shortly, in this setting U may prefer not to choose the quality with the smallest associated cost, so that contract $\{q_1, \ldots, q_m; \omega\}$ is not equivalent to $\{q_m; \omega\}$ anymore. Initially we consider the case in which D chooses ω to induce U to appropriately select q_i in all the states of the world. We refer to it as the "fully-delegating contract". The profit function of firm D remains as in the benchmark, while the payoff function of firm U is now made up of two parts: its material payoff and its reciprocity payoff, modeled as in Englmaier and Leider (2012) and Macho-Stadler and Pérez-Castrillo (2018):[8]

$$\pi_U(q_i) = \underbrace{\omega - c_i}_{\text{material payoff}} + \underbrace{\mu K R}_{\text{reciprocity payoff}} . \tag{5}$$

The material payoff corresponds to profits. The reciprocity payoff is made up of three terms. The first one, $\mu \geq 0$, is U's sensitivity to reciprocity. It captures how much U is concerned with the consequences of its actions on D. If $\mu = 0$ we are back in the benchmark. The second term, K, is the kindness function. It is computed as the difference between the payoff that U expects to obtain under the proposed contract (the "job description") and the outside option: $K \equiv \omega - E[c] - \underline{U}$, where $E[c] = \sum_{i=1}^{n} p c_i = \frac{1}{n} \sum_{i=1}^{n} c_i$ is the expected

[7] We think that the outside option is a natural reference point for assessing perceived kindness. Still, our results hold if we imagine the reference point to be a different fixed value.

[8] For certain values of the parameters it may happen that the profits of firm U are negative *ex-post*. In our modeling we exclude limited liability considerations, so that firm U produces the appropriate quality even when this is not *ex-post* profitable (we assume U to be "deep-pocket"). We do so because limited liability considerations do not add substantially to our model and do not change our results.

cost for firm U before the state of the world is revealed. If $K > 0 \quad (K < 0)$, D is giving to U something more (less) than the outside option and we say that D is perceived as kind (unkind). If $K = 0$ we are back in the benchmark. The third term is simply D's expected gross revenues under the proposed contract. The optimal delegating contract to induce U to always choose the appropriate quality solves the following maximization problem:

$$\begin{aligned} \max_{\omega} \quad & R - \omega \\ \text{s.t.} \quad & \omega - E[c] + \mu K R \geq \underline{U} \quad \text{(I.R.)} \\ & \omega - c_i + \mu K R \geq \omega - c_j + \mu K r; \forall i \in [1,n], \forall j \in [1,m], i \neq j \quad \text{(I.C.)} \end{aligned} \tag{6}$$

The first constraint, I.R., is the individual rationality constraint. Under the proposed contract, U receives ω, chooses the appropriate quality in each state of the world, thus bearing an expected cost $E[c]$, and generates a reciprocal payoff $\mu K R$. For the I.R. to be satisfied this payoff has to be larger than or equal to $\underline{U}$.[9] For the sake of explanation in what follows we refer to $\underline{U} + E[c]$ as to the "individually-rational price". I.C. contains $(n \times m) - 1$ incentive compatibility constraints. They require that for every state of the world, the appropriate quality maximizes U's payoff. These ensures that U finds it optimal to always choose the appropriate quality. As we show in the Appendix, the contract that solves the above maximization problem is:

$$\left\{ q_1, \ldots, q_m; \underline{U} + E[c] + \frac{c_1 - c_m}{\mu(R-r)} \right\}. \tag{7}$$

The term $\underline{U}+E[c]$ is the individually-rational component of the price, necessary to satisfy the I.R.; $\frac{c_1-c_m}{\mu(R-r)}$ is the reciprocal component of the price, required to induce reciprocal behavior. The reciprocal component of the price is larger the higher the cost to U of producing the most expensive input (high c_1) and the lower the cost of the best alternative for U (high c_m). The difference between c_1 and c_m represents the increase in cost U faces if it decides to produce the appropriate quality in the state $s = 1$, instead of the cheapest-one, q_m. If this difference is not very high, then the cost for U of the most expensive input and of the least expensive input are not very different; consequently firm D can induce reciprocal behavior by U at a relatively small cost. The reciprocal component is smaller the more U is concerned with reciprocity (high μ). If U is very concerned with the consequences of his actions on the profits of D, then even a small increase of the price over the individually-rational part ensures that the appropriate quality is always chosen by U. Finally, the reciprocal

[9] As in Englmaier and Leider (2012), the I.R. assures that D never offers a contract that induces U to retaliate.

component is larger the less important it is for D to get the appropriate input (low $R - r$). If this difference is small, then the increase in the reciprocity payoff of U from choosing the appropriate input instead of another input is small. In order for the I.C. to hold, D must leverage on K by offering a high price.

Apart from the delegating contract characterized above, firm D can also propose (one of the) two binding contracts identified in the previous section. Since these contracts "bind" firm U in its choice of the quality, the binding contracts are the same as in the benchmark. Consider, first, that contract $\{q_i; \omega\}, i \in [1, n]$ is offered. The kindness function is $K' \equiv (\omega - c_i) - \underline{U}$. The optimal contract to induce firm U to choose the quality $q_i, i \in [1, n]$ solves the following maximization problem:

$$\begin{aligned} \max_{\omega} \quad & pR + (1-p)r - \omega \\ \text{s.t.} \quad & \omega - c_i + \mu K'[pR + (1-p)r] \geq \underline{U} \quad \text{(I.R.)} \end{aligned} \tag{8}$$

As in the benchmark, the solution is $\omega_i^* = \underline{U} + c_i$. Again the optimal contract for D is $\{q_n; \underline{U} + c_n\}$. Analogously, if contract $\{q_j; \omega\}, j \in [n+1, m]$ is offered, the optimal contract for firm D is $\{q_m; \underline{U} + c_m\}$. As in the benchmark we assume that contract $\{q_n; \underline{U} + c_n\}$ is weakly preferred by D to $\{q_m; \underline{U} + c_m\}$. Firm U experiences reciprocal motives towards firm D if and only if its expected payoff under the job description is greater than its outside option. This is to say, if the individual rationality constraint does not bind at the optimum. We can conclude that to induce reciprocal behavior, firm D must offer to a reciprocal firm U a payment which is strictly greater than those in the binding contracts, as stated in the following lemma.

Lemma 1. *To induce reciprocal behavior, firm D must offer to a reciprocal firm U a price strictly greater than those in the binding contracts.*

Having computed the price for the delegating contract, we now derive the sufficient condition for this contract to be preferred to any binding contract. This establishes a sufficient condition for delegation being optimal for firm D.

Proposition 1. *With a reciprocal upstream firm, the fully-delegating contract is preferred by D to any binding contract if:*

$$\mu \geq \frac{c_1 - c_m}{(R-r)[((1-p)(R-r) - E[c] + c_n]}. \tag{9}$$

The above inequality states that the fully-delegating contract is more likely to be observed when: U is very reciprocal (high μ); it is very important for firm D to get the appropriate input (when $R-r$ is high); it is very unlikely that the

true state of the world is the one indicated in the binding contract (p is low) or this contract is very expensive (high c_n); when the best alternative for U is very expensive for it (high c_m) or when it is relatively cheap for U to produce even the most expensive input (low c_1); when the expected cost of producing the input is low (low $E[c]$).

5.1 The extent of delegation

In Proposition 1 we have stated the sufficient condition for delegation to be optimal. Next issue is the extent of delegation. The fully-delegating contract described in the previous section incentivizes firm U to choose the appropriate quality in each state of the world. However, it may happen that the appropriate inputs for the first s' states of the world are so expensive, that it is optimal for firm D to get q_m and produce r if the state of the world is $s \leq s'$, and to get the appropriate input otherwise. We refer to this contract as a "partially-delegating contract". The fully-delegating contract is a special case of a partially-delegating contract, namely when $s' = 0$. The kindness function for the partially-delegating contract described above is: $K'' \equiv \omega - E[c] + p[\sum_{i=1}^{s'} c_i - s'c_m] - \underline{U}$. Formally, the optimal partially-delegating contract solves the following maximization problem:

$$\begin{aligned}
\max_{\omega} \quad & (1 - s'p)R + (s'p)r - \omega \\
\text{s.t.} \quad & \omega - E[c] + p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \mu K''[(1 - s'p)R + (s'p)r] \geq \underline{U} \quad \text{(I.R.)} \\
& \omega - c_i + \mu K''R \geq \omega - c_j + \mu K''r; \forall i \in [s' + 1, n], \forall j \in [1, m], i \neq j \quad \text{(I.C.1)} \\
& \omega - c_i + \mu K''R \leq \omega - c_m + \mu K''r; \forall i \leq s' \quad \text{(I.C.2)}
\end{aligned} \tag{10}$$

The I.R. is the individual rationality constraint. Under the proposed contract, U receives ω, chooses q_m if $s \leq s'$ and the appropriate quality otherwise, thus bearing a cost $p\left[\sum_{i=s'+1}^{n} c_i + s'c_m\right] = E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right]$, and generates a reciprocal payoff $\mu K''[(1 - s'p)R + (s'p)r]$. For the I.R. to be satisfied this payoff has to be larger than or equal to $\underline{U}$. I.C.1 requires that U delivers the appropriate input when the state of the world is $s \in [s' + 1, n]$. I.C.2 requires that quality q_m is delivered if the state of the world is $s \leq s'$. As shown in the Appendix, the solution to the above maximization problem is:

$$\omega^{***} = E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \underline{U} + \frac{c_{s'+1} - c_m}{\mu(R - r)}. \tag{11}$$

We interpret $E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \underline{U}$ as the individually-rational component of the price and $\frac{c_{s'+1}-c_m}{\mu(R-r)}$ as the reciprocity component. The reciprocal component of the price is larger the higher the cost to U of producing the most expensive input (high $c_{s'+1}$) and the lower the cost of the best alternative for U (high c_m). The difference between $c_{s'+1}$ and c_m represent the increase in cost U faces if it decides to produce the appropriate quality in the state $s = s' + 1$, instead of the cheapest-one, q_m. If this difference is not very high, then the cost of the most expensive input and of the least expensive input are not very different; consequently firm D can induce reciprocal behavior by U at a relatively small cost. The reciprocal component is smaller the more U is concerned with reciprocity (high μ). If U is very concerned with the consequences of his actions on the profits of D, then even a small increase of the price over the individually-rational component ensures that the appropriate quality is always chosen by U. Finally, the reciprocal component is larger the less important it is for D to get the right input (low $R - r$). If this difference is small, then the increase in the reciprocity payoff of U from choosing the appropriate input instead of another input is small. In order for the I.C.1 to hold, D must leverage on K by offering a high price.
In what follows we compute the condition for the fully-delegating contract to be preferred to a partially-delegating contract implementing q_m if $s \leq s'$ and the appropriate quality otherwise.

Proposition 2. *The fully-delegating contract is preferred by firm D to the partially-delegating contract that implements q_m if $s \leq s'$ and the appropriate quality otherwise as long as:*

$$\mu \geq \frac{c_1 - c_{s'+1}}{p(R-r)[s'(R-r) - (\sum_{i=1}^{s'} c_i - s'c_m)]}. \tag{12}$$

The fully-delegating contract is more likely to be preferred to a partially-delegating contract such that U delivers the appropriate-quality input when the state of the world is $s \leq s'$ and q_m otherwise, when: firm U is very reciprocal (high μ); the most expensive input is not very expensive (low c_1); and it is very important for D to get the right input (high $R - r$). For the fully-delegating contract to be optimal condition (12) must hold for any $s' \leq n$.
We turn now to the identification of the optimal partially-delegating contract from the point of view of firm D. The optimal s' for firm D is the largest value of s such that the contract implementing the appropriate quality for all but s' states of the world is preferred to the one that implements the appropriate quality for all but $s' + 1$ states of the world. If we make the simplifying assumption that the difference in cost of producing two subsequent inputs is constant, $c_i - c_{i+1} \equiv \Delta c, \forall i \in [1, m-1]$, we can state the following proposition:

Proposition 3. *If we assume $\Delta c = c_i - c_{i+1}$ to be constant for every $i \in [1, m-1]$, the optimal partially-delegating contract from the point of view of firm D is the one that implements q_m for $s \leq s'^*$ and the appropriate input for $s \in [s'^* + 1, n]$ and s'^* is computed as:*

$$s'^* = \begin{cases} 0, & \text{for } \left\lfloor \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \right\rfloor < 0 \\ \left\lfloor \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \right\rfloor & \text{for } 0 \leq \left\lfloor \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \right\rfloor \leq n \\ n, & \text{for } \left\lfloor \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \right\rfloor > n \end{cases} \tag{13}$$

where $\lfloor x \rfloor$ is the floor function, i.e. the function that returns the greatest integer smaller or equal to x.

More delegation is granted to firm U when: it is very sensitive to reciprocity (high μ); the difference in cost between two subsequent inputs is small (low Δc); and the probability p is high. In what follows we will refer to s'^* as the "optimal level of delegation". Notice that, by construction, $s'^* = n$ is equivalent to a contract that binds U at producing q_m. The following corollary states the condition for full-delegation to be granted when $c_i - c_{i+1} \equiv \Delta c, \forall i \in [1, m-1]$.

Corollary 1. *If we assume $\Delta c = c_i - c_{i+1}$ to be constant for every $i \in [1, m-1]$, full delegation is granted to firm U, as long as:*

$$\mu > \left[p(R-r) \left(2 - m + \frac{R-r}{\Delta c} \right) \right]^{-1}. \tag{14}$$

Full delegation is more likely to be granted when; firm U is very reciprocal (high μ); it is very important for D to get the appropriate input ($R - r$ is high); and when the difference in cost between two subsequent inputs is small (small Δc).

The above Corollary states the condition on μ, such that it is optimal for firm D to grant full delegation to firm U, *i.e.* $s'^* = 0$. Analogously, the following Corollary states the condition such that firm U is bind at producing q_m ($s'^* = n$):

Corollary 2. *If we assume $\Delta c = c_i - c_{i+1}$ to be constant for every $i \in [1, m-1]$, firm U is bind at producing q_m as long as:*

$$\mu \leq \left[p(R-r) \left(1 - m + n + \frac{R-r}{\Delta c} \right) \right]^{-1}. \tag{15}$$

We now turn to a more detailed characterization of how s'^* varies as a function of μ. The following Corollary establishes the conditions such that intermediate levels of delegation ($s'^* = i, i \in [1, n-1]$) are optimal for D.

Corollary 3. *If full delegation is not reached, we have that for the optimal level of delegation to be $s'^* = i, i \in [1, n]$, the following condition on μ must hold:*

$$\left[p(R-r)\left(i+1-m+\frac{R-r}{\Delta c}\right)\right]^{-1} \geq \mu > \left[p(R-r)\left(i+2-m+\frac{R-r}{\Delta c}\right)\right]^{-1}. \tag{16}$$

We indicate with $\mu_i, i \in [0, n]$ the largest value of μ such that $s'^* = i$ and with with $\Delta\mu_i \equiv \mu_i - \mu_{i+1}, i \in [0, n-1]$, the difference between two subsequent values of μ_i. Two cases are considered separately. To begin with, if $s'^* = 0$, we have that $\mu_0 = \infty$ and $\Delta\mu_0 = \infty$. Secondly, if $s'^* \in [1, n]$, we have that:

$$\mu_i = \left[p(R-r)\left(i+1-m+\frac{R-r}{\Delta c}\right)\right]^{-1} \tag{17}$$

and for $i \in [1, n-1]$, $\Delta\mu_i$ takes the following form:

$$\Delta\mu_i = \left[p(R-r)\left(i+1-m+\frac{R-r}{\Delta c}\right)\left(i+2-m+\frac{R-r}{\Delta c}\right)\right]^{-1}. \tag{18}$$

As can be seen from equation (17), for every $i \in [1, n]$ we have that μ_i is finite and for every $i \in [1, n-1]$, $\mu_i > \mu_{i+1}$. Since $\mu_0 = \infty$, we have that for every $i \in [0, n-1]$:

$$\mu_i > \mu_{i+1}. \tag{19}$$

We can now make the following statement about $\Delta\mu_i$.

Proposition 4. *For every $i \in [0, n-2]$, we have that the difference between two subsequent values of μ_i, $\Delta\mu_i \equiv \mu_i - \mu_{i+1}$ is such that $\Delta\mu_i > \Delta\mu_{i+1}$.*

The intuition behind this proposition can be better appreciated graphically. Figure 2 reports on the horizontal axis the value of μ and on the vertical axis the optimal level of delegation s'^*. Recall that the lower the value of s'^*, the more firm U is delegated. The solid line plots s'^* as function of μ for given values of $p, (R-r), \Delta c, m$. At $\mu = 0$, we have that there is no delegation at all ($s'^* = n$). Then, if we slowly move rightward along the horizontal axis and cross μ_n, the value of s'^* "jumps"to $n-1$, meaning that if the sensitivity parameter μ belongs to the interval $]\mu_n, \mu_{n-1}]$, firm U is "delegated"to produce q_n if the state of the world is $s = n$. In order for U to be delegated to choose the appropriate quality in two states of the world $s = \{n, n-1\}$, a larger increase in μ is required: $\Delta\mu_{n-1} > \Delta\mu_n$. Then, to further enlarge the scope of delegation to three states of the world $s = \{n, n-1, n-2\}$, an even larger increase in μ is required: $\Delta\mu_{n-2} > \Delta\mu_{n-1}$. Every additional state of the world

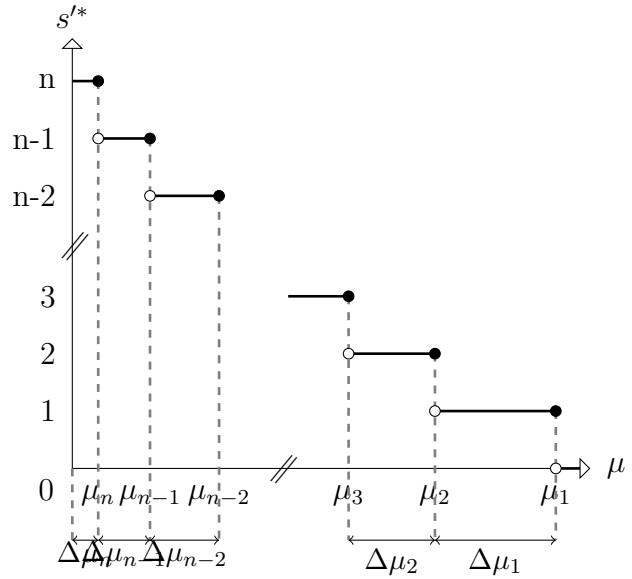


Figure 2: Solid lines represent s'^* as a function of μ for given values of $p, (R - r), \Delta c, m$.

that is added to those for which firm U produces the appropriate input requires a larger increase in μ. This means that neglecting the role of reciprocity (*i.e.* assuming $\mu = 0$) leads to inaccurate predictions even when the actual level of the parameter μ is low. To observe delegation it is enough that firm U is moderately reciprocal.

6 Conclusion and discussion

In the present paper we have developed a simple principal-agent model of procurement that accounts for other-regarding behavior. We have shown that when the upstream firm is motivated by reciprocity, the set of enforceable contracts is enlarged. Inducing reciprocal behavior is thus a way in which firms may limit, or even prevent, opportunistic behavior. This allows the downstream firm to delegate more decision to the upstream firm without the risk of being exploited. We interpret the binding contract as an employment relationship (vertical integration) and the delegating contract as market transaction. Our model is not the first attempt to study supplier relationships with non purely-selfish firms. Compared to other similar attempts we identify two elements of novelty in our model. Firstly, we explicitly include a non-monetary

component in the payoff of the upstream firm. Secondly, we show that it is possible to elicit reciprocal behavior also in one-shot interactions. In our model we posit that contracts with state-contingent payments are not enforceable. This assumption is not as strong as it may seem. According to Fehr and Tyran (1996) reciprocity is particularly important in an incomplete-contracts framework. As a matter of fact, if all the possible contingencies are already considered in a contract, then both a reciprocal and a purely-selfish firm behave as established by the contract and reciprocity does not add anything to the prescriptive nor to the normative power of the model. Furthermore, if we consider that writing long, state-contingent payment schemes is costly, our model posits that it is possible to induce the upstream firm to produce the appropriate quality even if the contract specifies just one payment. Social capital enters our model in terms of the sensitivity parameter μ. We imagine that the higher the level of social capital, the more the upstream firm is reciprocal. A potential weakness of our model is that it abstracts from the market structure in that it does not take into account the possibility that there are several upstream and downstream firms competing in the market. This weakness is not peculiar to our model, but is common to a vast literature in industrial organization (see, for instance, the models in Grossman and Hart (1986) and Baker et al. (2002)). Secondly, apart from a very simple example in Dufwenberg and Kirchsteiger (2004), the literature on reciprocity has generally focused on games with two players (Rabin, 1993; Englmaier and Leider, 2012). A very simple way to overcome the above mentioned weakness is to make the outside option $\underline{U}$ of the upstream firm contingent on the market structure, *i.e.* the outside option should be high when there are few upstream firms and/or many downstream firms. In the context of our model this changes only the price of the input, but does not affect the conditions for delegation to occur, as they are independent from $\underline{U}$. Modeling reciprocity in a context where several players interact is certainly an interesting path for future research.

Following the mainstream approach in vertical integration literature, in our model we assume both firms to be risk neutral (Hart and Moore, 1990; Baker et al., 2002). Extending the analyses to allow one (or both) firms to be risk averse is an interesting further development, but it is out of the scope of the present paper.

In conclusion our model can help to explain why in the real world, even when the standard approaches to industrial organization would predict vertical integration (high contracting costs, inefficient courts, specific investments), firms continue to rely on market transactions.

7 Appendix

Solution of Maximization problem (2)

$$\begin{aligned} \max_{\omega} \quad & pR + (1-p)r - \omega \\ \text{s.t.} \quad & \omega - c_i \geq \underline{U} \quad \text{(I.R.)} \end{aligned} \tag{20}$$

Since we are looking for the smallest value of ω *that solves the above maximization problem, the individual rationality (I.R.) constraint binds at the optimum:* ${\omega_i}^* = \underline{U} + c_i$.

Proof of Inequality (4)

The expected payoff of D under contract $\{q_n; \underline{U}+c_n\}$ *is* $pR+(1-p)r-(\underline{U}+c_n)$, *while under contract* $\{q_m; \underline{U}+c_m\}$ *it is* $r-(\underline{U}+c_m)$. *The first contract is (weakly) preferred by D when the associated expected payoff is higher than that associated with the second contract, i.e.:*

$$\begin{aligned} & pR + (1-p)r - (\underline{U} + c_n) \geq r - (\underline{U} + c_m) \\ & \iff \\ & p(R-r) \geq c_n - c_m \quad \square \end{aligned} \tag{21}$$

Solution of Maximization problem (6)

$$\begin{aligned} \max_{\omega} \quad & R - \omega \\ \text{s.t.} \quad & \omega - E[c] + \mu K R \geq \underline{U} \quad \text{(I.R.)} \\ & \omega - c_i + \mu K R \geq \omega - c_j + \mu K r; \forall i \in [1,n], \forall j \in [1,m], i \neq j \quad \text{(I.C.)} \end{aligned} \tag{22}$$

The constraints can be rearranged as follows:

$$\begin{aligned} & K[1+\mu R] \geq 0 \quad \text{(I.R.)} \\ & \mu K(R-r) \geq c_i - c_j; \forall i \in [1,n], \forall j \in [1,m], i \neq j \quad \text{(I.C.)} \end{aligned} \tag{23}$$

The I.R. requires K to be non negative (it is easy to see that the term in braces is strictly positive), from which:

$$\omega \geq \underline{U} + E[c]. \tag{24}$$

The tightest I.C. requires that when $s = 1$, U *produces the most expensive input* q_1 *instead of the cheapest-one* q_m*:*

$$\mu K(R-r) \geq c_1 - c_m. \tag{25}$$

After substituting for K, the tightest I.C. is satisfied for

$$\omega \geq \underline{U} + E[c] + \frac{c_1 - c_m}{\mu(R-r)}. \tag{26}$$

Given that $\frac{c_1 - c_m}{\mu(R-r)}$ *is strictly positive, when inequality (26) is satisfied, so does inequality (24). Since we are looking for the lowest value of* ω *that induces reciprocal behavior, the tightest I.C. binds at the optimum:*

$$\omega^{**} = \underline{U} + E[c] + \frac{c_1 - c_m}{\mu(R-r)}. \tag{27}$$

Solution of Maximization problem (8)

$$\begin{aligned} \max_{\omega} \quad & pR + (1-p)r - \omega \\ \text{s.t.} \quad & \omega - c_i + \mu K'[pR + (1-p)r] \geq \underline{U} \quad \text{(I.R.)} \end{aligned} \tag{28}$$

The I.R. can be rearranged as follows:

$$K'\{1 + \mu[pR + (1-p)r]\} \geq 0. \tag{29}$$

Since the term in braces is strictly positive, the above inequality is satisfied as long as $K' \geq 0$*, which is true for* $\omega \geq \underline{U} + c_i$*. The solution to the above maximization problem is given by the binding I.R.:* ${\omega_i}^* = \underline{U} + c_i$*.*

Proof of Lemma 1. *Since* $\omega_n^* = \underline{U} + c_n > \underline{U} + c_m = \omega_m^*$*, it is sufficient to prove that* $\omega^{**} > \omega_n^*$*, which is true if:*

$$E[c] + \frac{c_1 - c_m}{\mu(R-r)} > c_n \tag{30}$$

The inequality is always satisfied, given that $\frac{c_1 - c_m}{\mu(R-r)} > 0$ *and* $E[c] > c_n$ *(recall that* $E[c]$ *is computed as the average of costs, the smallest being precisely* c_n*).* □

Proof of Proposition 1. *Since we are assuming that from the point of view of D* $\{q_n; \underline{U} + c_n\}$ *is the optimal binding contract, it is enough to determine the condition under which it is that for D:* $\{q_1, \ldots, q_n; \underline{U} + E[c] + \frac{c_1 - c_m}{\mu(R-r)}\} \succeq$

$\{q_n; \underline{U} + c_n\}$. *To determine this condition, we compare the expected profits of firm D under the two contracts:*

$$R - \left(\underline{U} + E[c] + \frac{c_1 - c_m}{\mu(R-r)}\right) \geq pR + (1-p)r - (\underline{U} + c_n)\,. \tag{31}$$

In Section 3 we required the difference $R-r$ to be large, without fully-specifying what does this mean. Here we require $R-r$ to be strictly larger than $\frac{E[c]-c_n}{1-p}$:

$$R - r > \frac{E[c] - c_n}{1-p}. \tag{32}$$

When this condition holds, we have that the fully-delegating contract is preferred by D to any binding contract as long as:

$$\mu \geq \frac{c_1 - c_m}{(R-r)[(1-p)(R-r) - E[c] + c_n]}. \tag{33}$$

Contrariwise, if condition 32 does not hold, firm D never delegates. □

Solution of Maximization problem (10)

$$\begin{aligned}
\max_{\omega} \quad & (1-s'p)R + (s'p)r - \omega \\
\text{s.t.} \quad & \omega - E[c] + p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \mu K''[(1-s'p)R + (s'p)r] \geq \underline{U} \quad \text{(I.R.)} \\
& \omega - c_i + \mu K''R \geq \omega - c_j + \mu K''r; \forall i \in [s'+1, n], \forall j \in [1, m], i \neq j \quad \text{(I.C. 1)} \\
& \omega - c_i + \mu K''R \leq \omega - c_m + \mu K''r; \forall i \leq s' \quad \text{(I.C. 2)}
\end{aligned} \tag{34}$$

The constraints can be simplified as follows:

$$\begin{aligned}
& K''\left\{1 + \mu[(1-s'p)R + (s'p)r]\right\} \geq 0 \quad \text{(I.R.)} \\
& \mu K''(R-r) \geq c_i - c_j; \forall i \in [s'+1, n], \forall j \in [1, m], i \neq j \quad \text{(I.C. 1)} \\
& \mu K''(R-r) \leq c_i - c_m; \forall i \leq s' \quad \text{(I.C. 2)}
\end{aligned} \tag{35}$$

The I.R. requires K'' to be non negative, from which $\omega \geq E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \underline{U}$. The tightest I.C.1, $\mu K(R-r) \geq c_{s'+1} - c_m$, is satisfied for:

$$\omega \geq \frac{c_{s'+1} - c_m}{\mu(R-r)} + E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \underline{U}; \tag{36}$$

the tightest I.C.2, $\mu K(R-r) \leq c_{s'} - c_m$, is satisfied for:

$$\omega \leq \frac{c_{s'} - c_m}{\mu(R-r)} + E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \underline{U}. \tag{37}$$

Given that $\frac{c_{s'+1}-c_m}{\mu(R-r)} > 0$ by construction, I.R. is implied by inequality (36). Since $c_{s'} > c_{s'+1}$, the right-hand side of inequality (36) is strictly smaller than the right-hand side of inequality (37) and the tightest I.C.1 ($i = s'+1, j = m$) binds at the optimum:

$$\omega^{***} = E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \underline{U} + \frac{c_{s'+1} - c_m}{\mu(R-r)}. \tag{38}$$

Proof of Proposition 2. *The delegating contract that always implements the appropriate quality is preferred by firm D to the partially-delegating contract that implements q_m if $s \leq s'$, and the appropriate quality otherwise as long as its payoff is greater under the first contract than under the second:*

$$R - \left\{\underline{U} + E[c] + \frac{c_1 - c_m}{\mu(R-r)}\right\} \geq (1-s'p)R + (s'p)r - \left\{\frac{c_{s'+1} - c_m}{\mu(R-r)} + E[c] - p\left[\sum_{i=1}^{s'} c_i - s'c_m\right] + \underline{U}\right\} \tag{39}$$

In Section 3 we required the difference $R - r$ to be large. Here we formalize it by requiring that:

$$R - r > \frac{1}{s'}\sum_{i=1}^{s'} c_i - c_m. \tag{40}$$

If the above condition holds, then firm D prefers the fully-delegating contract to any partially delegating contracts as long as:

$$\mu \geq \frac{c_1 - c_{s'+1}}{p(R-r)[s'(R-r) - (\sum_{i=1}^{s'} c_i - s'c_m)]}. \quad \square \tag{41}$$

If condition (40) does not hold, then the partially-delegating contract that implements q_m if $s \leq s'$, and the appropriate quality otherwise is preferred by firm U to the fully-delegating contract.

Proof of Proposition 3. *The expected payoff of firm D from the partially-delegating contract that implements the appropriate quality for all but the first s' states of the world is given by:*

$$(1-s'p)R+(s'p)r-\left\{\frac{c_{s'+1}-c_m}{\mu(R-r)}+E[c]-p[\sum_{i=1}^{s'}c_i-s'c_m]+\underline{U}\right\}. \tag{42}$$

The expected payoff of firm D from the partially-delegating contract that implements the appropriate quality for all but the first $s'+1$ states of the world is given by:

$$[1-(s'+1)p]R+[(s'+1)p]r-\left\{\frac{c_{s'+2}-c_m}{\mu(R-r)}+E[c]-p[\sum_{i=1}^{s'+1}c_i-(s'+1)c_m]+\underline{U}\right\}. \tag{43}$$

Firm D prefers the first contract as long as the expected profits are higher under the first contract than under the second:

$$\begin{aligned} & p(R-r)-\frac{c_{s'+1}-c_{s'+2}}{\mu(R-r)}-p(c_{s'+1}-c_m)\geq 0 \\ & \iff \\ & p(R-r)-\Delta c\left\{\frac{1}{\mu(R-r)}+p[m-(s'+1)]\right\}\geq 0. \end{aligned} \tag{44}$$

The optimal value of s' is the smallest value that implicitly solves the above inequality, i.e. the smallest s' such that:

$$s'\geq\frac{1}{p\mu(R-r)}+m-1-\frac{R-r}{\Delta c}. \tag{45}$$

Since s' is a state of the world, by construction, we have that $s'\in[0,n]$. Thus, if we indicate with $\lfloor x\rfloor$ the floor function of x, i.e. the function that returns the greatest integer smaller or equal to x, we have that:

$$s'^{*}=\begin{cases}0, & \text{for } \left\lfloor\frac{1}{p\mu(R-r)}+m-1-\frac{R-r}{\Delta c}\right\rfloor<0\\ \left\lfloor\frac{1}{p\mu(R-r)}+m-1-\frac{R-r}{\Delta c}\right\rfloor, & \text{for } 0\leq\left\lfloor\frac{1}{p\mu(R-r)}+m-1-\frac{R-r}{\Delta c}\right\rfloor\leq n\\ n, & \text{for } \left\lfloor\frac{1}{p\mu(R-r)}+m-1-\frac{R-r}{\Delta c}\right\rfloor>n\end{cases} \quad \square. \tag{46}$$

Proof of Corollary 1. *Granting full delegation to firm U means that* $s'^* = 0$. *From Proposition 3 this is true as long as:*

$$\Big\lfloor \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \Big\rfloor \leq 0. \tag{47}$$

Considering only the case when the above inequality binds, we have that this is true as long as:

$$\frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} < 1. \tag{48}$$

In Section 3 we required $R - r$ *to be large. Here we formalize it by requiring that:*

$$R - r > (m-2)\Delta c. \tag{49}$$

If this condition holds, solving for μ *we have that full delegation is granted to firm U when:*

$$\mu > \left[p(R-r) \left(2 - m + \frac{R-r}{\Delta c} \right) \right]^{-1}. \quad \square \tag{50}$$

If, instead, condition (49) does not hold, firm U is not granted full-delegation.

Proof of Corollary 2. *From Proposition 3, we have that the optimal level of delegation is* $s'^* = n$ *if and only if :*

$$\begin{aligned} &\Big\lfloor \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \Big\rfloor \geq n \\ &\iff \\ &\frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \geq n. \end{aligned} \tag{51}$$

Solving for μ *we get*[10]*:*

$$\mu \leq \left[p(R-r) \left(1 - m + n + \frac{R-r}{\Delta c} \right) \right]^{-1}. \quad \square \tag{52}$$

[10] Also here we require $R - r$ to be "large". In this setting the requirement is already satisfied if condition (49) holds.

Proof of Corollary 3. *From Proposition 3, we have that the optimal level of delegation is* $s'^* = i, i \in [1, n-1]$ *if and only if :*

$$\begin{aligned} &\Big\lfloor \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \Big\rfloor = i \\ &\iff \\ &i+1 > \frac{1}{p\mu(R-r)} + m - 1 - \frac{R-r}{\Delta c} \geq i. \end{aligned} \tag{53}$$

Solving for μ *we get*[11]*:*

$$\left[p(R-r)\left(i+1-m+\frac{R-r}{\Delta c}\right)\right]^{-1} \geq \mu > \left[p(R-r)\left(i+2-m+\frac{R-r}{\Delta c}\right)\right]^{-1}. \quad \square \tag{54}$$

Proof of Proposition 4. *Applying the definition of* $\Delta\mu_i$*, we have that, for every* $i \in [0, n-2]$*,* $\Delta\mu_i > \Delta\mu_{i+1}$ *as long as:*

$$\mu_i - \mu_{i+1} > \mu_{i+1} - \mu_{i+2}, \tag{55}$$

which can be simplified as follows:

$$\mu_i - \mu_{i+2} > 0. \tag{56}$$

Inequality (19) assures that the above condition is always satisfied. $\square$

[11] Also here we require $R - r$ to be "large". In this setting the requirement is already satisfied if condition (49) holds.

References

Acemoglu, D., Johnson, S., and Mitton, T. (2009). Determinants of vertical integration: Financial development and contracting costs. *The Journal of Finance*, 64(3):1251–1290.

Akerlof, G. A. (1982). Labor contracts as partial gift exchange. *The Quarterly Journal of Economics*, 97(4):543–569.

Akerlof, G. A. and Yellen, J. L. (1990). The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*, 105(2):255–283.

Alonso, R. and Matouschek, N. (2008). Optimal delegation. *Review of Economic Studies*, 75(1):259–293.

Baker, G., Gibbons, R., and Murphy, K. J. (2002). Relational contracts and the theory of the firm. *The Quarterly Journal of Economics*, 117(1):39–84.

Bloom, N., Sadun, R., and Van Reenen, J. (2012a). The organization of firms across countries. *Quarterly Journal of Economics*, 127(4):1663 – 1705.

Bloom, N., Sadun, R., and Van Reenen, J. (2012b). The organization of firms across countries. *The Quarterly Journal of Economics*, 127(4):1663–1705.

Coase, R. H. (1937). The nature of the firm. *Economica*, 4(16):386–405.

Dawes, R. M. and Thaler, R. H. (1988). Anomalies: Cooperation. *The Journal of Economic Perspectives*, 2(3):187–197.

De Chiara, A. and Manna, E. (June 29, 2018). Delegation with a reciprocal agent. *Available at SSRN: https://ssrn.com/abstract=2841623 or http://dx.doi.org/10.2139/ssrn.2841623*.

Dufwenberg, M. and Kirchsteiger, G. (2004). A theory of sequential reciprocity. *Games and Economic Behavior*, 47(2):268–298.

Durlauf, S. N. and Fafchamps, M. (2005). Social capital. In Aghion, P. and Durlauf, S. N., editors, *Handbook of Economic Growth*, pages 1639–1699. Amsterdam: Elsevier.

Englmaier, F. and Leider, S. (2012). Contractual and organizational structure with reciprocal agents. *American Economic Journal: Microeconomics*, 4(2):146–183.

Fehr, E., Gächter, S., and Kirchsteiger, G. (1997). Reciprocity as a contract enforcement device: Experimental evidence. *Econometrica*, 65(4):833–860.

Fehr, E. and Tyran, J.-R. (1996). Institutions and reciprocal fairness. *Nordic Journal of Political Economy*, 23:133–144.

Fukuyama, F. (1995). *Trust: The Social Virtues and the Creation of Prosperity*. New York: The Free Press.

Grossman, S. J. and Hart, O. D. (1986). The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of political economy*, 94(4):691–719.

Gur, N. and Bjørnskov, C. (2017). Trust and delegation: Theory and evidence. *Journal of Comparative Economics*, 45(3):644–657.

Hart, O. and Moore, J. (1990). Property rights and the nature of the firm. *Journal of Political Economy*, 98(6):1119–1158.

Huber, J. D. and Shipan, C. R. (2006). Politics, delegation, and bureaucracy. In Weingast, B. and Wittman, D., editors, *The Oxford Handbook of Political Economy*, pages 256–272. Oxford University Press, USA.

Huck, S., Lünser, G. K., and Tyran, J.-R. (2012). Competition fosters trust. *Games and Economic Behavior*, 76(1):195–209.

Kastl, J., Martimort, D., and Piccolo, S. (2013). Delegation, ownership concentration and R&D spending: Evidence from italy. *The Journal of Industrial Economics*, 61(1):84–107.

Kőszegi, B. (2014). Behavioral contract theory. *Journal of Economic Literature*, 52(4):1075–1118.

Lane, C. and Bachmann, R. (1996). The social constitution of trust: supplier relations in britain and germany. *Organization Studies*, 17(3):365–395.

Macho-Stadler, I. and Pérez-Castrillo, D. (2018). Moral hazard: Base models and two extensions. In Corchón, L. C. and Marini, M. A., editors, *Handbook of Game Theory and Industrial Organization*, volume 1, chapter 16, page 453. Edward Elgar Publishing.

McCabe, K. A., Rassenti, S. J., and Smith, V. L. (1998). Reciprocity, trust, and payoff privacy in extensive form bargaining. *Games and Economic Behavior*, 24(1):10 – 24.

Putnam, R. D., Leonardi, R., and Nanetti, R. Y. (1994). *Making democracy work: Civic traditions in modern Italy.* Princeton: Princeton University Press.

Rabin, M. (1993). Incorporating fairness into game theory and economics. *The American Economic Review*, 83(5):1281–1302.

Shapiro, C. and Stiglitz, J. E. (1984). Equilibrium unemployment as a worker discipline device. *The American Economic Review*, 74(3):433–444.