Trust your neighbour.
Technological relatedness, social capital and outsourcing

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Abstract

Relying on a unique dataset on machine-tool small firms located in Emilia Romagna, Italy, we estimate the separate effect of technological relatedness and social capital on the propensity to fully or partially outsource production activities. We focus on a series of 29 production phases, for which we know if they have been operated in-house or outside the firm. Once controlled for endogeneity, we find that: (i) full outsourcing is positively related to social capital, but this effect vanishes as the technological relatedness with neighbouring firms increases; (ii) firms engage in concurrent sourcing only when neighbouring firms are highly technologically related. The phase-estimates show that: (iii) while social capital does matter for the full outsourcing of core activities, high technological relatedness is relevant for the full outsourcing of peripheral ones; (iv) no significant effect of technological relatedness and social capital emerges for the concurrent sourcing of both core and peripheral activities.

JEL classification: A13, D23, L23, L24, L64, R12

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1. Introduction

Recent urban economics studies identify industry concentration as a key element for determining the degree of vertical disintegration of firms. This relationship dates back to Stigler's (1951) work, and rests on the idea that spatial proximity reduces transport, search and managerial costs and reduces the scope for opportunistic behaviour by increasing mutual visibility and reciprocal trust.

Holmes (1999) provides a seminal empirical study on this topic. Using 1987 census data on US manufacturing plants, he finds that the intensity of a plant's input purchases is positively correlated with the level of employment in neighbouring plants in the same industry. Similar results are obtained by Ono (2007) for the US, Li and Lu (2009) for Chinese manufacturing, Taymaz and Kiliçaslan (2005) for the Turkish textile industry, Rama and Calatrava (2002) and Rama *et al.* (2003) for the Spanish electronic industry, Holl (2008) for Spanish manufacturing, Antonietti and Cainelli (2008, 2012) and Cainelli and Iacobucci (2009, 2012) for Italian manufacturing, and Antonietti et al. (2012) for the machine tools sector in the Emilia Romagna region of Italy.

All these studies find that, as the local concentration of employment increases, so does the propensity of firms to increase their purchase of material and business service inputs from external suppliers. The ways through which spatial agglomeration favours the outsourcing of production and service activities are two: reduced transport costs and reduced transaction costs, because of lower opportunism. According to Love and Roper (2001, p. 319): «*Proximity between purchaser and provider of the outsourced activity may influence the outsourcing decision due to agglomeration or clustering effects.* […] *These may affect the outsourcing decision by impacting on the costs of the outsourced activity, influencing the governance or management costs associated with outsourcing,* […] *or by changing the risks associated with information asymmetries, bounded rationality and opportunism*».

Spatial agglomeration allows firms to save in the transportation necessary for outsourcing, to gain from specialized services provided by local suppliers, or to benefit from increased scope of outsourcing, due to the presence of locally developed interpersonal networks and supply-chains. On the behavioural side, spatial clustering facilitates personal contacts and social interactions that reduce governance and management costs through the development of reciprocal trust among partners (Goldstein and Gronberg, 1984; Glaeser and Sacerdote, 1999). In this way, «the potential for such proximity effects – or outsourcing economies – is likely to be greater in urbanised or metropolitan areas» (Love and Roper, 2001, p. 319), because «agglomeration reduces opportunism, and so serves as a substitute for integration» (Helsley and Strange, 2007, p. 57).

In this paper we argue that, from an empirical point of view, the literature investigating the link between agglomeration and outsourcing can be improved in three ways. First, the use of a single measure of geographical concentration of economic activities as the main explanatory variable does not help clearly distinguish among the effects of agglomeration and trust. In addition, the use of different levels of industry aggregation does not help understand how important can be the role of technological contiguity, or relatedness, among neighbouring firms. The decision to subcontract may depend not only on transport and *static* transaction costs, but also on how aligned are the competencies and knowledge bases between providers and suppliers. A higher technological distance among the parties implies higher '*dynamic* transaction costs' (Langlois, 1992), like costs of persuading, negotiating, coordinating with, and teaching others. This is particularly true for small-sized firms, where typically financial resources and either market or bargaining power are lower for bearing such costs. From another perspective, firms can observe, imitate or differentiate from, the outsourcing behavior of neighbours more easily if they share the same knowledge base.

A second issue concerns the nature of outsourcing. Drawing on transaction cost theory (Coase, 1937; Williamson, 1985), both theoretical and empirical studies on agglomeration and outsourcing typically focus on the dichotomous "make-or-buy" choice. As stressed by recent business and organization studies (Parmigiani, 2007; Parmigiani and Mitchell, 2009; Puranam et al., 2013), firms, in practice, operate joint sourcing decisions, and do simultaneously make *and* buy the same good, a phenomenon often labelled as *concurrent sourcing*, or *partial outsourcing*, or *tapered* *integration* (Harrigan, 1984; see Parmigiani (2007) for a finer distinction between these forms of integration). When concurrently sourcing, the firm maintains a higher control over the outsourcing process, but incurs both the costs of coordinating the internal production and the costs of searching, finding, monitoring and maintaining external suppliers. Since monitoring and coordination activities differ between full and partial outsourcing, spatial agglomeration can exhibit different effects on the vertical boundaries of the firm. However, a direct investigation of these effects is still lacking in the literature.

Finally, the third issue concerns the nature of the outsourced activity. With few exceptions[1], the empirical literature on the local determinants of outsourcing makes use of dummy variables for measuring the general probability to outsource (Love and Roper, 2001; Ono, 2007; Antonietti and Cainelli, 2008; Cusmano et al., 2009; Antonietti et al., 2012), or a synthetic indicator of the intensity of outsourcing, given by the costs for purchased services over total production costs (Antonietti and Cainelli, 2012) or by the share of subcontracted inputs in all inputs (Taymaz and Kiliçaslan, 2005), or by the standard Adelman index of vertical integration (Holmes, 1999; Li and Lu, 2009; Burker and Minerva, 2010). Apart roughly distinguishing between material and service (including knowledge-intensive ones) activities, all these indicators do not clearly identify which phase of the production process, or which task, is contracted out by the firm. We believe that neglecting this aspect may be problematic when studying the effects of agglomeration on outsourcing[2]. In practice, production processes are heterogeneous, as they involve simple and complex tasks, high and low routinized activities, core and peripheral phases, innovative and

[1] Love and Roper (2001) focus on the outsourcing within the innovation process, while Cusmano et al. (2009) broadly distinguish among production, R&D, design and service activities.

[2] This aspect has been recently emphasised by Baldwin and Venables (2013) with respect to the offshoring case. In their opinion, the engineering details of the production process highly dictate the way in which different stages of the production are linked and unbundled across space. In particular, they distinguish between processes where goods move sequentially from upstream to downstream stages (i.e. snakes) and processes where multiple parts are assembled into a single body (i.e. spiders).

mature, or standardized, processes. If this is the case, the importance of transaction costs may vary across production phases, being particularly important for high-value added ones.

In this paper we try to address these three issues. First, we distinguish between agglomeration-induced technological relatedness and social capital. Second, we distinguish between full and partial outsourcing. Third, we take account of the specific production phase being outsourced, distinguishing between core and peripheral phases.

For the empirical analysis, we rely on a new and original dataset of small firms located in Emilia Romagna region, Italy, and specialized in the manufacturing of machinery and equipment (ATECO 2001 code D29, NACE rev. 2 code C28). This region represents an interesting case study because of its rapid post-war recovery, based on the industrial district model (Brusco, 1982), in which a strong division of labour and a high recourse to subcontracting with local specialized suppliers is mixed with high cooperation and competition among firms and highly localized social learning patterns (Asheim et al., 2009). Emilia Romagna represents also an interesting example of regional branching based on knowledge transfer across related sectors: «*Many successful sectors like ceramic tiles, the packaging industry and robotics emerged out of a pervasive regional knowledge base in engineering. These sectors not only built and expanded on this extensive knowledge base, they also renewed and broadened the regional economy of Emilia Romagna*» (Boschma, 2009, p. 9). Moreover, the industrial-district based Emilian model described by Brusco (1992), as well as recent empirical evidence (Cusmano et al., 2009) show that outsourcing in this region occurs predominantly at the local level, particularly in the machine-tool related industries. For all these reasons, we believe Emilia Romagna represents an appropriate example for testing the effects of relatedness and social capital on the local division of labour.

Our results show that technological relatedness and social capital are important predictors of the likelihood to subcontract production activities in the machine tool industry. For the full outsourcing case, we find that knowledge and trust act like substitute: as neighbouring firms become more technologically related, the role of social capital diminishes. This result holds particularly for the full outsourcing of peripheral stages, whereas for core stages social capital remains highly significant. What matters for the concurrent sourcing case, instead, is only a high technological relatedness among neighbouring firms, whereas social capital is never statistically significant.

The rest of the paper develops as follows. Section 2 presents the theoretical background and the main research hypotheses: first, we provide a theoretical motivation for the link between technological relatedness, social capital and the probability to fully and partially outsource production activities (2.1); then we formulate our research hypotheses at the level of each stage of production (2.2). Section 3 describes the data (3.1), the empirical strategy and the variables utilized in the estimates (3.2). In Section 4, we present and discuss the estimation results. Finally, Section 5 concludes.

2. Theoretical background and research hypotheses

2.1. Relatedness, social capital and full versus partial outsourcing

The wide literature on transaction costs has deeply investigated the factors that push firms to subcontract material or service activities to external suppliers. Generally, the recourse to the market, instead of vertical integration, depends on the level of transaction costs, which, in turn, depend on the degree of contractual incompleteness affecting economic transactions (Williamson, 1985). Asset specificity, market and technological uncertainty, information asymmetries and the risk of opportunistic behaviour all contribute to increase hold-up problems, thus discouraging firms to subcontract goods and services.

According to Williamson (2005), the vertical boundaries of the firm are not only determined by transaction attributes, but also by the characteristics of the surrounding environment. Following Windrum et al. (2009, p. 198) words: "the make/buy decision is not a question of ownership but of control”. In this paper, we focus on two factors that are supposed this decision, and characterize the local environment in which the firm is located: technological relatedness and social capital.

Although both of them contribute to determine the level of transaction costs, we here assume that they influence the outsourcing decision in two different ways: while technological relatedness is related to price incentives, social capital is more related to non-price factors.

The geographic concentration of activities increases not only the spatial proximity between clients and suppliers, thus reducing transport costs, but it is also associated to greater suppliers availability, which reduces the average price of outsourcing (Ono, 2007) and increases the efficiency and quality of the client/supplier matching process, thus reducing search and matching costs (Duranton and Puga, 2004). In addition, a densely populated area increases favours a better coordination among specialized tasks, thus reducing the opportunity costs from inefficient coordination (Baumgardner, 1988).

A higher likelihood to release activities is not only driven by higher supplier availability, but also by the degree of technological relatedness between firms (Boschma, 2005). The higher is the technological relatedness among neighbouring firms, the easier should be the monitoring over the service provided, as firms may easily exchange technical advice and information, and can better absorb, decode and master external knowledge, often tacit, procedural and of a know-how type from business partners (Langlois, 1992; Zander and Kogut, 1995).. This holds not only from a buyer-purchaser perspective, but also for the case of competing firms: if they share the same knowledge base, they can better observe each other, and imitate or differentiate their outsourcing behaviours more easily.

Social capital is a difficult concept to define, since it encompasses different aspects of human being. Here social capital is conceived as a system of shared values and beliefs that should prevent opportunistic behaviour by favouring trust building and mutual cooperation among people. This definition is in line with the one provided by Putnam et al. (1993), according to whom social capital refers to features of social organisation, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions, and with the one provided by Bowles and Gintis (2002, p. F419), where it: «generally refers to trust, concern for one's associates, a willingness to live by the norms of one's community and to punish those who do not».

In the last decades, the notion of social capital has been extensively utilized in many fields, including economics, management, organization, sociology, psychology, political science, and planning. Social capital is generally related to many aspects of socio-economic life, like, among the others, higher economic growth (Zak and Knack, 2001), higher financial development (Guiso et al., 2004), higher innovation (Akçomak and ter Weel, 2009), higher education (Coleman, 1988; OECD 2001), and higher local development (De Blasio and Nuzzo, 2009)[3]. Some other studies from organization science, labour economics and game theory have focused on social capital as a determinant of governance structure and establishment size, through the role that increased trust, or reduced opportunism, play on the decentralization of decision in larger firms, in avoiding shirking behaviour in team, or in building reputation in one-shot transactions (for a short review see Burker and Minerva, 2012). According to Williamson (1985), trust is a social norm that reduces the need to use hierarchy and vertically integrated structures to attenuate opportunism[4]. Areas where social capital is higher are expected to have higher levels of trust and pro-social attitudes like altruism, preferences for reciprocal fairness and moral obligations not to defect or behave with guile. In such a kind of local environment, market transactions are favoured, and outsourcing should be easier to manage.

We assume that the probability for firm *i* to fully outsource (*FO*) production activities depends, other than from a set of firm-level characteristics, on two main features of the external environment in which the firm operates: the degree of technological contiguity between neighbouring firms and the level of social capital. In the following, we capture technological relatedness with a single density indicator, where the numerator measures employment belonging,

[3] For a critical review on the empirics of social capital see Durlauf (2002) and Durlauf and Fafchamps (2005).

[4] Bloom et al. (2012) provide cross-country evidence that trust favours decentralization of decisions and reduces the average size of plants. Similar results are also found for Italy by Burker and Minerva (2012).

respectively, to the same 1 digit industry (i.e manufacturing), 2 digit industry (i.e. machine tool manufacturing), or 3 digit industry (i.e. manufacturing of general purpose machinery, manufacturing of agricultural machinery, manufacturing of hand tool machinery, manufacturing of machinery for domestic use) of the subcontracting firm.

Other things being equal, we do expect that:

H1*: the higher the level of social capital within the area of firm location, the higher the probability to fully outsource production activities*.

However, the higher is the degree of technological relatedness between neighbouring firms, the lower should be the role of social capital in predicting the propensity to outsource activities. Then:

H2: *the higher the technological relatedness between firms (i.e. the higher the density of neighbouring firms belonging to the same sector), the lower the importance of social capital in predicting full outsourcing.*

Differently, when undertaking concurrent sourcing (*CS*) strategies, firms balance higher production costs (because the operation of the outsourced task is partly kept in house) and lower transaction management costs (because they can better monitor the quality of the service provided). This latter aspect is of crucial importance for modelling the role of social capital and technological relatedness. Since the concurrently sourcing firm can operate a more direct (or less costly) control over the outsourcing process, the need to locate in a high trust-building environment should be lower. Instead, the CS choice can be motivated by higher technological relatedness, which further reduces monitoring and dynamic transaction costs. Therefore, we do expect that, other things being equal:

H3: *higher technological relatedness among neighbouring firms should facilitate the likelihood to concurrently source activities, whereas social capital should not be relevant*.

2.2. Phase-heterogeneity in full and partial outsourcing

All the hypotheses previously formulated refer to full and partial outsourcing, without any distinction on the single activity being contracted out. Our data, described later in Section 3, allow to separate the machine tool production process into a set of 29 phases, listed in Table 1. To our knowledge, this is the first time that the outsourcing decision of the firm is analysed at this level of disaggregation.

[TABLE 1 AROUND HERE]

These phases include:

- preliminary (knowledge-intensive) activities like design and machinery projecting;
- early working activities like hot and cold-working, gear working;
- treatments (cold and hot);
- assembling;
- ancillary activities like rubber, glass and wood working or software development;
- final stages like testing, painting and refining;
- post-production activities like repairing and component replacement or re-working.

Table 1 shows the number of firms operating each single phase, and the percentage of firms developing them in-house or outside through full outsourcing (FO) or concurrent sourcing (CS).

The organization of production across phases is quite heterogeneous. The five phases which are fully outsourced most frequently are sintering, thermal and surface treatments, glass working and sandblasting, whereas the five ones which are concurrently sourced most frequently are cold-working, working by shaving removal, assembling by welding, electrical assembling and installing. On average, assembling and post-production phases are those internalized more frequently (i.e the ones for which, on average, the relative internalization index RELINT=INT/(FO+CS) is higher than 1), followed by final stages. Early phases, treatments and ancillary stages, instead, are outsourced more intensively. Based on this evidence, we consider the former as the *core* phases, and the latter as the *peripheral* ones[5]. We also note that concurrent sourcing is generally less frequent than full outsourcing, except for the case of post-production stages.

Figure 1 summarizes the phase distribution along the outsourcing process.

[FIGURE 1 AROUND HERE]

At this stage of the analysis, it is difficult to predict how technological relatedness and social capital can influence the outsourcing of each single phase. In principle, we expect that the full outsourcing of core activities is particularly sensitive to opportunism, whereas the peripheral stages are more sensitive to supplier availability and market prices. When the firm contracts out a core activity, a trustworthy environment is required to mitigate the risk of finding a supplier behaving opportunistically: in this case, the costs from cheating behaviour are high, because the firm is releasing its core knowledge base and its high-value added activities. Differently, totally outsourcing a peripheral phase should be more sensitive to the availability of technologically related providers. The main costs and risks associated to the outsourcing of peripheral phases are related to the search of, and match with, specialized suppliers, to control over the quality of the service provided and to motivate providers. We assume that these costs increase the higher is the technological distance between neighbouring firms. This holds also for competing firms: the

[5] This distinction seems also intuitive: assembling, installing/testing and repairing reasonably represent the activities that mostly characterize the machine tool industry.

capability to imitate competitors' outsourcing behaviour should increase as firms are technologically related.

Therefore, we do expect that:

H4: *social capital positively should affect the propensity to full outsource core stages, whereas density and technological relatedness should positively influence the full outsourcing of peripheral phases*.

With respect to CS, we rest on the general hypothesis that social capital should not be a relevant predictor, since the firm maintains control over the organization and quality of the outsourcing service. Differently, we might expect CS of core phases to be more frequent when the technological relatedness between neighbours increases. In this case, firms may be likely to partly release core activities only when finding a partner sharing the same knowledge base, so to minimize coordination costs. Then we formulate the following testable hypothesis:

H5: *social capital should not affect the likelihood to concurrently source both core and peripheral phases. Technological relatedness should favour the concurrent sourcing of core stages.*

The picture emerging from the estimates will induce us to formulate general conclusions on the outsourcing behaviour of machine-tool firms in Emilia Romagna.

3. Dataset and variables

3.1. The dataset

The data are extracted from the Sector Studies (*Studi di Settore*), developed by the Italian Fiscal Authority (*Agenzia delle Entrate*) with the aim of establishing a benchmark of relevant fiscal data and provide the most detailed and objective picture on firms' fiscal position[6].

We obtained a dataset of about 4,500 firms belonging to the machine-tool industry (NACE code C28, ATECO 2001 code D29), located in Emilia Romagna region in 2005, and employing less than 100 employees (i.e. and with annual turnover of less than 5,164,169 euros). After cleaning data from missing values in the variables of interest, and after deleting a little, and not representative, bunch of firms with more than 50 employees, we come up with a final sample of 3,280 firms. Table 2 shows the firm distribution by industry, employment class and province (NUTS 3 region) of location.

[TABLE 2 AROUND HERE]

Table 3 shows some statistics on the representativeness of our data, once compared with 2001 Census data.

[TABLE 3 AROUND HERE]

Studying the outsourcing behaviour of small firms may represent a limit for a fully representative analysis on outsourcing. Although in Emilia Romagna 90% of firms employ less than 50 employees, they account for almost 60% of the regional value added. However, looking at small firms can provide useful insights: first, because the literature on outsourcing determinants is not

[6] Data have been obtained thanks to a formal agreement between the University of Bologna (Department of Statistical Sciences), Emilia-Romagna Region and the Italian Statistical Institute (ISTAT).

specifically targeted at small firms, although their relevance in the current European context; second, because they represent the pillars of industrial clusters and their business is more sensitive to local conditions than large firms. From a policy perspective, our results will be more targeted at small firms, rather than being extendable to all types of companies.

3.2 Empirical strategy and variables description

Our empirical strategy consists of two steps. In the first, we focus on the probability to fully or partially outsource production activities. In the second step, we separately consider these two probabilities at the level of each single phase (see Table 1 for the full list).

Since the dependent variables are binary, we estimate the two following probit models for FO and CS:

$$(1)\ \Pr(FO_{ir}=1\,|\,\mathbf{X}_{ir}, Density_r, SocialCapital_r)=\Phi(\mathbf{X}_{ir}^{'}\boldsymbol{\beta}_{FO}+Density_r\gamma_{FO}+SocialCapital_r\delta_{FO})$$

$$(2)\ \Pr(CS_{ir}=1\,|\,\mathbf{X}_{ir}, Density_r, SocialCapital_r)=\Phi(\mathbf{X}_{ir}^{'}\boldsymbol{\beta}_{CS}+Density_r\gamma_{CS}+SocialCapital_r\delta_{CS})$$

where i represents the firm and r represents the province (NUTS 3 region) of firm location.

The first dependent variable is a dummy equal to 1 when the firm fully outsources its production phases (*FO*) and 0 otherwise. The second is a dummy equal to 1 when the firm concurrently source its production phases (*CS*), and 0 otherwise. When we refer to the whole production process, *FO* (*CS*) is equal to 1 when the firm fully (partially) outsources at least one of its production activities; when we refer to the single phase a value of 1 for *FO* (*CS*) refers to the decision to fully (partially) outsource that specific phase.

To make the results more readable, we also pool the 29 phases in two groups, i.e. core and peripheral stages. We consider as *core* those groups of phases with an average relative internalization index RELINT higher than 1, and as *peripheral* all the remaining ones: from Table 2, these blocks of phases include assembling, final and post-production activities. The criterion adopted is based on the idea that the more developed in-house is a phase, the more strategic it should be for the firm: phases relatively more internalized are those where the capabilities of the firm are created and accumulated, and where the firm built its knowledge base and comparative advantage.

Among regressors, we distinguish among firm-level controls **X**, density (*Density*) and social capital (*Social Capital*). Controls include variables capturing the internal organization of the firm and standard determinants of the outsourcing decision. Firm age is computed as 2005 minus the start-up year of the firm, in log (*Age*); employment size (*Micro*), given by two dummy variables equal to 1 for firms employing 1 to 10 employees and 11 to 50 employees respectively (this latter used as the reference); the level of human capital (*HC*), or skill intensity, of the workforce, given by the (log) share of white collars (managers, executives and clerks); (log) labour cost per employee (*ULC*); the number of products offered by each firm, as a proxy for scope economies (*NPROD*); three dummies identifying if the market in which the firm operates is local/regional (*Local*), national (ref.) or global (*Global*); two asset-specificity variable measuring the percentage of turnover coming from catalogue production (*Catalogue*) and production based on client's design (*Client Design*)[7]; two continuous variables (share of turnover) measuring own production (*Prod_own*) (in Italian *Conto-proprio*) and production on behalf of a third party (*Third party*) (in Italian *Conto-terzi*), so to distinguish whether the firm is a supplier or not. In addition, we include five three-digit industry dummies, and 29 phase dummies in order to control for sector-specific effects and for the structure of the production process.

Finally, we include two covariates referring to the characteristics of the environment in which our machine-tool firms operate. Density refers to the province in which firm *i* is located and it is calculated as: (i) as (log) manufacturing (1 digit, ATECO2002 code D) employment (from 2001

[7] These two variables should capture the degree of asset specificity surrounding firm activity. Producing from catalogue design implies a standardized, and thus more general, type of production, whereas producing using customers' design should imply a more client-specific type of production.

Census data provided by ISTAT) per square kilometre (*Density_1digit*); (ii) as (log) machine-tool manufacturing (2 digit, ATECO2002 code 29) employment per square kilometre (*Density_2digit*); (iii) as (log) manufacturing (3 digit, ATECO2002 codes 29.1, 29.2, 29.3, 29.4, 29.5 and 29.7) employment per square kilometre (*Density_3digit*).

Social Capital is measured by a normalized index provided by Cartocci (2007), which borrows the key elements from Putnam et al. (1993). This index is obtained by pooling, through a principal component analysis, the following four elements: (i) the number of newspapers circulating per 1,000 inhabitants (average between 2001 and 2002); (ii) the amount of population participating to the electoral turnouts per 100 voters (in years 1999-2001); (iii) the average between the standardized number of blood donations and number of donors per 1,000 inhabitants (in 2002); (iv) the average between the number of sport associations (in 1999) and the number of sports memberships by 1,000 inhabitants (in 2001). For all the methodological details, see Cartocci (2007).

A final issue concerns endogeneity. Since our data are cross-sectional, and even if we measure density and social capital four years before outsourcing, a potential simultaneity bias may affect our probit estimates if density and social capital are persistent over time. In order to test for the exogeneity of our two main explanatory variables, we use the Smith and Blundell (1986) test, where the test statistic is evaluated with respect to a Chi squared distribution of the number of potentially endogenous variables. As instrument for social capital, we use the years of foreign past dominations that governed over Italian provinces in the seven hundred years before the creation of the unified Italian State (Di Liberto and Sideri, 2011)[8]. The idea is that the type of foreign dominations shaped the cultural and entrepreneurial context of these regions, favouring the process of social capital accumulation over time, and characterizing the level of institutional quality of

[8] The foreign past dominations in Emilia Romagna include the Papal state (Bologna, Ferrara, Forlì-Cesena and Ravenna), Bourbons (Parma and Piacenza), Venetians (Ravenna), and Austrians (Parma and Piacenza). For many years, many provinces have also been independent from any foreign domination. See Di Liberto and Sideri (2011) for details.

regions. As a robustness check, we also use an index of social capital in the 1960s (as in Acemoglu et al., 2009 and De Blasio and Nuzzo, 2009), developed by Arrighetti et al. (2003)[9]. To instrument our three density variables we use the manufacturing employment density in 1951, with the idea that spatial agglomeration in those years occurred mainly as a phenomenon related to the post-war reconstruction process, rather than to outsourcing[10].

4. Results

Tables 4, 5 and 6 provide the probit results for the full sample, while Tables 7 and 8 show the probit results for each single phase and each groups of phases respectively.

From Table 4, we observe that the propensity to fully outsource production activities is negatively related to employment size and positively and significantly related to labour cost and own production, whereas less significant is the fact of working on behalf of third parties.

As regard technological relatedness and social capital, we find that higher local density of manufacturing activities is correlated to a higher likelihood to fully outsource production activities. Results from Column 1 seem also to corroborate H1: firms located in regions with higher levels of social capital are more likely to fully outsource their manufacturing activities. Moreover, results in Columns 2 and 3, provide evidence in favour of H2: the positive effect of social capital vanishes as the technological relatedness between neighbouring firms increases. In this case, while the coefficient of our density variables remains highly significant, the one pertaining social capital becomes not statistically significant[11]. In addition, results in Column 4 confirm that high

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[9] The social capital index developed by Arrighetti et al. (2003) is slightly different than the one provided by Cartocci (2007), since it considers the literacy rate of the local population, the participation to electoral turnouts and to important referenda. For further details, see Arrighetti et al. (2003).

[10] Unfortunately, the three-digit industry classification between 1951 and 2001 is not fully comparable. For this reason, we instrument our *Density_3digit* variable using its 1971 value.

[11] One might argue that this result is driven by multicollinearity. As shown in Appendix, Table A1, the pairwise correlations between variables is low, and results do not change if density or social capital are drop from estimates. In addition, multicollinearity tends to inflate the standard errors, which is not our case. Finally, a look at the scatter plots between density variables and social capital does not reveal any sign of collinearity (plots available on request).

technological relatedness remains a significant predictor once we control for the employment density in non-machine tool manufacturing industries (*Density_other*)[12]. Finally, the Smith and Blundell statistic does not reject the null hypothesis of exogeneity of our density and social capital variables.

[TABLE 4 AROUND HERE]

For the CS case, Table 5 shows a quite different picture with respect to Table 4. The decision to concurrently source is positively related to age, size, unit labour cost and negatively related to the geographical scope of the final market area and to the propensity to produce on its own. In line with H3, Column 1 shows that neither density nor social capital are significant predictors of the likelihood to partially outsource production. However, Column 2 shows that, as the technological relatedness increases, the effect of social capital turns negative and statistically significant. This result is confirmed in Column 3, where close technological relatedness turns statistically significant, and in Column 4 where we also control for the density in other manufacturing industries different from machine tool production. Finally, as before, the Smith and Blundell test does not reject the null hypothesis of exogeneity of density and social capital.

[TABLE 5 AROUND HERE]

In order to test for H3, we split the sample in two parts: on the one hand, we consider only outsourcing firms, either fully or partially; on the other, we exclude fully outsourcing firms and we focus only firms concurrently sourcing or producing in-house. Results from Table 6 show that higher social capital drives the choice between FO and CS, whereas close technological relatedness

[12] We also consider the employment density of the most relevant manufacturing industry related to the machine-tool one, namely metal products, as given by national input-output tables. When using this variable instead of *Density_other*, results remain unchanged, and *Density_3digit* turns significant at 5% level.

predicts the choice between CS and INT. These results confirm H3: for the switch from CS to FO, i.e. from a partial to a low control over the production process, a highly trustworthy environment is required, while for the switch between CS and INT, i.e. from partial to a full control over the production process, social capital is not required while technological relatedness becomes relevant.

[TABLE 6 AROUND HERE]

We now look at the estimation results for each single phase. Table 7 summarizes the results of the single phases for which we could actually run the probit estimates. For reasons of space, we only report the estimated coefficients of the density and social capital variables.

[TABLE 7 AROUND HERE]

From Table 7 it emerges a quite heterogeneous picture. Social capital (SC) seems to affect mostly the FO of assembling and post-production stages, while density is significant for the general FO of treatment activities and few other phases like hot working, assembling by welding, and sandblasting. Interestingly, it becomes more significant when FO is compared to the choice of producing in-house, i.e internalization (INT): in this case, higher density and technological relatedness become significant with respect to other early working (5, 6, 7) and final stages (22, 23).

With respect to the CS choice, with few exceptions, we note that neither density nor social capital are significant predictors. For post-production phases, the sign of social capital turns negative, but in the last column, we observe that such a negative effect concerns the choice between CS and INT, whereas it turns positive for the choice between FO and INT.

In Table 8, we try to offer a clearer picture by showing estimate results for core and peripheral phases, according to the classification described in Section 3.2. Below these two rows, we also provide evidence for the eight groups of phases, as identified in the survey questionnaire[13]. In line with H4, we observe that the propensity to FO core activities increases as the level of local social capital increases, whereas the effect of technological relatedness appears only at the three-digit level and lower in magnitude. When peripheral stages are subcontracted, instead, technological relatedness becomes relevant (at 1% level) and substitute for social capital. Finally, partly in line with H5, neither density nor social capital predict the CS of both core and peripheral stages.

[TABLE 8 AROUND HERE]

5. Conclusions

Relying on a new firm-level dataset on machine-tool firms located in Emilia Romagna region, Italy, the paper empirically investigates the relationship between technological relatedness, social capital and outsourcing (full and partial). Once controlled for firm-specific attributes and endogeneity, it finds that technological contiguity and high social capital are important predictors of the choice to fully outsource production activities. Differently, the decision to partially outsource is not affected by social capital, probably because the firm can better monitor external suppliers. The choice is driven more by the fact of being located within a technologically related area.

We provide additional empirical evidence on the relationship between spatial agglomeration and firm vertical boundaries. Differently from previous studies, we clearly distinguish the effect played by technological relatedness from that of social capital, which contributes to reduce

[13] As a robustness check, we also redefine core stages as those single activities for which RELINT is higher than 1 (from Table 1 we include phase 7, 10-13, 19-21, 24, 25-29), and peripheral all the remaining ones. Differently from the classification adopted in Table 8, more heterogeneous phases are now grouped together, irrespective of the eight original groups they belong to. Since results do not change qualitatively, we remain on the original classification that provides a more comprehensible framework.

opportunism and increase trust. For the first time, we are also able to estimate such a relationship for each single phase of the machine-tool production process.

When looking at the single activity being fully or partially outsourced, we find that, while concurrent sourcing is not related with local social capital, the full outsourcing of core activities seems to be particularly sensitive to it. For the full outsourcing of peripheral stages, instead, we observe that higher technological relatedness substitutes for social capital.

From a policy perspective, our results, although limited to small firms and to the case of Emilia Romagna, can be useful for designing the environment which is mostly conducive to an efficient division of labour across firms and production phases.

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FIGURES AND TABLES

Figure 1. Phase distribution across production organization modes

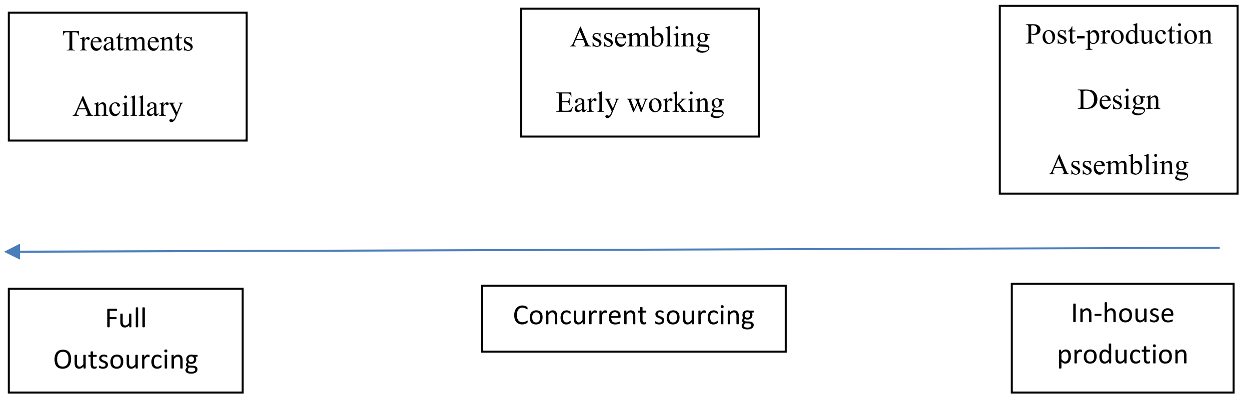

Table 1. Phase description and distribution

Group	Phase	N	%INT	% FO	%CS
Design	1 Design	1,276	69.83	11.76	18.42
Early working	2 Sintering	92	13.04	83.70	3.26
	3 Hot-working	403	23.33	66.25	10.42
	4 Cold-working	1,221	29,57	49,30	21,13
	5 Working by shaving removal	1,253	34.48	31.92	33.60
	6 Gear working	690	22.61	64.35	13.04
	7 Refining	1,126	53.37	29.57	17.05
	Average		*24.46*	*61.88*	*13.66*
	RELINT	**0.32**			
Treatments	8 Thermal treatments	769	4.68	92.59	2.73
	9 Surface treatments	905	14.59	77.35	8.07
	Average		*9.635*	*84.97*	*5.400*
	RELINT	**0.11**			
Assembling	10 Assembling by welding	1,712	50.53	26.29	23.19
	11 Assembling by sticking	331	69.49	23.26	7.25
	12 Assembling by riveting	586	77.30	14.16	8.53
	13 Mechanical assembling	2,121	76.47	7.73	15.79
	14 Electrical assembling	1,377	40.60	37.62	21.79
	Average		*62.88*	*21.81*	*15.31*
	RELINT	**1.69**			
Ancillary	15 Control software development	693	28.28	56.71	15.01
	16 Rubber and plastics working	375	28.00	59.47	12.53
	17 Glass working	39	5.13	92.31	2.56
	18 Wood working	72	31.94	62.50	12.42
	Average		*23.34*	*67.75*	*8.92*
	RELINT	**0.30**			
Final	19 Testing	1,846	84.56	6.66	8.78
	20 Packing	1,215	81.89	11.19	6.91
	21 Washing	489	75.46	18.61	5.93
	22 Sand-blasting	688	15.84	79.51	4.65
	23 Painting	1,264	24.84	62.74	12.42
	24 Installing	1,632	70.40	11.09	18.50
	Average		*56.52*	*35.74*	*7.74*
	RELINT	**1.30**			
Post-production	25 Repairing and ordinary maintenance	2,182	79.97	7.01	13.02
	26 Repairing and scheduled maintenance	1,068	78.46	11.05	10.49
	27 General overhaul	1,223	83.73	7.85	8.42
	28 Component replacement	1,779	83.02	6.69	10.29
	29 Component re-working	619	70.60	18.26	11.15
	Average		*77.70*	*10.33*	*11.98*
	RELINT	**3.48**			

Table 2. Descriptive statistics

Industry (3 digit)	Num. obs.	%
29.1 Manufacturing of general-purpose machinery	192	5.85
29.2 Manufacturing of other general-purpose machinery	1820	55.49
29.3 Manufacturing of agricultural and forestry machinery	286	8,72
29.4 Manufacturing of metal forming machinery and machine tools	260	7.93
29.5 Manufacturing of special-purpose machinery	689	21.01
29.7 Manufacturing of other-purpose machinery (domestic use)	33	1.01
Total	3280	100.0
Employment size		
1-10	2319	70.70
11-50	961	29.30
Provincial (NUTS 3 region) distribution		
Piacenza	190	5.79
Parma	529	16.13
Reggio Emilia	508	15.49
Modena	595	18.14
Bologna	747	22.77
Ferrara	155	4.73
Ravenna	211	6.43
Forlì-Cesena	143	6.16
Rimini	143	4.36
Total	3280	100.0

Table 3. Sample representativeness

Employment class	Census 2001	%	Sector Studies	%
≤ 5	3795	59.3	2932	63.8
6-9	765	11.9	557	12.1
10-15	638	10.0	466	10.1
16-19	252	3.9	231	5.0
20-49	599	9.4	393	8.6
50-99	177	2.8	14	0.3
≥ 100	176	2.7	-	-

Table 4. Full outsourcing: probit estimates, full sample

	(1)	(2)	(3)	(4)
Age	-0.017	-0.016	-0.016	-0.016
	(0.013)	(0.013)	(0.014)	(0.013)
Micro	0.079***	0.079***	0.080***	0.080***
	(0.031)	(0.031)	(0.031)	(0.031)
HC	-0.006	-0.007	-0.007	-0.007
	(0.030)	(0.030)	(0.030)	(0.030)
ULC	0.032***	0.032***	0.030***	0.031***
	(0.008)	(0.008)	(0.008)	(0.008)
NPROD	-0.007	-0.007	-0.007	-0.007
	(0.010)	(0.010)	(0.010)	(0.010)
Local	-0.026	-0.026	-0.026	-0.027
	(0.016)	(0.017)	(0.017)	(0.017)
Global	0.013	0.013	0.012	0.012
	(0.034)	(0.034)	(0.034)	(0.034)
Catalogue	0.033	0.032	0.029	0.029
	(0.053)	(0.053)	(0.053)	(0.053)
Client design	0.010	0.010	0.009	0.009
	(0.050)	(0.050)	(0.049)	(0.049)
Prod_own	0.180***	0.180***	0.179***	0.179***
	(0.047)	(0.048)	(0.047)	(0.047)
Third party	0.078*	0.076*	0.073*	0.073*
	(0.042)	(0.043)	(0.047)	(0.043)
Density_1digit (manufacturing)	0.056**			
	(0.024)			
Density_2digit (machine tool)		0.041**		
		(0.019)		
Density_other (non-machine tool manufacturing)				-0.003
				(0.038)
Density_3digit			0.075***	0.0077*
			(0.027)	(0.041)
Social capital	0.097**	0.080	0.078	0.076
	(0.040)	(0.048)	(0.048)	(0.049)
Industry dummies	Yes	Yes	Yes	Yes
Phase dummies	Yes	Yes	Yes	Yes
N	3241	3241	3241	3241
Pseudo R^2	0.47	0.47	0.47	0.47
Corr. Class. (%)	84.14	84.36	84.45	84.08
Smith – Blundell test χ^2	3.226	3.663	3.001	
(p-value)	(0.199)	(0.160)	(0.223)	

Notes: cluster-robust (at industry-province level) standard error are reported in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%. Cells report marginal effects at the mean of continuous variables and for discrete change of dummy variables from 0 to 1. Instruments: Density_1digit = Density_1digit 1951; Density_2digit = Density_2digit 1951; Density_3digit = Density_3digit 1971, Social capital = years of past dominations.

Table 5. Concurrent sourcing: probit estimates, full sample

	(1)	(2)	(3)	(4)
Age	0.043***	0.043***	0.044***	0.044***
	(0.012)	(0.013)	(0.013)	(0.013)
Micro	-0.102***	-0.103***	-0.102***	-0.102***
	(0.031)	(0.031)	(0.031)	(0.031)
HC	0.012	0.012	0.012	0.012
	(0.018)	(0.018)	(0.018)	(0.018)
ULC	0.061***	0.061***	0.061***	0.061***
	(0.008)	(0.008)	(0.008)	(0.008)
NPROD	0.009	0.009	0.009	0.009
	(0.007)	(0.007)	(0.007)	(0.007)
Local	-0.052***	-0.052***	-0.052***	-0.052***
	(0.012)	(0.012)	(0.012)	(0.012)
Global	0.026	0.026	0.027	0.026
	(0.024)	(0.024)	(0.024)	(0.024)
Catalogue	-0.027	-0.027	-0.027	-0.031
	(0.038)	(0.038)	(0.038)	(0.038)
Client design	0.008	0.008	0.007	0.007
	(0.032)	(0.032)	(0.032)	(0.032)
Prod_own	-0.118*	-0.118*	-0.118*	-0.117*
	(0.063)	(0.063)	(0.063)	(0.063)
Third party	-0.053	-0.054	-0.055	-0.056
	(0.038)	(0.038)	(0.038)	(0.038)
Density_1digit (manufacturing)	0.029			
	(0.023)			
Density_2digit (machine tool)		0.022		
		(0.019)		
Density_other (non-machine tool manufacturing)				-0.022
				(0.033)
Density_3digit			0.047**	0.064**
			(0.020)	(0.032)
Social capital	-0.075	-0.084*	-0.085*	-0.094**
	(0.046)	(0.045)	(0.041)	(0.039)
Industry dummies	Yes	Yes	Yes	Yes
Phase dummies	Yes	Yes	Yes	Yes
N	3280	3280	3280	3280
Pseudo R^2	0.23	0.23	0.23	0.23
Corr. Class. (%)	74.91	74.91	74.82	74.94
Smith – Blundell test χ^2		1.087	0.707	
(p-value)		(0.297)	(0.702)	

Notes: cluster-robust (at the firm level) standard error are reported in parentheses. *** significant at 1%; ** significant at 5%; * significant at 10%. Cells report marginal effects at the mean of continuous variables and for discrete change of dummy variables from 0 to 1. Instruments: Density_3digit = Density_3digit 1971, Social capital = years of past dominations.

Table 6. Concurrent sourcing Vs production in-house (INT) and full outsourcing (FO)

	CS Vs INT	CS Vs INT	CS Vs INT	CS Vs FO	CS Vs FO	CS Vs FO
Density_1digit	0.022			0.009		
	(0.022)			(0.032)		
Density_2digit		0.022			0.004	
		(0.019)			(0.025)	
Density_3digit			0.062***			0.009
			(0.019)			(0.034)
Social capital	-0.044	-0.051	-0.048	-0.131**	-0.134**	-0.134**
	(0.039)	(0.040)	(0.037)	(0.054)	(0.057)	(0.057)
N	1525	1525	1525	2075	2075	2075
Pseudo R^2	0.15	0.15	0.15	0.09	0.09	0.09

Table 7. Probit estimates by single production phase

		FO		CS		FO Vs INT		CS Vs INT	
	Phase	Density	SC	Density	SC	Density	SC	Density	SC
				n.s.	n.s.			-0.035***	n.s.
Design	1	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-0.024**	n.s.
				0.043*	n.s.			n.s.	n.s.
		n.s.	0.222***			n.s.	0.260***		
	3	0.084**	0.201***	n.s.	n.s.	n.s.	0.236**	-	-
		0.132**	0.193***			0.131**	0.220**		
						n.s.	0.352***		
	4	n.s.	n.s.	n.s.	n.s.	n.s.	0.341***	n.s.	n.s.
						n.s.	0.334***		
						0.166***	n.s.		
Early working stages	5	n.s.	n.s.	n.s.	n.s.	0.139***	n.s.	n.s.	n.s.
						0.212***	n.s.		
				n.s.	n.s.	0.206***	n.s.		
	6	n.s.	n.s.	n.s.	n.s.	0.168**	n.s.	-	-
				0.066**	n.s.	0.243***	n.s.		
		n.s.	0.199**			0.129**	0.378***		
	7	n.s.	0.192**	n.s.	n.s.	0.122**	0.341***	n.s.	n.s.
		n.s.	0.188**			0.177***	0.321***		
		0.039***	n.s.			0.001***	n.s.		
	8	0.030***	n.s.	-	-	0.005***	n.s.	-	-
		0.027**	n.s.			0.012***	n.s.		
Treatments		0.091***	0.164**	-0.028***	n.s.	0.124***	0.232**		
	9	0.083***	0.139**	-0.021**	n.s.	0.125***	0.182**	-	-
		0.088***	0.122*	n.s.	n.s.	0.167***	n.s.		
		0.072**	0.192**			0.094***	0.243***	n.s.	n.s.
	10	0.056**	0.170*	n.s.	n.s.	0.078***	0.214***	n.s.	n.s.
		0.049	0.162*			0.104***	0.210***	0.058*	n.s.
		n.s.	0.174***			n.s.	0.304***		
	12	n.s.	0.171***	-	-	n.s.	0.301***	-	-
Assembling		n.s.	0.162***			n.s.	0.288***		
		n.s.	0.063**	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	13	n.s.	0.065**	n.s.	n.s.	n.s.	0.066*	n.s.	n.s.
		n.s.	0.069**	0.030*	n.s.	n.s.	0.067*	0.042**	n.s.
	14	n.s.	0.149**			n.s.	0.162*	n.s.	n.s.
		n.s.	0.160**	n.s.	n.s.	n.s.	0.175*	n.s.	n.s.

		n.s.	0.161**			n.s.	0.173*	0.086*	n.s.
Ancillary	15	n.s. n.s. 0.115**	0.149** n.s. n.s.	-0.043* -0.043** -0.046**	n.s. n.s. n.s.	n.s. n.s. n.s.	0.448** 0.441** 0.427**	-	-
	19	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s. n.s. 0.006**	n.s. n.s. n.s.
	20	-0.045*** -0.041*** n.s.	0.095** 0.105** 0.121**	n.s.	n.s.	n.s. n.s. n.s.	0.128*** 0.140*** 0.141***	-	-
Final stages	21	n.s. n.s. n.s.	0.260*** 0.254*** 0.258***	-	-	n.s.	n.s.	-	-
	22	0.083*** 0.064*** 0.099***	-0.110* -0.131** -0.147**	-	-	0.062** 0.060*** 0.070**	-0.255*** -0.265*** -0.277***	-	-
	23	n.s.	n.s.	n.s.	n.s.	0.094** 0.073** 0.146***	n.s. n.s. n.s.	n.s. n.s. 0.002***	n.s. n.s. n.s.
	24	n.s. n.s. n.s.	0.082* 0.082* 0.084*	0.028* 0.028* 0.048**	-0.111*** -0.121*** -0.121***	n.s. n.s. n.s.	0.143*** 0.144*** 0.144***	0.041** 0.037* 0.066**	-0.090** -0.106*** -0.100***
	25	n.s. n.s. n.s.	0.053*** 0.052** 0.052**	0.036** 0.031*** 0.046***	-0.048* -0.060** -0.057**	n.s. n.s. n.s.	0.064** 0.061** 0.062**	n.s. n.s. n.s.	-0.056*** -0.061*** -0.057***
Post-production stages	26	0.026* n.s. n.s.	0.082*** 0.074*** 0.073***	n.s.	n.s.	0.046** 0.030* 0.047*	0.055** 0.041* 0.044*	n.s.	n.s.
	27	n.s. n.s. n.s.	0.053* 0.052** 0.053**	n.s. n.s. n.s.	-0.042** -0.043** -0.043**	n.s.	n.s.	n.s. n.s. n.s.	-0.075*** -0.072*** -0.075***
	28	n.s. n.s. n.s.	0.046*** 0.043*** 0.044**	n.s. n.s. n.s.	-0.071*** -0.073*** -0.071**	n.s. n.s. n.s.	0.050* 0.047* 0.050*	n.s. n.s. n.s.	-0.080*** -0.075*** -0.077***
	29	-0.029** -0.033** n.s.	0.121*** 0.128*** 0.134***	-	-	n.s. n.s. 0.115***	n.s. n.s. n.s.	-	-

Table 8. Probit estimates by groups of production phases

		FO		CS	
Core vs Peripheral blocks of phases	Phase	Density	SC	Density	SC
Core	10-14 24-29	n.s. n.s. 0.059**	0.106*** 0.100*** 0.100***	n.s. n.s. n.s.	-0.087*** -0.090*** -0.090***
Periphery	3-9 15-18	0.094*** 0.056** 0.089***	0.179*** n.s. n.s.	n.s. n.s. n.s.	n.s. n.s. n.s.
Groups of phases (from questionnaire)					
Design	1	n.s. n.s. n.s.	n.s. n.s. n.s.	n.s. n.s. 0.043*	n.s. n.s. n.s.
Early working stages	3-7	n.s. n.s. n.s.	0.120*** 0.108*** 0.105***	n.s. n.s. 0.019**	n.s. n.s. n.s.
Treatments	8-9	0.071*** 0.058*** 0.053***	n.s. n.s. n.s.	-0.028*** -0.022*** n.s.	n.s. n.s. n.s.
Assembling	10-14	n.s. n.s. n.s.	0.118*** 0.116*** 0.115***	n.s. n.s. n.s.	n.s. n.s. n.s.
Ancillary	15-18	0.022*** 0.018*** 0.020***	0.039*** 0.033** 0.031**	-0.044* -0.043** -0.046**	n.s. n.s. n.s.
Final stages	19-23	n.s. n.s. 0.051*	n.s. n.s. n.s.	n.s. n.s. n.s.	n.s. n.s. n.s.
Post-production stages	24-29	n.s. n.s. n.s.	0.065*** 0.064*** 0.065***	0.031** 0.023** 0.042***	-0.054*** -0.064*** -0.063***

Appendix

Table A1. Pairwise correlations between density, social capital and the other variables

	Density_1digit	Density_2digit	Density_3digit	Social Capital
Age	0.05***	0.05***	-0.06***	0.03*
Micro	-0.04**	-0.04**	0.03	0.01
HC	0.05***	0.06***	0.00	0.02
ULC	0.06***	0.06**	-0.00	0.01
NPROD	-0.02	-0.02	0.02	0.00
Local	-0.05***	-0.05***	0.06***	0.05***
Global	0.03*	0.03*	-0.08***	-0.04**
Catalogue	0.08***	0.09***	-0.11***	-0.03*
Client design	-0.00	-0.00	0.01	0.04**
Prod_own	0.10***	0.11***	-0.09***	-0.02
Third party	-0.04**	-0.04**	0.01	0.07**
Density_1digit	1.00	0.91***	0.42***	-0.16***
Density_2digit	0.94***	1.00	0.40***	-0.01
Density_3digit	0.42***	0.40***	1.00	0.04**
Social Capital	-0.16***	-0.01	0.04**	1.00