

Social Capital and Firm's Productivity in Italy: a Multilevel Approach¹

by

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Abstract

Matching and merging different databases, we study how firm's productivity is affected by individual characteristics and provincial context conditions in Italy. Mainly, we focus on the relation between social capital, in its different forms and dimensions and calculated at provincial level and firms' productivity, calculated using the non-parametric DEA approach. We find that exporting, self-financing firms, and firms belonging to groups, are more productive. In particular, Cooperative firms are more productive than limited company. Moreover, the variables capturing the social capital show strong positive correlation with firms' productivity, indicating that a widespread civism intended as pro-social behavior independent of specific interpersonal bounds, seems to create an economic environment which is more favorable to entrepreneurship and collaboration among firms, since it increases interpersonal trust, lowers transaction costs, enhances the compliance of formal or informal rules of fairness and fosters a more transparent, impartial and efficient working of the public administration.

JEL CODE: C19, D24, R10

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1. Introduction

The aim of this paper is to examine the relation between social capital, in its different forms and dimensions, and firms' efficiency. The hypothesis investigated is that the efficiency of every firm may be explained by its own characteristics as well as by the context in which it operates. Among these contextual characteristics we focus mainly on social capital and inequality. The relation between inequality, social capital and economic efficiency, which had not attracted much attention so far, emerges as a significant one from our analysis.

While much of the empirical literature usually focuses on the effect of social capital upon GDP or other macroeconomic indicators of economic development, a very few studies try to assess its impact at the microeconomic level³. This essay aim to help developing this line of research and overcoming the inherent limitations of an approach built upon correlations between social variables and macroeconomic performance.

Economic literature offers several interpretations of the influence of social capital on firm's performance: social capital can affect not only the firms' output levels, but also their

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³ Bürker and Minerva (2013), Bürker *et al.* (2013), Cingano and Pinotti (2013), are to be mentioned for their attempts to detect the effect of social capital on firms' performance and dimension.

organization and managerial structures, their propensity to innovate and R&D investments, and their degree of internationalization in both marketing and production.⁴

The influence of social capital on firms' performance can be understood as a general reduction of transaction costs which produces positive externalities (Fukuyama, 1995; Maskell, 2000). An example is the increase of trust level among agents which allows a cooperative solution in a context of the Prisoner's Dilemma (Torsvik, 2000). A second one is the reduction of asymmetric information caused by wide circulation of knowledge on markets and technologies (Dakhli and De Clercq, 2004). A further example is the lower risk aversion, due both to the speed of information and to the lower monitoring costs of investment that foster an increase of innovation and productivity levels (Kaasa et al., 2007; Ackcomak and Ter Weel, 2009).

Despite the wealth of literature developed during the last few decades, the concept of social capital is still rather vague (Solow, 1995), casting doubts on the existence of a uniquely defined concept. From a historical point of view, the term "social capital" may be understood as a "code" which is able to bring together different, but closely related, research interests that tend to develop along the borders between economics, sociology and political science.

We can distinguish two different approaches to the study of social capital. The first approach, the "endogenous" approach, which treats social capital as a specific endowment of individuals or organizations, which can be improved or destroyed by people's behavior. Following Coleman (1988), a stock of social capital in a given society can be created by reciprocal trustful relationships. The second approach, the "exogenous" approach, stresses instead that social capital is a structural element inherent to each society, which has been created, over the centuries, by the accumulation of cultural and religious values, political systems and institutions. Following this line, Putnam et al. (1993) attempt to explain the differences in economic development between the Southern and the Northern regions of Italy with reference to different levels of civiness that were developed since the Middle Ages and self-reinforced over time (De Blasio and Nuzzo, 2009).

Interestingly, Whereas many authors agree in deeming the two approaches towards social capital as mutually incompatible (Jackman and Miller, 1998), others tend to join these different approaches, in the effort to develop a notion of social capital as a multi-faceted, multidimensional and dynamic phenomenon (Knack and Keefer, 1997, La Porta et al., 1997, Keefer and Knack, 2002; Akcomak and Ter Weel, 2009).

The great complexity of the notion of social capital has given rise to an even greater variety of measurement methods. Putnam et al. (1993), for example, make use of some aggregate measures, such as the number of cooperatives active in a specific area or the degree of people participation into non-profit organizations. Following this approach, many scholars have used different indicators of traditional associative density based on data available along many years, such as volunteering, political participation, crime rates or blood donations. Other authors have tried to apply methods emerging from the field of experimental economics in order to estimate measures of social capital in controlled environments (Berg et al., 1995, Glaeser et al., 2000). On the whole, the most widespread method used in recent years has been focused on establishing indicators drawn from specific surveys, such as the World Values Survey (Knack and Keefer, 1997, La Porta et al., 1997, Zak and Knack, 2001; Alesina and La Ferrara, 2002; Berggren et al., 2008; Roth, 2009; Tabellini, 2010), the European Values Studies (Beugelsdijk and Van Schaik, 2005; Hausera et al, 2010) or, in the Italian case, the Istat Multipurpose Survey and the Survey of Household Income and Wealth of

⁴ In this line of research, in which social capital is considered for its effects at firms' level rather than from a general macroeconomic perspective, see Yli-Renko - Autio - Sapienza 2001; Cooke 2007; Salavisa - Fontes 2012; Rass - Dumbach - Danzinger - Bullinger - Moeslein 2013. For Italy in particular see Masciarelli 2011 e Laursen - Masciarelli - Prencipe 2012.

the Bank of Italy (Cartocci, 2007; Righi, 2013). In Italy, thanks to the work of Putnam, there has been a long tradition as shown by a recent workshop held at Bank of Italy in June 2014. Yet much of the empirical literature use to measure social capital at the country or, at most, regional level. Analyses at the lower level (urban areas or provinces) have often been prevented by availability or reliability of data⁵.

This article has been built on the basis of three specific choices pertaining to the three distinct phases of our research: the selection of social capital indicators; the technique of productivity estimation; the methodology applied to examine the relationship between social capital and productivity.

Firstly, in order to take account the complex nature of social capital, we use a large set of variables from the 'Inquiry into the aspects of daily life', "Non-Profit Organizations census" and "voters at the European polls". These variables are summarized by Principal Component Analysis, from which we extracted the "latent" variables of social capital.

Then, the resort to Data Envelopment Analysis (DEA) allows us to describe firms' productivity with a view to their specific sector of production and with no resort to parametric techniques. Thanks to the Cebi-Cerved very ample database, it is possible to attain productivity estimation for about 284,000 Italian firms from all sectors in the year 2011.

Finally, by the employment of a multilevel technique in the analysis of the data on social capital and on economic performance, we try to assess the specific contribution of social capital after having taken into account other possible influences, both pertaining the firm itself (legal status, the degree of self-financing, the participation in groups, and propensity to export) and the structural economic characteristic of the area of firm's localization (the existence of districts, the quality of local infrastructures, markets accessibility, the quality of local institutions as perceived by local subjects, prominence and degree of internationalization of the local entrepreneurial fabric). In this context, we analyze the relation between income inequality, social capital and firm's efficiency. More specifically inequality, as measured by Gini Index, appears to entertain a negative relation with both efficiency and social capital.

In the pages that follow, section 2 describes the methodologies applied in our analysis; section 3 presents our mapping of firms' productivity in Italian provinces; the main results stemming from our multilevel analysis on the correlation between firms' efficiency, inequality, social capital, and the structural variables of both firms and territories, will be presented in section 4; section 5 concludes.

2. Methodology

2.1 – Social capital indicators in 103 Italian provinces.

In view of the complex nature of social capital, we thought it better not to use *ad hoc* single density variables. Rather, we employed a heterogeneous set of variables from which we extracted "latent" variables related to social capital. These "latent" variables, which cannot be observed directly, are the theoretical entities underlying the initial variables.

The set of initial variables is reported in Table 1 below. This set includes: 25 variables obtained during the 'Inquiry into the aspects of daily life' (Istat), 2 variables taken from the Non-Profit Organizations census (Istat), and 1 variable relative to the number of voters at the European polls (Italian Ministry of Interior). The first set of 25 variables, in particular, was reconstructed in the recent contribution by Foderà and Pavolini (2014). By applying the

⁵ Analysis at the provincial level have been offered by Cartocci (2007), De Blasio e Nuzzo (2009), Di Liberto e Sideri (2011), Mauro e Pigliaru (2011), Crescenzi *et al.* (2013). Andini (2014) describes the relation between social capital and economic growth at the municipal level. A brief review of this literature is offered by Antonio Accetturo and Guido De Blasio (2014).

“pooling technique” (Verma et. al. 2009) to the Istat ‘Inquiry into the aspects of daily life’ carried out in 2009, 2010 and 2011, Foderà and Pavolini extracted 167,347 observations from which they reconstructed the 25 variables that we employed. These variables reflect the account of aspects of daily life including relationships, values and beliefs, and they are fully available for the purpose of a by-province analysis.

Tab. 1 - Observable variables

Spocon	In your spare time, do you always practice one or more sports? (a)
Sposal	In your spare time, do you sometimes practice sport? (a)
amici2	Do you meet your friends more than twice a week? (a)
Amici	Do you meet your friends at least once a week? (a)
intca3	In the last few 3 months, how often did you used internet at home? (a)
intatt8	In the last 3 months have you read or downloaded newspapers, news, journals? (a)
incomu5	In the last few months have you read weblog or blog? (a)
Lquot	Do you read a newspaper at least once a week? (a)
Pamici	Do you have political information by your friends? (a)
Pparen	Do you have political information by your relatives? (a)
Pcons	Do you have political information by people you know? (a)
Vandal	In the area where you live, how much happens to see vandalism against commons? (a)
Avvocato	Has your family recourse to lawyers? (a)
Sporco	In the area where you live, are the streets dirt? (a)
Crim	In the area where you, is there crime risk? (a)
Ccarta	In the area where you, are there recycling bins for paper? (a)
Cvetro	In the area where you, are there recycling bins for glass (a)
Rcarta	Do you make recycling of paper? (a)
Rvetro	Do you make recycling of glass? (a)
Risec	What do you think about economic resources of your family during the last year? (a)
Fiducia	Do you trust other people or are you very careful? (a)
fidu1	If you lose your wallet, how likely do you think it would be returned by a neighbor? (a)
fidu2	If you lose your wallet, how likely do you think it would be returned by a policeman? (a)
fidu3	If you lose your wallet, how likely do you think it would be returned by a stranger? (a)
volAC	Number of volunteers in all no-profit organizations per 1000 inhabitants: social activity only (b)
Vol	Number of volunteers in all no-profit organizations per 1000 inhabitants (b)
Amipar	Have you ever asked friends or relatives to help you find a job? (a)
eleUE	Percentage of voters at the European Parliament's elections (c)

Source: a) Inquiry into the aspects of daily life (Istat, 2009-11); b) General Census of No Profit Organizations (Istat 2011); c) Minister of Home Affairs

For the choice of the “latent” variables underlying the 28 initial variables, we employed the Principal Component Analysis (PCA). This is a multivariate statistical technique (Hotelling, 1933), commonly employed in order to reduce a large dataset comprised of many variables into a smaller one. Mathematically, PCA produces/gives back non-interrelated (orthogonal) indicators that represent weighted linear combinations of the employed variables. The name of these indicators is “components.” In formal terms:

$$C_j = a_{j1}X_1 + a_{j2}X_2 + \dots + a_{ji}X_i$$

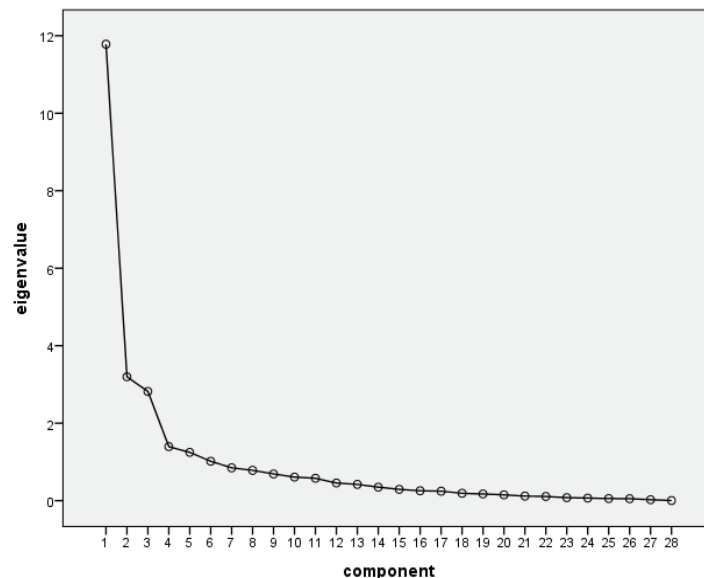
where X_i stands for the i -th variable and a_{ji} is the weight that the variable i assumes in the component j .

By applying the PCA we obtained the same number of components as the number of variables that have been used in the analysis, as well as a descending order of these components, arranged from the highest to the lowest percentage of total variance explained. We could thus single out the number of “latent” variables by choosing those among the components that contribute to explain the largest variance, that is, those which correspond to the ‘elbow’ of the descending graph of the eigenvalue.

The use of PCA thus gives us the possibility to obtain two distinct results: to avoid arbitrary choices, and to represent, in the most unbiased way, the multidimensional nature of social capital. The “latent” variables extracted make up our many-sided representation of social capital, and reference will be made to these variables in what follows.

Figure 1 below reports the results we obtained. As the graph shows, attention can be focused on the first 4 components, which explain 68.554% of the total variance contained in the set of 28 variables employed. These 4 components represent, therefore, our “latent” variables of social capital.

Fig. 1 - Descending graph of the eigenvalue (principal component analysis)



In order to better describe the relation between the initial set of variables and the “latent” variables, we made an orthogonal rotation of the axes (using the varimax method) and made use of the “rotated matrix of components”. Using the factorial weights, a_{ji} , contained in the Matrix reported in Tab. 2, we can now understand the nature and the composition of each “latent” variable. For instance, in the first “latent” variable, higher factorial weights can be related to: sport activities, more frequent access to internet, more frequent reading of

journal and blogs, people's perception of their own economic status, their trust in other people (neighbors, police officials, strangers), the help provided by friends and relatives during the search for a job (that we labeled "Amipar" following Foderà and Pavolini 2014). This latter initial variable, unlike all the others, presents a negative factorial weight. This means that there exists an inverse relation between the "Amipar" variable and the first "latent" variables observed. In view of the overall nature of the initial variables, we labeled the first "latent" variable of social capital as the variable of "social participation, trust, volunteering and information".

Tab. 2 - Rotated component matrix

	Component			
	1	2	3	4
Spocon	0.729	0.36	0.061	0.325
Sposal	0.614	0.204	-0.074	0.178
amici2	-0.244	-0.146	-0.078	-0.857
Amici	-0.339	-0.281	-0.121	-0.811
intca3	0.591	0.276	0.406	0.357
intatt8	0.647	0.369	0.305	0.312
incomu5	0.727	0.351	0.247	0.371
Lquot	0.73	0.157	-0.051	0.181
Pamici	-0.163	-0.119	0.052	-0.299
Pparen	0.239	-0.01	0.081	0.036
Pcons	0.128	-0.055	-0.065	0.026
Vandal	-0.151	-0.027	0.88	0.007
Avvocato	0.002	0.053	-0.035	0.039
Sporco	-0.144	-0.445	0.759	-0.103
Crim	-0.178	0.21	0.81	0.315
Ccarta	0.333	0.765	-0.057	0.053
Cvetro	0.435	0.792	-0.002	0.099
Rcarta	0.504	0.583	-0.055	0.383
Rvetro	0.499	0.596	-0.064	0.385
Risec	0.748	0.256	-0.074	0.111
Fiducia	0.75	0.002	-0.121	0.12
fidu1	0.698	0.246	-0.384	0.335
fidu2	0.542	0.207	-0.3	0.298
fidu3	0.798	0.054	-0.023	0.121
volAC	0.739	0.286	-0.227	-0.081
Vol	0.808	0.218	-0.348	-0.038
Amipar	-0.708	-0.377	0.148	-0.162
eleUE	0.109	0.741	-0.031	0.219

Extraction method: principal component analysis. Rotation Method: Varimax with Kaiser's normalization

Looking at the factorial weights as reported in Tab. 2, it is also possible to contextualize of the remaining "latent" variables of social capital: the second can be qualified as the

"Civiness" variable, the third as "crime and vandalism", the fourth as "rarity of interpersonal relation". For instance, in the second "latent" variable, higher factorial weights can be related to recycling of paper and glass, and percentage of voter turnout for European elections: all these variables reflect people's awareness of their participation in the life of their community. The third "latent" variable, on the other hand, seems to be characterized more by a higher factorial weight of those among the initial variables, which are related to the diffusion of crime and acts of vandalism against public property: these variables can provide a measure of how much the diffusion of anti-social behaviors is perceived by people. In the fourth "latent" variable, there is a convergence of the two initial variables representing the weekly frequency of getting together with friends. However, these variables have a negative factorial weight. The underlying "latent" variable, therefore, probably represents a measure of the scarcity of social intercourse.

2.2. The Measure of firm's productivity: Data Envelopment Analysis (DEA)

In order to measure the efficiency of Italian firms we have adopted a non-parametric technique known as Data Envelopment Analysis (DEA).

DEA was proposed for the first time by Charnes, Cooper e Rhodes (1978), who succeeded in transforming the calculation of the efficiency index proposed by Farrell (1957) into a linear programming problem. During the 1980s, the technique was further implemented. Banker, Charnes and Cooper (1984) extended the measure of efficiency to the hypotheses of variable returns of scales, while Charnes, Cooper, Seiford and Stutz (1983) introduced a multiplicative combinational method with piece-wise log-linear frontier. During the 1990s, thanks to the development of specific applicative software (Coelli, 1996), DEA methodology spread its application to many fields, concerning both the public and the private sectors of the economy⁶.

Within the DEA approach, the production-possibility frontier of a sector of the economy, or of the entire economy, can be obtained by solving a system of linear equations based on the data of the decision-maker (e.g. the firms). Unlike the stochastic approach, DEA allows to find the production-possibility frontier without making resort to a previously defined production function, thus avoiding the errors of measurement and the assumptions associated with the latter procedure.

Once the production-possibility frontier had been identified, DEA compares the outcomes of each firm with the frontier, thus obtaining an indicator of relative performance. Comparison can be made in two ways: one that follows an output-oriented approach and the other that follows a factors-of-production-oriented approach. In the former case, assuming a given quantity of the factors of production, each firm's output is compared to the potential maximum level of production. In the latter case, DEA compares the quantity of factors of production employed by each firm with the minimum quantity of the same factors that could be employed to obtain the same quantity of output. In both cases, three distinct measures can be obtained: technical efficiency at constant returns of scale (TE_{CSR}), technical efficiency at variable returns of scale (TE_{VSR}), and scale efficiency (SE).

The measures of efficiency are invariant to the changes in the unity of measure and have an interval of existence between 0 and 1. The measure of technical efficiency, in particular, is expressed by the distance of each decision-maker from the frontier, thus providing information on its ability to reduce waste. Value 1 is associated to the maximum level of efficiency, namely when the producer is on the production-possibility frontier, and it tends to zero as efficiency decrease. Due to DEA peculiar structure, technical efficiency at

⁶ See Fried, Lovell and Schmidt (2008) for closer examination of DEA.

constant returns of scale is independent of the choice between the output-oriented approach and the factors-of-production-oriented approach, its measure being the same in both cases. The difference between technical efficiency at variable returns of scale and technical efficiency at constant scale returns provides the ground for the measurement of scale efficiency. It registers the effects of the size of each firm on its producing capacity, assuming value 1 in correspondence of the optimal size. In all other cases, the measure of scale efficiency tends to zero as the firm size grows too big or too small.

In calculating the efficiency of the Italian firms we have adopted an output-oriented approach⁷. In this way, we want to seize firms' ability of expanding the output obtained from given quantities of factors of production. In order to do so, we employ the data base of the central balance-sheet data office, from which we have extracted 336,541 entrepreneurial cases corresponding to the set of Italian firms with a sales of at least €500,000 in 2011. Since 52,533 firms presenting missing values were removed, the final dataset is composed by roughly 284,000 firms. For each one of these firms we have registered information pertaining to value added, total labour cost, and total net fixed assets. Value added is employed as the measure of production, while the cost of labour (wages, stipends, severance pay) and the fixed assets (tangible and non-tangible, net of depreciation) is taken to represent the factors of production. In the attempt to reflect the peculiarity of each sector, we measure the efficiency of each firm within its sector by following the Istat 3 digit sectors classification.

2.3. Firms' productivity and its determinants: Multilevel analysis

Our aim is to examine the way in which firms' productivity simultaneously depends on their individual features as well as on the features of the territory they belong to. For this reason, we consider the firm level micro-dimension along with the macro-dimension as determined by the context in which the firm is located, i.e. the province it belongs to.

In order to combine the micro- with the macro-effects, the sectorial and territorial dimensions, the impact of firm's variables and that of context variables, we adopt a multilevel approach recently employed in several domains (sociology, epidemiology, demography)⁸ to analyze phenomena in which the available data present themselves as organized on more layers⁹.

The problem of data hierarchic structures has already been dealt with in the statistical literature. Mono-level models adjusted with mixed effects (Searle, Casella e McColluch, 1992) and contextual analysis (Iversen, 1991), for example, can be used to analyze data with a complex variance structure. However, the usual "single-level" models show distortions in estimations and standard errors (Aitkin e Longford, 1986 and Burstein et al, 1978) and are constructed on the basis of assumptions about the structure of the variance-covariance matrix that are sometimes scarcely plausible. For instance, these models work on the assumption of an independence of observations, while the performance of firms operating in the same setting is clearly related to institutional, infrastructural and informative contexts.

The multilevel approach considers clusterization as intrinsic to datum and can therefore be employed to obtain non-distorted estimates (Snijder and Bosker, 1999; Maas and Hox, 2004). It assumes the structure of correlation as heterogeneous and non-constant, thus permitting a higher degree of consistency between theoretic interpretation and the statistical model employed.

⁷ Calculations are by using the Deap ver. 2.1 computer program (Coelli T.J., 1996)

⁸ For instance, when the territory is considered, the different levels are the regions within nations and the provinces within each region; if the social level is considered, we may distinguish individuals in 'groups' – where groups can be determined on the basis of ethnicity, religion, income etc. – and groups within societies.

⁹ Recently, Giovannetti et al. (2013) have applied the multilevel approach to relate Italian firms' performance, proxied by their propensity to export, to both geographical context and individual characteristics.

The model employed in this study is:

$$Y_{ijk} = \alpha + \sum_{h=1}^r \beta_h X_{hijk} + \sum_{p=1}^s \gamma_p Z_{pj} + \sum_{r=1}^v \gamma_r M_{rk} + U_j \quad \text{con } i : 1, \dots, n, \quad j = 1, \dots, 103 \quad e \quad k = 1, \dots, 20 \quad (1)$$

Where X_{hij} , represent the h individual variables, of the firms i operating in the province j , of the region k . Z_{pj} are the p contextual variables related to the province j ; M_{rk} are the r contextual variables related to the region and, finally, $U \sim N(0, \tau^2)$

The different measurements of efficiency presented in section 2.2 have been adopted in our application of multilevel analysis. However, as the differences between the two measurements are scarcely significant, and our space being limited, we found it convenient to present only the analysis of output-oriented efficiency. Table 3 present the main descriptive statistics of technical efficiency for the three main areas of Italy and for the whole sample. As will be shown in our maps productivity of Italian provinces, firms' efficiency in the North is higher than in Central and Southern regions. And this finds confirmation by observing different points in the distributions.

Independent variables have been subdivided in *individual variables*, each one capturing a peculiarity of the individual firm, and *context variables*, pertaining to the characteristics of the territory (the province and the region) in which the firm is located.

Among the *individual variables* we have considered: 1) firms' self-financing (thousands of euros) as an indicator of the ability to finance fixed investment, the expansion of production and new technologies out of its own profits; 2) the value of participation (thousands of euros) in other firms (this in order to grasp any correlation between participation in groups and efficiency) 3) a dichotomous variable showing whether the firm is an exporter or not. As to the latter, our sample shows, quite unrealistically, that less than 3% of the firms are exporters, which is a quota very much below the available statistics on Italian firms. This underestimation depends on the fact that the indication of exports in the balance-sheets is optional, and many firms prefer not to provide this information. Therefore, the export quota reported in the balance-sheets is in itself scarcely representative. However, given the emphasis on the strict correlation between firms' efficiency and their presence in international markets that is frequently given in the literature on international trade, and in view of the massive empirical evidence supporting this interpretation, we reckoned it important to take account of any information about exports that we were able to collect. 4) In order to take firms' dimension into account we have subdivided firms on the basis of their registered volume of sales¹⁰. We have thus constructed four sets, each one of the same dimension, in which the smaller firms present sales comprised between €500,000 and €800,000. 5) Finally, we have subdivided firms according to their legal status, distinguishing between individual proprietorships, partnerships, and limited company on the one hand, and cooperative societies and consortiums on the other. Our objective was to capture any possible spin-off between business structures and productivity.

Among the *context variables* we have included, for each province: 1) its quota of the Italian exports and 2) the number of firms included per province in our sample data set. The average export quota of the provinces is 2.73% of the aggregate Italian exports, with a minimum corresponding to the province of Enna (0.0045%) and a maximum in the province of Milan (10.6%). The average number of firms per province in our sample is 13,678, but there is a large dispersion of data from a minimum of 241 firms with a volume of sales of above

¹⁰ Because of the high skewness of the Italian firms' distribution, we use 4 equally represented classes as in Giovannetti et al. (2010)

€500,000 in the province of Agrigento to a maximum of 30,000 firms of the same sub-set in the province of Milan. The fraction of Italian exports and the number of firms per each province offer an approximate measure of the thickness of the local productive structure: through the creation of networks, the transfer of information, the starting up of innovation processes, and the collective demand of certain goods and services, a thicker productive structure can stimulate the growth of external economies while generating positive spillovers on each firm's productivity and access to markets.

3) The provincial index of infrastructures built by the Tagliacarne Institute is a third indicator that we have included in the analysis of the possible determinants of firms' productivity. This index is expression of a census of all the local infrastructures (harbors excluded) in relation to population, value added and the area of each province.

4) A Jacob Index, calculated as in Neffke et al (2012), allows to consider positive externalities stemming from diversification, by detecting in each province the number of sectors (by 2 digit) which contain more than 10 firms.

Once these four contextual determinants (that we may call structural) have been considered, it is possible to assess the specific impact of social capital and inequality. The 4 component emerging from our PCA have been included in our model. As a further feature of the social environment in which firms are located, we have considered also the Gini index of income inequality at province level for 2011 as estimated, using data from the Italian Department of Finance, by Acciari and Mocetti (2013).

Tab. 3 – Descriptive Statistics – Output-oriented efficiency

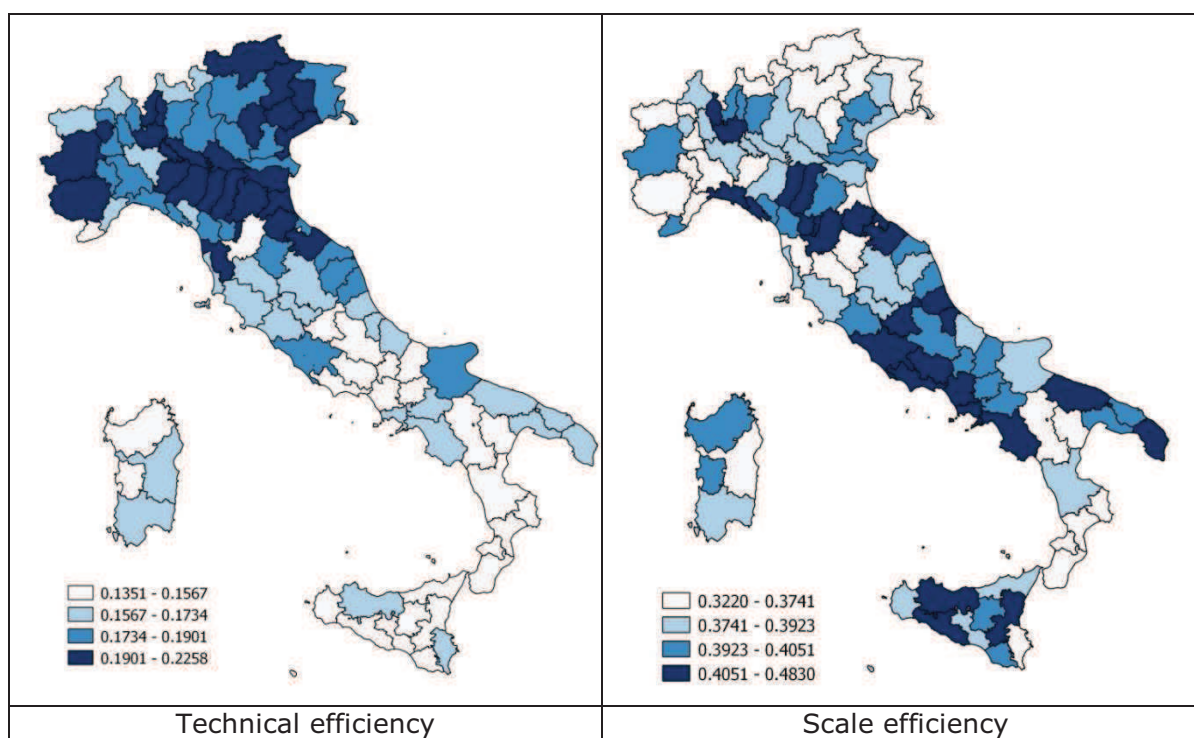
Variable Output-Oriented Efficiency	Observations	Mean	Standard Dev.	25 th Percentile	Median	95 th Percentile
North	142759	0.195	0.190	0.062	0.138	0.582
Centre	53195	0.179	0.181	0.055	0.124	0.54
South	51525	0.157	0.166	0.046	0.104	0.476
Whole sample/Italy	283988	0.181	0.181	0.057	0.127	0.542

3. Italian firm's efficiency: a by-province mapping

The calculations made in measuring efficiency provided us with a mass of data that were too numerous to be represented at the level of the individual decision-maker. Therefore, we aggregated data according to territorial localization, thus obtaining an average provincial measurement. Afterwards, in order to obtain a simpler and more immediate description of the obtained results, these average measures have been represented in specific thematic maps.

Figure 2 presents this twofold perspective. It shows differences in terms of technical efficiency and of scale efficiency. A more intense coloration corresponds to a higher degree of efficiency.

Fig. 2 – Measures of average provincial efficiency (in quartiles), esteemed by an output-oriented model at variable scale returns.



The measures of technical efficiency at variable returns of scale confirm the Italian dualism. Moving from the North of the country to the South, the registered efficiency levels progressively decrease. In Central Italy, two clusters of moderate efficiency can be located: one in the West, with a southern extension reaching to the province of Rome, and the other at East, extending to the province of Lecce in the South and with some offshoots in Campania. In Sicily higher degrees of technical efficiency seems to coincide with the areas in which industrialization is less recent.

Much more varied is the geographical distribution of scale efficiency, which in many cases presents an opposite situation if compared with the distribution of technical efficiency. The worst performance, under this respect, is provided by the provinces of the North, and especially of the North-East. The latter evidence may find an explanation in a recent study on the levels of firms' productivity in this area presented by the Fondazione Nord-Est¹¹. According to that study, the fall of employment in the North-East has been less marked than the decreases of the average GDP per year, with the result of a lower average productivity. By means of our data, a more detailed account of what may actually have happened can be given. In our perspective, the cause of the reduced productivity in the North-East is to be found not to so much in a lack of technical efficiency, which does not emerge from our data, as in the inappropriate scale dimensions, which may be the result of transitory labour-hoarding policies.

¹¹ 'Open' project, Fondazione Nord Est, February 2013.

4. Social capital and firms' efficiency: some evidence from the multilevel analysis

Table 5 shows the results of the specifications of our multilevel analysis estimated by taking the output-oriented efficiency at variable returns as dependent variable.

First evidence is the strong significance of the selected individual variables: both a good level of self-financing and participation in other firms entail significant positive effects on the expressed firms' efficiency. By reducing the burden of financial costs, self-financing facilitates the investments that allow improving marketing and production. Yet squared self-financing shows a non-linearity, inverting its effect upon technical efficiency as it grows beyond a certain (roughly 3 millions of euros).

In the same vein, firm's participation in groups or other formal networks is usually positively related to product and process innovation, R&D investments, and the presence of firms in international markets. Participation in groups, when associated to horizontal and vertical integration, entails positive effects on decision coordination, a reduction of the area in which transaction costs operate, and a better exploitation of scale and scope economies. Not surprisingly firms' immobilization in participation is highly correlated with efficiency.

Coherently with a wide theoretical and empirical literature, our data show that exports are positively related to firms' efficiency¹². Export trade may be both a cause and an effect of high firms' efficiency, which usually makes its appearance well before the firm successfully access to foreign markets¹³; anyway, once internationalized, firms are further stimulated to improve their competitiveness in terms of costs and margins as well as of product quality and receive strong incentives to innovation broadly intended. Moreover, larger volumes of sales allow a better exploitation of scale economies, thus abating the impact of plants, patents acquisitions, R&D expenses and management. For all these reasons, exports, despite the limitations of our data mentioned above, appear to be important in explaining the level of productivity of each firm.

Remaining at the level of individual firm's features, it is also worth noticing that the legal status has contrasting effects: being a company has a negative effect, while cooperatives and consortiums do better than partnerships. The better performance of cooperatives, and even individual proprietorships compared to companies, can eventually be explained in several ways: lower organizational and transaction costs, a reduced impact of asymmetric information, lower cost of labor due to specific contractual forms may help explaining cooperatives' performances. Finally, as expected, larger dimensions of firms statistically correspond to higher levels of technical efficiency.

Turning now to the context variables, we can observe that being located in a province which contains a large population of firms has significant relation to efficiency. The presence of a rich productive landscape may give rise to manifold spillover effects and positive externalities on the firms which are located therein. Yet, it is not the mere quantity of firms which foster efficiency, but also their quality and diversification. The Jacob index helps grasping this dimension. Our data show that in the Italian provinces, the Jacob Index is again positively related to firm's performance. The more the industrial structure is diversified in a specific area, the more its firms are efficient. However, the squared Jacob index is not significant.

Infrastructures also exert a relevant positive effect which cannot be perfectly disentangled from the two above mentioned structural factors. The three factors taken together show a high correlation, probably due to the overlapping phenomena that they together contribute to generate in any social, economic and institutional environment. In order to cope with this problem we decided to remove them one by one in our specifications and then test the joint significance of each couple upon efficiency.

¹² See in particular the Fondazione RES 2013 Report, and especially chapter V, by Asmundo and Nerozzi.

¹³ See the Fondazione RES 2013 Report, and especially chapter V, by Asso, Foderà and Pipitone.

After having examined the individual and structural component of firms' efficiency, we can now turn to the analysis of variables associated with social capital in its different forms. All the components of social capital presented in section 1 are statistically significant in our model irrespective of the particular specification employed.

Component 1 emerges from a wide set of variables related to social participation, trust, volunteering and information and has a positive though not very great relation to firm's efficiency. Pro-social behaviors are widely held to favor interpersonal trust, increase the performance of institutions and reduce social conflicts, thus helping to ameliorate also the allocative efficiency of markets with positive spillovers upon firms. Yet Component 1 may probably be underestimated in our analysis. This may be due to the presence within Component 1 of a very sensitive variable, namely "Amipar", which presents a negative correlation with efficiency and thus weakens the magnitude of Component 1. In other specifications we made without including Amipar within Component 1, the magnitude of the latter was higher. Amipar indicates the strength of parental and friendship bonds in channeling economic choices and relationship: its negative relation with firm's efficiency offers support to the widely held view that familiar or friendship ties, which tend to isolate communities from the outsiders, hold back economic development. Inefficient allocation of human resources and the hindering of market mechanism generated by the widespread recourse to these "strong" networks, may be associated with the institutional and bureaucratic inefficiencies which has the effect of increasing costs for the entire productive system. Moreover, when the recourse to these strong networks is needed in order to overcome transaction and bureaucratic costs, this may erect barriers to entrance of the non local entrepreneurs and investors, thus giving an advantage to locally based but eventually less efficient firms.

Component 2 (That we named "Civicness") presents a much higher and positive magnitude. Being located in provinces with a higher voter turnout in European elections or where recycling is more widely practiced is associated with a high Component 2 and is positively related with firms' efficiency. Widespread civic behaviors and a more scrupulous adherence to the rules of fairness, especially if practiced on a voluntary basis and not as response to any system of sanctions or incentives (that could also be of a moral nature, as in the case of the above mentioned Amipar component), may create an environment in which the quality of life is better and also business activities are facilitated.

Component 3 ("crime, vandalism and urban blight") seems to be positively associated with efficiency. This fact may be the result not of any direct causal relation, rather of the most productive firms being located in urban areas where crimes, vandalism and other manifestations of social distress, are more likely to occur regardless of the level of productivity.

Component 4 ("rarity of interpersonal relationships") seems to entertain a positive relation with productivity. Again this association does not seem to provide any basis to envision some kind of direct causality with firms' efficiency. As far as the distribution of technical efficiency follows a north/south pattern, the association with component 4 may be the result of the different relational attitudes toward the use of spare time which characterizes the different regions of the country. Yet some direct link could emerge as far as friendship relation may be used (like in the variable Amipar) to distort market mechanisms or bureaucratic processes and give rise to forms of exclusion or discrimination in economic relationships.

The last variable that we examine to describe the social context in which firms' activities take place, is the Gini Index of income inequality. The Gini Index shows a negative and significant relation to firms' efficiency. A high index of income inequality is associated with a low level of efficiency and a low level of social capital. Again a set of different interpretations may be given to this phenomenon. A first one is that income inequality is a source of social

conflict which may increase transaction, insurance and other types of costs; moreover inequality decrease interpersonal trust, discourage social participation and induce risk aversion, with the consequent negative effect all these factors exert upon firms' efficiency. In other words the Gini Index may capture a proxy of social capital. A second, possibly alternative, interpretation is that income inequality is higher in those areas in which economic relations are crystallized and the dominance of a consolidated groups of 'rentiers' cannot be compensated or reduced by a vivid and dynamic productive sector able to provide more qualified jobs and higher salaries for a significant part of the population. Adopting Dany Rodrick's terminology the undisputed dominance of "extractive" social and economic institutions may produce both income inequality and firm's inefficiency. The relation between income inequality and economic development is such a complex one that we don't aim to manage it within the limited scope of this essay. We are content to ascertain that, along with social capital, the Gini Index of income inequality shows a relation to firms' efficiency also at the province level, which is robust to different kinds of specifications.

As the multi-level analysis identifies the above mentioned relations as significant at a national level, it is not difficult to highlight, on the basis of the variables territorial distribution, the major differences that exist between the macro-areas. Firms' efficiency as we have estimated it, reflects, in more than one way, the endowments of social capital as ascertained in section 2. The Northern provinces, with a higher level of social capital in the civic behavior component and a lower/weaker degree of friends and family relations, are usually populated by firms that are more productive. Central Italy presents a more varied situation, with irregular levels of social capital and productivity. In the South, stronger familiar ties, feebler civic behaviors, less political participation and trust in interpersonal relationships go hand in hand with less efficient firms.

Tab. 5– Output-Oriented efficiency under variable returns to scale (OO) – Whole sample

VARIABLES	(1) Output Oriented	(2) Output Oriented	(3) Output Oriented	(4) Output Oriented	(5) Output Oriented	(6) Output Oriented	(7) Output Oriented	(8) Output Oriented	(9) Output Oriented
Individual Characteristics									
Self Financing	0.088*** (0.004)	0.088*** (0.004)	0.088*** (0.004)	0.088*** (0.004)	0.088*** (0.004)	0.088*** (0.004)	0.088*** (0.004)	0.087*** (0.004)	0.0877*** (0.00358)
Self Financing (squared)	-1.44e-05*** (1.06e-06)	-1.44e-05*** (1.06e-06)	-1.44e-05*** (1.06e-06)	-1.44e-05*** (1.06e-06)	-1.44e-05*** (1.06e-06)	-1.44e-05*** (1.06e-06)	-1.44e-05*** (1.06e-06)	-1.43e-05*** (1.06e-06)	-1.44e-05*** (1.06e-06)
Value of Participation	0.003*** (0.0005)	0.003*** (0.0005)	0.003*** (0.0005)	0.003*** (0.0005)	0.003*** (0.0005)	0.003*** (0.0005)	0.003*** (0.0005)	0.003*** (0.0005)	0.003*** (0.0005)
Export	15.92*** (0.212)	15.84*** (0.212)	15.91*** (0.212)	15.96*** (0.212)	15.79*** (0.212)	15.62*** (0.212)	15.61*** (0.212)	15.64*** (0.213)	15.61*** (0.212)
Size (medium- small)	0.996*** (0.103)	0.983*** (0.103)	1.000*** (0.103)	1.009*** (0.103)	0.979*** (0.103)	0.958*** (0.103)	0.958*** (0.103)	0.964*** (0.103)	0.958*** (0.103)
Size (medium- large)	3.190*** (0.102)	3.157*** (0.101)	3.190*** (0.101)	3.208*** (0.102)	3.154*** (0.102)	3.098*** (0.101)	3.098*** (0.101)	3.107*** (0.102)	3.098*** (0.101)
Size (large)	11.59*** (0.100)	11.50*** (0.100)	11.53*** (0.100)	11.58*** (0.100)	11.54*** (0.100)	11.39*** (0.101)	11.38*** (0.101)	11.39*** (0.101)	11.38*** (0.101)
Individual, Partnership and limited company	-1.889*** (0.092)	-1.876*** (0.092)	-1.879*** (0.0920)	-1.910*** (0.092)	-1.851*** (0.092)	-1.808*** (0.092)	-1.800*** (0.092)	-1.811*** (0.0922)	-1.802*** (0.092)
Cooperative and Consortiums	2.026*** (0.167)	2.155*** (0.167)	2.091*** (0.167)	2.085*** (0.167)	2.079*** (0.167)	2.248*** (0.167)	2.257*** (0.167)	2.260*** (0.168)	2.253*** (0.167)
Contextual Characteristics									
Jacob		0.101*** (0.024)						-0.014 (0.025)	0.039 (0.029)
Jacob squared		-0.001 (0.001)						0.0001 (0.0004)	-0.007 (0.0004)
N. of firms at province level			0.006*** (0.0003)				0.002*** (0.001)		0.002*** (0.0008)
Infrastructures (without ports)				0.0113*** (0.001)				0.005*** (0.001)	
Gini Index					-0.141*** (0.014)		-0.0820*** (0.030)	-0.046* (0.027)	-0.088*** (0.030)
Trust and Social Partecipation						0.177*** (0.011)	0.140*** (0.016)	0.156*** (0.014)	0.134*** (0.016)
Civicness						0.480*** (0.025)	0.400*** (0.035)	0.455*** (0.036)	0.390*** (0.040)
Crime, Vandalism and urban blight						0.158*** (0.015)	0.139*** (0.027)	0.127*** (0.029)	0.139*** (0.029)
Rarity of Interpersonal relationships						0.437*** (0.036)	0.326*** (0.050)	0.349*** (0.053)	0.323*** (0.056)
Constant	14.74*** (0.001)	12.01*** (0.359)	14.25*** (0.109)	13.37*** (0.001)	20.34*** (0.001)	14.09*** (0.001)	17.28*** (1.185)	15.77*** (0.001)	17.02*** (1.205)
Observations	247,454	247,454	247,454	246,952	247,454	247,454	247,454	246,952	247,454

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

6. Concluding Remarks

In this paper, we have attempted an analysis of the relationship between firms' productivity, inequality and social capital variables in the geographical context in which firms are located. Productivity has been measured through the DEA methodology that assesses each firm's productivity through a comparison with the best performing firms of the same sector. In particular, we estimated an output-oriented model under variable returns to scale. Then, on the basis of an aggregation of these measurements, it has been possible to calculate the average firm's productivity for 103 Italian provinces and then to map the efficiency of the *ca.* 284,000 firms included in the Cebi-Cerved database. As the divergence between the values of efficiency measured through a factors-of-production-oriented and the output-oriented technique was minimal, we decided to report only the latter. The results we have thus obtained confirm that a relevant productivity gap exists between the North and the South of the country. However, we have also found higher productivity areas in the provinces geographically located along the line connecting Naples to Bari.

The map of productivity has been related to the social capital endowments as they emerged in the analysis put forth in section 2. The analysis was carried out by means of a multilevel model through which it is possible to handle complex structures the units of which are not mutually independent and related to the group they belong to.

The relations that are usually accepted in the literature found confirmation in our analysis. The exporting firms, the self-financing firms, and the firms taking part to groups, are also the more productive. Moreover, cooperative firms are more productive than companies. On the other hand, looking at the context variable, it appears that infrastructures, the number of firms and a Jacob index of diversification are factors associated with a higher level of productivity.

As to the social capital variables, multilevel analysis shows that all the component emerging from the PCA undertaken in section 2, are associated component associated with positive and significant values of firms' productivity: Component 1, that we described as "trust and social participation", component 2, ("civicness"), Component 3 ("crime, vandalism and urban blight") and Component 4 ("rarity of interpersonal relations") show positive correlation with firms' efficiency. Strong family and friends relationships, which are captured both by component 1 and component 4 are negatively related to firms' productivity: a more frequent resort to family and friends relationships, especially when they are used as an asset to job searching, may indicate, and at the same time fortify, an institutional and social environment in which higher transaction costs and external diseconomies are a handicap to entrepreneurship. By contrast, a widespread civism intended as pro-social behavior independent of specific interpersonal bounds, seems to create an economic environment which is more favorable to entrepreneurship and collaboration among firms, since it increases interpersonal trust, lower transaction costs, enhance the compliance of formal or informal rules of fairness and foster a more transparent, impartial and efficient working of the public administration.

The interaction between these social capital dimensions to a large extent explains the different levels of firms' productivity observable in different macro-areas of the country. In the North, higher standards of civic behavior and a less frequent resort to family and friends relations seem to be strongly correlated with higher levels of firms' efficiency. In the South a lower endowment (or employment) of "civic" social capital and a larger impact of the "strong" networks are associated to a lower average efficiency of the firms.

The analysis of social capital broadly intended, as well as of its different forms and expressions, is in many cases a necessary but not sufficient condition to the understanding of the influence that social, cultural and relational factors can bear on entrepreneurship's quality

and success and on its local economic impact. A negative role in relation to firm's efficiency is played by inequality. The more unequal a province is, according to the Gini Index of income inequality, the less efficient are the firms located therein. The latter may hinder productivity by playing as a boost to social distress and conflicts; yet it may itself be the result of poor working of the market and of development processes that may render the social structure more static and polarized in terms of income, wealth and opportunities. While a simple causal direction cannot be derived from our multilevel regression, the correlation between social capital, equality and firm's efficiency appears to emerge as a robust and significant one, which certainly calls for further explorations.

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