Firm productivity and institutional quality: Evidence from Italian industry

Annamaria Nifo
University of Sannio

Andrea Lasagni
University of Parma

Gaetano Vecchione
Second University of Naples

Abstract

This paper aims to contribute to the debate on the determinants of differentials in firms productivity. The case of Italy looks particularly interesting, since there is a substantial and long-lasting productivity gap between industrial firms located in the southern regions and those in the rest of the country. We test the hypothesis that macro factors, especially the quality of institutions, play a central role in explaining firm productivity in Italy. Consistent with previous studies, our results show that institutional quality is one of the basic determinants of the observed TFP differentials across firms in different Italian regions.

JEL code: **C33, D24, L60, O43, R11**

Keywords: *productivity, macroeconomic factors, institutional quality, differentials*.

Introduction

Recent years have witnessed growing interest in the heterogeneity of firms productivity. While considerable empirical evidence has been gathered about large, persistent and ubiquitous productivity differentials across businesses, the central theoretical question on the main determinants of such heterogeneity is still under debate. Therefore, in the search for a satisfactory answer to the question recently posed by Syverson (2011, p. 3): "*is it dumb luck, or instead something – or many things – more systematic?*", economists have sought to identify the factors affecting productivity and single out their relative weight in explaining inter-firm differences.

An appealing taxonomy of the determinants of productivity differentials is that distinguishing between *internal* and *external* factors. The former label is used for those engendered and controlled by decisions made by firms' managers or owners, the latter for those connected to the outside environment rather than insiders' behavior. A list of the first kind of factors usually includes: size (Van Biesebroeck, 2005), industry (), the adopted technology (Jorgenson et al., 2008; Bartelsman et al., 2009; Faggio et al., 2009), the endowment of human capital (Shearer, 2004; Bandiera et al., 2009) and especially managerial skills (Bushnell and Wolfram, 2009; Bloom and Van Reenen, 2010), the amount of R&D investments (Doraszelski et al., 2009), the degree of international openness (), the propensity to innovate and the ability to promote product upgrading (Kortum et al., 2004; Balasubramanian et al., forthcoming), etc. Conversely, the second source of inter-firm productivity differences typically concerns the *macroeconomic* context in which firms operate: for example, more competitive and contestable markets, a context more favorable to innovation, inter-firm cooperation and positive spillovers and so on. Often, a positive and important *external* factor is also recognized in the good institutional quality of the geographical area where the firm is located. Such quality may be defined as a fruitful combination of formal institutions, good rules and practices, cooperation among firms, researchers and policy makers. High levels of institutional quality may significantly help to enhance the ability of a region to capture development opportunities (North, 1990; OECD, 2001), a mechanism which may emerge through increases in local firms' productivity.

Pin-pointing the most relevant determinants of firms' productivity and evaluating their relative importance might be crucial not only for assessing the economic performance of regions and countries and understanding its underpinnings, but also for developing better-targeted policies. From the policy maker's viewpoint, this issue seems to be particularly relevant when firms' productivity differentials are evidently connected to different geographical locations. Under such circumstances, *macro* factors, such as local institutional quality, are expected to be especially significant to explain the observed diversity. The case of Italy, in this respect, looks particularly interesting, since a substantial and long-lasting productivity gap has opened up between industrial firms located in the regions of the *Mezzogiorno* (a large area accounting for about one third of the whole of Italy[1][1]) *vis-à-vis* those in the rest of the country.

As we will see later in greater detail, the relevance of institutions and more generally macroeconomic factors in explaining inter-firm productivity differentials is widely recognized by the theoretical literature and validated by empirical investigation. While these studies deal more often with international comparisons, in other cases the attention is rather on interregional heterogeneity. This paper focuses on Italian industrial firms, aiming to contribute to the discussion on the main determinants of the observed gap between the Centre-North and Southern firms' Total Factor Productivity (TFP). Our working hypothesis is that differences in local institutional quality endowments are crucial in shaping inter-firm productivity differentials.

For this purpose, we build a unique dataset by matching two sources: MET (2008) surveys containing information collected through direct interviews with a large representative sample of about 25,000 manufacturing companies, and the AIDA Bureau Van Dijk data containing

1[1] The term *Mezzogiorno* corresponds to the Southern regions plus the islands, namely Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicily and Sardinia.

information on financial variables for the same firms. As a result, we obtain a rich dataset for an unbalanced panel of about 4,000 units over the period 1998-2007. Estimation of TFP and its determinants is carried out by employing several different estimation techniques (OLS, FE, GMM and Levinsohn-Petrin). The robust result is consistent with most of the existing literature: institutions matter, as they prove to be one of the main drivers of firms' productivity differentials.

The paper is organized as follows: after this introduction, Section 2 provides an overview of the literature on external factors as determinants of productivity levels, growth and differentials, and particularly on the role of *institutional quality*. Section 3 presents the econometric investigation, illustrates the estimation methods and discusses the main results. Section 4 summarizes the main conclusions.

2. Macroeconomic determinants of firm productivity: A literature review

The idea that social, historical and cultural factors, institutions and the political andadministrative context may play a decisive role in conditioning and steering the development process, as well as the economic success or decline of countries, regions and individual firms, has been extensively considered by the economic literature, both from the perspective of national and regional growth and that of firms' productivity.

From the former perspective, a very broad strand of literature has focused on the ties between the above-mentioned macroeconomic factors and the economic growth of countries and regions: in this vein, many eminent contributions (for example, Hall and Jones, 1999; Acemoglu et al., 2001, 2002; Easterly and Levine, 2003; Alcála and Ciccone, 2004) have provided theoretical grounds and extensive empirical evidence supporting the role of macroeconomic factors (such as institutional quality, openness to international trade, and geographical conditions) as fundamental determinants of long-run productivity and drivers of growth.

On the other hand, many other authors have been concerned with the influence of the environment, and more specifically of institutional quality, on firms' productivity, which can be affected by the operating environment through a variety of channels. Syverson (2010) and Chanda and Dalgaard (2008) identify the presence of spillovers and the degree of competition as the main channels through which the external macroeconomic factors impinge on the level of business productivity. In this interpretation, spillovers basically operate through *incentive mechanisms*: they encourage companies to invest more in R&D (Griffith et al., 2007), shorten the technology distance (Bloom et al., 2007), and accelerate the process of convergence to the productivity levels of the leader in the domestic market (Bartelsman et al., 2008). Other related studies (Foster et al., 2001; Melitz, 2003; Bloom et al., 2009; Eslava et al., 2004, Bernard et al., 2006; Fernandes, 2007; Verhoogen, 2008) focus on the relationship between *intensity of competition* and productivity. Greater competition allows the best companies to gain larger market shares at the expense of less efficient firms: the so-called "Darwinian selection of the market" rewards the most competitive, dynamic, flexible and innovative producers. In addition, competition creates greater opportunities for comparing performance, making it easier for owners to monitor managers (Lazear and Rosen, 1981; Nalebuff and Stiglitz, 1983). Also, improvements in productivity may generate higher revenues and profits in a more competitive environment where price elasticity of demand tends to be higher and, since more competition is likely to raise the likelihood of bankruptcy at any given level of managerial effort, managers have to work harder to avoid this outcome (Shmidt, 1996; Aghion and Howitt, 1998). An additional effect of greater competition on firms' productivity may stem from the increased incentive for workers, provided that product market rents are shared with workers in the form of higher wages or reduced effort (Haskel and Sanchis, 1995).

Other studies focus on the relationship between *intensity/quality of market regulation* and productivity. In this view, a poor or inadequate regulation can create perverse incentives that reduce productivity (Bridgam et al., 2009). By contrast, largely positive effects can be associated to the implementation of an incentive program combining the gains of economic operators to obtain particular standards of operational efficiency (Knittel, 2002), similar to those of the programs of product market regulations in OECD countries (Nicoletti and Scarpetta, 2005, Arnold et al., 2008), or privatization programs in Eastern European countries (Brown et al., 2006).

Looking more closely at the role of institutions, it is at least since the work of Douglass North (1990, p. 3), for whom "institutions are the rules of the game in a society", that institutions have been acknowledged to crucially contribute to forming the set of incentives underlying behavior and individual choices. As institutions significantly affect the degree of development of an economy, its capacity for growth, the extent of inequalities, etc., many scholars have focused on the links between institutional quality and economic results. The importance of institutional quality as a basic determinant of economic growth and TFP in the long term has been ascertained by many recent contributions (for example, McGuinness, 2007; Acemoglu and Robinson, 2008; Chanda and Dalgaard, 2008). These have shown how better institutions create a favorable business environment and a legal structure which facilitates investments and directs them towards activities able to ensure higher and more rapid economic growth. Good institutions promote accumulation of physical and human capital (Rodrik et al., 2004), encourage firms to use better technology, invest in knowledge creation and transfer (Loayza et al., 2005), produce on a larger scale and operate with a long time horizon, with a positive impact on competitiveness and economic performance (Aron, 2000), thereby ensuring higher levels of efficiency and often a fairer distribution of income (Bowen and De Clercq, 2008). More generally, other studies, both for cross-country (Barro and Lee, 1993; Nugent, 1993; Mauro, 1995; World Bank, 1997; Brunetti, 1997; Knack and Keefer, 1997; Djankov et al., 2002) and inter-regional comparisons (Heliwell and Putnam, 1995; Barro and Sala-i-Martin, 1995; Arrighetti and Serravalli, 1999a; Dall'Aglio, 1999), have provided evidence for significant correlations between measures of institutional quality and various indicators of economic performance.

An important related issue concerns the measure of institutional quality. As the concept of institution is a complex one, it has often been somehow represented by a weighted average of measures of socio-politico-administrative indicators (for example, the degree of corruption, the good or bad definition of property rights, trial times, administrative capacity of local and regional governments – concerning for example health and social policies and waste management – market competitiveness and barriers to entry, tax evasion and the size of the shadow economy, the endowment of social and economic infrastructures and so on). Nifo and Vecchione (2012), with reference to Italian provinces, constructed the synthetic indicator Institutional Quality Index (IQI), based on five groups of elementary indexes (in turn connected to measures of corruption, governance, regulation, law enforcement and social participation). The other items of IQI concern major dimensions of institutional quality: the degree of freedom of press and association (Voice and Accountability), the quality of public service and the policies formulated and implemented by the local government (Government Effectiveness), the ability of government to promote and formulate effective regulatory interventions (Regulatory Quality), the perception concerning law enforcement both in terms of contract fulfilment, property rights, police forces, activities of the magistracy and crime levels (Rule of Law), the degree of corruption of those performing public functions both in terms of illegal gains and private proceeds acquired to the detriment of society (Control and Corruption).

Each of these distinct facets of institutional quality was previously analyzed separately by the literature.The relationship between corruption and regional or national productivity has long been discussed from both a theoretical (Krueger, 1974; Rose-Ackerman, 1978; Baumol, 1990; Acemoglu and Verdier, 2000) and empirical perspective (Méon and Sekkat, 2005; Salinas-Jimenez, 2011). While the specific relationship between corruption and firm productivity remains almost unexplored (a significant exception being De Rosa et al., 2010), both theory and empirical evidence highlight the negative consequences of corruption for resource allocation, entrepreneurship, investment and innovation (Baumol, 1990). Other studies emphasize that the entry of new firms is made more difficult in the presence of greater corruption and larger unofficial economies (Djankov et al., 2002); investment decisions are discouraged by *de facto* entry barriers into otherwise competitive markets (Alesina et al., 2003); corruption directly affects the sources of productivity enhancements, technological progress and investment (Svensson, 2005; Krusell and Rios-Rull, 1996).

Concerning "Regulatory Quality", other contributions show the positive impact of liberalization and privatization policies in the OECD area on productivity in all sectors (Nicoletti and Scarpetta, 2003) and document the negative relationship between entry barriers and services productivity in France and Italy (Daveri et al., 2011). An investigation of micro data from Bangladesh, China, India and Pakistan (Dollar et al., 2003) shows that the impact of *investment climate* on firms' TFP is systematically positively related to the "Regulatory Quality" indicators.

Concerning the issue of "Government Effectiveness", some studies have highlighted the impact of the history of peoples and connected institutional structures on the economic performance of countries (Hall and Jones, 1999), focusing for example on the role of political institutions in steering entrepreneurial efforts towards more productive activities and supporting business (Baumol, 1990; Murphy et al., 1991). Arrighetti and Lasagni (2011) argue that private firms are more able to innovate and to push technological change where the intermediate government bodies (primarily local political and administrative institutions) play a more active and positive role, influencing also firms' productivity. More effective public policies in health, transport and education (Kneller and Misch, 2010), transport (Datta, 2008; Shirley and Winston, 2004), and public electricity services (Reinkka and Svensson, 2002) are found to affect firms' productivity positively. The empirical works regarding the "Rule of Law" find that a higher degree of "Rule of Law" is associated with better long-run economic performance (Haggard and Tiede, 2011).

As regards the literature on institutional quality, there has been extensive coverage of institutional thickness (Amin and Thrift, 1994) and social capital (Putnam, 1993a; Narayan and Pritchett, 1997; Woolcock, 1998). Both these concepts are connected to a broad combination of factors including the presence of virtuous local institutions and inter-institutional links able to create a sharing culture and a set of values which help construct the so-called "social atmosphere", generate mutual trust, enhance innovative capacity, expand common knowledge and strengthen local economic activity. Empirical evidence has clarified what role social cohesion (Rodrik, 1997; Ritzen Easterly and Woolcock, 2000) and the spread of collaborative and associative practices (Putnam, 1993a and 1993b; Narayan,1999) may have as a driver of economic development, showing that growth is favored by greater social peace and political stability, and by a better quality of institutions and public services.

The item “Voice and Accountability” of IQI fits into the debate on social capital *à la Putnam*, while representing a dimension of social capital more consistent with the focus of the present work: a fair picture of the degree of citizens’ participation in social and public life, represented by their willingness to act as volunteers, the presence of non-profit organizations and social cooperatives, and the number of books published. The literature on the relationship between social participation and firm performance suggests that knowledge flows are geographically bound as they tend to stream through social networks (Powell and Owen-Smith 2004; Sorenson 2003; Tallman et al. 2004).

From the policy maker's viewpoint, the issue of the impact of institutional quality on firms’ performance seems to be particularly relevant when firms’ productivity differentials are evidently connected to different geographical locations. In this occurrence, the *macro* factors, such as local institutional quality, are expected to be especially significant to explain the observed inter-firm diversity. The case of Italy, in this respect, looks particularly interesting, since there is a substantial and long-lasting productivity gap between industrial firms located in the Southern regions and those in the rest of the country. For Italy, the literature largely recognizes a role for institutions in explaining productivity differentials. For example, Nifo (2011), Aiello et al. (2010), Basile et al. (2009), Cannari et al. (2009), and Viesti (2005) attach a crucial role to *context* factors in accounting for the significant and persistent productivity dispersion across Italian firms and regions. In particular, concerning institutions, Del Monte and Giannola (1997) claim that institutional factors have contributed to creating an unfavorable business environment and preventing decades of aid policies in the South being effective. In a similar vein, Scalera and Zazzaro (2010) argue that public policies have been undermined by a poor institutional context. All these papers point out the negative impact on the economic performance of Southern firms and regions exerted by poor institutional quality, corruption, excessive bureaucratization, poor or inefficient organization of public services, a lower endowment of infrastructures, and the lack of security.

From the empirical standpoint, the shortage of reliable micro data has seriously curbed investigations. Nevertheless, a few studies on the *macro* determinants of smaller productivity in southern Italy are worth mentioning. Aiello *et al.* (2012) explain the gap with poor infrastructure endowment , the lower efficiency of local administration and the lower investments in R&D. Fazio and Piacentino (2010) find that, especially for labor-intensive firms, the lower productivity in the South is due to worse socio-economic conditions rather than to firm-specific factors. Erbetta and Petraglia (2008), arguing that firms located in the Italian *Mezzogiorno* suffer from a significant productivity gap, conclude that this is due to K is our measure of physical capital, namely the value of tangible fixed assets as reported in the balance sheet, and L is our measure of employment level, namely the number of employees. The values (natural logs) of all variables are observed for the i-th firm (i=1,…, about 4,000) in different years t (t=1,…,10)2[5].

The Cobb-Douglas version for (1) with constant returns to scale $\alpha_k + \alpha_l \equiv 1$ is:

$$Y_{it} = A_{it} K_{it}^{\alpha_k} L_{it}^{\alpha_l} \qquad 3)$$

Taking the natural logarithm and considering m_{it}, $\alpha_0, w_{it}, \varepsilon_{it}$ as respectively: i) the value of expenditures for the purchase of material goods (as suggested in Van Beveren, 2010), i.e. “raw materials expenditures”, ii) a constant fixed term, iii) a firm-specific time varying term (our proxy for the TFP), iv) the error measurement term, equation (3) becomes:

2[5] To control for inflation effects, we deflate our original data on firms’ revenues by using the ISTAT index of producer prices in different sectors (ISTAT ATECO codes for the detail at two-digit level). The data for physical capital and the purchase of material goods are also deflated by using the ISTAT index of producer prices for capital goods.

$$y_{it} = \alpha_0 + \alpha_l l_{it} + \alpha_k k_{it} + \alpha_m m_{it} + w_{it} + \varepsilon_{it} \qquad 4)$$

where lower case letters indicate natural logarithms. Substituting in (2):

$$\ln(A_{it}) = \ln(Y_t) - \alpha^l \ln(L_{it}) - \alpha^k \ln(K_{it}) - \alpha^m \ln(M_{it}) - \varepsilon_{it}$$

where:

$$\mathrm{E}\left[\ln(A_{it})\right] = w_{it} \qquad 5)$$

Thus, we assume that the productivity is in the residual, after controlling for inputs K, L and M, and we will estimate firm-level TFP values. We estimate separate production functions for 11 different groups of industries3[6]. By estimating separate production functions for various industry groups, one can examine in a more consistent manner the individual heterogeneity in the data. As recalled by Van Biesebroeck (2007), “productivity is intrinsically a relative concept” and therefore it is necessary to compare TFP “indexes”. For this purpose, we compute our TFP index as a ratio between the value of w_{it} and the average of w_{it} across all firms in the industry (two-digit ISTAT ATECO code).

As mentioned above, there are different estimators to compute a TFP index. In our paper four of them are considered in estimating equation 4: Ordinary Least Square (OLS), Fixed Effects (FE), Blundell-Bond System General Method of Moments (SYS-GMM), and Levinsohn-Petrin (LP). The OLS approach assumes that the inputs in the production function are exogenous i.e. independent of the firm’s efficiency level, thus ignoring the simultaneity problem emphasized by the methodological literature on TFP estimation. Well known methods suited to dealing with the problem of input endogeneity include the FE and IV (Instrumental Variables) methods (Griliches and Mairesse, 1995). The FE estimator corrects for both the simultaneity and selection bias. As a consequence, the estimated coefficients of the variable inputs (labor and materials) are expected to

3[6] See Appendix 2 for details on industry grouping.

be lower than those produced by OLS (Van Biesenbroeck, 2007). However, as explained by Arnold (2005), there are still some major drawbacks in the FE estimator. First, a substantial part of the information in the data is left unused. A fixed-effect estimator uses only variability across time, which tends to be much lower than cross-sectional variability. This means that the coefficients will be weakly identified. Second, the assumption that technology is fixed over time may not always be reasonable, making the whole procedure invalid. In the literature (see Van Beveren, 2010), two GMM methods are generally employed to handle these problems: the "difference" GMM and more recently the "system"GMM proposed by Arellano and Bover (1995) and further developed by Blundell and Bond (2000)4[7]. The system GMM uses a system of equations where lagged levels of variables serve as instruments for an equation in first differences and lagged first differences are used as instruments for an equation in levels5[8]. A fourth, widely-employed method is that proposed

4[7] In essence, to tackle the 'endogeneity of inputs' or simultaneity bias (i.e., the correlation between the level of inputs chosen and unobserved productivity shocks, see De Loecker, 2007), it is necessary to find good instruments. This is the basic idea at the heart of the Arellano-Bond (AB) estimator that stems from the Anderson & Hsiao (AH) estimator. AH removed the individual heterogeneity by differencing the basic panel model and then instrumenting to fix the endogeneity problem. Arellano and Bond (1995) proposed the model in the context of a GMM estimator. As Van Beveren (2010) recalled, possible instruments include the lagged levels of the inputs. Specifically, after first-differencing the production function, lagged inputs can be used as instruments for changes in the inputs. However, because inputs tend to be highly persistent over time, lagged levels of inputs tend to be only weakly correlated with input changes. In empirical practice, using lagged inputs as instruments for changes in inputs may cause the capital coefficient to be biased downwards (and often insignificantly) and lead to unreasonably low estimates of returns to scale. Thus, Blundell and Bond (1999) propose an extended (GMM SYS) estimator using lagged first-differences of the variables as instruments in the level equations and find that this estimator yields more reasonable parameter estimates. "Blundell and Bond estimator augments Arellano-Bond by making an additional assumption, that first differences of instrument variables are uncorrelated with the fixed effects. This allows the introduction of more instruments, and can dramatically improve efficiency" (Roodman 2009, p. 1).

5[8] Blundell and Bond (2000) suggest that the system GMM is the most appropriate estimator when estimating first differences with weak instruments. It has been shown to be a more reliable and robust estimator than the difference by Levinsohn and Petrin (2003). This latter technique is very close to the semi-parametric Olley and Pakes approach, but it has the advantage of requiring fewer data at firm level6[9].

Our estimation of the production function (Table A2.1) evaluates elasticities, not always statistically significant, to be between 0.10 and 0.49 (with respect to labour) and between 0.06 and 0.14 (with respect to capital). For materials, the variance of elasticity is somewhat larger, lying between 0.18 and 0.91; in few cases the Levinsohn-Petrin procedure estimates a materials coefficient equal to one7[10]. As expected, we find that OLS and FE model often underestimate the coefficient of capital, which turns to be larger in GMM and LP regressions. Table 1 shows the correlation among the different TFP estimators for our data. We find that the different methods yield remarkably high correlation in TFP estimates (like in Van Biesenbroeck, 2007, and Van Beveren, 2010).

[Table 1 - here]

To complete our discussion on the estimated values of TFP across firms, we use a graphical comparison of the cumulative distributions of TFP (see Figure 1). Regardless of the estimation

---

GMM when estimating production functions (see e.g. Lokshin et al., 2008; Hempell, 2005; O'Mahony and Vecchi, 2009; Ballot et al., 2001).

6[9] The method suggested by Olley and Pakes (1996) gives consistent and unbiased estimates only in the case of a strictly monotonous relationship between the proxy and output. Consequently, firms that make only intermittent investments will have their zero-investment observations truncated from the estimation routine because the monotonicity condition does not hold for these observations. Levinsohn and Petrin (2003) suggest using intermediate inputs as a proxy rather than investment. Typically, many datasets will contain significantly less zero-observations in materials than in firm-level investment. Levinsohn and Petrin also offer several specification tests to check for the appropriateness of the proxy used. We do not use the Olley-Pakes method because our dataset is fully balanced (we do not have any firm exit in our data)

7[10] As explained by Arnold (2005), this is due to an imposed upper limit in the estimation algorithm.

method, the TFP distribution for firms localized in the South lies always above (and to the left of) the TFP distribution for firms localized in the North, thus confirming the productivity gap of Southern firms .

[Figure 1 - here]

All in all, at the end of this stage we arrive at reasonably robust firm-level TFP estimates. These are used in the second step, when we study the effect of institutional quality on firm productivity.

3.3 Explaining productivity: can institutional quality make the difference?

Having obtained firm-level estimated TFP, we now use it as a dependent variable, to assess the role of institutional quality as an explanatory factor for firms' productivity. Our measure of institutional quality is the IQI indicator introduced in section 2 and originally proposed by Nifo and Vecchione (2012).

As mentioned above, the IQI is structured into 24 elementary and five aggregate indexes (dimensions)[8[11]] regarding some major quality characteristics of a governance system covering the early 2000s. Each dimension is the result of the aggregation of simple indexes whose values are gathered from official sources and surveys conducted by public, private and non-governmental institutions[9[12]].

Figure 2 illustrates the geographical pattern of IQI in Italy, highlighting a clear institutional quality divide between the North and South of the country.

[Figure 2 - here]

8[11] Voice and accountability, Government effectiveness, Regulatory quality, Rule of law, Control and corruption

9[12] For a more detailed discussion of the aggregation method and data sources, see Nifo and Vecchione (2012).

The importance of the North-South gap with respect to a broad range of socio-economic conditions, widely documented by the literature discussed above, is confirmed by Figure 2 for institutional quality as well: all the provinces in the *Mezzogiorno* have lower levels of institutional quality than in the rest of Italy.

Estimation of the determinants of firm TFP is carried out through equation (6) whose parameters are estimated by using five alternative mothods. In each model, we regress firm TFP on the IQI and a set of other regressors used as controls:

$$TFP_i = \alpha_i + \beta_1 X_i + \beta_2 S_i + \beta_3 IQI_i + \varepsilon_i \quad (6)$$

where TFP_i is the TFP index calculated as average across the years 2005-2007 to reduce short-time shock bias; X_i is a vector including: firms' age in years (AGE); two dummy variables relative to firms' class size (SIZE); a group membership dummy (GROUP); industry dummies (PAVITT[10[13]]). S_i is a location dummy (SOUTH) equal to 1 for firms located in Southern regions, and 0 otherwise; IQI_i is the institutional quality index.

[Table 2 - here]

Table 2 reports the results of regressions. First of all, it may be noted that our working hypothesis is basically confirmed: IQI coefficients are positive and significant in all the four different models. The estimated coefficients indicate that higher institutional quality tends to improve firm performance by about 19-26% depending on the estimation techniques. This outcome is confirmed even with the inclusion of the dummy SOUTH, capturing various other effects related to the less favorable location.

[10[13]] Pavitt Taxonomy includes the following firm categories: 1) Supplier dominated, 2) Supplier or Scale intensive, 3) Specialized Supplier, 4) Science Based.

The estimated impact of control variables is also fairly informative. First, small and medium sized enterprises show lower levels of TFP than large firms employing more than 250 workers. The productivity gap is mostly evident for the smallest firms with less than 50 employees (about 20% of our sample; see Table A1.2). We believe that this result is consistent with the previous literature on Italian industry (see for example Castellani and Giovannetti, 2010 or Aiello *et al.*, 2012), where productivity premia for large and medium-sized firms are associated with other factors as well (e.g. internationalization, economies of scale or human capital endowment). Second, firms belonging to a business group show significantly higher levels of TFP than other firms. Finally, age does not appear to be relevant in determining TFP (except for GMM1 or GMM2 estimation, when its coefficient shows a significantly positive sign).

An interesting question is whether the positive relationship between IQI and firm-level TFP can be specifically attributed to one or more of the factors included in the synthetic index. To evaluate the possibly different effects of each sub-index composing the IQI, we ran a set of regressions by using some IQI sub-indexes as right-hand-side variables. The additional insights provided by this exercise can prove particularly useful in designing measures to promote productivity.

In Tables 3 and 4, where the IQI is respectively replaced by the sub-indexes "Control and Corruption" and "Regulatory Quality" we do not find significant effects on firm TFP. Both of them have the expected sign across all models (negative and positive respectively), but coefficients are never statistically significant.

[Table 3 - here]

A possible explanation is that the level of corruption is quite similar across Italian regions (De Rosa et al., 2010), and small differences are unlikely to be associated with productivity differentials at firm level.

[Table 4 - here]

Somewhat surprisingly, and in contrast with previous studies on the relationship between *investment climate* and firm performance (for example Dollar et al., 2003), we could not find any significant impact of “Regulatory Quality” on firms’ TFP. Conversely, when considering the IQI dimension “Government Effectivness” (Table 5), the estimated coefficients are significant and similar in magnitude to those reported in Table 2.

[Table 5 - here]

Concerning the dimension “Rule of Law” (including indexes on judges’ productivity, trial times, shadow economy and crimes), we get coefficients with the expected sign across all models, even if unfortunately not statistically significant.

[Table 6 -here]

Finally, in Table 7 we report the results of regressions obtained with the IQI sub-index “Voice and Accountability” representing how much citizens participate in social life. This is positively associated with firm-level TFP and its influence is statistically significant. In particular, we can see the estimated impact of “Voice and Accountability” reported in Table 2 and Table 5. This happens probably because, where “Voice” is relatively low, firms incur higher organizational costs and a lower degree of cooperation across social groups.

[Table 7 - here]

Summarizing, the results of our regressions seem to confirm that for Italian industrial firms individual productivity is strongly affected by the institutional quality of provinces where they are located. This conclusion supports the view that the comparative performance of firms located in Southern Italy is significantly undermined by factors *external* to firms, i.e. connected to the general context of the location in a Southern region, which pose additional constraints on firms' efforts to increase productivity and competitiveness.

4. Concluding remarks

This paper explored the hypothesis that differences in institutional quality endowments are crucial in shaping inter-firm productivity differentials. For this purpose, we built a unique dataset for an unbalanced panel of about 4,000 Italian manufacturing companies over the period 1998-2007 to estimate individual TFP and its determinants by employing several different estimation techniques (OLS, FE, GMM and Levinsohn-Petrin).

The robust result, in line with our hypotheses, is consistent with most of the existing literature that ascribes a key role to the business environment and institutional context in determining firms' productivity: "institutions do matter" as they prove to be one of the main drivers of TFP differentials. Firms' productivity, as measured by TFP, does appear to be affected by institutional features, suggesting that future research should carefully consider the possible consequences of alternative institutional settings on a variety of economic variables. The presence of invaluable spillovers connected to good quality institutionsand the incentive mechanisms activated by them, is one of the main channels through which macroeconomic factors positively impact on the *investment climate* and competitiveness.

In addressing the multidimensionality of the institutional structure, this paper also provided a more nuanced analysis of the institutional determinants of firms' productivity. In particular, among the different aspects and elementary indexes constituting the synthetic IQI indicator, the dimensions relative to "Government Effectiveness" and "Voice and Accountability", accounting for the suitability and strength of government policies and the social capital endowment at the local level, proved to have the most effect on firm productivity. Interestingly and - in some way - surprisingly, corruption did not emerge as having a robust impact on such productivity.

From a policy perspective our results indicate that institutional and regulatory reform – especially in “Government Effectiveness” and “Voice and Accountability” – may enhance the ability of lagging regions to capture development opportunities, for example by specializing in higher-valued products and seeking to reap benefits from international integration.

This analysis was performed prior to the 2008 international crisis. Further studies to extend the analysis of the correlation between institutional quality and productivity during and after the crisis, would certainly be both interesting and desirable.

References

Acemoglu, D., S. Johnson. and J.A. Robinson. 2001. 'The colonial origin of comparative development: an empirical investigation', *American Economic Review*, 91, pp. 1369-1401.

Acemoglu, D. and J.A. Robinson. 2008. 'The role of institution in growth and development, Commission on growth and development', Working Paper No. 10, Commission on Growth and Development.

Acemoglu, D. and T Verdier. 2000. 'The Choice between Market Failures and Corruption', *American Economic Review*, American Economic Association,vol. 90(1), pages 194-211.

Aghion, P. and P. Howitt. 1998. *Endogenous Growth Theory*. Cambridge, MA: MIT Press.

Aiello, F., V. Pupo and F. Ricotta. 2010. 'Un'analisi territoriale della produttività totale dei fattori in Italia', Working Paper No. 07, Dipartimento di economia e statistica, Università degli Studi della Calabria.

Aiello, F., V. Pupo and F. Ricotta. 2012. 'Explaining TFP at firm level in Italy. Does location matter?', paper presented at SIE 53rd Annual Conference Matera, 18-20 October 2012.

Alesina, A., S. Ardagna, S. Nicoletti and F. Schiantarelli. 2005. 'Regulation and Investment', *Journal of the European Economic Association*, June, pp. 1-35.

Alesina, Alberto and E.L. Ferrara. 2000. 'Participation in Heterogeneous Communities', *Quarterly Journal of Economics*, 115 (3), 847–904.

Amin, A. and N. Thrift. 1994. *Globalisation, institutions and regional development in Europe*, Oxford University Press.

Arellano, M., and O. Bover. 1995. 'Another Look at the Instrumental Variable Estimation of Error-Components Models', *Journal of Econometrics*, 68, 29-52.

Arnold, J.M. 2005. 'Productivity Estimation at the Plant Level: a practival guide', Working paper, http://www.jensarnold.de/prodest.pdf.

Arnold, J., G. Nicoletti and S. Scarpetta. 2008. 'Regulation, Allocative Efficiency and Productivity in OECD Countries: Industry and Firm-Level Evidence', OECD Economics Department Working Papers No. 616.

Arrighetti, Alessandro, Andrea Lasagni. 2011. 'Capitale sociale, contesto istituzionale e performance innovativa delle imprese', *Scienze Regionali* (10), pp. 5-34.

Arrighetti, A. and G. Serravalli. 1999. *Istituzioni intermedie e sviluppo locale*, Rome: Donzelli Editore.

Aron, J. 2000. 'Growth and institutions: A review of the evidence', The World Bank Research Observer, vol. 15, 1, pp. 1203-1228.

Balasubramanian, N. and J. Sivadasan. 2011. 'What Happens When Firms Patent? New Evidence from U.S. Economic Census Data', *Review of Economics and Statistics*, 93 (1), 126-146.

Bandiera, O., I. Barankay and I. Rasul. 2009. ‘Social Connections and Incentives in the Workplace: Evidence from Personnel Data’, *Econometrica*, 77 (4), 1047-94.

Basile, R., D. Castellani and L. Benfratello. 2009. ‘Le determinanti della localizzazione delle imprese multinazionali: l’attrattività dell’Italia nel contesto europeoì, in Rondi L. and Silva F. (eds.), *Prove di Cambiamento nel Sistema Produttivo Italiano*, Il Mulino, Bologna.

Barro, R. and J. Lee. 1993. ‘Losers and Winners in Economic Growth’, NBER Working Paper No. 4341.

Barro, R. and X. Sala-I-Martin. 1995. *Economic Growth*, New York: McGraw Hill.

Bartelsman, E. P. Gautier and J. de Wind. 2011. ‘Employment Protection, Technology Choice, and Worker Allocation’, DNB Working Paper No. 295.

Bartelsman, E., J. Haltiwanger and S. Scarpetta. 2009. ‘Cross Country Differences in Productivity: The Role of Allocation and Selection’, NBER Working Paper No. 15490.

Bartelsman, E., J. Haskel and R. Martin. 2008. ‘Distance to Which Frontier? Evidence on Productivity Convergence from International Firm-level Data’, CEPR Discussion Paper No. 7032.

Baumol, W.J. 1990. ‘Entrepreneurship: productive, unproductive, and destructive’, *Journal of Political Economy*, 98, 5(1), 893-921.

Bekes, G. and B. Murakozy. 2005. ‘Firm Behaviour and Public Infrastructure: The Case of Hungary’, KTI/IE Discussion Papers No. 4.

Bernard, Andrew, Jensen Bradford and Peter Schott. 2006. ‘Trade Costs, Firms and Productivity’, *Journal ofMonetary Economics*, 53(5): 917-37.

Bloom, N., M. Schankerman. and J. Van Reenen. 2007. ‘Identifying Technology Spillovers and Product Market Rivalry’, NBER Working Paper No. 13060.

Bloom, N. and J. Van Reenen. 2010. ‘Why Do Management Practices Differ across Firms and Countries?’ *Journal of Economic Perspectives*, 24(1): 203-24.

Blundell, R. and S. Bond. 1998. ‘Initial conditions and moment restrictions in dynamic panel data models’, *Journal of Econometrics*, 87: 11-143.

Bridgman, B., Q.Shi and J.A. Jr. Schmitz. 2009. ‘The Economic Performance of Cartels: Evidence from the New Deal U.S. Sugar Manufacturing Cartel, 1934-74’, Federal Reserve Bank of Minneapolis, Research Department Staff Report 437.

Brunetti, A. 1997. ‘Political Variables in Cross-country Growth Analysis’, *Journal of Economic Surveys*, 11 (2).

Bowen, H.P. and D. De Clerq. 2008. ‘Institutional Context and the Allocation of Entrepreneurial Effort’, *Journal of International Business Studies*, 39, 747-67.

Brown, J. David,. John S. Earle and Almos Telegdy. 2006. ‘The Productivity Effects of Privatization: Longitudinal Estimates from Hungary, Romania, Russia, and Ukraine’, *Journal of Political Economy*, 114(1): 61-99.

Bushnell, J.B. and C. Wolfram. 2009. ‘The Guy at the Controls: Labor Quality and Power Plant Efficiency’ in Richard Freeman and Kathryn Shaw (eds) *International Differences in the Business Practices and the Productivity of Firms*, Chicago: University of Chicago Press.

Cannari, L., M. Magnani and G.Pellegrini. 2009. ‘Quali politiche per il Sud? Il ruolo delle politiche nazionali e regionali nell’ultimo decennio’, in Banca d’Italia, Questioni di Economia e Finanza, No. 50.

Castellani, D. and G: Giovannetti 2010. ‘Productivity and the international firm: dissecting heterogeneity’, *Journal of Economic Policy Reform*, Vol. 13 (1), 25–42.

Chanda, A. and C.J. Dalgaard. 2008. **‘**Dual economies and international total factor productivity differences: Channelling the impact from institutions, trade, and geography’, *Economica 75* (300), 629-661.

Coleman, J. 1990. *Foundations of Social Theory*. Cambridge MA: Harvard University Press.

Costa, D. L. and M.E. Kahn. 2003 ‘Civic Engagement and Community Heterogeneity: An Economist’s Perspective’, *Perspectives on Politics*, 1 (1), 103–11.

Dall’Aglio, V. 1999. ‘Istituzioni intermedie e dinamica della distribuzione del reddito nelle province italiane: una verifica empirica non parametrica’, in A. Arrighetti and G. Seravalli (eds.), *Istituzioni intermedie e sviluppo locale.* Donzelli editore, Rome.

Daniele, V. and P. Malanima. 2007. ‘Il prodotto delle regioni e il divario Nord-Sud in Italia (1861-2004)’, *Rivista di Politica Economica*, March-April.

Datta, S. 2008. ‘The Impact of Improved Highways on Indian Firms’, Unpublished manuscript. Available at http://www.enterprisesurveys.org/ResearchPapers/.

Daveri, F., R. Lecat and M. L. Parisi 2011. ‘Service Deregulation, Competition and the Performance of French and Italian Firms’, Banque de France Working Paper No. 346.

De Rosa, D., N. Gooroochurn and H. Gorg. 2010. ‘Corruption and Productivity: Firm-Level Evidence from the Beeps Survey’, Kiel Working Paper No. 1632.

Del Monte, Alfredo and Adriano Giannola. 1997. *Istituzioni economiche e Mezzogiorno*, La Nuova Italia Scientifica, Roma.

Dettori, B., E. Marrocu, R. Paci. 2008. ‘Total factor productivity, intangible assets and spatial dependence in the European region’ Working Paper IAREG No. 5/03.

Di Giacinto, V. and G. Nuzzo. 2006. ‘Explaining labour productivity differentials across Italian regions: the role of socio-economicstructure and factor endowments’, *Papers in Regional Science*, 85, 2, 299-320.

Djankov, S., R. La Porta, F. Lopez De Silanes. and A. Shleifer. 2002. ‘The regulation of Entry’, *Quarterly Journal of Economics*, 117, pp. 1-37.

Dollar, D., M. Hallward-Driemeier. and T. Mengistae. 2003. ‘Investment Climate and Firm Performance in Developing Economies’, Development Research Group, World Bank, WDC.

Doraszelski, U. and J. Jaumandreu. 2009. ‘R&D and Productivity: Estimating Endogenous Productivity’ Unpublished paper.

Easterly, W. and R. Levine. 2003. ‘Tropics, germs and crops: the role of endowments in economic development’, *Journal of monetary economics*, 50, 3-39.

Erbetta, F. and C. Petraglia. 2008. ‘Drivers of regional efficiency differentials in Italy: technical inefficiency or allocative distortions?’, CERIS-CNR Working Paper No. 2.

Eslava, Marcela, John C. Haltiwanger, Adriana Kugler and Maurice Kugler. 2004. ‘The Effects of Structural Reforms on Productivity and Profitability Enhancing Reallocation: Evidence from Colombia’, *Journal of Development Economics*, 75(2): 333-72.

Faggio, G., K.G. Salvanes and J. Van Reenen. 2009. ‘The Evolution of Inequality in Productivity and Wages: Panel Data Evidence’, LSE Working Paper No. 0821.

Fazio, G. and D. Piacentino D. 2010. ‘A Spatial Multilevel Analysis of Italian SMEs' Productivity’, *Spatial Economic Analysis*, 5, 3, 299-316.

Fernandes, Ana M. 2007. ‘Trade Policy, Trade Volumes and Plant-Level Productivity in Colombian Manufacturing Industries’, *Journal of International Economics*, 71(1): 52-71.

Fosterm, L., J. Haltiwanger and C.J. Krizan. 2001. ‘Aggregate Productivity Growth: Lessons from Microeconomic Evidence’, *NBER Studies in Income and Wealth, vol. 63: New Developments in Productivity Analysis*. Chicago and London: University of Chicago Press, 303-63.

Gabe, T. 2003. ‘Local fiscal policy and establishment growth’, *Journal of Regional Analysis and Policy*, vol. 33, no. 1, pp. 57-80.

Giannola, Adriano. 2009. Quando le banche si incontrano. Dall'interbancario al mercato interno dei capitali; *Rivista Economica del Mezzogiorno*, 1/2.

Giannola, Adriano and Antonio Lopes. 2011. ‘Banca, sistema produttivo e dualismo in Italia; continuità e mutamenti strutturali. Una riflessione di lungo periodo’, *Rivista economica del Mezzogiorno*, XXV, 3.

Graziani, A.1998. *Lo sviluppo dell'economia italiana*, Torino: Bollati Boringhieri.

Griffith, R., R. Harrison and J. Van Reenen. 2007. ‘How Special is the Special Relationship? Using the Impact of U.S. R&D Spillovers on U.K. Firms as a Test of Technology Sourcing’, *American Economic Review*, 96(5): 1859-75.

Griliches, Z. and J. Mairesse. 1998. ‘Production Functions: The Search for Identification”, in Strom, S. (ed.), *Econometrics and Economic Theory in the Twentieth Century: The Ragnar Frisch Centennial Symposium*, Cambridge: Cambridge University Press, 169–203.

Haggard, S. and L. Tiede. 2011. ‘The Rule of Law and Economic Growth: Where are We?’ *World Development*, 39, 5, 673-685.

Hall, R. and C.I. Jones. 1999. ‘Why do some countries produce so much more output per worker?’, *Quarterly Journal of Economics*, 114, pp. 83-116.

Haskel, J. and A. Sanchis. 1995. 'Privatization and X-Inefficiency: A Bargaining Approach', CEPR Discussion Papers No. 1192.

Helliwell, J. F. and R. Putnam R. 1995. 'Economic Growth and Social Capital in Italy', *Eastern Economic Journal*, vol. 21, 3.

Hempell, T. 2005. 'What's Spurious, What's Real? Measuring the Productivity Impacts of Ict at the Firm-Level', *Empirical Economics*, 30, 427-464.

Jorgenson, D.W., S. Ho Mun and Kevin J. Stiroh. 2008. 'A Retrospective Look at the U.S. Productivity Growth Resurgence', *Journal of Economic Perspectives*, 22(1): 3-24.

Kaufmann, D., A. Kraay and M. Mastruzzi. 2011. 'The Worldwide Governance Indicators: Methodology and Analytical Issues', *Hague Journal on the Rule of Law*, 3 (02), 220- 246.

Klette, T.J. and S. Kortum. 2004. 'Innovating Firms and Aggregate Innovation', *Journal of Political Economy*, 112(5), 986–1018.

Knack, S. and P. Keefer. 1997. 'Does Social Capital Have an Economic Payoff? A Cross-country Investigation', *Quarterly Journal of Economics*, vol. 112, 4, 1251-1288.

Kneller, R. and F. Misch. 2010. 'The composition of public spending and firm productivity: evidence from South Africa' mimeo, available at http://www.csae.ox.ac.uk/conferences/2011-EDiA/papers/327-Misch.pdf

Khwaja, Asim and Atif Mian. 2005. 'Unchecked Intermediaries: Price Manipulation in an Emerging Stock Market', *Journal of Financial Economics*. 78:1 (Nov.), 203-41.

Krueger, Anne O. 1974. 'The political economy of rent-seeking', *American Economic Review*, 3: 291-303.

Krusell, P. and J.V. Rios-Rull. 1996. 'Vested interests in a positive theory of stagnation and growth', *Review of Economic Studies*, 63, 301-329.

Lazear, E. and S. Rosen. 1981. 'Rank-Order Tournaments as Optimum Labor Contracts', *Journal of Political Economy*, 89 (5).

Levinsohn, J. and A. Petrin. 2003. 'Estimating Production Functions Using Inputs to Control for Unobservables', The *Review of Economic Studies*, 70(2), 317-341.

Loayza, N.V., A.M. Oviedo and L. Serven. 2005. 'The impact of regulation on growth and informality - cross-country evidence', Policy Research Working Paper Series No. 3623, The World Bank.

Lokshin, B., R. Belderbos, and M. Caree. 2008. 'The Productivity Effects of Internal and External R&D: Evidence from a Dynamic Panel Data Model', *Oxford Bulletin of Economics and Statistics*, 70, 399-399.

Mauro, P. 1995. 'Corruption and Growth', *Quarterly Journal of Economics*, vol. 110, 3, 681-712.

McGuinness, A. 2007. 'Institutions and Total Factor Productivity Convergence', Working Paper, Central Bank and Financial Services Authority of Ireland.

Melitz, M.J. 2003. 'The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity', *Econometrica*, 71(6): 1695-1725.

Murphy, K.M., A. Shleifer and R.W. Vishny. 1991. 'The Allocation of Talent: Implication for Growth', *Quarterly Journal of Economics*, Vol. 106, 2, 503–530.

Nalebuff, B. and J.E. Stiglitz. 1983. 'Information, competition and Markets', *American Economic Review*, 73, 278-283.

Narayan, D. and L. Pritchett. 1997. 'Cents and Sociability: Household Income and Social Capital in Rural Tanzania', Social Development and Development Research Group, Policy Research Working Paper No. 1796.

Narayan, D. 1999. 'Social Capital and the State: Complementarity and Substitution', World Bank Working Paper No. 2167.

Nicoletti, G. and S. Scarpetta. 2003. 'Regulation, productivity and growth: OECD evidence', *Economic Policy*, 18(36), 9-72.

Nicoletti, G. and S. Scarpetta. 2005. 'Product Market Reforms and Employment in OECD Countries', OECD Economics Department Working Paper, No. 472.

Nifo, Annamaria. 2011. L'industria del Mezzogiorno: un'analisi empirica sui divari di produttività, *Economia e politica industriale*, 38 (2011), No. 3, 105-126.

Nifo, Annamaria and Gaetano Vecchione. 2012. 'Migrazioni intellettuali e qualità delle istituzioni: il caso italiano', in Maria Rosaria Carillo (ed.), *Povertà, migrazione e sviluppo economico*, Rome: Carocci.

North, D.C. 1990. '*Institutions, institutional change and economic performance*', Cambridge: Cambridge University Press.

Nugent, J.B. 1993. 'Between State, Market and Households: A Neo-institutional Analysis of Local Organizations and Institutions', *World Development*, Vol. 21, 4, 623-632.

OECD. 2001. 'Territorial Outlook 2001', Organization for Economic Cooperation and Development, Paris.

Olley, G. S. and A. Pakes. 1996. 'The Dynamics of Productivity in the Telecommunications Equipment Industry', *Econometrica: Journal of the Econometric Society*, 64, 1263-1297.

Parrotta, P., D. Pozzoli, and M Pytlikova. 2011. 'Does Labor Diversity affect Firm Productivity?', Norface Discussion Paper Series.

Powell, W.W. and J. Owen-Smith. 2004. 'Knowledge networks in the Boston biotechnology community', *Organization Science*, 15: 5–21.

Putnam, R.D. 1993a. *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press.

Putnam, R.D. 1993b. 'The Prosperous Community. Social Capital and Public Life', *American Prospect*, 13, 35-42.

Reinikka, R. and J. Svensson. 2002. ‘Coping with poor public capital’, *Journal of Development Economics*, vol. 69, no. 1, 51-70.

Ritzen, J., W. Easterly and M. Woolcock. 2000. ‘On ‘Good’ Politicians and ‘Bad’ Policies: Social Cohesion’, Institutions and Growth, World Bank Working Paper No. 2448.

Roodman, D. 2009. ‘A Note on the Theme of Too Many Instruments’, *Oxford Bulletin of Economics and Statistics*, 71, 135-158.

Rodrik, D., A. Subramanian and F. Trebbi. 2004. ‘Institutions rule: the primacy of institutions over geography and integration in economic development’, *Journal of Economic Growth*, 9, 131-165.

Rodrik, D. 1997. ‘Where Did All the Growth Go? External Shocks, Social Conflict and Growth Collapses’, NBER, Working Paper No. 6350.

Rose-Ackerman, S. 1978. Corruption: A study in Political Economy, Academic Press.

Salinas- Jiménez, Ma, and J. Salinas-Jiménez. 2011. ‘Corruption and total factor productivity: level or growth effects’, *Portuguese Economic Journal*, 2, 109-128.

Scalera, Domenico and Alberto Zazzaro. 2010. ‘L’economia del Mezzogiorno. Nuova politica regionale, crisi globale e federalismo fiscale’, in M.C. Guerra and A. Zanardi (eds.), *La finanza pubblica italiana*. *Rapporto 2010*, 375-410, Bologna: il Mulino.

Shearer, B. 2004. ‘Piece Rates, Fixed Wages and Incentives: Evidence from a Field Experiment’, *Review of Economic Studies*, 71(2), 513-34.

Shirley, C. and C. Winston C. 2004. ‘Firm inventory behavior and the returns from highway infrastructure investments’, *Journal of Urban Economics*, vol. 55, no. 2, 398-415.

Sinkkonen, J. 2005. ‘Labour productivity growth and industry structure’, Bank of Finland Research, Discussion Papers, No. 4.

Sorenson, O. 2003. ‘Social networks and industrial geography’, *Journal of Evolutionary Economics*, 13(5) 513-527.

Syverson, C. 2011. ‘What determines productivity?’, *Journal of Economic Literature*, American Economic Association, vol. 49(2), 326-65.

Svensson, J. 2005. ‘Eight Questions about Corruption’, *Journal of Economic Perspectives*, Volume 19, Number 3, 19-42.

Tabellini, Guido. 2008. ‘Institutions and Culture: Presidential Address’, *Journal of the European Economic Association*, 6, 255-294.

Tallman, S., M. Jenkins, N. Henry and S. Pinch. 2004. ‘Knowledge, clusters and competitive advantage’. *Academy of Management Review* 29(2) 258-271.

Uphoff, N. and C.M. Wijayaratna. 2000. ‘Demonstrated benefits from social capital: the productivity of farmers organizations in Gal Oya, Sri Lanka’, *World Development*, 28(11), 1875–90.

Van Beveren, I. 2010. ‘Total Factor Productivity Estimation: a Practical Review’, *Journal of Economic Surveys*, 26(1), 98-128.

Van Biesebroeck, J. 2005. ‘Firm Size Matters: Growth and Productivity Growth in African Manufacturing’, *Economic Development and Cultural Change*, 53(3), 545-584.

Van Biesebroeck, J. 2007. ‘Robustness of productivity estimates’, *Journal of Industrial Economics*, LV (3).

Verhoogen, E.A. 2008. ‘Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector’, *Quarterly Journal of Economics*, 123(2), 489-530.

Viesti, G. 2005. ‘Nuove migrazioni. Il “trasferimento” di forza lavoro giovane e qualificata dal Sud al Nord’ in Il Mulino, 4, 678-688.

Woolcock, M. 1998. ‘Social capital and economic development: toward a theoretical synthesis and policy framework’, *Theory and Society*, Vol. 27, 2, 151-208.

World Bank, 1997. ‘World Development Report 1997: The State in a Changing World’, Oxford University Press.

1[2] The original source of the AIDA database is the National Business Register. All Italian companies (Or "All companies in Italy"??) must be registered in the National Business Register, and periodically supply some required data.

1[3] Additional details on the 2008 MET survey and tables with summary statistics can be found in Appendix 1 (Tables A1.1-A1.3).

[4]<![endif]> See Van Biesebroeck (2007) for a discussion on the different features of various methods for estimating TFP.

TABLES

TABLE 1: Correlation table of TFP measures

Estimation method	No. of firms	(1)	(2)	(3)	(4)	(5)
(1) OLS	4,066	1				
(2) FE	4,066	0.911	1			
(3) GMM1	3,922	0.561	0.776	1		
(4) GMM2	3,922	0.590	0.808	0.969	1	
(5) LP	4,066	0.540	0.511	0.361	0.380	1

Source: MET 2008 survey and AIDA Bureau Van Dijck database.

Note: GMM2 refers to estimates of the production function performed with fewer instruments with respect to GMM1 (see table in the Appendix).

TABLE 2: Effect of IQI (institutional quality index) on firm-level TFP (mean value 2005-2007): OLS regressions

	Y=TFP-OLS	Y=TFP-FE	Y=TFP-GMM1	Y=TFP-GMM2	Y=TFP-LP
SIZE CLASS 1 (d)	0.035	-0.421***	-1.323***	-1.277***	-0.262*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
SIZE CLASS 2 (d)	0.001	-0.220***	-0.886***	-0.826***	-0.264*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
GROUP (d)	0.048**	0.075***	0.145***	0.121***	0.05
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
AGE	-0.016	0.006	0.030**	0.030**	0.006
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
SOUTH (d)	-0.061*	-0.073**	-0.113**	-0.093**	0.073
	(0.04)	(0.04)	(0.04)	(0.04)	(0.10)
IQI index	0.241***	0.192**	0.198*	0.188*	0.264*
	(0.07)	(0.07)	(0.10)	(0.10)	(0.16)
Constant	0.895***	1.179***	1.858***	1.801***	1.056***
	(0.09)	(0.10)	(0.19)	(0.19)	(0.22)
Pavitt dummies	Yes	Yes	Yes	Yes	Yes
Obs.	4066	4066	3922	3922	4066
Firms	0.017	0.074	0.222	0.23	0.003

Note: (d) indicates a dummy variable. Standard errors in parentheses - Clustered by province (NUTS3) groups. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Size class 1 = 10-49 employees, Size class 2 = 50-249 employees. AGE is in logs. Note: the dependent variable for “Y=TFP-GMM2” is different from “Y=TFP-GMM1”, since the estimates of the production function were obtained with fewer instruments (see table in the Appendix).

TABLE 3: Effect of IQI sub index control and corruption on firm-level TFP (mean value 2005-2007): OLS regressions.

	Y=TFP-OLS	Y=TFP-FE	Y=TFP-GMM1	Y=TFP-GMM2	Y=TFP-LP
SIZE CLASS 1 (d)	0.041	-0.416***	-1.319***	-1.274***	-0.256*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
SIZE CLASS 2 (d)	0.006	-0.217***	-0.884***	-0.824***	-0.260*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
GROUP (d)	0.053***	0.080***	0.150***	0.125***	0.056
	(0.02)	(0.02)	(0.03)	(0.03)	(0.05)
AGE	-0.013	0.008	0.032**	0.032**	0.009
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
SOUTH (d)	-0.147***	-0.152***	-0.198***	-0.176***	-0.042
	(0.05)	(0.04)	(0.04)	(0.04)	(0.11)
IQI - Control & corruption	-0.009	-0.039	-0.049	-0.053	-0.072
	(0.08)	(0.08)	(0.08)	(0.07)	(0.19)
Constant	1.068***	1.345***	2.038***	1.978***	1.302***
	(0.09)	(0.10)	(0.17)	(0.18)	(0.23)
Pavitt dummies	Yes	Yes	Yes	Yes	Yes
Obs.	4066	4066	3922	3922	4066
Firms	0.013	0.072	0.221	0.229	0.002

Note: (d) indicates a dummy variable. Standard errors in parentheses - Clustered by province (NUTS3) groups. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. SIZE CLASS 1 = 10-49 employees, SIZE CLASS 2 = 50-249 employees. AGE is in logs. Note: the dependent variable for “Y=TFP-GMM2” is different from “Y=TFP-GMM1”, since the estimates of the production function were obtained with fewer instruments (see table in the Appendix).

TABLE 4: Effect of IQI sub index regulatory quality on firm-level TFP (mean value 2005-2007): OLS regressions.

	Y=TFP-OLS	Y=TFP-FE	Y=TFP-GMM1	Y=TFP-GMM2	Y=TFP-LP
SIZE CLASS 1 (d)	0.04	-0.416***	-1.319***	-1.273***	-0.254*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
SIZE CLASS 2 (d)	0.004	-0.218***	-0.885***	-0.824***	-0.258*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
GROUP (d)	0.050***	0.077***	0.144***	0.122***	0.055
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
AGE	-0.013	0.008	0.032**	0.032**	0.009
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
SOUTH (d)	-0.125***	-0.127***	-0.145***	-0.140***	-0.024
	(0.04)	(0.04)	(0.04)	(0.03)	(0.08)
IQI - Regulatory quality	0.056	0.035	0.105	0.052	-0.017
	(0.07)	(0.07)	(0.07)	(0.07)	(0.12)
Constant	1.028***	1.291***	1.932***	1.900***	1.247***
	(0.08)	(0.10)	(0.17)	(0.18)	(0.21)
Pavitt dummies	Yes	Yes	Yes	Yes	Yes
Obs.	4066	4066	3922	3922	4066
Firms	0.014	0.072	0.222	0.229	0.002

Note: (d) indicates a dummy variable. Standard errors in parentheses - Clustered by province (NUTS3) groups. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Size class 1 = 10-49 employees, Size class 2 = 50-249 employees. AGE is in logs. Note: the dependent variable for “Y=TFP-GMM2” is different from “Y=TFP-GMM1”, since the estimates of the production function were obtained with fewer instruments (see table in the Appendix).

TABLE 5: Effect of IQI sub index rule of law on firm-level TFP (mean value 2005-2007): OLS regressions.

	Y=TFP-OLS	Y=TFP-FE	Y=TFP-GMM1	Y=TFP-GMM2	Y=TFP-LP
SIZE CLASS 1 (d)	0.035	-0.421***	-1.322***	-1.277***	-0.260*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
SIZE CLASS 2 (d)	0.002	-0.219***	-0.885***	-0.826***	-0.262*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
GROUP (d)	0.052***	0.078***	0.148***	0.124***	0.054
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
AGE	-0.014	0.008	0.032**	0.032**	0.009
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
SOUTH (d)	-0.123***	-0.123***	-0.166***	-0.141***	-0.003
	(0.03)	(0.03)	(0.03)	(0.02)	(0.08)
IQI - Rule of Law	0.127*	0.096	0.092	0.103	0.092
	(0.07)	(0.07)	(0.09)	(0.08)	(0.11)
Constant	0.971***	1.244***	1.930***	1.859***	1.174***
	(0.09)	(0.10)	(0.19)	(0.19)	(0.19)
Pavitt dummies	Yes	Yes	Yes	Yes	Yes
Obs.	4066	4066	3922	3922	4066
Firms	0.014	0.072	0.221	0.229	0.002

Note: (d) indicates a dummy variable. Standard errors in parentheses - Clustered by province (NUTS3) groups. * p < 0.10, ** p < 0.05, *** p < 0.01. Size class 1 = 10-49 employees, Size class 2 = 50-249 employees. AGE is in logs. Note: the dependent variable for “Y=TFP-GMM2” is different from “Y=TFP-GMM1”, since the estimates of the production function were obtained with fewer instruments (see table in the Appendix).

TABLE 6: Effect of IQI subindex government effectiveness on firm-level TFP (mean value 2005-2007): OLS regressions

	Y=TFP-OLS	Y=TFP-FE	Y=TFP-GMM1	Y=TFP-GMM2	Y=TFP-LP
SIZE CLASS 1 (d)	0.039	-0.418***	-1.321***	-1.275***	-0.258*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
SIZE CLASS 2 (d)	0.001	-0.220***	-0.887***	-0.827***	-0.265*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
GROUP (d)	0.051***	0.077***	0.147***	0.122***	0.052
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
AGE	-0.017	0.005	0.029**	0.029**	0.005
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
SOUTH (d)	-0.096***	-0.099***	-0.144***	-0.122***	0.037
	(0.03)	(0.03)	(0.03)	(0.03)	(0.09)
IQI - Government effectiveness	0.261***	0.218**	0.201*	0.193**	0.296*
	(0.10)	(0.10)	(0.10)	(0.09)	(0.18)
Constant	0.971***	1.236***	1.926***	1.865***	1.136***
	(0.08)	(0.09)	(0.17)	(0.17)	(0.18)
Pavitt dummies	Yes	Yes	Yes	Yes	Yes
Obs.	4066	4066	3922	3922	4066
Firms	0.016	0.073	0.222	0.23	0.003

Note: (d) indicates a dummy variable. Standard errors in parentheses - Clustered by province (NUTS3) groups. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Size class 1 = 10-49 employees, Size class 2 = 50-249 employees. AGE is in logs. Note: the dependent variable for “Y=TFP-GMM2” is different from “Y=TFP-GMM1”, since the estimates of the production function were obtained with fewer instruments (see table in the Appendix).

TABLE 7: Effect of IQI subindex voice and accountability on firm-level TFP (mean value 2005-2007): OLS regressions

	Y=TFP-OLS	Y=TFP-FE	Y=TFP-GMM1	Y=TFP-GMM2	Y=TFP-LP
SIZE CLASS 1 (d)	0.045	-0.413***	-1.315***	-1.269***	-0.249*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.15)
SIZE CLASS 2 (d)	0.012	-0.211***	-0.878***	-0.818***	-0.248*
	(0.05)	(0.07)	(0.15)	(0.16)	(0.14)
GROUP (d)	0.052***	0.078***	0.148***	0.124***	0.053
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
AGE	-0.015	0.007	0.031**	0.031**	0.006
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
SOUTH (d)	-0.113***	-0.111***	-0.156***	-0.131***	0.04
	(0.03)	(0.03)	(0.03)	(0.02)	(0.08)
IQI -Voice and accountability	0.130***	0.115**	0.105*	0.111**	0.243**
	(0.05)	(0.05)	(0.06)	(0.06)	(0.10)
Constant	0.986***	1.245***	1.934***	1.868***	1.100***
	(0.07)	(0.09)	(0.17)	(0.18)	(0.19)
Pavitt dummies	Yes	Yes	Yes	Yes	Yes
Obs.	4066	4066	3922	3922	4066
Firms	0.015	0.073	0.222	0.23	0.004

Note: (d) indicates a dummy variable. Standard errors in parentheses - Clustered by province (NUTS3) groups. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Size class 1 = 10-49 employees, Size class 2 = 50-249 employees. AGE is in logs. Note: the dependent variable for “Y=TFP-GMM2” is different from “Y=TFP-GMM1”, since the estimates of the production function were obtained with fewer instruments (see table in the Appendix).

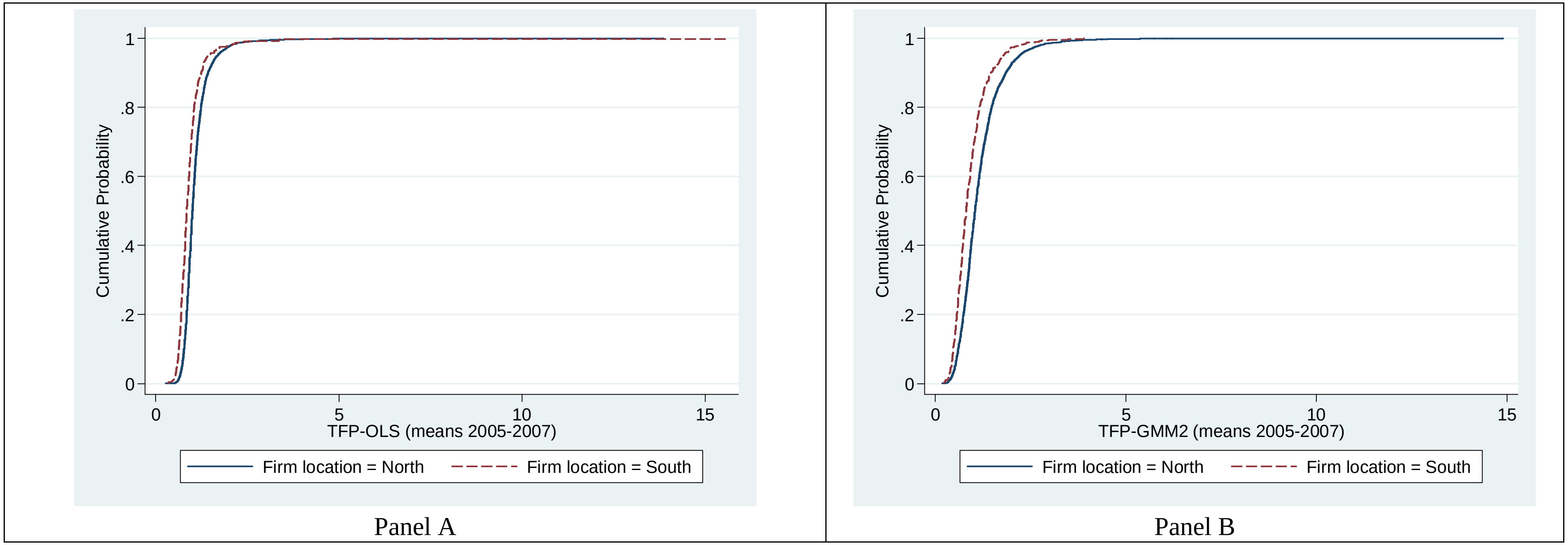

FIGURE 1: Cumulative distribution of TFP estimates (panel A = OLS estimates, panel B=GMM2 estimates), by geographical localization of firms (i.e. North = 0 and South=1).

Source: MET 2008 survey and AIDA Bureau Van Dijck database.

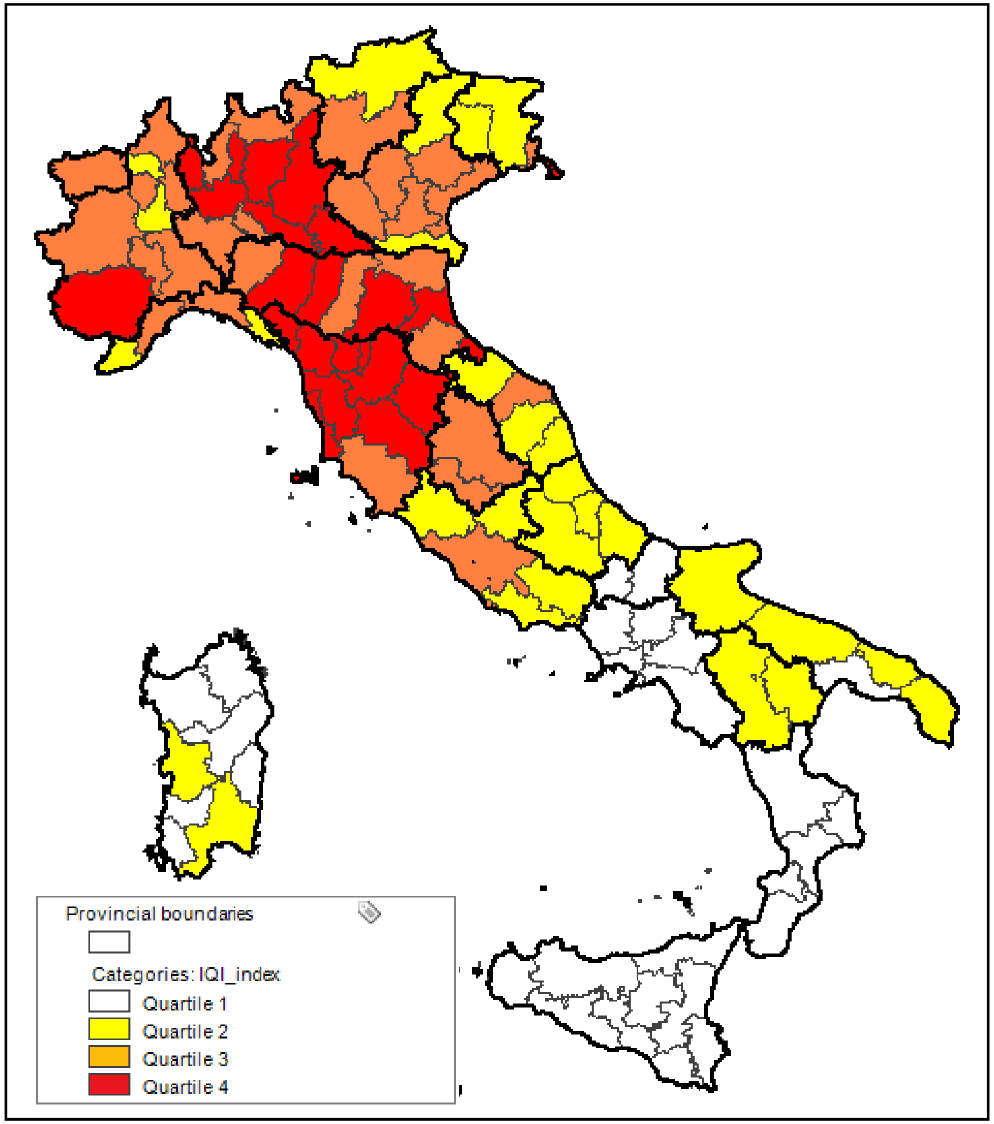

FIGURE 2: Geographical distribution of IQI
Source: Nifo and Vecchione (2012)

Annex 1 – The MET survey 2008 and the representativeness of our database

The universe of Italian private firms was stratified by MET according to the standard procedures by using the following variables: region (NUTS 2 level), size class (1-9 employees, 10-49 employees, 50-250 employees, more than 250 employees) and industry.

In order to define the sample size, the following choices were made:

- all firms with more than 250 employees were surveyed;
- the remaining firms were divided into three layers identified by the remaining three size classes: 1-9 employees, 10-49 employees, 50-250 employees;
- for each layer, an *a priori* fixed number of units to be surveyed was established, varying from region to region, depending on the number of the firms in the same region.

TABLE A1.1: Distribution of firm-level employment by region (NUTS 2 level): original MET sample data and retained firms.

Region	Our sample	Original MET sample
Piemonte	7.8	9.5
Valle D'Aosta	0.4	0.5
Lombardia	12.8	15.4
TN-BZ	1.8	2.9
Veneto	21.2	16.1
Friuli-VG	1.6	2.4
Liguria	0.8	1.6
Emilia Romagna	18.4	16.0
Tuscany	13.3	7.9
Umbria	2.0	1.7
Marche	2.7	1.8
Lazio	5.1	13.6
Abruzzo	1.0	1.3
Molise	0.3	0.3
Campania	2.7	2.2
Puglia	5.2	3.7
Basilicata	0.5	0.6
Calabria	0.4	0.5
Sicily	1.6	1.4
Sardinia	0.4	0.5
Total	100.0	100.0

Source: MET 2008 survey and AIDA Bureau Van Dick database; author's elaborations.

Note: elaborations based on firm sample used in OLS, FE and Levinsohn-Petrin regressions; for GMM regressions (see tables A.2.1a- A.2.1c) the number of firms is smaller because lagged values of variables were used as instruments, which excludes firms not providing data for the years 1998-2002.

TABLE A1.2: Distribution of firm-level employment by class size: original MET sample data and retained firms.

Class size	Our sample	Original MET sample
Micro (1-9)	-	4.4
Small (10-49)	22.5	13.4
Medium (50-249)	66.4	34.6
Large (250+)	10.3	47.6
Total	100.0	100.0

Source: MET 2008 survey and AIDA Bureau Van Dick database; author's elaborations.

Note: elaborations based on firm sample used in OLS, FE and Levinsohn-Petrin regressions; for GMM regressions (see tables A.2.1a- A.2.1c) the number of firms is smaller because lagged values of variables were used as instruments, which excludes firms not providing data for the years 1998-2002.

Annex 2 – Total Factor Productivity estimation

We estimate a separate production function for each industry group. Due to data constraints, we aggregated some of the 22 ISTAT-ATECO two digit manufacturing codes into 11 broader groups. According to Roodman (2009) there is a dangerassociated with having many instruments relative to observations. Therefore, we decided to report instrument counts for all estimates and we add GMM2 results. Concerning GMM results, Table A2.1 also reports the Arellano-Bond test to verify autocorrelation in difference residuals and the Sargan-Hansen test for over-identification. As shown in the tables, residuals are not autocorrelated and models are correctly identified.

TABLE A2.1a: Production function estimates for industry groups

Industry group	Method	Labor	Capital	Materials	Period dummies	N	Firms	AR(2)	AR(2) p-value	S-H	S-H p-value	STRU
1	OLS	0.240***	0.062***	0.674***	No	3513						
1	FE	0.158***	0.037***	0.601***	No	3513	431					
1	GMM1	0.174*	0.078***	0.481***	Yes	2958	424	1.508	0.132	297.487	0.239	297
1	GMM2	0.058	0.006	0.574***	Yes	2958	424	1.329	0.184	61.588	0.315	73
1	LP	0.211***	0.016	0.803***		3513						
2	OLS	0.406***	0.017**	0.476***	No	2566						
2	FE	0.275***	0.033***	0.423***	No	2566	297					
2	GMM1	0.191***	0.090**	0.239***	Yes	2196	294	0.535	0.593	265.969	0.703	295
2	GMM2	0.083	-0.03	0.278**	Yes	2196	294	0.874	0.382	54.503	0.569	73
2	LP	0.362***	0	0.919***		2566						
3	OLS	0.407***	0.062***	0.456***	No	2593						
3	FE	0.273***	0.047***	0.434***	No	2593	325					
3	GMM1	0.332***	0.128***	0.265**	Yes	2180	319	1.077	0.282	257.468	0.806	294
3	GMM2	0.199*	0.141**	0.277***	Yes	2180	319	1.061	0.288	63.932	0.246	73
3	LP	0.301***	0.022	0.513***		2593						

Note: group 1 = ISTAT-ATECO 15--food products and beverages; group 2 = ISTAT-ATECO cod.17--textiles; group 3 = ISTAT-ATECO cod.18--wearing apparel; dressing and dyeing of fur; ISTAT-ATECO cod.19--Tanning and dressing of leather; luggage, handbags, saddlery, harness and footwear; Abbreviations: GMM1 = system GMM estimates (Blundell-Bond, 1998) using the STATA command xtabond2. GMM2 = equivalent to GMM1 but using the option “collapse” to reduce the number of instruments (Roodman, 2009); LP = Levinsohn-Petrin estimates; AR(2) = Arellano-Bond test for autocorrelation in difference residuals; S-H = Sargan/Hansen test for joint validity of the instruments. STRU= number of instruments.

TABLE A2.1b: Production function estimates for industry groups

Industry group	Method	Labor	Capital	Materials	Period dummies	N	Firms	AR(2)	AR(2) p-value	S_Ha	S-H p-value	STRU
4	OLS	0.562***	0.038***	0.393***	No	3406						
4	FE	0.221***	0.032***	0.424***	No	3406	420					
4	GMM1	0.100**	0.057***	0.189***	Yes	2867	418	-0.343	0.731	285.71	0.411	297
4	GMM2	0.144	-0.01	0.289***	Yes	2867	418	-0.054	0.957	58.455	0.422	73
4	LP	0.496***	0.101	0.209		3406						
5	OLS	0.348***	0.043***	0.598***	No	4186						
5	FE	0.196***	0.022***	0.566***	No	4186	498					
5	GMM1	0.190***	0.005	0.404***	Yes	3559	491	2.748	0.006	316.935	0.069	297
5	GMM2	0.174*	0.011	0.520***	Yes	3559	491	2.486	0.013	66.124	0.191	73
5	LP	0.344***	0.171**	1.000***		4186						
6	OLS	0.410***	0.090***	0.534***	No	2711						
6	FE	0.262***	0.032***	0.528***	No	2711	331					
6	GMM1	0.245***	-0.048	0.454***	Yes	2280	326	1.094	0.274	285.912	0.407	297
6	GMM2	0.256**	-0.052	0.480***	Yes	2280	326	1.086	0.277	60.23	0.36	73
6	LP	0.398***	0	0.688***		2711						
7	OLS	0.429***	0.038***	0.500***	No	7376						
7	FE	0.251***	0.029***	0.438***	No	7376	905					
7	GMM1	0.202***	-0.008	0.320***	Yes	6230	897	2.422	0.015	332.45	0.019	297
7	GMM2	0.067	-0.03	0.383***	Yes	6230	897	2.252	0.024	81.303	0.019	73
7	LP	0.409***				7376						

Note: group 4 = ISTAT-ATECO cod.20--wood and of products of wood and cork, except furniture; articles of straw and plaiting materials; ISTAT-ATECO cod.21--pulp, paper and paper products; ISTAT-ATECO cod.22--Publishing, printing and reproduction of recorded media; group 5 =ISTAT-ATECO cod.23--coke, refined petroleum products and nuclear fuel; ISTAT-ATECO cod.24--chemicals and chemical products; ISTAT-ATECO cod.25--rubber and plastic products; group 6 = ISTAT-ATECO cod.26--other non-metallic mineral products; group 7 = ISTAT-ATECO cod.27--basic metals; ISTAT-ATECO cod.28--fabricated metal products, except machinery and equipment.

Abbreviations: GMM1 = system GMM estimates (Blundell-Bond, 1998) using the STATA command xtabond2. GMM2 = equivalent to GMM1 but using the option “collapse” to reduce the number of instruments (Roodman, 2009); LP = Levinsohn-Petrin estimates; AR(2) = Arellano-Bond test for autocorrelation in difference residuals; S-H = Sargan/Hansen test for joint validity of the instruments.

TABLE A2.1c: Production function estimates for industry groups

Industry group	Method	Labor	Capital	Materials	Period dummies	N	Firms	AR(2)	AR(2) p-value	S_Ha	S-H p-value	STRU
8	OLS	0.384***	0.036***	0.548***	No	4327						
8	FE	0.212***	0.034***	0.576***	No	4327	506					
8	GMM1	0.264***	0.044*	0.361***	Yes	3718	501	-0.195	0.845	292.584	0.305	297
8	GMM2	0.295*	0.033	0.439***	Yes	3718	501	-0.459	0.646	57.993	0.438	73
8	LP	0.347***	0.052**	0.343*		4327						
9	OLS	0.414***	0.003	0.528***	No	2789						
9	FE	0.243***	0.032***	0.557***	No	2789	335					
9	GMM1	0.065	0.019	0.362***	Yes	2362	331	0.369	0.712	278.447	0.532	297
9	GMM2	0.19	0.035	0.372***	Yes	2362	331	0.253	0.8	69.311	0.127	73
9	LP	0.395***	0.00	0.793***		2789						
10	OLS	0.404***	0.061***	0.466***	No	1149						
10	FE	0.283***	0.059***	0.546***	No	1149	143					
10	GMM1	0.195***	0.039	0.331***	Yes	965	142	0.871	0.384	134.574	1	287
10	GMM2	0.253**	0.096*	0.255***	Yes	965	142	0.634	0.526	55.473	0.533	73
10	LP	0.339***	0.045	0.041		1149						
11	OLS	0.320***	0.016**	0.629***	No	2107						
11	FE	0.172***	0.016*	0.681***	No	2107	249					
11	GMM1	0.179***	0.043*	0.491***	Yes	1797	246	-0.81	0.418	236.506	0.966	294
11	GMM2	0.05	0.127**	0.535***	Yes	1797	246	-1.566	0.117	57.743	0.448	73
11	LP	0.311***	0.093	1.000***		2107						

Note: group 8 = ISTAT-ATECO cod.29--machinery and equip. n.e.c..; group 9 = ISTAT-ATECO cod.30--office machinery and computers; ISTAT-ATECO cod.31--electrical machinery and apparatus n.e.c.; ISTAT-ATECO cod.32--radio, television and communication equipment and apparatus; ISTAT-ATECO cod.33--medical, precision and optical instruments, watches and clocks; group 10 = ISTAT-ATECO cod.34--motor vehicles, trailers and semi-trailers; ISTAT-ATECO cod.35--other transportequipment; group 11 = ISTAT-ATECO cod.36--furniture; manufacturing n.e.c.
Abbreviations: GMM1 = system GMM estimates (Blundell-Bond, 1998) using the STATA command xtabond2. GMM2 = equivalent to GMM1 but using the option “collapse” to reduce the number of instruments (Roodman, 2009); LP = Levinsohn-Petrin estimates; AR(2) = Arellano-Bond test for autocorrelation in difference residuals; S-H = Sargan/Hansen test for joint validity of the instruments.