INSTITUTIONAL QUALITY AND FIRMS' PRODUCTIVITY IN EUROPEAN REGIONS

Mariarosaria Agostino m.agostino@unical.it
Marco Di Tommaso ditommaso@economia.unife.it
Annamaria Nifo nifo@unisannio.it
Lauretta Rubini rbnltt@unife.it
Francesco Trivieri trivieri@unical.it

ABSTRACT

We investigate the relationship between regional institutional quality and firms' productivity over the 2010-2014 period, by regressing a measure of TFP for European manufacturing SMEs on a region-level index of institutional quality and its components, rule of law and government effectiveness. We find strong evidence that better local institutions help SMEs to become more productive. Besides, the impact of institutions comes out to interplay with some firms' characteristics such as size, age, human capital and productivity level, as well as the firms' operating sector. These findings have important implications for the definition of suitable strategies to foster economic growth in EU regions.

JEL code: D02, M48, O52
Keywords: Institutional quality, SMEs' TFP, regions, Europe.

INTRODUCTION

Development accounting exercises have shown that per-capita income growth across countries can be explained by both differences in the amount of production inputs (Caselli, 2005) and changes in productivity. In particular, the aggregate and individual firms' Total Factor Productivity (TFP) has been acknowledged as a key driver of long-run growth, and a crucial mechanism for increasing living standards, since the seminal work of Solow (1957) and Abramovitz (1956) up to more recent analyses (Caselli, 2005; Hall & Jones, 1999; Syverson, 2011).

However, what are the determinants of TFP, and specifically of small and medium-sized enterprises (SMEs) TFP? An interesting taxonomy distinguishes between *microeconomic* and *context* factors affecting firm productivity. The former label is used for factors connected to firms' features, and managers' or owners' decisions; the latter one for those linked to the outside environment, such as more competitive and contestable markets, more favourable conditions to innovation, inter-firm cooperation and positive spillovers, and so on. Often, a positive and important *context* factor is also recognized in the good quality of institutions operating in the geographical area where the firm is located. Actually, local institutions should be particularly relevant for SMEs, usually strongly rooted in the territory where they operate.

This paper investigates the relationships between local institutional quality and SMEs' TFP to deepen our knowledge on a particular aspect, which is little investigated by the extant literature, i.e. heterogeneity in institutions' effectiveness. Indeed, our analysis builds on the idea that institutional quality might be considered in a broad sense as a peculiar kind of productive input, in principle characterised by either complementarity or substitutability with other firms' or environment's favourable characteristics. If institutional quality is complementary to those features, the latter should boost the beneficial influence of institutional factors on TFP. Vice versa, if institutional quality tends to substitute for the lack of some firms'/environment's favourable conditions, we should record a decreasing influence of institutional quality on TFP, when conditioning on these factors.

To provide evidence on such contrasting propositions, we test whether the relationship between institutional quality and SMEs' TFP is moderated by individual characteristics (such as productivity performance, age, size, and human capital employed), the technological level of the industrial sector which firms belong to, and the economic performance of the region where the firm is located.

Our analysis takes advantage of firm-level data: we employ a measure of TFP of about 6,500 manufacturing firms located in seven European countries (Austria, France, Germany, Hungary, Italy, Spain, United Kingdom) for the period 2010-2014, retrieved from the EFIGE survey, containing information collected through direct interviews to a large representative sample of manufacturing companies.

To account for local institutional endowment, we consider the overall region-level (NUTS2) index *EQI* built by Charron et al. (2014), as well as its components named rule of law (*RUL*) and government Effectiveness (*GOV*), which focus on more specific aspects of institutional quality, respectively capturing the confidence of agents in the framework of legal rules imposed by the government, and the effectiveness of public intervention in enforcing those rules and thus promoting a favourable regional business environment. The adoption of specific indicators of particular institutional aspects, together with the overall index, is another distinctive feature of the paper, justified by the conjecture that the presence of a well-defined legal framework in terms of contract fulfilment, activity of magistracy and police, and low crime levels on one side (rule of law), and the government ability to promote and implement effective regulatory interventions on the other (Regulatory quality) are likely to be more important in shaping firms' incentives and opportunities to reach high productivity levels than the other two pillars of EQI (Voice and accountability and Corruption), which are essentially defined in terms of press freedom and bribery in public school and health and medical public services. The review ~~of~~ in the Related Literature section ~~Section 2~~ shows the importance that the literature has recognized to the institutional dimensions of rule of law and government effectiveness.

Another qualifying element of the paper is the regional scope of the analysis, contrasting the prevailing approach which studies the effectiveness of institutions at a country level. As argued by Charron et al. (2014, p. 70), that choice follows the belief "that national differences matter more than subnational

ones", whereas actually "the latter tend to trump the former quite frequently". Indeed, inspection of the European regional ranking provided by Charron et al. (2014) shows cross-cutting diversity in institutional endowment, with differences among regions, even within the same country, being often larger than those among countries, so as to depict a dualism between high-quality-institution core regions in Central and Northern Europe and low-quality-institution peripheral regions. In some cases the inter-regional variability is really huge; for example, in Italy "the gap between Bolzano region, which ranks near the top of all EU regions, and Campania, which is among the lowest, is wider than the gap between the countries of Denmark and Hungary" (Charron et al., 2014, p. 70). Given this sub-national heterogeneity, the regional focus seems us to be suitable to exploit variability that international comparisons would not take into account, thus yielding additional insights on incentives and opportunities supplied by good institutions for better firm performances. Several authors share this view, showing that institutional quality may significantly vary within countries (Tabellini, 2010), with relevant consequences on several economic outcomes, firms' TFP included (Lasagni et al., 2015). In the same vein, Audretsch & Keilbach (2004) focus on the central role of the regional institutional context in fostering and steering firms' access to the market. For developing countries, evidence about heterogeneity in institutional endowment at a subnational level is available as well (Meyer &-Nguyen, 2005).

Consistent with theoretical and empirical literature, and regardless of the indicator of institutional quality we use, our findings support the hypothesis of a significant positive impact of institutions on firms' TFP. Besides, institutions seem to be more important in fostering TFP for smaller, younger, less human-capital intensive firms, and those operating in less technologically advanced industries, thus suggesting that well-designed and more effective government institutions may play a compensating role with respect to firms' individual factors of weakness. This indication is confirmed by the evidence provided by a quantile regression analysis showing that good institutions matter more for less productive firms.

The paper is organised as follows. ~~Section 2~~ The next section provides an overview of the literature on institutional quality as a determinant of TFP differentials and some more specific aspects related to

issues addressed in the paper. ~~Section 3~~ After, we present our research hypotheses, the empirical model and estimation methods. ~~while~~ ~~Section 4~~ The successive section reports the main results, while the final one ~~section 5~~ summarises the main conclusions and discusses some policy implications.

RELATED LITERATURE

In the economic literature context factors connected to geographical, historical, cultural, social, political and administrative peculiarities, and in particular institutional features, are widely recognised as determinants of the economic success or decline of countries, regions and individual firms. Concerning, in particular, the relationship between local institutional quality and firms' productivity, many authors have dealt with a variety of channels through which institutions affect the operating environment and ultimately firms' performance.

Syverson (2011) and Chanda & Dalgaard (2008) identify the presence of spillovers and the degree of competition as the main channels through which context and institutional factors impinge on the level of business productivity. In this interpretation, spillovers basically operate through incentive mechanisms: they encourage companies to innovate and adopt new technologies (Nguyen & Jaramillo, 2014) and to invest more in R&D (Griffith et al., 2006), shorten the technology distance (Bloom et al., 2013), and accelerate the process of convergence to the productivity levels of the leader in the domestic market (Bartelsman et al., 2008). Issar et al. (2017) show a positive effect of institutions on TFP, by means of an increase in efficiency. Other related studies (Bloom & Van Reenen, 2010; 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. Also, competition creates greater opportunities for comparing performance, making it easier for owners to monitor managers (Nalebuff & 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 (Aghion & 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 & Sanchis, 1995).

Strictly institutional factors are those related to the quality of the legal and political system. The rule of law and the effectiveness of government policy have been recognised to establish ground rules – and then economic incentives – shaping choices, activities and strategies of utility-maximising entrepreneurs (North, 1990; Urbano et al. (2019); Williamson, 2000). The presence of a secure and well-defined legal framework and an effective local government reduces uncertainty and transactions costs, facilitates production and exchange, promotes accumulation of physical and human capital (Nifo et al., 2017; Rodrik et al., 2004), increases mutual trust and social capital (Efendic et al., 2015), attracts ambitious high-growth firms (Estrin et al., 2013),encourages firms to operate on a larger scale and with a longer time horizon (Aron, 2000), to use better technology and to invest in knowledge creation and transfer (Loayza et al., 2005).

As these institutional dimensions contribute to well-defined property rights, they encourage business activities, because investors tend to seek places where contracts are enforced and clear, so that business relations with the parties involved in the commercial transaction are relatively safe and the risk of not recovering their funds and owing the results of their investments is reasonably low (Acemoglu & Robinson, 2008). If the law is perceived as clear, fair and easily enforceable, right incentives arise to invest and accumulate physical and human capital (Rodrik et al., 2004) and boost economic growth and development (Demirgüç-Kunt & Maksimovic, 1998). Largely positive effects can be associated to the implementation of incentive programs 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 (Arnold et al., 2008), or privatization programs in Eastern European countries (Brown et al., 2006). On the other hand, in countries and regions with a high risk of expropri-

ation and insecure property rights or where there are crime, violence, corruption and ineffective government intervention, investments tend to be lower (Anderson, 1999). Also, poor or inadequate regulation can create perverse incentives that reduce productivity (Bridgman et al., 2009).

A peculiar channel through which institutions may impact on firms' productivity is connected to the stimuli supplied to entrepreneurship. According to Bosma et al. (2018), institutions somehow coordinate entrepreneurs' activities by determining whether, how, and under what conditions the latter can get access to the production inputs labour, finance and knowledge. Levie & Autio (2011) argue that better institutional endowment increases returns from business activity compared to employee work, encouraging individuals to invest in entrepreneurship. Audretsch et al. (2019) underline the role of institutional environments conducive to increasing the success for newly established ventures (the so-called entrepreneurial ecosystems) demonstrating that the quality of institutions, both formal and informal, has a relevant marginal effect on quality and quantity of entrepreneurship.

Many other authors (Agostino et al. 2019; Audretsch & Keilbach, 2004; Ghio et al., 2015; Acs & Sanders, 2013; Hayter, 2013) emphasise different reasons to recognise a crucial role to regional institutions in entrepreneurship and firms' entry. Finally, it is worthwhile recalling that the rule of law (Efendic et al., 2015; Estrin et al., 2013) and regulatory quality (van Stel et al., 2007; Bjørnskov & Foss, 2008) are identified as institutional dimensions particularly relevant to entrepreneurship.

Finally, concerning the relationship (complementarity versus substitutability) between institutional quality and other determinants of firms' performance, ascertaining whether the benefits granted by good institution are larger or smaller according to the firm's size, age, human capital endowment and operational sector is basically an empirical matter, since from a theoretical viewpoint the institutional *macro* factor might act both as a complement and a substitute of individual *micro* factors. Considering, for example, human capital, a highly educated workforce may better exploit the opportunities supplied by a better institutional context, but the relative gain in terms of differential productivity from (say) higher public administration efficiency and lower criminality might be higher for firms with little skilled work-

ers. To our knowledge, the issue has been little explored, and mainly by managerial literature. According to Porter (1980, p. 3) since public policies and the institutional context are much relevant to business strategy and performance, "the differing abilities of firms to deal with them" should matter a lot. In this view, the most capable firms are expected mostly benefit from a favourable institutional environment. In the same vein, Teece (1986) points out that property rights protection and a proper regime of appropriability most needed by highly innovating technological industries, so that good institutions are especially beneficial for advanced sectors. Against the reasons in favour of the complementarity hypothesis, other studies document cases where a substitution effect arises between institutional quality and other inputs, highlighting that the former matters more when firms conditions are on average worse. For example, with reference to the case of China in 1998-2009, Lee & Lee (2019) show that the institutional development impact more on the productivity of national private-owned than foreign-owned companies, despite the fact that the latter can share better technical and managerial knowledge with their parent companies located in their home or developed countries. More generally, Kim & Lee (2009) find that institutional quality (and secondary education) results in being more growth conducive for low-income than high-income countries, and at a sub-national level Ma et al. (2013) document that local institutions affect foreign subsidiary performance in China more in the less developed area. Summarising, the sign of interactions between institutions and other variables relevant to firm performance may in principle go either direction so that ascertaining its course is basically an empirical matter.

RESEARCH HYPOTHESES, EMPIRICAL MODEL AND ESTIMATION METHODS

Our research hypotheses, consistent with indications of the literature surveyed above, are the following:

H1: Local institutional quality should be positively associated with SMEs' TFP thanks to a more secure and well-defined legal framework, lower transactions costs and stronger incentives to accumulate physical and human capital.

H2: Institutional quality is expected to interplay with firms' features, positively associated with SMEs' TFP. If the complementarity (substitutability) hypothesis holds, institutional quality should be more relevant to firms more (less) capable and operating in more (less) advanced industries, and wealthier (poorer) geographical areas.

Our estimating model is:

$$y_{ij} = \alpha + \beta_1 INST_j + \phi \boldsymbol{X}_{ij} + \epsilon_{ij} \quad (1)$$

where the dependent variable y is the average TFP (calculated on TFP values from 2010 to 2014) of manufacturing firm i in region j; [i] *INST* is either the overall indicator of regional institutional quality *EQI* or alternatively the component indexes *RUL* or *GOV*;[ii] $\boldsymbol{X}$ is a vector of control variables related to either firms' individual characteristics or regional and sectoral features; and ϵ_{ij} is the error term. Firms' individual characteristics included among control variables are: *SIZE*, based on total assets; *AGE*, in years; a set of dummy variables taking unit value respectively if the firm sets up formal training programs for employees (*TRAIN*), is involved in a foreign business group (*FOREGROUP*), faces competition mainly from rivals located abroad (*FORECOMP*), exports (*EXP*), carries out research and development activities (*R&D*) and product or process innovation (*INNO*). Regional and sectoral features include: a dummy, $HMTI$, taking value 1 for industrial sectors characterized by high and medium-high technological intensity according to the OECD (2011) classification (Hatzichronoglou, 1997);[iii] the annual regional growth rate (*GDP*); the regional population density (*DENS*); the regional share of population aged 15-64 with tertiary education (*EDU*); the regional share of households with access to internet at home (*CONNE*); the number of sectors (NACE Rev 2, 2-digit level) in the region with more than 10 firms in 2008 (*JACOB*). A set of industry dummies, controlling for unobserved heterogeneity at the industry level, is also included among regressors.[iv] The data appendix provides more details on the variables employed, the sources from which they are drawn, and the heterogeneity in institutional quality and TFP across European regions (see Tables A1 and A2).

To test H1, we estimate our benchmark Equation 1, allowing for random effects at the regional level. To test H2, we first adopt a Quantile Regression, to assess whether the influence of our key variables differs for differently productive firms. Then, we interact institutional variables with firms' characteristics[v], as the latter ones have been proven to be the most important drivers of diversity in TFP across European regions (Aiello & Ricotta, 2016). Indeed, in line with this evidence, local institutions can explain a minor share of TFP firm heterogeneity in our work too. Nevertheless, they might play a significant role in either substituting or reinforcing the influence of firms' characteristics positively affecting SMEs' performance. Finally, we make the impact of our main regressors conditional on the type of industry (more or less technologically advanced) the firm belongs to and on the regional GDP per capita growth, regarded as other factors potentially moderating (again either compensating or complementing) institutional effects on TFP.

On a methodological ground, since firms in our sample are nested within administrative regions, we adopt a multilevel (ML) model typically used when dealing with hierarchical data.[vi]

It is worth highlighting that the qualitative and quantitative data from the EFIGE survey refer to the triennium 2007-2009 but in most cases are available for 2008 only. As a consequence, we cannot resort to dynamic panel data methods to account for firms' unobserved heterogeneity and potential endogeneity problems, i.e. unobserved cultural and historical factors may drive both TFP levels and institutional quality in a province; more productive firms may choose to operate in areas with better institutional quality, and regions where firms have higher productivity, may aim at changing regulation (Audretsch et al., 2018). Yet, concerns of simultaneity bias are partially attenuated by the fact that a) firm-level data on explanatory variables refer to previous periods (mostly 2008 or 2009) compared to the dependent variable (2010 and 2013 mean value), and b) the key regressors *EQI, RUL* and *GOV* are likely to change little and slowly in response to firms' performance.[vii] Also, our analysis focuses on SMEs (hiring less than 250 employees), which are likely to be strongly rooted in a region. This makes sensible the conjecture that, while these firms are affected by the institutional quality of the area where

are located, it is unlikely that the most productive of them move and sort themselves into provinces with better institutional quality.

Nevertheless, after estimating Equation (1) by the mixed-effects method, we also use a two-stage Instrumental Variables (IV-2SLS) procedure to tackle concerns of residual endogeneity. In particular, we employ as instruments literacy and urbanisation rates drawn from Tabellini (2010), both defined at the regional level at the end of the 1800s. These rates seem indeed to be good predictors of regional institutions development in the subsequent decades, whereas they can be deemed as exogenous with respect to firms' performance in current years (Tabellini, 2010; Rodriguez-Pose & Di Cataldo, 2015).[viii]

RESULTS

Table 1 reports estimates of equation (1), the key regressor being *EQI*, *RUL* and *GOV*, respectively in columns 1, 2 and 3. A preliminary look at the control variables reveals that they tend to assume the expected sign (except INNO) even if in some cases (*FORECOMP*, *EXP*, *R&D* and *INNO*) are statistically insignificant at the 10% or 5% level. Concerning firm-level variables, *SIZE*, *AGE*, *FOREGROUP* and *TRAIN* come out to be relevant. Moreover, a U-shaped relationship emerges between firms' size (total assets) and TFP, and an inverted U-shape relationship between firms' age and TFP. Competing in international markets signals higher abilities and is associated with higher TFP; training has a positive influence on productivity, presumably thanks to the accumulation of employees' skills. Furthermore, little surprisingly, firms operating in the high and medium-high technology industries are on average characterised by better productivity performances. On the other hand, regional variables appear to be not significant in most cases.[ix]

[TABLE 1]

Turning to our key variables, results reported in columns 1-6 clearly indicate that institutions play a role in determining firms' productivity, as coefficients of *EQI*, *RUL* and *GOV* are always positive and

highly significant. According to the multilevel estimates, the impact of *RUL* seems slightly higher than that of GOV, and in line with that of EQI.[x]

To test hypothesis H2, we start by assessing whether the impact of institutions is different for differently productive firms, allowing for different point estimates for firms respectively belonging to the 10^{th}, 50^{th}, and 90^{th} percentile of TFP distribution. Results reported in Table 2 highlight that the impact of the regional institutional quality on TFP is evidently heterogeneous across firms: with some differences among *EQI, RUL* and *GOV,* in general the effectiveness of institutional endowment is stronger for the first two considered segments of the TFP distribution, and weaker and statistically insignificant for the last. Therefore, institutions seem to influence firms' performance in a heterogeneous way, benefitting more the less productive firms.

[TABLE 2]

The following analysis extends the latter indication. We introduce an interaction variable $INTE$ between the indicator of regional institutional quality and some dummy variables, described in Table A1: *DSIZE*, *DAGE*, *DHK*, $HMTI$, and *DGDP*, taking unit value respectively for firms with at least 50 employees, older than 15 years (first quartile critical value); with a share of graduate employees higher than the national average; operating in high and medium-high technological industries; located in a region with per capita GDP growth higher than the median value.

[TABLE 3]

As shown in the last rows of Table 3, the institutional variables are always jointly significant with the interaction term, the impact of *EQI, RUL* and *GOV* being reduced (by the value of the coefficient of *INTE*) for relatively larger and older firms, with a higher share of graduate employees, operating in high and medium-high technology industries.[xi] This result implies that the impact is lower for larger and older SMEs (respectively equal to 61.8% and 81.4% of the impact exerted on other firms), and for

those with a higher share of graduate employees (88%). Similarly, the effect of institutions on the productivity of technologically advanced firms is lower, amounting at about 75.6% of the effect exerted on other firms.[xii]

Concerning the latter result, an explanation might be in the attitude of high-tech firms to invest in strategic activities such as property right protection to be less exposed to the influence of the external institutional endowment. In this sense, the largest and more powerful high-tech corporations may have a weaker need for effective institutions, since they might even be in the position to shape the institutional action, becoming themselves "institutions of global governance" (May, 2015).

POLICY IMPLICATIONS AND CONCLUSIONS

The analysis carried out in this work shows that regional institutional quality – meant in both a general fashion, and more specifically in terms of rule of law and government effectiveness – plays a significant role in shaping productivity of European firms, thus extending to the case of SMEs, within a regional perspective, a result common to other previous studies. Our analysis is, to the best of our knowledge, the first empirical exercise aimed at studying interaction effects between local institutional quality and firms' characteristics. In detail, we aim at detecting which firms benefit more from the context conditions granted by good institutions and find that good institutional quality is more important for SMEs' performance the smaller and the younger firms are, and the lower human capital and technology they employ.

These results have to be considered with cautiousness and need to be confirmed (or confuted) by future research. It may contain relevant information to policy-makers, as the observed diversity in the impact of institutions on TFP according to the typology of firms has clear implications on long-term strategic plans of the industrial policy, and the choice among "picking the winners" or "building future winners" (Baum & Silverman, 2004; Evenett & Voicu, 2001). An intervention aimed at improving the overall institutional quality is usually interpreted as a horizontal measure, providing the endowment necessary to allow all firms to count on the same business environment conditions, and therefore equally

benefiting the productive system as a whole. Our findings alert instead to the fact that better institutions might especially favour weaker enterprises. Therefore, promoting institutional improvement, *de facto* would translate into an investment for "building future winners". As a consequence, policy evaluation should be cautious and avoid too negative judgements on measures failing to pick the winners in the short run, but able to support the medium-long term growth of lagging-behind SMEs, and therefore to create the basis for the emergence of future winners.

In conclusion, given the role of institutions for the growth of weaker firms, policies reinforcing the institutional endowment could be considered as policies specifically benefiting specific actors, carried out without paying the potential costs connected to selective policies (Aghion et al., 2011; Birdsall & Fukuyama, 2011; Di Tommaso et al., 2017; Lin, 2011). The regional scope at which our analysis is conducted is particularly relevant because of heterogeneity in European local institutional endowment, and the perspective of EU policies increasingly focused on the regional level, now considered the layer at which policy decisions might have the highest influence (Keating, 1997; Ohmae, 1992).

DATA APPENDIX

The European Quality Index (EQI) constructed by Charron et al. (2014) is a survey-based index of quality of government at the regional level for the European member states. The index is based on a survey of European citizens' perceptions about the quality of institutions. EQI measures specifically the levels of Quality of Government among 172 EU regions based on the experiences and perception of citizens. Sixteen survey questions are asked, in accordance with the four 'pillars' of the World Bank's WGI: rule of law, government effectiveness, voice and accountability, and control of corruption.[xiii] Questions are centred on three public services that are often funded or administered at sub-national levels: education, healthcare and law enforcement. The survey asks respondents to rate the provision of these three categories of public services with respect to three related concepts of institutional quality, i.e. quality, impartiality and level of corruption. Data are aggregated by using different weighting schemes to obtain a robust indicator of EQI and its single components. Full details are given in Charron et al. (2014).

For firms' micro-data we resort to the EU-EFIGE Bruegel-UniCredit dataset, provided by the Belgian non-profit international association Bruegel. This dataset contains both survey and balance-sheet data (the latter drawn from the BvD Amadeus database) on a representative sample of about 15,000 manufacturing firms with at least ten employees operating in seven European countries: Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom. Details on the criteria, the sampling design and the weighting schemes employed to ensure standard statistical representativeness of the collected data (ex-ante and ex-post, for each country) are too technical to be reported here – and we refer to the extensive discussions in Barba Navaretti et al. (2011), Altomonte et al. (2012), and Altomonte and Aquilante (2012). From the EFIGE dataset, we draw a measure of firms' TFP for each year in the period 2010-2014. To compute this measure – overcoming endogeneity problems, and allowing for industry-specific production functions – observations have been assigned to sectors (at NACE 2 digit levels), and then the Levinsohn and Petrin (2003) model has been applied to each sector, controlling for country and year fixed-effects.[xiv] It has to be highlighted that, since TFP can be retrieved only after matching information from the EFIGE and AMADEUS databases, and data from AMADEUS are

available for around 50% of the EFIGE sample, TFP is defined on a smaller number of firms. Nevertheless, “the resulting restricted sample does not show any particular bias in terms of representation by category of firm” (Altomonte et al., 2012, p. 21). Finally, potential issues of country representativeness are addressed in footnote 1 of the main text.

References

Abramovitz, M. (1956). Resource and Output Trends in the United States since 1870. Retrieved from http://www.nber.org/chapters/c5650.pdf

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review*, *91*(5), 1369–1401. https://doi.org/10.1257/aer.91.5.1369

Acemoglu, D., & Robinson, J. A. (2008). Reversal of Fortune : Geography and Institutions in the Making of the Modern World Income. *Quarterly Journal of Economics*, *117*(4), 1231–1294. https://doi.org/10.1162/003355302320935025

Aghion, P., Boulanger, J., & Cohen, E. (2011). Rethinking Industrial Policy. *Bruegel Policy Brief*, (4), 1–8.

Aghion, P., & Howitt, P. (1998). *Endogenous growth theory*. MIT Press.

Aghion, P., & Howitt, P. (1992). A model of growth through creative destruction. Econometrica, 60(2), 323–351.

Aiginger, K., & Sieber, S. (2006). The Matrix Approach to Industrial Policy. *International Review of Applied Economics*, *20*(5), 573–601. https://doi.org/10.1080/02692170601005507

Acs, Z. J., & Sanders, M. (2013). Knowledge spillover entrepreneurship in an endogenous growth model. Small Business Economics, 41(4), 775–795.

Altomonte, C., Aquilante, T., & Ottaviano, G. I. P. (2012). The triggers of competitiveness: the EFIGE cross-country report. Bruegel Blueprint 17, 17 July 2012. Retrieved from http://aei.pitt.edu/35878/

Anderson, D. A. (1999). The Aggregate Burden of Crime. *The Journal of Law and Economics*, *42*(2), 611–642. https://doi.org/10.1086/467436

Arnold, J., Nicoletti, G., & Scarpetta, S. (2008). *Regulation, allocative efficiency and productivity in OECD countries: Industry and firm-level evidence* (Economics Departiment Working Paper No. ECO/WKP(2008)24). Geneve.

Aron, J. (2000). Growth and Institutions: A Review of the Evidence. *The World Bank Research Observer*, *15*(1), 99–135. https://doi.org/10.1093/wbro/15.1.99

Arrow, K. (1962a). Economic welfare and the allocation of resources for invention. In R. Nelson (Ed.), The rate and direction of inventive activity (pp. 609–626). Princeton, NJ: Princeton University Press.

Arrow, K. J. (1962b). The economic implications of learning by doing. Review of Economic Studies, 29(3), 155–173.

Audretsch, D.B., Belitski, M. & Desai, S. (2015) Entrepreneurship and economic development in cities, *Annals of Regional Sciences*, 55 (1), 33-60.

Baker, G., Gibbons, R., & Murphy, K. J. (2001). Bringing the Market Inside the Firm? *The American Economic Review*, *91*(2), 212–218.

Barba Navaretti, G., Castellani, D., & Pieri, F. (2014). Age and firm growth: evidence from three European countries. *Small Business Economics*, *43*(4), 823–837. https://doi.org/10.1007/s11187-014-9564-6

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

Baum, J. A. C., & Silverman, B. S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. *Journal of Business Venturing*, *19*(3), 411–436. https://doi.org/10.1016/S0883-9026(03)00038-7

Bedi, A. S., & Edwards, J. H. . (2002). The impact of school quality on earnings and educational returns—evidence from a low-income country. *Journal of Development Economics*, *68*(1), 157–185. https://doi.org/10.1016/S0304-3878(02)00010-X

Bernard, A. B., Jensen, J. B., & Schott, P. K. (2006). Trade costs, firms and productivity. *Journal of Monetary Economics*, *53*(5), 917–937. https://doi.org/10.1016/J.JMONECO.2006.05.001

Birdsall, N., & Fukuyama, F. (2011). *New Ideas on Development after the Financial Crisis*. Baltimore: John Hopkins University Press.

Bloom, N., Schankerman, M., & Reenen, J. Van. (2013). Identifying Technology Spillovers and Product Market Rivalry. *Econometrica*, *81*(4), 1347–1393. https://doi.org/10.3982/ECTA9466

Bloom, N., & Van Reenen, J. (2010). Why Do Management Practices Differ across Firms and Countries? *Journal of Economic Perspectives*, *24*(1), 203–224. https://doi.org/10.1257/jep.24.1.203

Bowen, H. P., & De Clercq, D. (2008). Institutional Context and the Allocation of Entrepreneurial Effort. *Journal of International Business Studies*, *39*(4), 747–768.

Bridgman, B., Qi, S., & Schmitz, J. A. (2009). *The Economic Performance of Cartels: Evidence from the New Deal U.S. Sugar Manufacturing Cartel, 1934-74*. Minneapoli. Retrieved from https://minneapolisfed.org/research/sr/SR437.pdf

Brown, J. D., Earle, J. S., & Telegdy, Á. (2006). The Productivity Effects of Privatization: Longitudinal Estimates from Hungary, Romania, Russia, and Ukraine. *Journal of Political Economy*, *114*(1), 61–99. https://doi.org/10.1086/499547

Cantarelli, C. C., Flyvbjerg, B., Molin, E. J. E., & van Wee, B. (2010). Cost overruns in large-scale transportation infrastructure projects: Explanations and their theoretical embeddedness. *European Journal of Transport and Infrastructure Research*, *10*(1), 5–18. Retrieved from http://arxiv.org/abs/1307.2176

Caselli, F. (2005). ACCOUNTING FOR CROSS-COUNTRY INCOME DIFFERENCES. In P. Aghion & S. Durlauf (Eds.), *Handbook of Economic Growth* (pp. 679–741). Elsevier Ltd.

Chanda, A., & Dalgaard, C. (2008). Dual Economies and International Total Factor Productivity Differences: Channelling the Impact from Institutions, Trade, and Geography. *Economica*, *75*(300), 629–661. https://doi.org/10.1111/J.1468-0335.2007.00673.X

Charron, N., Dijkstra, L., & Lapuente, V. (2014).Regional Governance Matters: Quality of Government within European Union Member States *Regional Studies, 48*(1), 68-90.

Charron, N., Dijkstra, L., & Lapuente, V. (2015). Mapping the Regional Divide in Europe: A Measure for Assessing Quality of Government in 206 European Regions. *Soc Indic Res*, *122*, 315–346. https://doi.org/10.1007/s11205-014-0702-y

Crain, W. M., & Oakley, L. K. (1995). The Politics of Infrastructure. *The Journal of Law and Economics*, *38*(1), 1–17. https://doi.org/10.1086/467323

Colombelli, A., Krafft, J. & Vivarelli, M., (2016). To be born is not enough: The key role of innovative startups, Small Business Economics, 47, 277–291.

Demirgüç-Kunt, A., & Maksimovic, V. (1998). Law, Finance, and Firm Growth. *The Journal of Finance*, *53*(6), 2107–2137. https://doi.org/10.1111/0022-1082.00084

Di Tommaso, M. R., Tassinari, M., Bonnini, S., & Marozzi, M. (2017). Industrial policy and manufacturing targeting in the US: new methodological tools for strategic policy-making. *International Review of Applied Economics*, *31*(5), 681–703. https://doi.org/10.1080/02692171.2017.1303036

Djankov, S., La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. (2002). The Regulation of Entry. *The Quarterly Journal of Economics*, *117*(1), 1–37. https://doi.org/10.1162/003355302753399436

Easterly, W., & Levine, R. (2003). Tropics, germs, and crops: how endowments influence economic development. *Journal of Monetary Economics*, *50*, 3–39. https://doi.org/10.1016/S0304-3932(02)00200-3

Efendic, A., Mickiewicz, T., & Rebmann, A. (2015). Growth aspirations and social capital: Young firms in a post-conflict environment. *International Small Business Journal*, *33*(5), 537–561. https://doi.org/10.1177/0266242613516987

Eslava, M., Haltiwanger, J., Kugler, A., & Kugler, M. (2004). The effects of structural reforms on productivity and profitability enhancing reallocation: evidence from Colombia. *Journal of Development Economics*, *75*(2), 333–371. https://doi.org/10.1016/J.JDEVECO.2004.06.002

Estrin, S., Korosteleva, J., & Mickiewicz, T. (2013). Which institutions encourage entrepreneurial

growth aspirations? *Journal of Business Venturing*, *28*, 564–580. https://doi.org/10.1016/j.jbusvent.2012.05.001

Evenett, S. J., & Voicu, A. (2001). *Picking winners or creating them? Revisiting the benefits of FDI in the Czech Republic*. Retrieved from https://www.alexandria.unisg.ch/22178/

Farole, T., Rodriguez-Pose, A., & Storper, M. (2011). Cohesion Policy in the European Union: Growth, Geography, Institutions. *JCMS: Journal of Common Market Studies*, *49*(5), 1089–1111. https://doi.org/10.1111/J.1468-5965.2010.02161.X

Fernandes, A. M. (2007). Trade policy, trade volumes and plant-level productivity in Colombian manufacturing industries. *Journal of International Economics*, *71*(1), 52–71. https://doi.org/10.1016/J.JINTECO.2006.03.003.

Ghio, N., Guerini, M., Lehmann, E. E., & Rossi-Lamastra, C. (2015). The emergence of the knowledge spillover theory of entrepreneurship, *Small Business Economics*, *44*(1), 1–18.

Glaeser, E. L., La Porta, R., Lopez-de-Silanes, F., &Shleifer, A. (2004). Do Institutions Cause Growth? *Journal of Economic Growth*, 9, 271-303.

Griffith, R., Harrison, R., & Van Reenen, J. (2006). 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), 1859–1875. https://doi.org/10.1257/AER.96.5.1859

Hall, R. E., & Jones, C. I. (1999). Why Do Some Countries Produce So Much More Output Per Worker Than Others? *Source: The Quarterly Journal of Economics*, *114167*(1223), 83–116.

Haskel, J., & Sanchis, A. (1995). Privatisation and X-Inefficiency: A Bargaining Approach. *The Journal of Industrial Economics*, *43*(3), 301. https://doi.org/10.2307/2950582

Hatzichronoglou, T. (1997). Revision of the High-Technology Sector and Product Classification, OECD Science, Technology and Industry Working Papers, 1997/02, OECD Publishing. http://dx.doi.org/10.1787/134337307632

Hayter, C. S. (2013). Conceptualizing knowledge-based entrepreneurship networks: Perspectives from the literature. Small Business Economics, 41(4), 899–911.

Henisz, W. J. (2002). The institutional environment for infrastructure investment. *Industrial and Corporate Change*, *11*(2), 355–389. https://doi.org/10.1093/icc/11.2.355

Issar, A., Lim, J., & Mohapatra, S. (2017). *Institutional Quality and International Differences in Firm Productivity* (No. 2017-2–1). Ahmedabad. Retrieved from https://web.iima.ac.in/assets/snippets/workingpaperpdf/66292458020 17-02-01.pdf

Johnson, S., La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. (2000). Tunneling. *American Economic Review*, *90*(2), 22–27.

Keating, M. (1997). The invention of regions: political restructuring and territorial government in Western Europe. *Environment and Planning C: Government and Policy*, *15*, 383–398. Retrieved from http://journals.sagepub.com/doi/pdf/10.1068/c150383

Kim, S., & Law, M. T. (2012). History, Institutions and Cities: A View from the Americas. *Journal of Regional Science*, *52*(1), 10–39. https://doi.org/10.1111/J.1467-9787.2011.00751.X

King, R. G., & Levine, R. (1993). Finance and Growth: Schumpeter Might Be Right. *The Quarterly Journal of Economics*, *108*(3), 717–737. https://doi.org/10.2307/2118406

Klenow, P. J., & Rodriguez-Clare, A. (1997). *The Neoclassical Revival in Growth Economics: Has It Gone Too Far?* (Vol. 12). MIT Press.

Knack, S., & Keefer, P. (1995). Institutions and economic performance: Cross-country tests using alternative institutional measures. *Economics & Politics*, *7*(3), 207–227. https://doi.org/10.1111/j.1468-0343.1995.tb00111.x

Knack, S., & Keefer, P. (1997). Does Social Capital Have an Economic Payoff? A Cross-Country Investigation. *Source: The Quarterly Journal of Economics*, *112167*(4223), 1251–1288.

Knittel, C. R. (2002). Alternative Regulatory Methods and Firm Efficiency: Stochastic Frontier Evidence from the U.S. Electricity Industry. *Review of Economics and Statistics*, *84*(3), 530–540. https://doi.org/10.1162/003465302320259529

Koenker, R., & Hallock, K. F. (2001). Quantile Regression. *Journal of Economic Perspectives*, *15*(4), 143–156. https://doi.org/10.1257/jep.15.4.143

La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. (1999). Corporate Ownership Around the World. *The Journal of Finance*, *54*(2), 471–517.

Lasagni, A., Nifo, A., & Vecchione, G. (2015). Firm productivity and institutional quality: Evidence from italian industry. *Journal of Regional Science*, *55*(5), 774–800. https://doi.org/10.1111/jors.12203

Lazear, E. P., & Rosen, S. (1981). Rank-Order Tournaments as Optimum Labor Contracts. *Journal of Political Economy*, *89*(5), 841–864. https://doi.org/10.1086/261010

Lee, K., & Kim, B. Y. (2009). Both Institutions and Policies Matter but Differently for Different Income Groups of Countries: Determinants of Long-Run Economic Growth Revisited. *World Development*, *37*(3), 533–549. https://doi.org/10.1016/j.worlddev.2008.07.004

Lee, H. and Lee, K. (2019). Institutions Matter Differently,Depending on the Ownership Types of Firms: Interacting Effects on Firm Productivity in China. *Singapore Economic Review*, forth-coming.

Levie, J., & Autio, E. (2011). Regulatory Burden, Rule of Law, and Entry of Strategic Entrepreneurs: An International Panel Study. *Journal of Management Studies*, *48*(6), 1392–1419. https://doi.org/10.1111/j.1467-6486.2010.01006.x

Lin, J. Y. (2011). New Structural Economics: A Framework for Rethinking Development. *The World Bank Research Observer*, *26*(2), 193–221. https://doi.org/10.1093/wbro/lkr007

Loayza, N. V., Oviedo, A. M., & Servén, L. (2005). *The Impact of Regulation on Growth and Informality: Cross-country Evidence - Norman V. Loayza, Ana María Oviedo, Luis Servén - Google Libri* (Policy Research Working Paper Series No. WPS3623). Washington.

May, C. (2015). Who's in charge? Corporations as institutions of global governance. *Palgrave Communications*, *1*(1), 1–10. https://doi.org/10.1057/palcomms.2015.42

Mcguinness, A. (2007). *Institutions and total factor productivity convergence* (Research Technical paper No. 9/07). Dublin.

Meyer, K. E., and Nguyen, H. V. (2005). Foreign Investment Strategies and Sub-national Institutions in Emerging Markets: Evidence from Vietnam. Journal of management studies, 42(1), 63-93.

Nalebuff, B. J., & Stiglitz, J. E. (1983). Information, Competition, Markets. *American Economic Review*. American Economic Association. https://doi.org/10.2307/1816855

Nawaz, S. (2015). Growth effects of institutions: A disaggregated analysis. *Economic Modelling*, *45*, 118–126. https://doi.org/10.1016/j.econmod.2014.11.017

Nguyen, H., & Jaramillo, P. (2014). *Institutions and Firms'Return to Innovation: Evidence from the World Bank Enterprise Survey* (No. 6918). Washington. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2449899

Nicoletti, G., & Scarpetta, S. (2005). *Product Market Reforms and Employment in OECD Countries* (OECD Economics Department Working Papers No. 472). Geneva: OECD Publishing. https://doi.org/10.1787/463767160680

Nifo, A., Scalera, D., & Vecchione, G. (2017). The rule of law and educational choices: evidence from Italian regions. *Regional Studies*, *51*(7), 1048–1062. https://doi.org/10.1080/00343404.2016.1262945

Nifo, A., & Vecchione, G. (2014). Do Institutions Play a Role in Skilled Migration? The Case of Italy. *Regional Studies*, *48*(10), 1628–1649. https://doi.org/10.1080/00343404.2013.835799

North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press. https://doi.org/10.2307/2234910

OECD. (2001). *Territorial Outlook 2001*. Paris.

Ohmae, K. (1992). The Rise of the Region State. *Foreign Affairs*, *72*, 78–87. Retrieved from http://heinonline.org/HOL/Page?handle=hein.journals/fora72&id=358&div=33&collection=journals

Porter, M. E. (1980): Competitive Strategy. New York: The Free Press

Przeworski, A. (2004). Institutions Matter?1. *Government and Opposition*, *39*(4), 527–540.

https://doi.org/10.1111/j.1477-7053.2004.00134.x

Rodriguez-Pose, A. (2001). Is R&D investment in lagging areas of Europe worthwhile? Theory and empirical evidence. *Papers in Regional Science, 80*, 275–295. https://doi.org/10.1111/j.1435-5597.2001.tb01800.x

Rodriguez-Pose, A. (2013). Do Institutions Matter for Regional Development?: Regional Studies: Vol 47, No 7. *Regional Studies*, *47*(7). https://doi.org/10.1080/00343404.2012.748978

Rodriguez-Pose, A., & Di Cataldo, M. (2015). Quality of government and innovative performance in the regions of Europe. *Journal of Economic Geography*, *15*(4), 673–706. https://doi.org/10.1093/jeg/lbu023

Rodrik, D. (1996). Understanding Economic Policy Reform, *Journal of Economic Literature*,XXXIV, 9–41.

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development. *Journal of Economic Growth*, *9*, 131–165.

Roland, G. (2004). Understanding institutional change: Fast-moving and slow-moving institutions. *Studies in Comparative International Development*, *38*(4), 109–131. https://doi.org/10.1007/BF02686330

Romer, P. (1990). Endogenous technological change. Journal of Political Economy, 98(5), S71–S102.

Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, *39*(3), 312–320.

Syverson, C. (2011). What Determines Productivity? *Journal of Economic Literature*, *49*(2), 326–365. https://doi.org/10.1257/jel.49.2.326

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

Turok, I. & McGranahan, G. (2013). Urbanization and economic growth: the arguments and

evidence for Africa and Asia. *Environement & Urbanization*,25(2), 465-482.

Urbano, D., Aparicio, S. & Audretsch, D. (2018). Twenty-five years of research on institutions, entrepreneurship, and economic growth: what has been learned?, Small Business Economics, doi: 10.1007/s11187-018-0038-0.

Verhoogen, E. A. (2008). Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector. *Quarterly Journal of Economics*, *123*(2), 489–530. https://doi.org/10.1162/qjec.2008.123.2.489

Williamson, C. R., & Kerekes, C. B. (2011). Securing Private Property: Formal versus Informal Institutions. *The Journal of Law & Economics*, *54*(3), 537–572. https://doi.org/10.1086/658493

Williamson, J. (2004). *The Washington Consensus as Policy Prescription for Development*. Washington: World Bank.

Williamson, O. E. (2000). The New Institutional Economics: Taking Stock, Looking Ahead. *Journal of Economic Literature*, *38*(3), 595–613. https://doi.org/10.1257/jel.38.3.595

Whitley, R. (1999). Divergent Capitalisms: The social structuring and change of business systems, Oxford: Oxford University Press.

TABLE 1 -Description of the variables used in the estimations and main summary statistics

VARIABLE	DESCRIPTION	Mean	Std. Dev.	Min	Max	Obs
TFP	Total Factor Productivity (average 2010-2014)	-0.733	0.541	-2.460	0.612	8,223
EQI	Region-level index of Institutional Quality (average of 2010 and 2013)	0.378	0.641	-2.263	1.343	13,306
RUL	Region-level index of Rule of Law (average of 2010 and 2013)	0.275	0.523	-1.113	1.843	13,306
GOV	Region-level index of Government Effectiveness (average of 2010 and 2013)	0.229	0.553	-1.530	1.763	13,306
HMTI	Dummy = 1 for high and medium-high technology industries (based on the Eurostat classification at NACE Rev 2, 2-digit level)	0.228	0.420	0	1	13,978
GDP	Regional gross domestic product (average of annual growth rates 2010-2014)	0.014	0.019	-0.023	0.059	13,306
SIZE	Total assets (thousands of euro)	7,006	16,775	125	185,030	11,332
AGE	2009 minus firm's year of establishment	33	27.606	2	158	13,950
TRAIN	Share of employees involved in formal training programs in 2008	0.443	0.497	0	1	13,978
FOREGROUP	Dummy = 1 if firm belongs to a foreign group (in 2008).	0.085	0.279	0	1	13,978
FORECOMP	Dummy = 1 if the firm's main competitors are located abroad (in 2008).	0.139	0.346	0	1	13,970
EXP	Dummy = 1 if in 2008 a firm sold abroad some or all of its own products/services	0.668	0.471	0	1	13,978
R&D	Dummy = 1 if a firm undertook R&D activity in the three years 2007-2009	0.511	0.500	0	1	13,974
INNO	Dummy = 1 if a firm carried out (in the three years 2007-2009) product or process innovation	0.649	0.477	0	1	13,978

All the variables are based on data coming from EFIGE (European Firms in a Global Economy) dataset, except EQI, RUL, GOV (in log terms) and GDP which are based on data drawn from Charron et al. (2014 and 2015)

TABLE 2 - Estimationresults

	OLS (Bench)			QUANTILE													
	EQI	RUL	GOV	EQI					RUL					GOV				
				q10	*q25*	*q50*	*q75*	*q90*	*q10*	*q25*	*q50*	*q75*	*q90*	*q10*	*q25*	*q50*	*q75*	*q90*
EQI	0.088 *** *0.0000*			0.122 *** *0.0000*	0.101 *** *0.0000*	0.073 *** *0.0000*	0.085 *** *0.0000*	0.040 ** *0.0460*										
RUL		0.060 *** *0.0010*							0.101 *** *0.0090*	0.084 *** *0.0010*	0.045 ** *0.0410*	0.035 *0.1550*	-0.005 *0.8630*					
GOV			0.070 *** *0.0000*											0.105 *** *0.0000*	0.089 *** *0.0000*	0.058 *** *0.0000*	0.065 *** *0.0000*	0.034 * *0.0570*
HMTI	0.133 *** *0.0000*	0.136 *** *0.0000*	0.132 *** *0.0000*	0.139 *** *0.0070*	0.129 *** *0.0000*	0.138 *** *0.0000*	0.136 *** *0.0000*	0.147 *** *0.0000*	0.132 *** *0.0070*	0.129 *** *0.0000*	0.141 *** *0.0000*	0.147 *** *0.0000*	0.149 *** *0.0000*	0.142 *** *0.0030*	0.125 *** *0.0000*	0.139 *** *0.0000*	0.140 *** *0.0000*	0.139 *** *0.0000*
GDP	1.749 ** *0.0490*	2.713 *** *0.0020*	2.070 ** *0.0200*	0.975 *0.5940*	2.216 * *0.0690*	3.571 *** *0.0000*	1.123 *0.3150*	1.730 *0.2330*	2.119 *0.1870*	3.436 *** *0.0030*	3.778 *** *0.0000*	2.303 ** *0.0420*	2.005 *0.1610*	0.713 *0.7040*	2.036 * *0.0710*	3.696 *** *0.0000*	1.283 *0.2030*	2.010 *0.1770*
SIZE	-0.396 *** *0.0000*	-0.397 *** *0.0000*	-0.396 *** *0.0000*	-0.220 *** *0.0010*	-0.291 *** *0.0000*	-0.436 *** *0.0000*	-0.492 *** *0.0000*	-0.491 *** *0.0000*	-0.233 *** *0.0010*	-0.295 *** *0.0000*	-0.441 *** *0.0000*	-0.485 *** *0.0000*	-0.487 *** *0.0000*	-0.228 *** *0.0010*	-0.302 *** *0.0000*	-0.447 *** *0.0000*	-0.487 *** *0.0000*	-0.498 *** *0.0000*
SIZE2	0.019 *** *0.0000*	0.019 *** *0.0000*	0.019 *** *0.0000*	0.007 * *0.0750*	0.012 *** *0.0020*	0.021 *** *0.0000*	0.025 *** *0.0000*	0.026 *** *0.0000*	0.008 * *0.0600*	0.012 *** *0.0010*	0.021 *** *0.0000*	0.025 *** *0.0000*	0.025 *** *0.0000*	0.008 * *0.0570*	0.012 *** *0.0000*	0.021 *** *0.0000*	0.025 *** *0.0000*	0.026 *** *0.0000*
AGE	0.086 ** *0.0150*	0.085 ** *0.0170*	0.088 ** *0.0140*	0.208 ** *0.0340*	0.119 ** *0.0150*	0.080 * *0.0810*	0.057 *0.1220*	0.087 *0.1350*	0.213 ** *0.0180*	0.114 ** *0.0150*	0.090 ** *0.0380*	0.047 *0.2000*	0.080 *0.1460*	0.215 ** *0.0170*	0.115 *** *0.0090*	0.071 * *0.0940*	0.059 * *0.0880*	0.084 *0.1350*

AGE2	-0.014**	-0.014**	-0.015**	-0.031**	-0.019**	-0.014*	-0.011*	-0.016*	-0.032**	-0.018**	-0.015**	-0.010	-0.015*	-0.033**	-0.018**	-0.012*	-0.012**	-0.016*
	0.0110	*0.0140*	*0.0100*	*0.0370*	*0.0160*	*0.0520*	*0.0580*	*0.0980*	*0.0210*	*0.0170*	*0.0230*	*0.1130*	*0.0900*	*0.0190*	*0.0140*	*0.0680*	*0.0350*	*0.0930*
TRAIN	0.033***	0.033***	0.033***	0.014	0.027**	0.040***	0.049***	0.026*	0.002	0.023*	0.043***	0.046***	0.022	0.011	0.025*	0.039***	0.045***	0.033**
	0.0010	*0.0010*	*0.0010*	*0.4520*	*0.0330*	*0.0000*	*0.0000*	*0.0980*	*0.9250*	*0.0540*	*0.0000*	*0.0000*	*0.1540*	*0.5520*	*0.0500*	*0.0000*	*0.0000*	*0.0500*
FOREGROUP	0.055***	0.055***	0.054***	-0.005	0.0320	0.065***	0.069***	0.121***	-0.013	0.0280	0.060***	0.064***	0.117***	-0.036	0.0250	0.069***	0.071***	0.119***
	0.0080	*0.0070*	*0.0080*	*0.8820*	*0.1980*	*0.0020*	*0.0030*	*0.0020*	*0.7170*	*0.2490*	*0.0050*	*0.0060*	*0.0010*	*0.3610*	*0.3170*	*0.0010*	*0.0020*	*0.0020*
FORECOMP	0.021	0.021	0.022	-0.031	0.003	0.037**	0.035*	0.063***	-0.030	0.002	0.039***	0.037*	0.065***	-0.027	0.002	0.037**	0.038**	0.062***
	0.1580	*0.1490*	*0.1370*	*0.2970*	*0.8790*	*0.0130*	*0.0570*	*0.0060*	*0.3330*	*0.9140*	*0.0070*	*0.0540*	*0.0010*	*0.3550*	*0.9100*	*0.0170*	*0.0380*	*0.0080*
EXP	0.019*	0.020*	0.019	0.011	0.028*	0.015	0.008	0.012	0.016	0.033**	0.014	0.013	0.009	0.006	0.026*	0.014	0.014	0.016
	0.0970	*0.0780*	*0.1020*	*0.6450*	*0.0520*	*0.1860*	*0.5390*	*0.4460*	*0.5150*	*0.0370*	*0.2570*	*0.3330*	*0.6130*	*0.7860*	*0.0830*	*0.2210*	*0.2800*	*0.3280*
R&D	0.007	0.009	0.007	0.006	0.020	0.008	0.005	0.010	0.008	0.021	0.006	0.008	0.008	0.005	0.022	0.010	0.005	0.007
	0.5040	*0.4180*	*0.4980*	*0.7380*	*0.1160*	*0.4730*	*0.6840*	*0.5240*	*0.6760*	*0.1210*	*0.5720*	*0.5230*	*0.6250*	*0.7920*	*0.1050*	*0.3720*	*0.7250*	*0.6910*
INNO	-0.010	-0.010	-0.010	-0.008	0.002	0.002	-0.014	-0.037**	0.003	0.005	0.003	-0.018	-0.040**	0.005	0.005	0.001	-0.016	-0.034**
	0.3420	*0.3570*	*0.3500*	*0.7090*	*0.8950*	*0.8700*	*0.3070*	*0.0240*	*0.8770*	*0.7040*	*0.7680*	*0.1770*	*0.0190*	*0.8240*	*0.7090*	*0.9590*	*0.2340*	*0.0370*
N	6,791	6,791	6,791			6,791					6,791					6791		
Model test	247.1	244.4	245.9															
	0.0000	*0.0000*	*0.0000*															
R^2	0.533	0.531	0.532															

test [q10=q25=q50=q75 =q90]	2.890	1.790	2.350
	0.021	*0.128*	0.052

For the description of the variables see Table 1.

TABLE 3 - Estimationresults

	OLS			MIXED EFFECTS			2SLS		
	EQI	RUL	GOV	EQI	RUL	GOV	EQI	RUL	GOV
EQI	0.095***			0.114***			0.346***		
	0.0000			*0.0000*			*0.0000*		
RUL		0.069**			0.118***			0.738***	
		0.0160			*0.0000*			*0.0000*	
GOV			0.083***			0.105***			0.308***
			0.0000			*0.0000*			*0.0000*
HMTI	0.140***	0.146***	0.144***	0.125***	0.128***	0.130***	0.158***	0.230***	0.168***
	0.0000	*0.0010*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
INTEQI	-0.035**			-0.032**			-0.116***		
	0.0410			*0.0460*			*0.0000*		
INTRUL		-0.037*			-0.0310			-0.239***	
		0.0600			*0.1150*			*0.0000*	
INTGOV			-0.054***			-0.049***			-0.175***
			0.0050			*0.0090*			*0.0000*
GDP	1.747**	2.721**	2.018**	0.4480	1.1460	0.2860	0.5140	0.1350	1.6860
	0.0490	*0.0390*	*0.0230*	*0.7500*	*0.4310*	*0.8430*	*0.6660*	*0.9180*	*0.1380*
SIZE	-0.394***	-0.400***	-0.398***	-0.386***	-0.390***	-0.389***	-0.409***	-0.448***	-0.420***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
SIZE2	0.019***	0.019***	0.019***	0.018***	0.018***	0.018***	0.020***	0.022***	0.020***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
AGE	0.089**	0.084*	0.090**	0.093***	0.089***	0.094***	0.086**	0.0650	0.086**
	0.0120	*0.0700*	*0.0110*	*0.0050*	*0.0060*	*0.0040*	*0.0300*	*0.1230*	*0.0300*
AGE2	-0.015***	-0.014*	-0.015***	-0.017***	-0.016***	-0.017***	-0.016**	-0.012*	-0.015**
	0.0090	*0.0700*	*0.0080*	*0.0010*	*0.0020*	*0.0010*	*0.0140*	*0.0720*	*0.0190*
TRAIN	0.033***	0.034**	0.033***	0.035***	0.035***	0.034***	0.030**	0.032**	0.031***
	0.0010	*0.0170*	*0.0010*	*0.0000*	*0.0000*	*0.0000*	*0.0110*	*0.0110*	*0.0080*
FOREGROUP	0.056***	0.054**	0.055***	0.053***	0.052***	0.053***	0.067***	0.065***	0.069***
	0.0060	*0.0130*	*0.0070*	*0.0020*	*0.0030*	*0.0020*	*0.0020*	*0.0050*	*0.0010*
FORECOMP	0.0220	0.0200	0.0220	0.0170	0.0160	0.0170	0.028*	0.0220	0.0270
	0.1370	*0.4420*	*0.1370*	*0.2010*	*0.2300*	*0.2120*	*0.0870*	*0.2060*	*0.1020*
EXP	0.019*	0.0200	0.0180	0.0130	0.0130	0.0120	0.0150	0.0190	0.0150
	0.0970	*0.2500*	*0.1090*	*0.2390*	*0.2350*	*0.2610*	*0.2400*	*0.1700*	*0.2710*
R&D	0.0070	0.0080	0.0070	0.0040	0.0040	0.0040	0.0000	0.0000	-0.0010
	0.5220	*0.1660*	*0.5370*	*0.6930*	*0.6740*	*0.7280*	*0.9880*	*0.9710*	*0.9620*

INNO	-0.0090	-0.0100	-0.0090	-0.0080	-0.0090	-0.0080	-0.0040	-0.0120	-0.0020
	0.3760	*0.2610*	*0.3850*	*0.4390*	*0.4080*	*0.4440*	*0.7610*	*0.3820*	*0.8580*
N	6,791	6,791	6,791	6,791	6,791	6,791	5,050	5,050	5,050
Model test	240.54	237.00	238.60	7,457.0	7,418.4	7,450.6	181.21	156.34	180.57
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
R^2	0.534	0.531	0.533						
test (EQI, INTEQI)	23.41			29.06			83.60		
	0.0000			*0.0000*			*0.0000*		
test (EQI+INTEQI)	2.979			3.494			6.981		
	0.0014			*0.0002*			*0.0000*		
test (RUL, INTRUL)		4.67			15.42			66.26	
		0.0410			*0.0000*			*0.0000*	
test (RUL+INTRUL)		1.505			2.526			7.422	
		0.0655			*0.0062*			*0.0000*	
test (RUL, INTGOV)			19.74			27.03			83.08
			0.0000			*0.0000*			*0.0000*
test (RUL+ INTGOV)			1.462			2.171			5.115
			0.0722			*0.0139*			*0.0000*
LR test vs OLS				110.95	134.24	116.86			
				0.0000	*0.0000*	*0.0000*			
Sargan test							0.0820	4.0030	1.9610
							0.7751	0.0454	0.1614

For the description of the variables see Table 1.

[i] As the Data Appendix clarifies, the measure of TFP provided by the EFIGE dataset is defined on a restricted sample. Indeed, AMADEUS balance sheet data, required to compute TFP, are available for around 50% of the EFIGE sample of firms (Altomonte et al., 2012). To verify whether sample selection is an issue, we follow Pellegrino and Zingales's (2017) suggestion, replicating our estimations by omitting those countries (Austria, Germany, Hungary and the UK) that might be under-represented. The outcome of this sensitivity check – focusing on Italy, France and Spain for a

total number of 5605 firms, 87% of the estimation sample – corroborates our main findings and is available upon request.

[ii] In any case *EQI*, *RUL* and *GOV* are average values of the 2010 and 2013 figures.

[iii] High-technology industries are listed in Table A1 note.

[iv] Squared terms of *SIZE* and *AGE* are also inserted to account for non-linear effects.

[v] The variables we employ are proxies of size, age and human capital. They are meant to capture, respectively, economies of scale, learning-by-doing effects, and higher capabilities, as well as other potential effects of larger size, longer experience and higher skills on the ability of firms to successfully manage their inputs. For instance, larger and older firms may be less opaque (thus having better access to finance); attract employees with higher skills; may be more export-oriented, and thus more exposed to international competition and beneficial "learning-by-exporting" effects.

[vi] This model allows overcoming a restrictive assumption of the traditional single-equation modelling, namely the independence among errors, which entails a higher probability of rejecting the null hypothesis when it is in fact true. For further details on the multilevel approach, see De Leeuw & Meijer (2008).

[vii] The kind of institutional facets we consider is likely to fall within the slow-moving category. On slow-moving and fast-moving institutions see, for instance, Roland (2004).

[viii] Indeed, human capital accumulation and demographic factors are likely to affect institutional evolution over time. According to Glaeser et al. (2004, p. 272): "educated people are more likely to resolve their differences through negotiation and voting than through violent disputes. Education is needed for courts to operate and to empower citizens to engage with government institutions. Literacy encourages the spread of knowledge about the government's malfeasance". Moreover, urbanization could offer higher opportunities for education and foster the development of public services (see Turok & McGranahan, 2013, for a critical discussion of the urbanization effects on several channels of economic and institutional development).

[ix] Although this result (combined with the following ones on institutional variables) implies that institutions have a stronger impact than the other regional variables considered, we also run a regression (available upon request) on standardized variables, verifying that the EQI coefficient is larger than that of all the other variables defined at the regional level.

[x] Since the dependent variable is in log terms, a one-point increase in RUL is associated to an 8.8% increase in TFP. The Sargan test reported at the bottom of Table 2 confirms the validity of the instruments we employ in columns 3-6.

However, the 2SLS coefficients are higher than those obtained in all the other estimations, therefore we focus on the most conservative estimates.

[xi] At the bottom of Table 3, the statistical significance of the sums of the key coefficients (EQI+INTE, RUL+INTE and GOV+INTE) is assessed by computing the relative standard errors. This sum tends to be not significant when considering the DGDP dummy.

[xii] These ratios are obtained as the ratio of the sum of the coefficients of *EQI* and *INTEEQI* over the coefficient of *EQI*, in each case.

[1] The survey questions are:

- How would you rate the quality of the police force in your area?
- The police force gives special advantages to certain people in my area.
- All citizens are treated equally by the police force in my area.
- Corruption is prevalent in the police force in my area.
- How would you rate the quality of public education in your area?
- How would you rate the quality of the public healthcare system in your area?
- Certain people are given special advantages in the public education system in my area.
- Certain people are given special advantages in the public healthcare system in my area.
- All citizens are treated equally in the public education system in my area.
- All citizens are treated equally in the public healthcare system in my area.
- In your opinion, if corruption by a public employee or politician were to occur in your area, how likely is it that such corruption would be exposed by the local mass media?
- Please respond to the following: elections in my area are honest and clean from corruption.
- Corruption is prevalent in my area's local public school system.
- Corruption is prevalent in the public healthcare system in my area.
- In the past 12 months have you or anyone living in your household paid a bribe in any form to health or medical services?
- In your opinion, how often do you think other citizens in your area use bribery to obtain public services?

[2] "Output is proxied by added value, deflated using industry-specific (NACE rev 1.1) price indices retrieved from Eurostat (estimates using revenues as a proxy are fully comparable). The labour input is measured by the number

of employees, while capital is proxied by the value of tangible fixed assets deflated using the GDP deflator. Material costs are instead deflated by average industry-specific PPIs (Producers Price Index) weighted by input-output table coefficients" (Altomonte et al., 2012, page 20).