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Remaking Umbria. Competitiveness of Firms, Industries, and Value Chains

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Remaking Umbria.
Competitiveness of Firms, Industries, and Value Chains

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EXECUTIVE SUMMARY

Umbria has been knocked hard by the twin economic crises in 2008 and 2011. The negative impact of the crises further deteriorated an economic environment that was on a declining path of economic growth since the onset of the 2000s. In the same period, diagnostics further show that a gap has grown with the richest regions of the country, especially in terms of aggregate labor productivity. Unemployment has been on the rise, but investment by companies has been resilient. Unfortunately, investment by the public sector did not keep pace with the private sector, declining over the observed span of time.

Once we look at the performance of companies, we do find a good deal of heterogeneity. Productivity distributions are bimodal, which means that most efficient firms sit together with largely inefficient firms in the region. In fact, a polarization of firms in productivity and competitiveness is a constant of other European regions we compare, including the Four Motors for Europe (Lombardia, Baden-Württemberg, Auvergne-Rhône-Alpes, Catalunya) and other regions under industrial restructuring (Hessen, Bilbao, the Midlands).

Eventually, we discuss that a structural change is underway at a global level such that a polarization appears at the firm level. The diffusion of new technologies did not give way to a global boost in productivity, let alone Italy and Umbria. At the onstage of the digital revolution, most of the gains from efficiency have been caught by a few firms, while a good bunch of smaller and less productive firms continues to operate as if the digital technologies never existed. Policymakers should be aware that increasing the

absorption capacity by smaller and less efficient firms is key to have an impact on aggregate performances.

Separation of a regional, national and international level is needed to understand the structural changes that determine the specialization patterns by manufacturing companies in Umbria. Economic globalization, with outsourcing/offshoring strategies, and technological progress, with robots and changing labor demands, have inevitably changed the landscape for manufacturing. Manufacturing is nowadays only about 17% of the total value added generated in Umbria. On top of that, a 'servitization' of manufacturing industries is underway, since up to 39% of manufacturing value is determined by the role of business services, which are key to improve the quality of the final goods. In this context, it is necessary to consider whole supply chains, where the activity of companies upstream has an impact on the outcome of other companies downstream, and vice versa. In fact, once we consider the representative firms along supply chains, we find that the bulk of the value is generated by pre- and post-production services. From this point of view, Terni has on average a lower value generation than Perugia in the segments where production tasks are more standardized, e.g. assembly lines and production of parts and components. To boost the generation of economic value in the region, companies should be able to catch the train of the digital revolution, but once we look at the performance in innovation strategies, we find strengths and weaknesses. One relevant weakness seems the scarce investment in R&D by companies, which in turn determines also a relatively scant number of patent applications for the generation of new industrial knowledge. Eventually, we argue, both external and internal financial constraints make innovation difficult for companies in Umbria, especially if they are SMEs.

The twin financial crises in 2008 and 2011 exacerbated some long-term trends that have invested more advanced economies, including a fundamental rethinking of the way manufacturing production is organized. From this point of view, Italy and Umbria make no exception. The establishment of global value chains allow companies to focus on a segment of the entire production process, where they can benefit more from competitive advantages, while offshoring/outsourcing the other tasks at home or abroad. Although we

can register some timid signs of re-shoring back home some activities by companies that were too optimistic in the last decade, make no mistake because outsourcing and offshoring strategies are here to stay. National and foreign investors will still consider foreign countries as a valid alternative to invest, for example, in Umbria. In this case, one should focus more than ever to build on the local competitive advantages that the territory can offer. On top of that, manufacturing jobs increasingly require a higher content of skills in times of a digital revolution. Hence, investment in human capital is key for the next future.

In a nutshell, the peculiarity of Umbria is that there is a number of firms that are relatively less efficient, and they are responsible for the aggregate negative outcome regarding (labor) productivity. The relatively smaller size of manufacturing firms does not help, because investment in internationalization and innovation need a good deal of financial support. Firms that cannot rely on high cash flows for self-financing must resort to financial markets. Unfortunately, in Umbria as in other parts of Italy, there is a lack of 'patient capital' that could help in addressing resources towards longer-term objectives, including investment in innovation and industrial restructuring in times of crises. Part of the financial relief could come from EU funds for regional policy, especially when they are used specifically for R&D and capital equipment expenditures. In fact, the latter have shown a stronger impact already in the short term with respect to other measures financed by the ERDF, as from an assessment made on all EU regions. In particular, ERDF R&D expenditures do benefit more companies that are most in need of industrial restructuring, when the investment target is clear.

1. COMPETITIVENESS OF FIRMS AND INDUSTRIES

In this Chapter, we provide some brief diagnostics on the economic performance of Umbria and its companies, compared with the rest of Italy and other regions of the European Union. We document that Umbria has been hit hard by the twin crises of 2008 and 2011, worsening an ongoing deterioration of incomes that started already in the 2000s. However, the negative economic performance over the last decade has its roots in a structural transformation that other similar regions and countries of old industrialization are undergoing. The peculiarities of the Italian economic performance just add on top of that. Therefore, understanding the reasons behind such a structural change helps in shaping the right policies for Umbria and Italy in an ever-changing global scenario.

1.1 BRIEF DIAGNOSTICS

Umbria has been hit hard by the twin economic crises burst in 2008 and 2011, respectively. As evident in **Figure 1**, when the global financial crisis started to bite in 2009, the regional gross value added collapsed about -8% in Umbria, while in the rest of Italy and the European Union the figures were -5.5% and -4%, respectively. Therefore, despite a tentative recovery in 2010, the sovereign debt crisis hit Italy and other European countries again in 2011, and Umbria registered negative growth rates up to -4% in the following years.

Nonetheless, official data report that a revival of the manufacturing industries may be on the way (Banca d'Italia, 2018), because for the first time since the 2012 domestic demand has prevailed on exports, especially in metal processing, machinery and wearing apparel. At the time of the survey, one in two firms believed in a rise of orders in the short-term, although smaller manufacturing firms with less than 10 employees were still suffering (-0.6% of output).

In fact, short-term improvements in the performance of medium-sized firms should not prevent us from understanding the reasons of a structural drift of the economic

position of Umbria compared to other regions in Italy and in the rest of the European Union. In the next paragraphs, we show that once we look at information from firm-level data, the picture can be a bit more complicated than what aggregate performance shows.

Umbria has been knocked harder by the economic crisis than the average European or Italian region, but its negative performance just added to a negative trend that had already started in 2000. Please note how, in the same period, the average growth rate has been either positive for the European Union or around zero for Italy. In fact, the ratio between the GDP per capita at current market prices in Umbria and all Italy has been on a constant decreasing trend between 2000 and 2014. In **Figure 2**, we observe that the ratio just stopped in 2016 at a mere 88%. In other words, starting from comparable levels of economic prosperity between Umbria and the rest of Italy in 1999, a deterioration occurred bringing Umbria below the national average in about 20 years.

Figure 1: Gross value added (basic prices), growth rates in 2000–2016, authors' elaboration on Eurostat

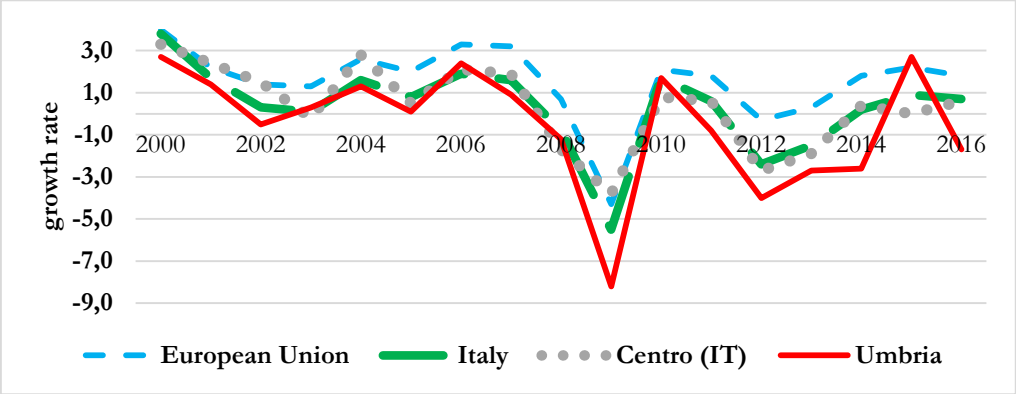


Figure 2: Ratio GDP per capita in Umbria and in Italy, 1998-2016. authors' elaboration on ISTAT

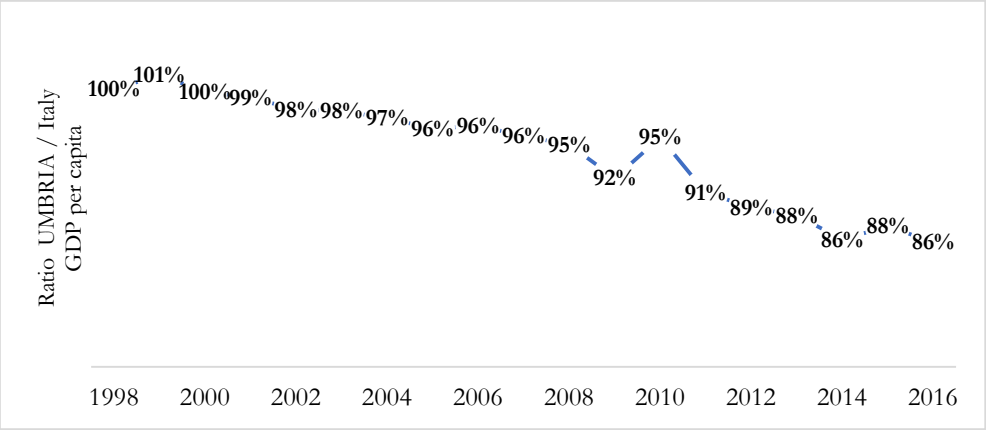
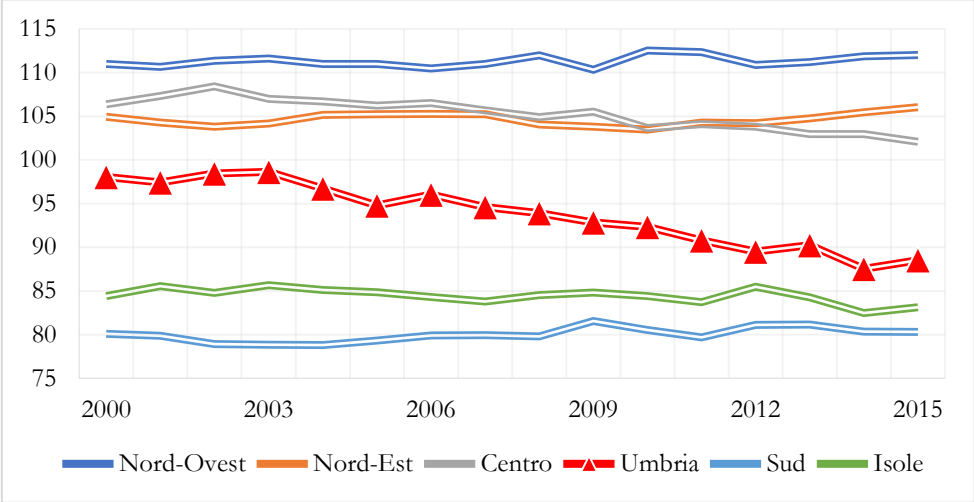


Figure 3: Value added per worked hour (Italy == 100) by macro-region, authors' elaboration on ISTAT.



In absolute terms, the picture may seem a bit gloomier, as the real GDP per capita in Umbria decreased from 27,189 euro per inhabitant in 2000 to 23,866 euro per inhabitant in 2016, whereas in Italy it just stagnated from 27,718 to 27,318 euro per inhabitant. Such a deterioration of individual prosperity is *prima facie* due to a divergence in labor productivity.

As reported in **Figure 3**, the returns from an hour worked were similar in Italy and in Umbria at around 26.1 and 25.5 euro respectively (98%). Following a similar trend as the one observed in **Figure 2**, the labor productivity in 2016 ended up being around 88.5%

of Italy as a whole. Such a negative trend in labor productivity is all the more interesting to study since it is not observed elsewhere in Italy. In terms of labor productivity, the historical gap between the North and the South of the country is persistent over the last decades, as shown by the parallel trends in **Figure 3**. Even in the same macro-region 'Centro' (as defined by NUTS code ITE), where we find Umbria together with Toscana, Marche and Lazio, the average returns per hour worked have been rather stable, although the macro-region gave ground to locations in the North-East in terms of relative performance. In general, the problem in Italy is that productivity is not increasing as it should be (see Calligaris et al., 2016), while in the specific case of Umbria there has been a decline. In the next paragraphs, we will comment more on the firm level origins of such a decline, when we will look at the performance of companies from balance sheet data. Here we want to check whether the sources of an aggregate decline in labor productivity can be ascribed to some composition changes in the factors of production, i.e. whether the aggregate movements of employment, unemployment, and capital formation can explain that the output of labor is decreasing over time in Umbria.

In **Figure 4**, we report a measure of investment (Gross Fixed Capital Formation) comparing macro-regions in Italy and Umbria along the period 2000-2016. We further decompose it in private investment by manufacturing firms and investment by state authorities. We observe that on average the rate has been proximate to zero, although the private investment from manufacturing firms has been increasing in Umbria, as well as in the Northern and Central regions of the country. Hence, the responsibility of an overall Italian stagnating formation of the capital comes from the public sectors in Umbria. Investment in new machinery and equipment, among others, as a result of increasingly innovative production processes, has been growing at an average speed of 3.26% in Umbria, whereas the average Italian rate has been a mere -1.32%. In the end, worst investment rates have been registered in Southern Regions, Sicily and Sardinia, while Umbria and the Central Region have been affected most by the constraints on public expenditures. Finally, there is no lack of resources invested by firms to replace old capital

goods, which could explain lesser productivity in Umbrian manufacturing activities, although some missing productivity can come from a lack of public investment.

In general, public support for innovation in Italy comes both from central administrations (18.1% of total investment) and from local authorities (16.1% of total investment). Only a residual share of around 3.8% comes from the European Union through structural funds. Regarding the latter, bigger firms seem to have better opportunities to succeed when compared to smaller firms. As a percentage of the total, 13.2% of bigger firms that started an application also obtained funds, against a mere 2.8% of smaller firms.

Figure 4: Average growth rate of Gross Fixed Capital Formation by macro-region in the period 2000-2016, authors' elaboration on Eurostat.

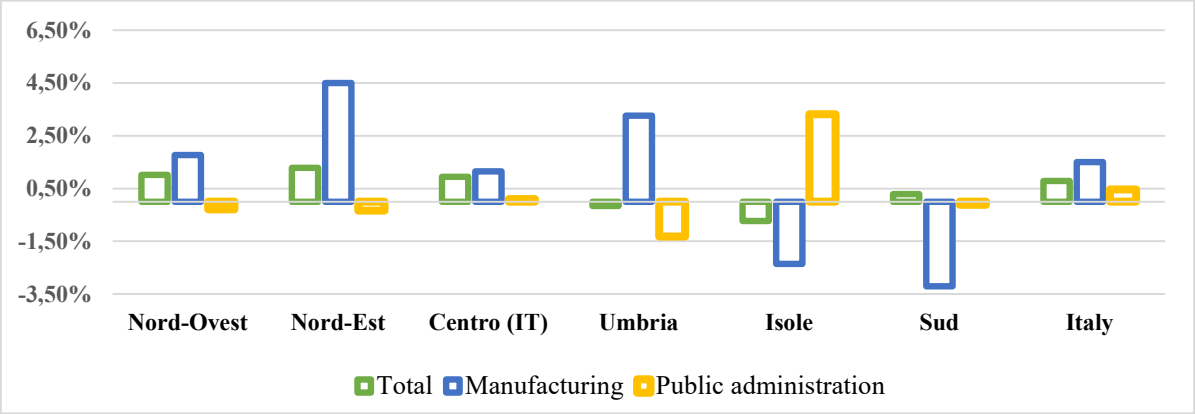


Figure 5: Economically active population in age 15-74, percentage by macro-region in the period 1999-2017, authors' elaboration on Eurostat.

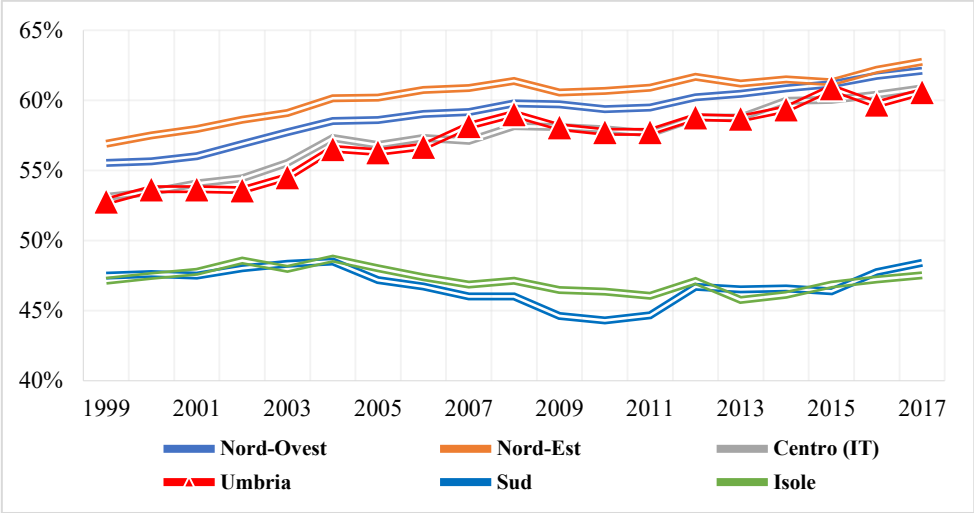
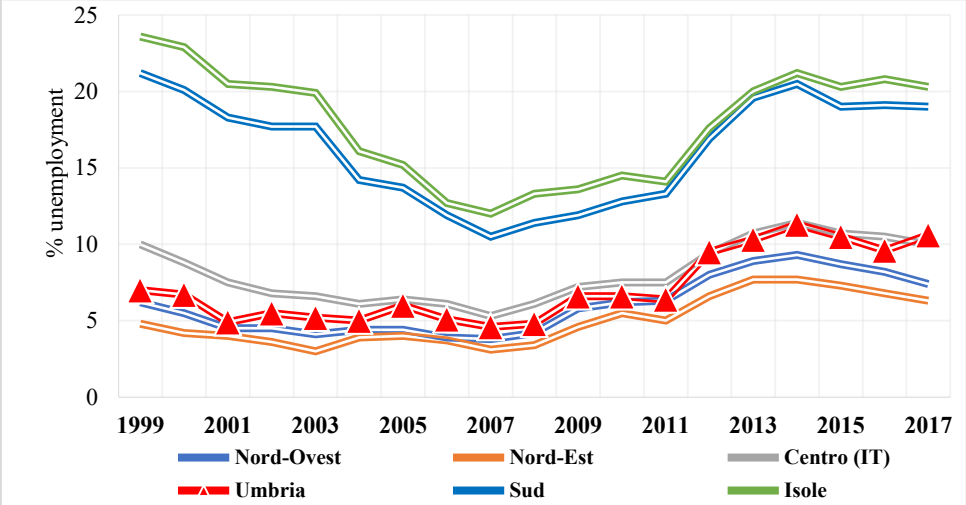


Figure 6: Unemployment in age 15 – 74, percentage by macro-region in the period 1999 – 2017, authors' elaboration on Eurostat.



As a matter of fact, when we look at the quality of investment in the latest available year 2016, we find that R&D for innovation of manufacturing activities is the most relevant category, in Umbria and in Italy (ISTAT, 2018a). Investment in R&D represents almost half of the overall expenditures, considering either in-house activities or R&D made in outsourcing, whereas investment in physical capital represents only about one-quarter of the total. The remainder is spent on marketing and design for the launch of new

products, purchases of intellectual property rights, and the professional training of employees. Naturally, the positive trend in R&D investment is particularly evident in manufacturing activities, including the automotive sector, electric machinery, and electronics products. In general, the intangible investment in R&D is less evident in services firms, although it is usually relevant in telecommunications and professional business services. On the other hands, industries where scale economies are important still rely on important shares of investment in physical capital goods, either to renew or to replace the existing stock. On average, according to ISTAT, R&D and other similar intangible investments are correlated with the size of the companies. Therefore, bigger companies with over 250 employees invest up to 83% in innovation, whereas smaller companies below 49 employees can afford to spend a non-negligible share of 55.8%.

In **Figure 5** and **Figure 6**, we combine information on trends about the active population and unemployment. The first tells us that there has been a mobilization of labor over time in Umbria and in the North of the country. In other words, in line with other modern economies, more people go and find a job, thanks for example to increasing participation of women to the labor markets, as well thanks to a deferred retirement of older people, due to the implementation of pension reforms that take into account an increasing life expectancy. In 2017, about 61% of the population in the age range between 15 and 74 years in Umbria was working. In this case, Umbria does show a trend similar to the ones observed by Northern regions, whereas in the Southern regions we do not observe any significant trend, neither increasing nor decreasing, in the participation rates of people to the labor markets. Similarly, in **Figure 6**, the unemployment trend is not that different in Umbria and in other Northern or Central regions. The development gap of labor markets between the North and the South of the country is just confirmed as persistent over the latest two decades from our data, but we cannot think of a reason why the trends are shown in **Figure 5** and **Figure 6** could determine the exceptional negative trend of labor productivity observed in **Figure 3**.

However, we do find strong volatility for unemployment over the last decade. Indeed, after a record low rate of 4.6% in Umbria in the year 2007, in the aftermath of the

financial crisis since 2008, the number of unemployed people raised gradually to 11.3% in 2014, to stop at 10.5% in 2017. Interestingly, young workers have slightly improved their chances to find a job in the latest years. In 2014, the unemployment rate in the range of 15-24 years was a worrying 42.5%, while in 2017 it is 30.8%. The situation for young workers is quite different if we confront Perugia and Terni, the two counties of Umbria. In the period 2014-2016, only one young worker out of two could find a job (53.1% of unemployment in 2015), whereas in Perugia the unemployment rate for workers in the range 15-24 years stopped at 28.1% in 2017.

1.2 THE DISTRIBUTION OF PRODUCTIVITY IN UMBRIA AND OTHER EUROPEAN REGIONS

In the previous paragraph, we made use of a notion of labor productivity that is intuitively an indicator of the average contribution of labor to output. However, as a production process in a firm or an industry can combine together capital, labor, materials, and technology in different ways, hence obtaining variable contributions of labor to output, we prefer to use the notion of Total Factor Productivity (TFP).

In the framework of economic growth, it is in general preferable to disentangle the contributions given by production factors (e.g. labor, capital) and the contribution that is not immediately explained by production factors. In this case, TFP catches the technological change and other determinants of the output, like managerial practices, the innovation of production processes, organizational solutions, and so on, which are usually not accounted for because not directly observed. In the Methodological Toolbox I, we briefly introduce one of the most recent econometric technique (Ackerberg, Caves and Frazer, 2015) that we picked for our analyses.

Methodological Toolbox I: Total Factor Productivity (TFP)

Total Factor Productivity (TFP) is the portion of output not explained by the quantity and quality of inputs used in production. In other words, it can proxy the individual firm ability to transform inputs in output (see also Syverson, 2011). We estimate a production function at the firm level after collecting information from the balance sheet in the period 2008-2016 for firms' output (revenues), labor (employees) and capital (total assets), taken individually for each firm *i* and time *t*. Therefore, we can estimate a log-linearized Cobb-Douglas production function in the form:

$$y_{it} = \beta_0 + \beta_1 l_{it} + \beta_k k_{it} + tfp_{it} + \varepsilon_{it}$$

where:

- y: (log of) value-added deflated by industry-specific Producer Price Indices (PPI);
- l: (log of) number of employees;
- k: (log of) capital (both tangible and intangible) assets;
- tfp: (log of) total factor productivity (TFP), originally unobserved by the analyst;
- ε: (log of) statistical noise.

Based on a theoretical model where firms have idiosyncratic efficiencies but face the same market structure and factor prices, we adopt the econometric methodology proposed by Ackerberg, Caves and Frazer (2015), which identifies the firm-level TFP taking into account the simultaneity bias, given by the possibility that a (manufacturing) producer can adjust the combination of factors of production at the moment that an improvement or worsening of technological capabilities occurs. The key point is to find an observable proxy for the unobserved productivity (technological) term. In this case, we choose changes in material goods in previous periods as instruments for productivity dynamics.

In the end, we can obtain aggregate TFP over the whole manufacturing industry in each region by taking market shares as individual weights, in the form:

$$TFP_{rt} = \sum_{i=1}^{I} ms_{it} * TFP_{it}$$

where ms_{it}, TFP_{it}, TFP_{rt} are respectively the market shares for firm i at time t, the TFP of firm i at time t, and the TFP of region r at time t. For further and useful details on the derivation of TFP from firm-level financial information and on other alternative techniques, see among others Van Beveren (2012).

In this paragraph, we make use of a sample of 62,206 manufacturing firms in Umbria active in the period 2007-2016, to estimate the Total Factor Productivity from the company level. The original data source is the Orbis database by Moody's Analytics, which collects balance sheet data with world coverage. Further control groups are collected to compare Umbria with other European regions. On one side, we take manufacturing firms active in the so-called Four Motors for Europe[1]: Lombardia in Italy, Baden-Württenberg in Germany, Rhône-Alpes in France, and Catalunya in Spain. On the other side, we also confront Umbria and its manufacturing firms with three EU regions that have undergone similar processes of industrial restructuring with a history of specialization in heavy medium-technology intensive industries: Hessen in Germany, Bilbao in Spain, and The Midlands in the United Kingdom. In the Appendix Tables A1 and A2, we provide a short description of the geographic and industrial coverage of our samples by region.

In **Figure 7** and **Figure 8**, we start by reporting the results for manufacturing firms in Umbria. In the first graph, we show an aggregate trend taking the productivity of each manufacturing firm in Umbria in each year and pondering it for the market share. In this way, we obtain a weighted average TFP that we can compare with labor productivity in **Figure 3**. In fact, the aggregate trends of TFP and labor productivity are quite similar over

[1] The Four Motors for Europe has been established as a collaboration network between four highly industrialized and research-oriented regions in Europe since 1988. The objective of the collaboration agreement is to increase economic and social cooperation for the long term economic growth, fostering common policies in science, research, education, environment and culture (see http://www.4motors.eu/en/)

the period of analysis, 2008-2016. In this case, we can argue that a lack of regional economic growth in Umbria is due to technological inefficiencies at the firm level. In other words, for an identical usage of capital and labor inputs, manufacturing firms in Umbria have been on average less and less efficient in delivering to the market in the period 2008-2016.

Certainly, the average is not informative enough of where such inefficiencies can be found. This is the reason why, in **Figure 8**, we look at the entire distribution of the (logs of) TFP in the year 2016, to observe which firms actually drive to the average negative trend. By construction of the graph, firms that are located on the left-hand side are less productive than firms located on the right. TFP values are transformed in logs for better visualization. Interestingly, we note that the distribution in **Figure 8** presents a polarization among firms. We detect two distinct groups of firms operating on the market: a bunch of inefficient firms on the left sits next to a vanguard of more competitive firms on the right. The same bimodality we observe for each year in the period 2008-2016. In fact, we can conclude that the average negative trend observed before the result of the increasing relevance of the left tail of the TFP distribution, while more competitive firms on the right-hand side keep their position over time.

Figure 7: Aggregate Total Factor Productivity in Umbria, weighted estimates from firm-level data, authors' computation on Orbis data - Moody's Analytics.

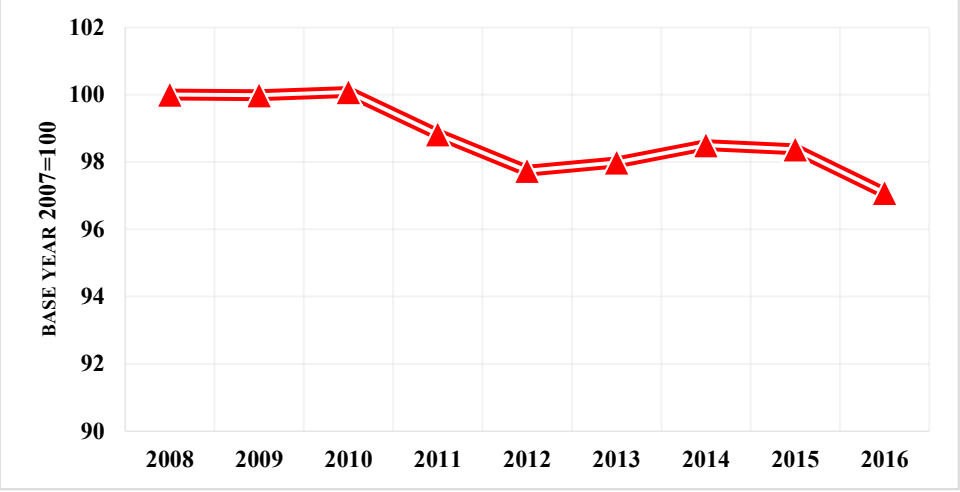
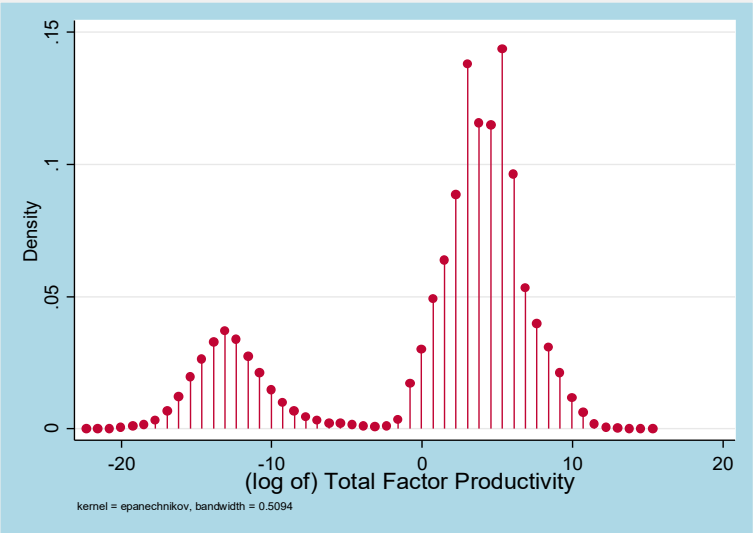


Figure 8: Firm-level distribution of Total Factor Productivity, manufacturing firms in Umbria in 2016, authors' elaboration on data from Orbis data - Moody's Analytics.



The problem of polarization between more and less efficient firms on the market seems to be common across all Europe (see Fattorini et al., 2018), so why do we have an issue in Umbria?

To make it clear, we repeat the exercise made for Umbria on firms that are active in the other seven regions across the European Union. In **Figure 9**, we report the TFP distributions of manufacturing firms in the group of the so-called 'Four Motors for Europe', which is a group of high-growth regions whose industrial activities are usually considered innovative across the continent. On the other hand, in **Figure 10**, we compare Umbria with a group of regions we picked, whose specialization pattern may be more similar to Umbria, i.e. based on high- and medium-high-tech manufacturing, often undergoing some processes of industrial restructuring.

In every region, we observe the same polarization reported in the case of Umbria. The main difference is the relative density of the least efficient firms *vis à vis* the most efficient firms. For example, in the 'Four Motors of Europe,' the least efficient firms are relatively less numerous than in the regions under industrial restructuring reported in **Figure 10**. All things considered, we may conclude that the aggregate trend is the result of

a composition effect: if more efficient firms prevail, then the trend for the region is positive, but a certain number of inefficient firms is present in any region.

Figure 9: Total Factor Productivity of manufacturing firms in the so-called 'Four Motors of Europe' in 2016, authors' elaboration on data from Orbis by Moody's Analytics.

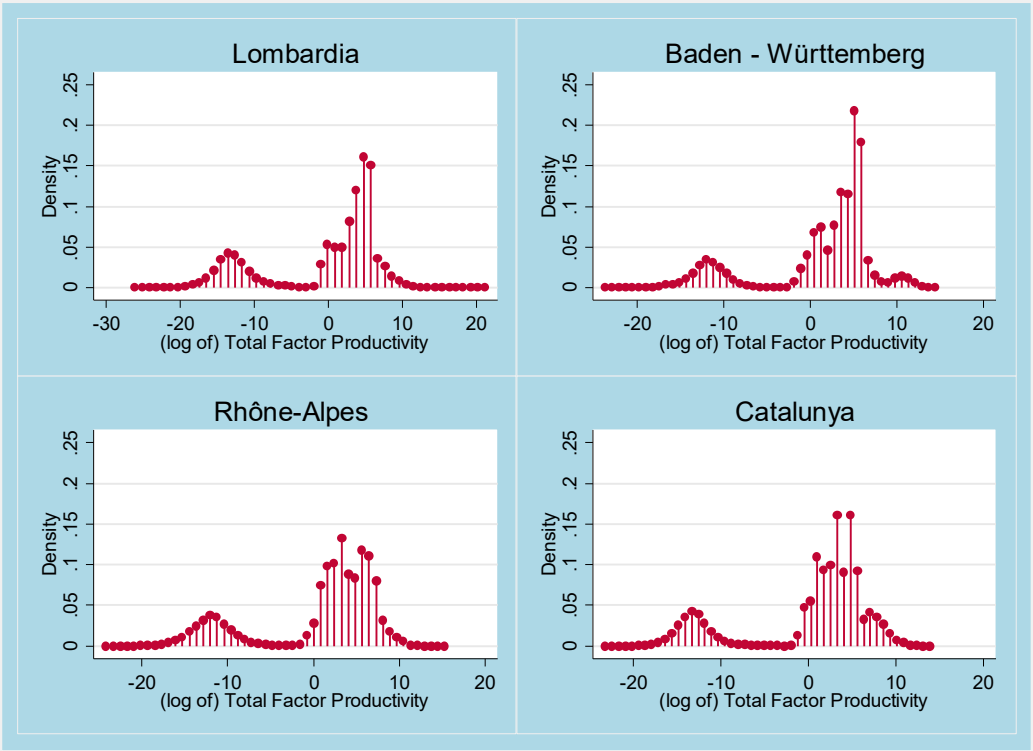
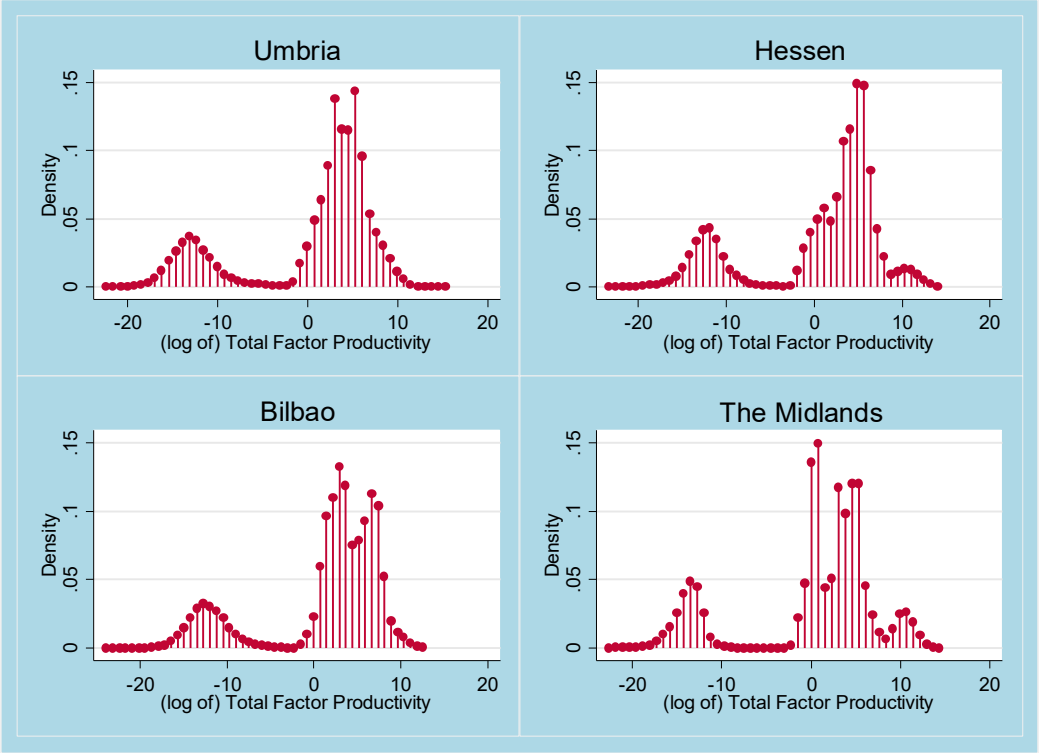


Figure 10: Total Factor Productivity of firms in Umbria and other industrial regions in 2016, authors' elaboration on data from Orbis by Moody's Analytics.



At this point, the question becomes how to eliminate or reduce such inefficiencies in some firms. In a recent report by the European Commission, Calligaris et al. (2016) discuss the Italian peculiarities. According to the report, a lack of productivity by Italian firms is explained by a general misallocation of resources. Ideally, an efficient market for inputs should allow for a flow of resources that relocate from less productive firms, where returns are lower, to more competitive firms, where returns are higher. In the case of Italy, the reallocation of resources has been hampered since 1995. According to estimates by Calligaris et al. (2016), Italian productivity would have been 18% higher in manufacturing industries and 67% higher in services industries, if the input resources would have moved towards more efficient firms. Among the sources of inefficiencies, the authors of the report enlist the system of unemployment benefits that focus on the *'job'* rather than on the *'worker'*. Unemployment benefits have been used mainly by low productivity firms, where misallocation of labor resources is higher because such a policy hinders creative destruction that would otherwise lead workers to find a new job in more productive firms.

A further constraint for Italian firms is represented by limited access to bank credit because smaller firms do not have the internal financial resources that are needed to invest in innovative projects, which could eventually enhance productivity. A lack of human capital is yet another example of a constraint on Italian productivity since the country has one of the lowest shares of graduates among European countries. From this point of view, Umbria is no exception to the rest of Italy. Lack of financial resources and misallocation of labor and human capital are as important in Umbria as they are in the rest of Italy. We will show in the last Chapter the policies that are needed for better functioning of the Italian financial and labor markets.

However, besides Italian peculiarities, there are some more fundamental reasons for stagnating productivity in many developed countries, not only in Italy, which are worth considering before discussing which policies better fits the Italian case.

1.3 MANUFACTURING FIRMS IN TERNI: PRODUCTIVITY, PROFITABILITY, AND SOLVENCY

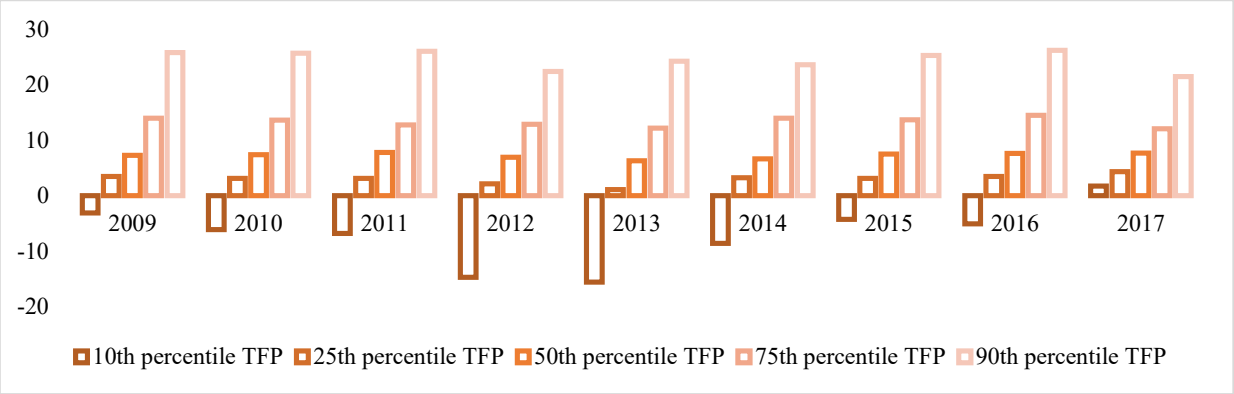
Terni is an old-century industrial site that has thrived since the onset of the Industrial Revolution when its plentiful water resources became a competitive advantage for the establishment of ironworks, steelworks, foundries, chemical factories, and textile mills. The industrialization of Terni has been crucial for the economic development of Italy, thanks also to his strategic position halfway between the North and the South of the country[2]. In 2016, Terni-Narni and the neighborhoods have been acknowledged a status of *'crisi industriale complessa'* (complex industrial crisis) by the Italian Government, which calls for a joint action by central and local authorities to work on some common objectives, including the identification of policy instruments for the safeguard of occupation and a

[2] For a detailed discussion of the role of first manufacturing industries in, see Toniolo (2014): while in Germany Essen and the 'Krupp' factory were taken as a model of the strategic development of the country in the heavy industries, the same role was attributed in the Kingdom of Italy to Terni and its newly-born steel factories. As a result, the development of an efficient upstream segment of heavy industries allowed a further expansion of the Italian industry in the automotive, shipbuilding, and machinery and equipment industries. Since the 90s, multinational enterprises have acquired stakes in the manufacturing firms of Terni, but in the meantime modern economies have undergone structural shifts that have shaken up heavy industries at a global level (Wood, 2017).

revival of the manufacturing activities, by generating new investment opportunities in a framework of environmental regeneration[3]. According to the last census by ISTAT, Terni-Narni was already classified as an area specialized in metal processing, with moderate labor productivity and maximum openness to trade with the rest of the world, since in 2011 the ratio between exports and value added in the country of Terni reached a 29.1% share. The following economic crisis regrettably brought the productivity and export performances of the territory well below the Italian average, as we commented also in Section 1.1.

Here below, we provide some descriptive statistics on the health and viability of firms in the county of Terni retrieved directly from their balance sheet information over the latest decade, updated up to 2017[4].

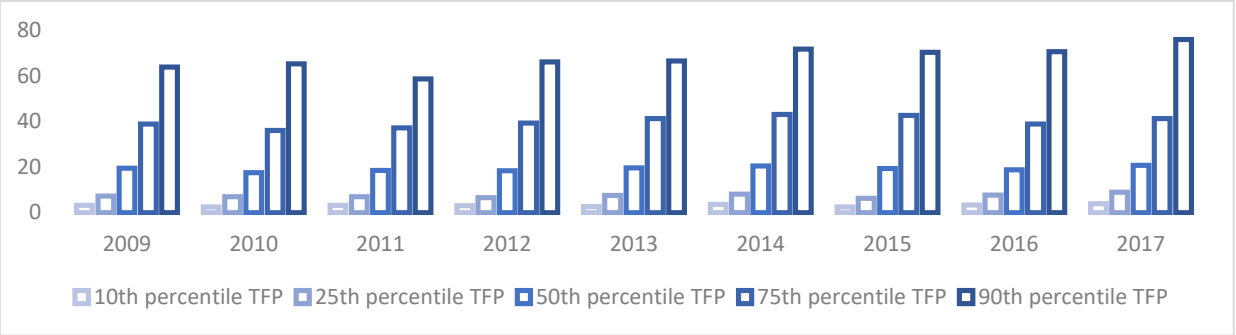
Figure 11: Profitability of manufacturing firms (EBITDA margin) over percentiles of Total Factor Productivity in Terni in 2009-2017, authors' elaboration on Orbis data by Moody's Analytics.



[3] See the instance put forward by Regione Umbria (DGR 509/2016) and the related ministerial decree on 7 October 2016.

[4] More details on the macroeconomic conditions of Terni and the ongoing process of industrial restructuring can be retrieved from updated reports produced by Banca d'Italia (2018) and by Osservatorio Provinciale sull'Economia della Provincia di Terni (ISTAT, 2018b).

Figure 12: Solvency of manufacturing firms over percentiles of Total Factor Productivity in Terni in 2009-2017, authors' elaboration on Orbis data by Moody's Analytics.



In **Figure 11**, we plot the average profitability of manufacturing firms measured by the EBITDA margin[5] in Terni over the period 2009-2017. Each bar of the graph considers a chosen percentile of the TFP distribution measured following the technique we derived in Section 1.2. In this way, we can consider firms' average profitability by a segment of productivity over time and check how their performance evolved in the period of analysis.

A similar exercise is made in **Figure 12** for firms' solvency, i.e. to check their ability to meet debts and obligations given the structure of their financial accounts[6]. In this case, as before, each bar represents the average solvency of a firm given its relative productivity with respect to the entire population of manufacturing firms. It is strikingly clear how the 10% least productive firms in Terni are much more sensitive in terms of profitability than the rest of manufacturing. When the crisis hit hardest in 2012 and 2013, their losses amounted up to 15% of yearly revenues on average. More productive firms also reduced slightly their profitability during the crisis, but they were more resilient to hard times. Indeed, many inefficient firms in the 10th percentile of the TFP distribution of the period 2009-2011 went bankrupt in 2013 and 2014. The exit of mostly inefficient firms allowed

[5] The EBITDA margin is a ratio of a configuration of gross profits (Earnings Before Interest Taxes Depreciation and Amortization) over a firm's revenues. It is built directly from the financial accounts of manufacturing firms registered in Umbria. It is much useful when used to compare profitability across companies, because it focuses on operating profitability before any consideration is made on the peculiar characteristic, financial or extraordinary activity of a firm in a single year.

[6] The Solvency Ratio we adopt here is built as a ratio between shareholders' funds and the sum of current and non-current liabilities of each firm in the period of analysis. A higher Solvency Ratio implies a higher availability of risk capital to cover the ensemble of a firm's liabilities.

reallocation of resources and a return to positive profits, on average, along with the entire distribution of TFP.

On the other hand, least productive firms (in the 10th percentile of the TFP distribution) are also the ones that have been less solvent in the period of analysis, because they had a shortage of risk capital. In the absence of external financial resources available to employ in non-profitable projects, the shareholders' funds have been reduced to the bones.

From this point of view, the exceptional exit of manufacturing firms registered by official statistics since 2013 should not be considered as a negative sign for the economy of the territory. Despite the short-term impact on local employment levels, it is desirable for the future that both capital and labor resources could find a better allocation, either in incumbent firms that are more productive or in newly-born firms that will exploit better the local competitive advantages of Terni. Unfortunately, the death of inefficient firms has not been compensated by new entrepreneurial activity in Terni. In the analyses of the next Chapter, we will comment on the sources of local competitive advantages that are there to be exploited by profitable investment projects.

1.4 THE PRODUCTIVITY PUZZLE AND ITS ITALIAN DECLINATION

A stagnation of innovation and productivity rates is a constant of most advanced economies in the last decades. It has been a puzzle for a while now, and it has flamed debate both in the academia and in policy-making institutions[7]. In 2018, global labor productivity has risen 2,3% (IMF, 2018), which is just a bit higher than the average of the latest three years, including the performance of catch-up economies, yet much lower than labor productivity improvements in the last decades. Nonetheless, expectations were

[7] For example, please consider the report by Haldane (2017), chief economist of the Bank of England, which has been discussed at the London School of Economics during a meeting on the roots of economic stagnation. For a summary of the debate on the hypothesis of the 'Great Stagnation', see also Farmer (2018), available on Project Syndicate (https://www.project-syndicate.org/commentary/secular-stagnation-revisited-stiglitz-summers-debate-by-roger-farmer-2018-09?barrier=accesspaylog)

much higher if one considered the potential of ongoing technological progress. Finally, where are all the efficiency gains promised by the Digital Revolution?

It was expected that the Third Industrial Revolution boosted economic growth after the implementation of digital technologies that allowed companies to rearrange production processes in a more efficient way. It was expected that digital platforms re-casted the relationship between workers and employers as ICT decrease dramatically the costs of interaction and supervision at geographic distances. It was expected, among other things, that just-in-time (JIT) manufacturing supply chain would have benefited by a further reduction of response times from and to chains of suppliers, wherever they were located, limiting the costs of inventory stocks.

Instead, the last surge of productivity occurred in the 70s and the country level trends have been stagnating since.

The reality is that technologies do not really spread fast and evenly in the productive system as we would expect. First, technological revolutions take time to have an impact. They happen but are also rare Take the case of three general-purpose technologies that had an impact in the last centuries: the steam engine, the electricity generator, and the printing press. Although these technologies did bring enormous benefits in the long term, these benefits revealed themselves much later than we realize. By their nature, general-purpose technologies like 3D printing or artificial intelligence nowadays are also highly disruptive. Such disruptions occur just for the same reasons why general-purpose technologies are so flexible and potentially pervasive. Before they spread to the entire economy, most innovative technologies are first adopted by a few firms in a few countries, who started to invest in them, then they propagate to the rest of the global economy. How fast they propagate determines also the aggregate efficiency gains of the single economies.

The current industrial revolution eventually depends on the adoption of computers, the use of the Internet, search engines, and digital platforms. In the early stages of the ongoing digital revolution, an important amount of resources is devoted to the adoption

of innovation and reorganization strategies, while private aggregate benefits will be realized only much later[8]. In fact, in the beginning, first-moving companies want to keep their technological advantage as long as possible, and they try to retain the acquired knowledge from spilling over to other potential competitors. Only when technological spillovers are unavoidable, the benefits start to spread to the rest of the economy up to the point that overall productivity boosts (IMF, 2018).

The first reason is that employers and workers must adapt. Workers need new skills to perform old jobs, but also often it is the case that new jobs replace old jobs. It is not impossible that retailing, publishing and banking industries will be completely different in the next future. Nowadays these industries are already restructuring thanks to the emergence of digital services, which allow consumers to purchase and operate online, although restructuring also entails that the consumers do not need as before a personal contact with the retailer, the bookseller or the banker.

On a macroeconomic scale, the problem of knowledge diffusion and economic growth has been of interest to many economic scholars, including recent studies (Comin and Mestieri, 2018) that document how adoption lags of technologies between countries have converged, while the intensity of use of adopted technologies have diverged. Although the focus of most studies is usually on the gap between advanced and developing economies, they give us also a direction to understand what happens within more advanced economies and regions. That is, on one hand, the spread of new technologies may be in principle faster across countries in modern times when we consider the impact of economic globalization on companies that operate on a global scale and can reach consumers in each part of the world. Yet there is important heterogeneity in how much these technologies are intensively used by how many producers in a country. In the short term, it is quite possible that the diffusion of knowledge in the economy is

[8] For example, James Watt invented a relatively efficient engine in 1774, but it took until 1812 to see the first steam locomotives to appear, then we waited until the 1830s to see the first impact on British output per capita. Consider also the case of the first digital computing device, the ENIAC, filed for a patent on June 26, 1947, by J. P. Eckert and J. Mauchly. It took decades before the benefits of computing technologies could usefully spread to the rest of the economy. In the 1980s, the productivity gains from the computer were not self-evident yet.

slower, especially in the presence of more oligopolistic markets, and the producers can show a polarization in the ability to innovate.

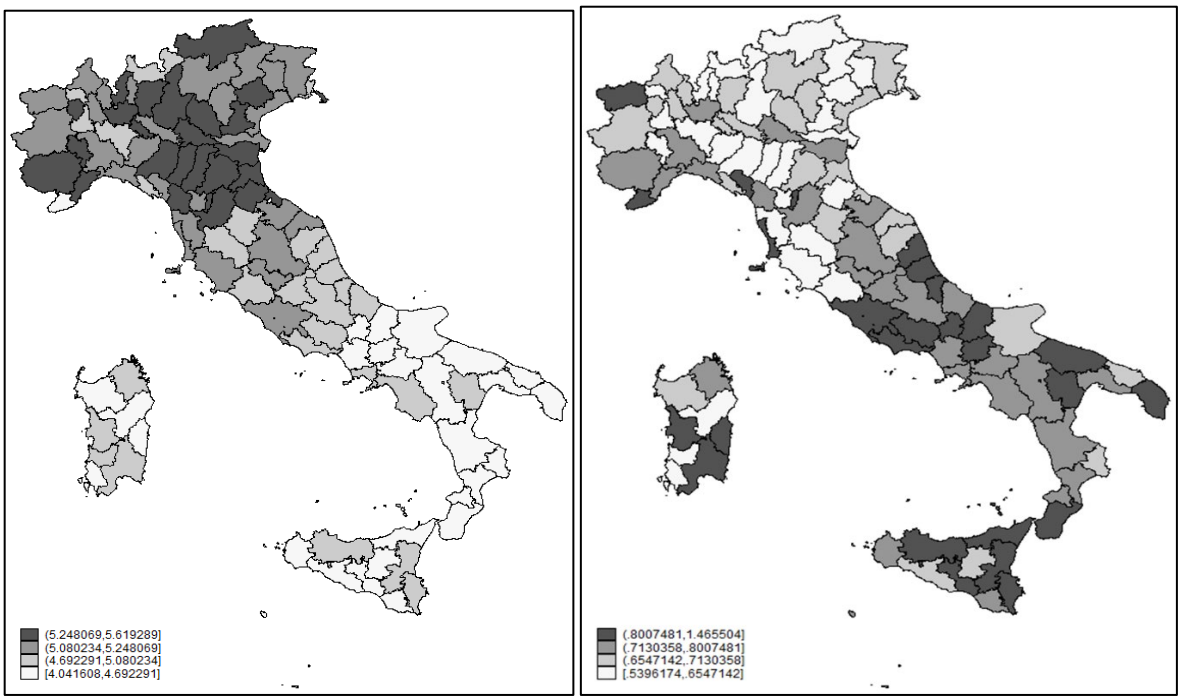
On top of the peculiarities of the innovation ecosystem, the market structure may also play a peculiar role in fostering or reducing the diffusion of technology in the entire economy. Technological innovations may have a direct influence on firms' market power (Dhanora et al., 2018) since firms at the frontier of innovation have an incentive to retain the technological advantage and use it as an entry barrier towards potential competitors. This is the case of Big Tech companies (Amazon, Google, etc.), which are integrating previously separated vertical industries (e.g. manufacturing and distribution) while engaging in a wave of merging and acquisitions of potential competitors. Both European and U.S. anti-trust agencies start keeping an eye on digital platform companies, to check whether there is a case of abuse of market power (McLaughlin, 2018).

On one hand, bigger and more productive producers can afford to invest and restructure production processes to adapt to the frontier of science and technology. On the other hand, smaller and more inefficient producers can struggle to keep the pace with their competitors. In support of our arguments, recent empirical evidence on productivity by firms in OECD countries (Andrews et al., 2016) shows how important has become the gap between successful firms on the technological frontier and least efficient firms that barely survive to exit from the market. From this point of view, the gap along the productivity distributions has increased over time. In this case, the country averages would just cancel out efficiency gains of some more competitive firms with the losses in efficiency by another segment of the economy that continues operating as if the Digital Revolution never started.

This duality among manufacturing firms is what we essentially retrieve also in Italy, but with a geographical twist (Rungi and Biancalani, 2019). Overall, **Figure 14** shows how a decrease in total factor productivity (TFP) over the last decade contributed to depress economic growth of the country, hampering the otherwise positive contributions by labor and capital. We could discuss how small is the positive contribution by both

capital and labor with respect to other more advanced economies, yet the negative contribution by TFP is an Italian peculiarity.

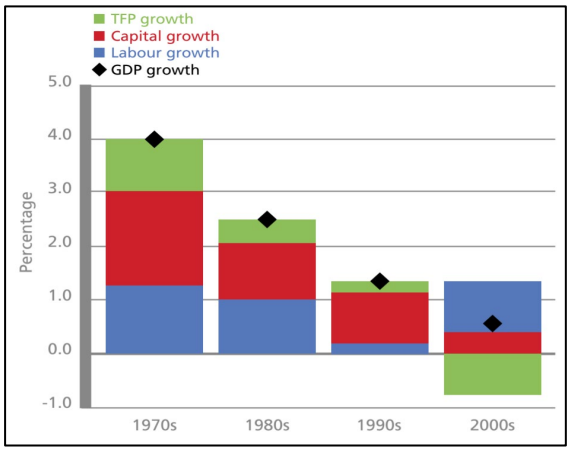
Figure 13: Average productivity (on the left) and productivity dispersions (on the right) of manufacturing companies in Italian provinces, source: Rungi and Biancalani (2019).



However, when we look at how productivity maps on Italian provinces in **Figure 13**, we find that there is a huge geographic gap between the North and the South of the country. Manufacturing companies are on average more productive in the provinces of the *Centro-Nord* and less productive in the *Mezzogiorno*, as shown in the left panel of **Figure 13**. This is nothing new and widely acknowledged by the public. Yet, when we look at the right panel of the same **Figure 13**, we find a more interesting fact: productivity dispersions are wider in the provinces of the South than in the North of the country. As suggested by Rungi and Biancalani (2019), from where we extracted the productivity maps, this is due to a presence of mostly inefficient firms on the left tail of the productivity distributions in the *Mezzogiorno*. That is, even after we consider the different patterns of industrial specialization, there are more firms in the South that struggle to survive in competitive markets, while some more efficient firms can be found all across the country, whether they are located in the North or in the South. In the case of provinces in Umbria, both Perugia

and Terni show an intermediate level of productivity and its dispersions, on average, which is not that different from other neighboring regions in Central Italy. Average productivity in line with the North of the country, although in terms of dispersions the situation is often like troubled provinces from the South.

Figure 14: The contribution of productivity (TFP) to economic growth in Italy, source: Hassan and Ottaviano (2013).



1.5 CONCLUDING REMARKS

Umbria has been knocked hard by the twin economic crises in 2008 and 2011. The negative impact of the crises further deteriorated an economic environment that was on a declining path of economic growth since the onset of the 2000s. In the same period, diagnostics further show that a gap has grown with the richest regions of the country, especially in terms of aggregate labor productivity. Unemployment has been on the rise, but investment by companies has been resilient. Unfortunately, investment by the public sector did not keep pace with the private sector, declining over the observed span of time.

Once we look at the performance of companies, we do find a good deal of heterogeneity. Productivity distributions are bimodal, which means that most efficient firms sit together with largely inefficient firms in the region. In fact, a polarization of firms in productivity and competitiveness is a constant of other European regions we compare, including the Four Motors for Europe (Lombardia, Baden-Württemberg, Auvergne-

Rhône-Alpes, Catalunya) and other regions under industrial restructuring (Hessen, Bilbao, the Midlands).

Eventually, we discuss that a structural change is underway at a global level such that a polarization appears at the firm level. The diffusion of new technologies did not give way to a global boost in productivity, let alone Italy and Umbria. At the onstage of the digital revolution, most of the gains from efficiency have been caught by a few firms, while a good bunch of smaller and less productive firms continues to operate as if the digital technologies never existed. Policymakers should be aware that increasing the absorption capacity by smaller and less efficient firms is key to have an impact on general welfare.

2. UMBRIA, EUROPE, WORLD

In this Chapter, we frame the problem of manufacturing firms in Umbria in the international and Italian context, because separation of levels is needed between the regional, national and international determinants of change. We discuss how manufacturing and manufacturing jobs will never be as before because the global economy has undergone some important structural changes, including fragmentation of production activities across national borders through offshoring and outsourcing strategies, thanks also to the usage of ICT in supervision and monitoring at longer distances. Therefore, we show and argue how manufacturing and services industries are becoming more and more interwoven, also in Umbria, as they all participate to supply chains leading to the of the provision of final products and services to the consumers. This is the reason why we adopt an integrated framework of value generation along supply chains to catch the technological interdependence across firms and industries. We spot a peculiar shape of the so-called smile curve in Perugia and in Terni, which helps in spotting: i) which are the segments of economic activities that have a higher growth potential for the companies and the territories; ii) which are the segments where an intervention is most needed to innovate products and production processes.

2.1 THE FUTURE OF MANUFACTURING IN A GLOBAL AND DIGITAL AGE

Manufacturing companies are a key driving force for Umbria, providing about half a million jobs in the region. Historically, manufacturing industries have taken center-stage in any political agendas, mainly because manufacturing firms have traditionally provided most of the jobs that did not require high skills. Nowadays, the share of manufacturing employment is much lower than before in most of the high-income countries, including the European Union (UNIDO, 2016). Accordingly, in Umbria, the manufacturing industries *strictu sensu* provide only about 17% of regional value added.

Yet the general idea has always been, in Italy and elsewhere, that a revival of manufacturing is possible after a new wave of industrial revolution boosted by the

emergence of new technologies (3D printing, robotics, new materials, smart communication systems, 'big data' analytics). Unfortunately, it is not that simple.

On one hand, it is true that some good news keeps on coming, because after the massive offshoring operations abroad since the '90s, many companies have started considering the side effects of coordinating economic activities at longer distances, where management practices and legal environments are not like home. Therefore, there is evidence that, at least in some cases, it is more convenient to reshore back home production stages that were moved in Eastern Europe, Asian countries, and other emerging economies.

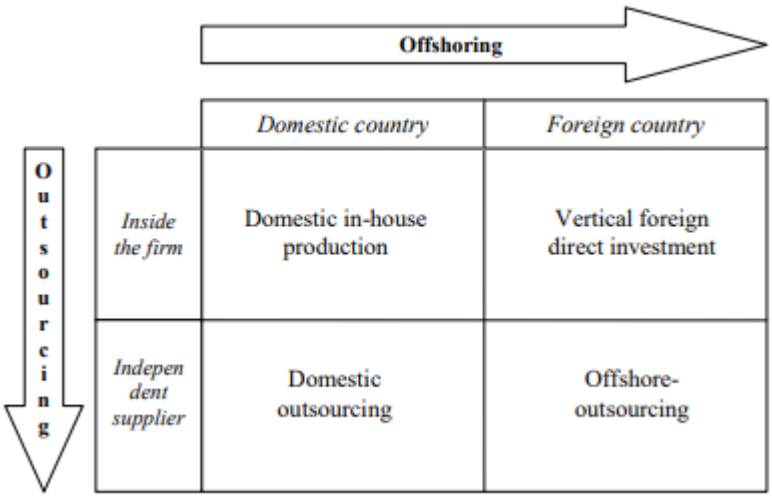
On the other hand, however, globalization, digitalization, and robotics are all together continuing changing the landscape of manufacturing production and manufacturing jobs. It all started with less international frictions when decreasing trade barriers and faster transportation allowed a fragmentation of production activities across national borders. Also, the adoption of Information and Communication Technologies (ICT) in the daily life of firms still allows supervision by headquarters at longer distances, while minimizing the inventory costs because supply chains can rely on faster adjustments thanks to prompt communications among buyers and suppliers.

Despite some regular cases of reshoring, economic globalization and technological progress have had a lasting impact on the organization of manufacturing activities, and there is no way to turn back. They prompted a fragmentation of production activities on a global scale, starting already from the 80s. Companies are now able to reorganize their activities crossing national borders and engaging on production networks with other buyers or suppliers that can be located wherever it is possible to exploit local competitive advantages in the production of intermediate inputs. Whether they benefit from a technological advantage or a cost advantage, companies can focus at home on a segment of core activities, where they can generate high economic value, while leaving to other companies the tasks where the latter have a competitive advantage.

The result is that production is organized by sequences of firms that can collaborate at a considerable distance, at home or abroad, thanks to the adoption of information and communication technologies. Starting from the design of a product until its final sale to consumers, a production network can gather many companies that are dispersed around the world. In **Figure 15**, we report a useful extracted from a report by OECD (2011), which represents the complex choices that firms face when they decide whether to offshore/outsource, at home or abroad.

If a company finds a supplier at home with a cost or a technological advantage in providing an intermediate good or service, it can decide to source from that supplier by either signing a supply contract or by acquiring that supplier, i.e. integrating that firm within the firm boundary after an operation of merging or takeover. The same choice can be repeated abroad if the supplier with a cost or a technological advantage is not present in the home country. In this case, a company can reach an agreement on a contract among independent parties or it can choose to establish or acquire a subsidiary in that country where it is either cheaper to produce that peculiar intermediate input that it needs, or it is just not available elsewhere.

Figure 15: Typologies of sourcing strategies, OECD (2011).



Technological progress has also changed dramatically the way workers and machines interact within the company, in the workplace. In many cases, robotics and automation have become or are expected to become direct substitutes of human work, hence the same production tasks can be performed by the machines or it needs fewer

workers than before. Accordingly, a debate has started on the consequences of robotization on the future of human work (West, 2018; Baldwin, 2019). There is the bright or a gloomier scenario, depending on whether one expects facing a future of shared prosperity and leisure, because robots will get us more free time to spend after work, or one expects mass unemployment and turmoil, because conflicts will arise to distribute the economic value produced by robots among losers of technological progress.

We will not delve into the roots and consequences of technological progress and how it will affect the near future of work. Nevertheless, we observe that thanks to robotization and machines there is already an ongoing shift in the generation of economic value, before mainly generated from manufacturing production, assembly of parts and components and other more standardized tasks, and now mostly generated by pre-production and after-sales services, including R&D, design, engineering, marketing and logistics activities.

In fact, pre- and post-production services are a relevant part of manufacturing processes, although we usually consider them as alien to manufacturing production, as if they are separated from the rest of the economy. On the contrary, if we look at manufacturing production from a broader perspective, these are business services that contribute to a better quality of products. This is the segment of the economy where one can start implementing innovation for the consumers. They are essential for customer care and satisfaction. Indeed, we argue, business services are ancillary to manufacturing production and they contribute with their value to improve the quality of final products, as it is perceived by the final consumers.

In this context, a shift of jobs outsourced by manufacturing firms to service firms cannot be considered a loss for the national or regional economy. In fact, some manufacturers are even proposing themselves as providers of services. When it happens, they can exploit synergies that bridge their know-how in manufacturing and the needs of consumers asking for a service.

Take the case of automotive producers, who can become important actors in mobility solutions of the near future. Instead of owning a car, one can consume 'services' of a car that are rented out after the producer makes available an entire car fleet able to reach the consumer where and when it is needed. This is already the case of ride-sharing, bike-sharing and car-sharing programs, as well as on-demand pop-up bus services, which are all successful examples of 'servitization' starting from manufacturing, often in agreement or in consortium with public authorities. The rising trend in vehicle-sharing will be possibly boosted when autonomous vehicles will reach the market. Renting automotive services will become more affordable and we can expect a further shift from self-owned cars to on-demand mobility solutions.

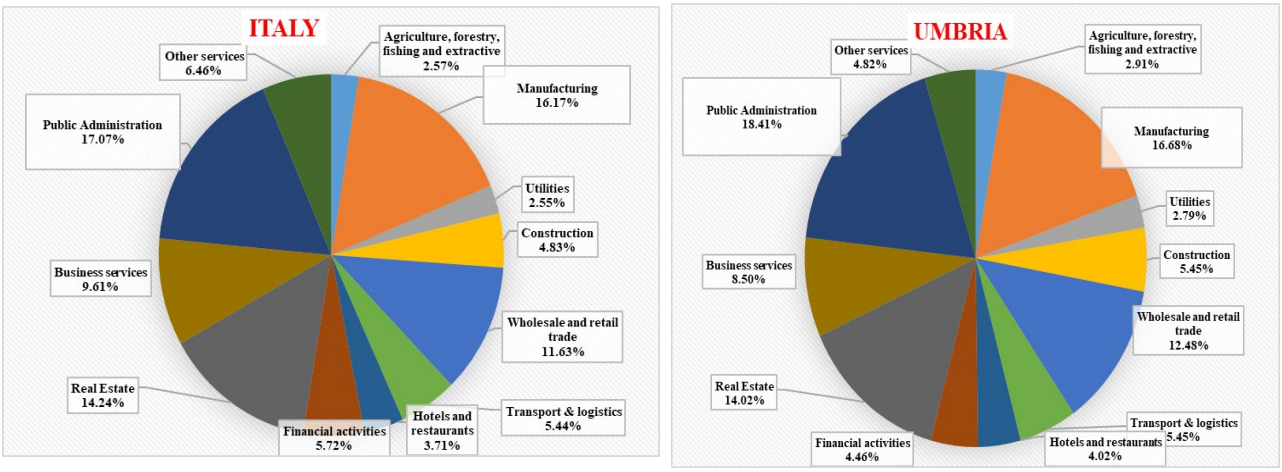
In short, integration between manufacturing and services activities potentially contributes to a revival of employment, officially within manufacturing firms but practically in their services segments. Eventually, new technologies can be used to keep manufacturing and services tightly interwoven along the manufacturing supply chains. But please, make no mistake, new jobs will no longer be the jobs associated with old-style assembly lines because modern manufacturing needs different skills and a certain degree of adaptability. Manufacturing will still be a driver of economic growth in Italy and in Umbria, but the conditions to create employment, generate and distribute economic value will be fundamentally different from the past.

In the following analyses, we will start mapping how the value is generated by firms and industries in Umbria, to catch where we are with the trends. Then, we will consider the full supply chains made of both manufacturing and services industries, starting from the accounts of single firms. In this way, we are able to spot the segments of activities that generate more value and, hence, have higher growth potential for both companies and territories.

2.2 THE WHEREABOUTS OF VALUE GENERATION IN UMBRIA

At first sight, a comparison between the national level and the regional level, in **Figure 16**, does not show a significant difference between the industrial specialization in Umbria, when taken alone, and Italy as a whole. Following ISTAT data, on aggregate in Umbria, we can find a similar composition of manufacturing and services industries with a similar generation of value.

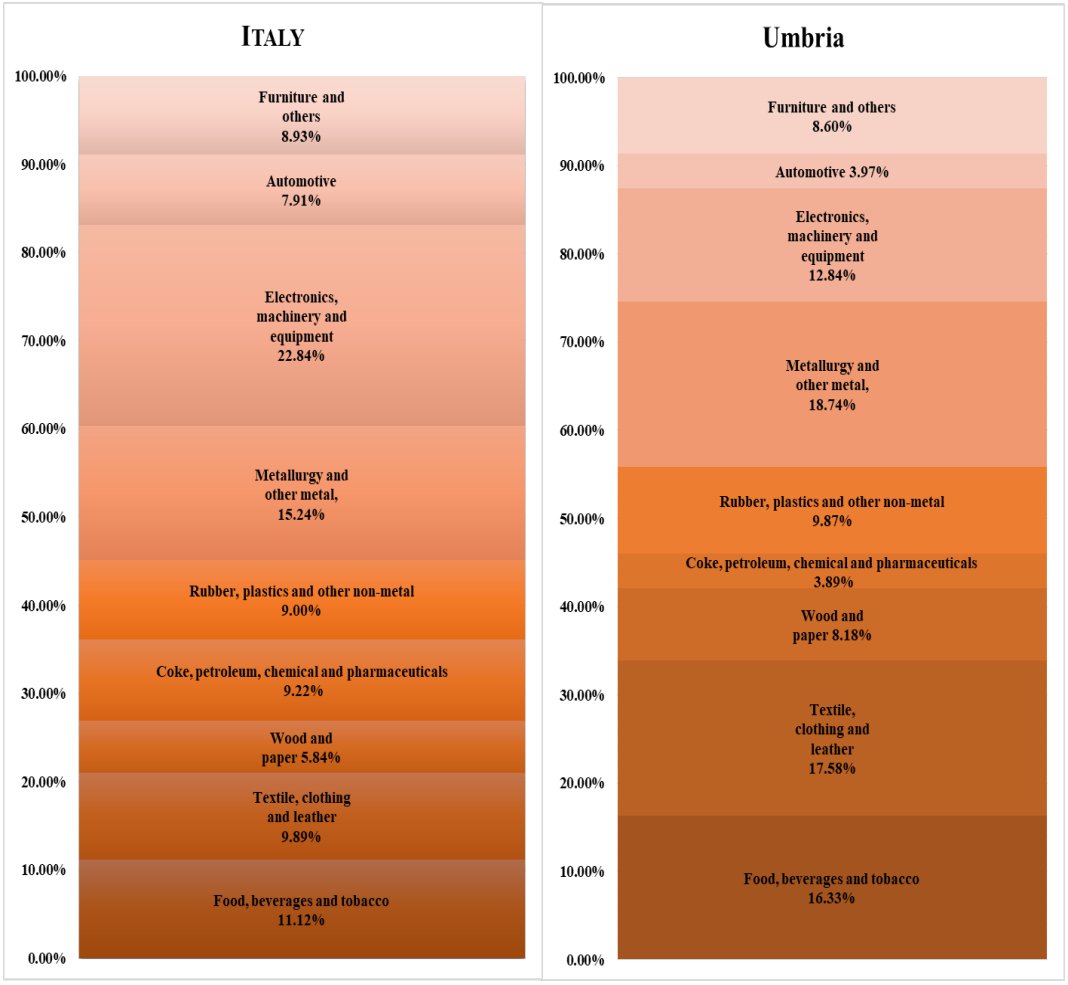
Figure 16: Generation of value added across main sectors in Italy and in Umbria in 2015, authors' elaboration on ISTAT



Both in Italy and in Umbria, following the evidence in **Figure 16**, manufacturing industries generate value added for about 16-17% of the total, while a lion's share of value added is generated by services industries, which we report separated in several categories, as expected by modern post-industrial economies. Under an aggregate dimension, all in all, Umbria is not that different from other Italian and European regions. Interestingly, the activities by the Public Administration account for a 17-18% of the total added value both in Umbria and in Italy. Some differences can be observed when we look at a disaggregation of the manufacturing industries in **Figure 17**, showing a higher value generated in Umbria by the firms that are active in the Textile, Clothing and Leather sector (17.6% of total manufacturing), in the Metallurgy and Other Metal Fabrication (18.8% of

total manufacturing), and in the Food and Beverages (16.3% of total manufacturing).The adoption of information and communication technologies (ICT) allows a different organization of companies along increasingly sophisticated supply chains, which fragment the production processes in different geographic locations, within and across national or regional borders. Starting from the R&D activity, design or engineering, a final product can go through several intermediate processing steps before reaching the final consumer.

Figure 17: Value generation from manufacturing industries, Italy and Umbria in 2015, authors' elaboration on ISTAT.



Therefore, in a modern economy, a company finds profitable to focus on the (intermediate or final) stages of production that better fit the local competitive advantages of its territory, while sourcing elsewhere the tangible or intangible inputs that are needed for delivering its output. We can call it an 'unbundling' of production (Baldwin, 2016),

which implies the formation of networks of companies that can coordinate their activities at distance after using modern ICT.

A firm can source intermediate goods and services produced by other companies elsewhere when they cannot be found in local markets. We already summarized in **Figure 15** the way a company can source inputs, at home or abroad, deciding whether to integrate that production task within or outside the firm boundary.

In either way, production knowledge embedded in the novel intermediate inputs passes to the company's production line. In the end, the company must decide:

i. whether to *make or buy* a (tangible or intangible) input, i.e., to produce it in-house or to sign a supply contract with an independent supplier in *outsourcing*;
ii. where it is better to source a (tangible or intangible) input, i.e., to find a domestic or foreign supplier.

From a combination of the previous choices, the modern firm establishes its economic boundary. It can choose to establish a subsidiary, at home or abroad, to which delegate the production of intermediate goods and services needed for the delivery of its own production. It can decide to purchase intermediate inputs from domestic or foreign suppliers when it is more convenient to do so because it is more efficient to sign a supply contract.

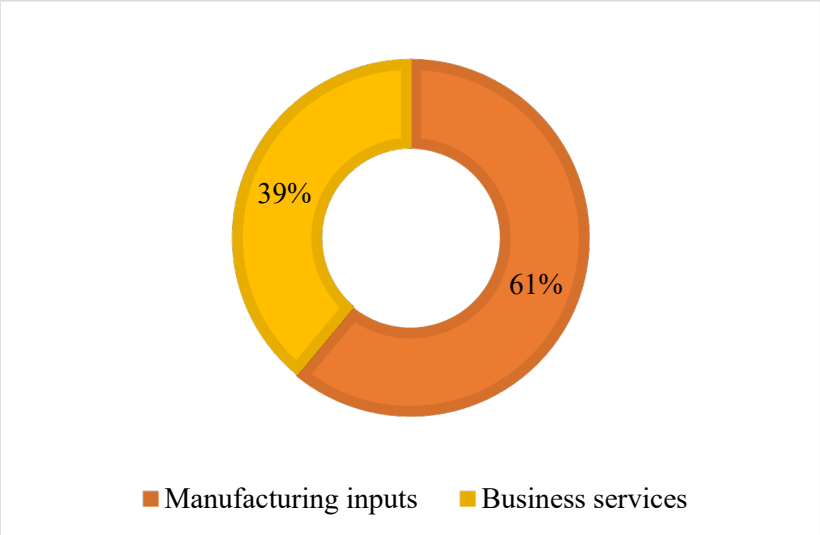
The result is a network-like organization of many companies that can become very much interdependent one from the other, each contributing to a small portion of the final value of a product purchased by consumers. At the end of the day, the *governance* of the production process can become more cumbersome, since each firm becomes a cog in a wheel, which the ICT allow to coordinate.

In this framework, whatever the strategic choices by a company, the value generated by a production process can be sliced across different firms engaged in different industries, which together shape a supply chain. Therefore, it does not make much sense

to evaluate the industrial specialization of a region like Umbria after extrapolating just on performances of single sectors, for example comparing manufacturing against services firms.

Indeed, in **Figure 18** we show that manufacturing firms in Umbria on average source 39% of business services for the delivery of their final output. That is, a typical manufacturing firm in Umbria heavily relies on the value that is provided by services companies, either in Italy or abroad, which may enhance the quality of the final product to compete on the market. In fact, both pre-production services like R&D, engineering and design, as well as post-production services, including logistics, marketing, customer care, typically constitute strategic segments for the supply chain of a modern company.

Figure 18: 'Servitization' of the manufacturing companies in Umbria: manufacturing and services inputs, authors' elaboration on Orbis by Moody's Analytics.



We would rather look at the generation and distribution of economic value across industries, through both a microeconomic and a macroeconomic dimension. In fact:

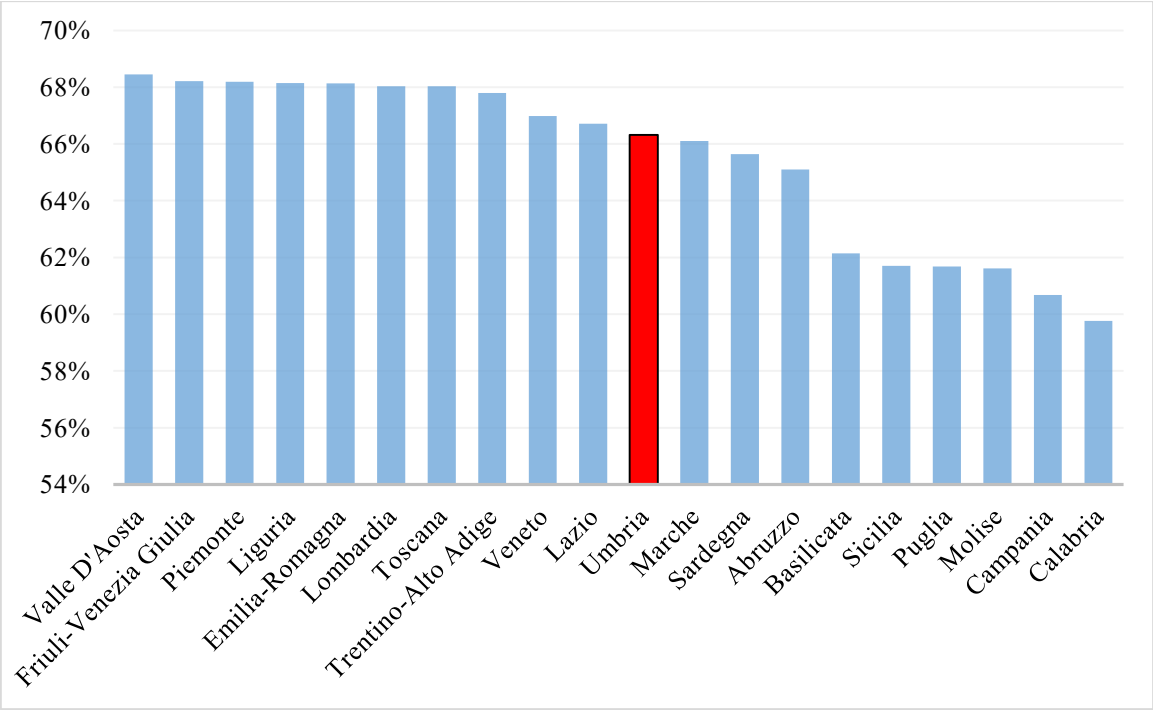
i. a microeconomic investigation of the generation and distribution of economic value, at the company level, is useful to evaluate the relative remuneration of production factors, workers and providers or risk capital;

ii. a macroeconomic investigation of the generation and distribution of economic value, in a region or a country, is useful to evaluate the relative remuneration of the local factors of production, i.e. how much the economic activity performed by firms contribute to the growth potential of that geographic area.

In **Figure 19**, we plot the value generated by the representative firm in each Italian region, estimated as the average of the indicator:

$$value\ added\ content = \frac{(operating\ revenues - cost\ of\ goods\ and\ services)}{operating\ revenues} \quad (1)$$

Figure 19: Value added content (%) in the representative firm of each Italian region in 2016, source: authors' elaboration on Orbis by Moody's Analytics.



Briefly, the value-added content of a firm represents how much value is generated and can be distributed to factors of production (labor, capital) that contributed to the production process (Rungi and Del Prete, 2018). In Umbria, the average firm generates about 66% of the value from its output, which is a share like in other Central regions in

Italy, not too far from the average firm in the Northern regions. Nonetheless, there is a fundamental difference between the generation of value in a manufacturing firm and in a service company.

Figure 20: Firm-level value added content in production in Umbria in 2016, authors' estimates on Orbis data by Moody's Analytics.

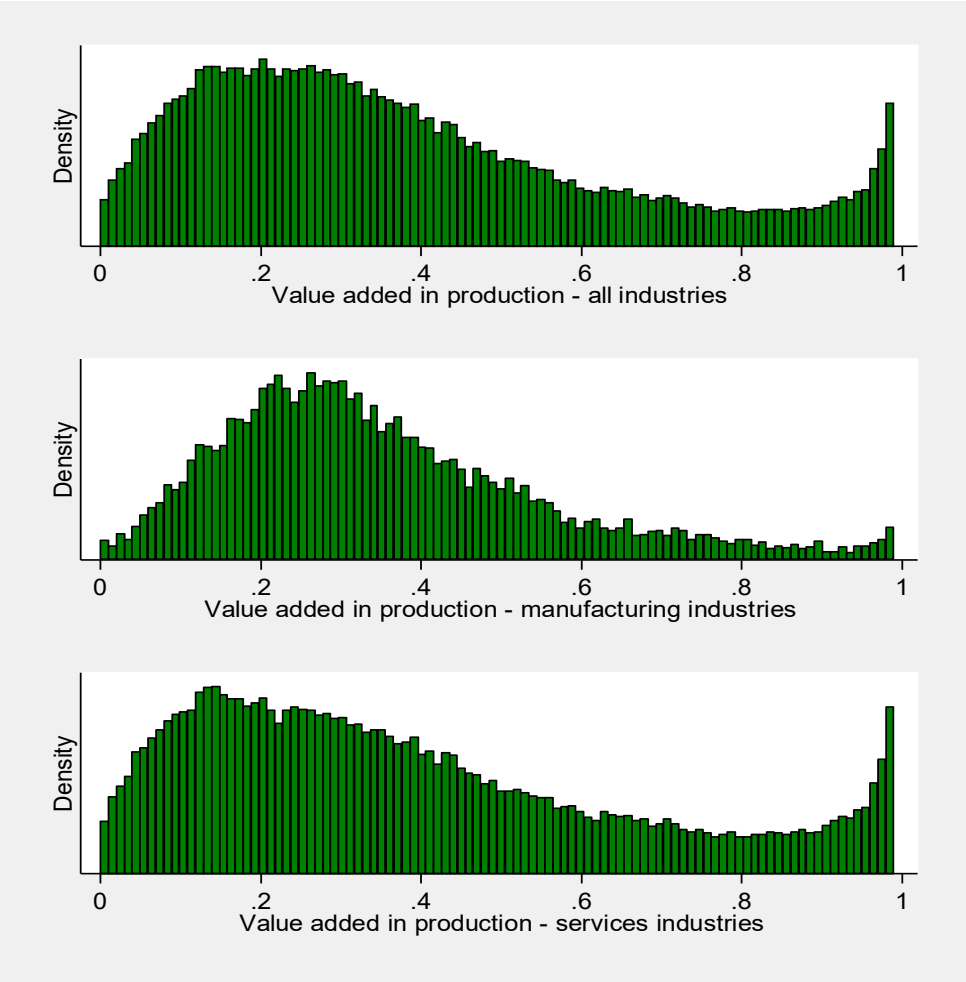
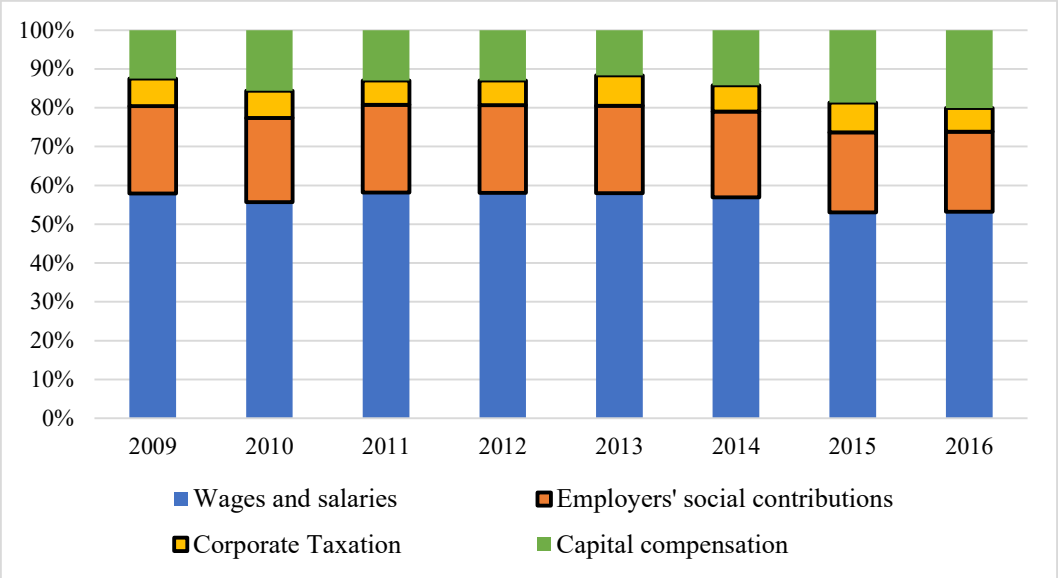


Figure 21: Distribution of firms' value added, taxation and social contributions in Umbria in 2009-2016, authors' elaboration on ISTAT.



In **Figure 20**, we report separately the distributions of value-added content of manufacturing and services firms in Umbria in 2016, and we show that services industries do generate slightly more value on average, although they are smaller in size, in part because they do not rely on purchases of tangible inputs for the delivery of their output. Yet we detect a bunch of firms, both in manufacturing and in services industries, which are able to generate more than 90% of the value out of their revenues. In **Appendix Table 2**, we further decompose within manufacturing firms and report firm-level distributions on boxplots, showing that a tremendous amount of heterogeneity can be found, while Textiles, Wearing Apparel, and Transport Equipment have the most dispersed distributions.

Eventually, in **Figure 21**, we show how companies in Umbria distribute aggregate value added in the period 2009-2016. We observe that up to 58% of the economic value goes directly to employees in the form of wages and salaries, while a further 28% is paid to the state by companies for social contributions destined to employees. Compensation to risk capital has slightly increased in 2016 up to 20% of the total, net of about a 6% share that represents corporate taxes. According to ISTAT, as retrieved also by companies' balance sheets in Orbis by Moody's Analytics, the corporate tax rate is about 30% on

average along the period of analysis. The employers' social contributions represent instead about 27.8% of the value of the wage bills.

2.3 THE 'SMILE CURVE' IN UMBRIA AND THE ROLE OF FOREIGN FIRMS

At this point, it should be clear that the issue is not whether manufacturing is an important driving force for the economy, nor it is how many manufacturing companies or jobs to create. Rather, the issue is how much value can be delivered along the manufacturing supply chains, hence generating sustainable jobs and growth for Umbria.

This framework cuts across sectoral boundaries and requires a horizontal approach rather than a sectoral one. To stay competitive on the domestic and global market in certain high value-added products, one needs to look at the interdependencies across sectors and along supply chains, including also services that contribute to enhance the quality of final products.

To assess the competitiveness of supply chains in Umbria, we rely on a celebrated framework (Mudambi, 2008; Rungi and Del Prete, 2018), which has been discussed at length in international fora (among others, OECD, 2013; WIPO, 2018), and which depicts the generation of economic value along global supply chains as a smiley curve. The latter is the shape that scholars guessed should appear once plotting the economic value of single production tasks ordered according to distance from the final consumers. That is, according to this framework, more economic value is increasingly generated at the beginning and at the end of the supply chains, where pre- and post-production services are usually located, while routine manufacturing tasks in the middle of the supply chains tend to generate lower economic value (e.g. assembly, parts, and components, etc.) because they are more standardized and markets are more competitive.

In fact, when we reproduce the exercise by Rungi and Del Prete (2018) on firms in Perugia and Terni in **Figure 22** and **Figure 23**, respectively, we do find a smile curve. For our purpose, we investigate the generation of value by firms included in our sample of

firms, as described in the **Appendix Table A1**, while adopting a finer metrics for the positioning of companies along the supply chain elaborated by Antràs and Chor (2013). Then, we perform a simple non-parametric econometric exercise that tries to find the better polynomial that fits the value-added content (see Eq. (1) above) of each firm in the sample that is ideally ordered along a representative supply chain[9], however controlling *ceteris paribus* for other firm-level characteristics (capital intensity, productivity, firm size, market power, and age) that could be correlated with the generation of economic value.

As we discussed in previous paragraphs, the value-added content of each firm is the economic value it generates, net of purchases of intermediate goods and services, over sales. Therefore, it represents how much each company distributes to production factors, as employee wages, dividends, and interest on capital, and taxes for public services. In aggregate, we have that all the value generated by companies in a country sums up to the gross value added of that country, which is distributed to production factors. Therefore, the higher the value generated by all firms, the higher the growth of that country. At the level of the company, a higher value is better for immediate stakeholders, both the owners of the capital and the workers. From a supply chain perspective, it is the portion of value generated by a single task before reaching the final consumer.

When we compare **Figure 22** and **Figure 23**, we find that on average domestic manufacturing firms that perform more standardized tasks generate a lower value than pre- and post-production services, mainly located at the beginning and at the end of the curve. Yet, firms in Terni generate on average a lower value added in the middle and at the end of the technological sequence, if compared to firms in Perugia. The minimum point of value-added content is registered at 0.41 in Perugia and at 0.37 in Terni. That is, the most standardized production task in Perugia generates about 41% of value over sales, while the same task in Terni generates 37% of value over sales. Also, post-production

[9] Here, we use downstreamness by Antràs and Chor (2013), which proxies how far an industry (and the firms in it) are far from final demand. Based on the input-output linkages among 420 industries (Antràs and Chor, 2013), it is possible to define, in greater detail, the position of a company in one industry relative to a company in another industry. Firms in upstream industries can be considered suppliers of the firms in downstream industries. Downstreamness ranges in the interval 0 to 1, where 0 is the beginning of a business line and 1 is the delivery to the final consumers.

services in Terni generate on average a value of 45% over sales, while the same tasks in Perugia generate up to 50% of value over sales.

Figure 22: The Smile Curve for firms in Perugia: value generation along supply chains for domestic and foreign activities, source: authors' elaboration on Orbis data by Moody's Analytics

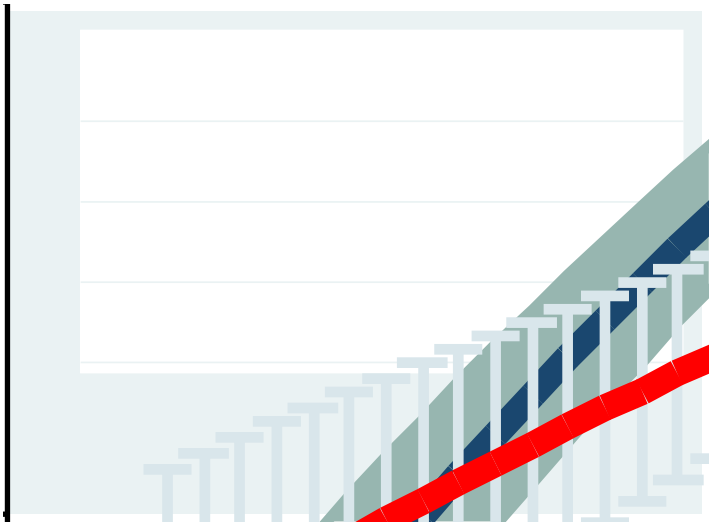
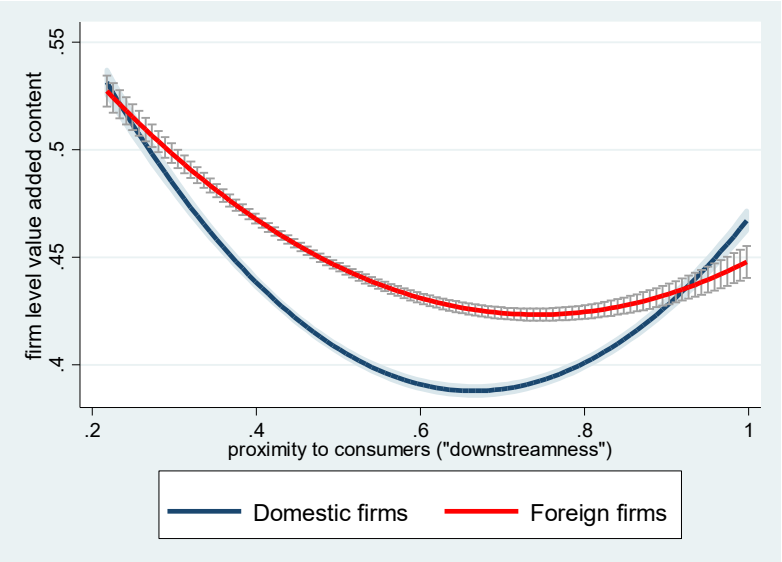


Figure 23: The Smile Curve for firms in Terni: value generation along supply chains for domestic and foreign activities, source: authors' elaboration on Orbis data by Moody's Analytics



Interestingly, when we consider the contribution of foreign firms, i.e., firms that are controlled by foreign investors but operate in Perugia or in Terni, we find that they

usually generate a higher value than domestically owned firms, especially in the middle of the technological sequence. Apparently, however, domestic firms have a slight competitive advantage, hence they generate more value than foreign firms, in post-production services. This is all the more relevant if we consider that foreign firms contribute only 8% of the economic value generated in Umbria, as reported in Table 1.

Table 1: Contribution of foreign firms to value generation in Umbria, % on total by category, source: authors' elaboration on Orbis data by Moody's Analytics

Industries	Large companies	Medium companies	Small companies	Total
Primary activities	25.64%	15.32%	5.40%	**19.40%**
Manufacturing	21.02%	2.04%	1.12%	**16.37%**
Utilities	5.57%	0.00%	0.58%	**0.01%**
Construction	0.11%	0.87%	0.52%	**0.53%**
Wholesale and retail trade	2.00%	0.65%	1.22%	**1.65%**
Transportation and storage	23.71%	1.40%	1.89%	**12.97%**
Financial services	4.29%	6.87%	2.65%	**3.74%**
Other non-financial services	0.53%	3.42%	0.52%	**0.43%**
Total	**11.12%**	**2.44%**	**0.86%**	**8.37%**

According to our data, about 284 foreign firms are active in all industries in Umbria, but they contribute relatively little to value-added generation. They are on average bigger than domestic firms and they invest relatively more in the agri-food sector, manufacturing activities, and transportation services. Indeed, we register a fundamental lack of direct investment by foreign investors in the services industries of all kinds. In the third chapter of this report, we will devote more space to a reasoned analysis of the policies that could foster the presence of foreign investors. It suffices here to note that Umbria is able to catch only 0.5% of the foreign direct investment coming to Italy (ISTAT-ICE, 2018), measured either in terms of employees or turnover.

2.4 INNOVATION ALONG SUPPLY CHAINS

The competitive position of Umbria in high value-added products and services has been at risk due to a lack of investments after the beginning of the economic crises in 2008. We have seen (**Figure 4**) how public administrations in Umbria shrank their contribution to gross fixed capital formation, while companies were more resilient and counterbalanced the impact of the crisis. The accumulated investment gap needs to be bridged to allow companies in Umbria to produce more innovative products and services using more resource-efficient production processes[10], notably through the deployment of high-impact manufacturing technologies.

Nonetheless, Umbria's position cannot be evaluated correctly if we do not consider the context in Italy and, more in general, in Europe. After Asian countries' fast catch-up in technologies and fast manufacturing recovery in the United States, the situation in the European Union is mixed. Although European firms are developing various relevant key enabling technologies (KET), far too few of them have become commonly adopted on a global scale (Bruegel, 2017), hence leaving the technological frontier to firms in other continents. According to some scholars, the gap of industrial dynamics is even widening within Europe, because German industry continues to realize positive developments, while France and Italy are falling behind since they did not manage to turn around the negative investment dynamics prompted by the 2008-11 crises.

The starting point is the combination of programs for the modernization of industries set by the European Union and by the Italian government in the latest years, including the access to funds for the industrial restructuring of the area of Terni-Narni[11].

[10] For a useful reference on the positioning of Umbria in the context of European policies, see also *"La valutazione del posizionamento del sistema produttivo regionale"* (Umbria, 2018) compiled for the regional government.

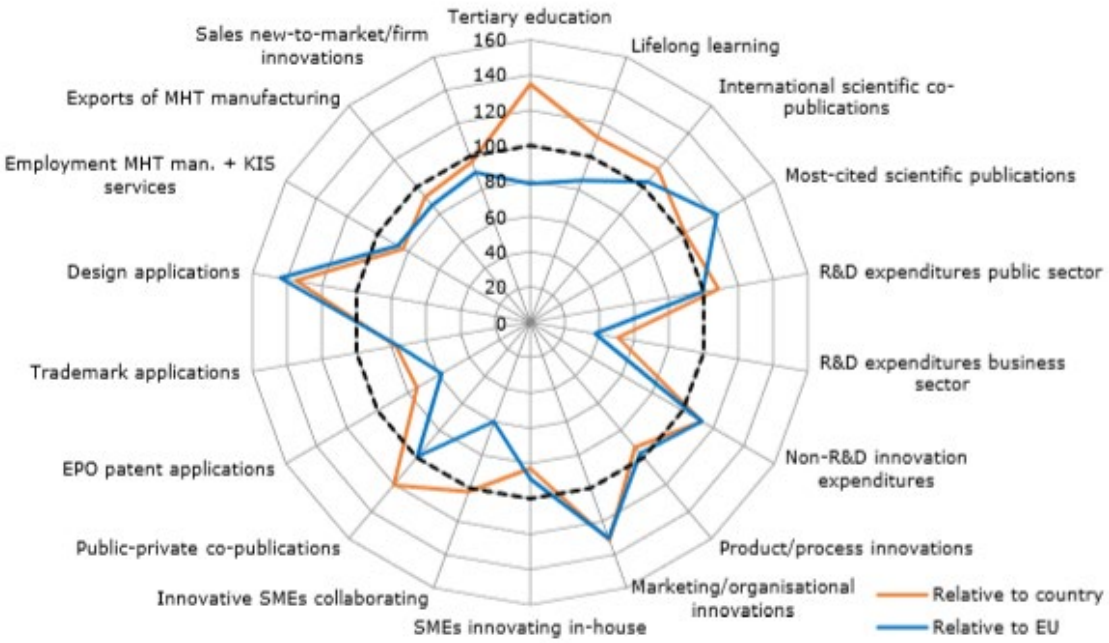
[11] The Italian Ministry of Economic Development spotted some *'aree di crisi industriale complessa'*, i.e. some geographic areas that have suffered more than others from economic recession and unemployment, and which have a systematic relevance for the Italian economy and its industrial policy. The complexity of the industrial crisis is defined as: i) coming from the crisis of a large company with an impact on the supply chains; ii) having an impact on a specific industry in which the area is highly specialized. In this context, the Ministry of Economic Development defines the contents of *ad-hoc* program agreements that promote investments for innovation, environmental recovery, human capital, energy efficiency, and necessary

We will spend a few words on the framework of industrial policy and its efficacy in the next chapter. Now, let us focus on the competitiveness of the innovation activities in Umbria.

According to the EU Regional Innovation Scoreboard (2017), Umbria is considered a *moderate innovator*. Although innovation performance has increased over time, the region does not perform like other leading regions and countries in the European Union (see **Figure 25**). However, Umbria has some notable strong points. The radar graph of **Figure 24** shows the performance of the region, against either the scores of Italy (red line) or the scores of the European Union (blue line), along the main dimensions of innovation that are considered by the Regional Innovation Scoreboard (2017). If a region has a strength, its line will rise above 100 along that dimension. If the region falls behind, the line will lag below the black reference line, accordingly. Design Applications and Marketing & Organizational Innovations are acknowledged as strong points in Umbria *vis à vis* both Italy and the European Union.

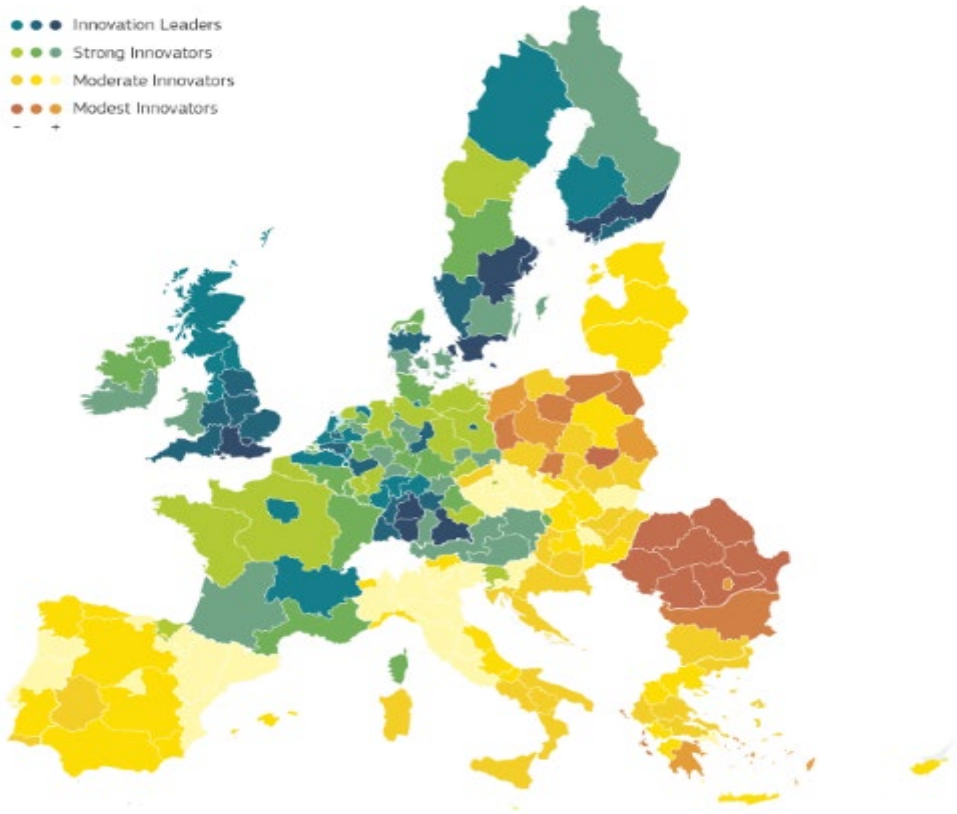
infrastructures. For more details, see https://www.mise.gov.it/index.php/it/impresa/competitivita-e-nuove-imprese/aree-di-crisi-industriale/crisi-industriale-complessa.

Figure 24: Innovation scoreboard of Umbria, *vis à vis* the rest of Italy (base = 100) and the European Union (base = 100), source: Regional Innovation Scoreboard (2017)



Unfortunately, lower Business R&D expenditures and patent applications are an important source of disadvantage. In a dynamic perspective, they indicate how much innovation will be embedded in products and production processes in the next future. This is especially relevant if one wants to catch the train of the actual digital revolution. According to our elaborations from Orbis data, in the year 2019, companies in Umbria have a total portfolio of only 2,478 registered patents (respectively, 1,829 registrations for firms in Perugia and 649 registrations for firms in Terni). According to estimates by the Eurostat, that makes for about only 33 patents each year for a million of inhabitants. The area of Terni performs relatively worse, as its inventors and institutions on average apply only for 17 patents for a million of inhabitants. Eventually, the most active region in intellectual property rights in Italy is the North-East, where each year there are 124 patent applications for a million of inhabitants. Italy on average presents 60 applications for a million of inhabitants.

Figure 25: Innovation scores in the European Union and its regions, source: European Innovation Scoreboard (2018)



Trademarks are another proxy indicator of the ability of companies to innovate. Yet the numbers on applications for trademarks do not show us a different picture. As from Orbis data, firms in Umbria hold only a total of 1,043 trademarks in their portfolios in 2019 (respectively, 909 in Perugia and 134 in Terni). That makes for an average of 105 demands for registrations of trademarks each year for a million inhabitants coming from firms active in Umbria, according to Eurostat data. Although the average performance in Italy is not significantly different (119 per million inhabitants), Umbria is far from the most active North-Eastern regions of the country (238 per million inhabitants).

Obviously, the most problematic indicator in Umbria, as reported by **Figure 24**, is the exceptionally low level of Business R&D expenditures, if compared with averages of Italy and the rest of the European Union. This is the elephant in the room, which needs immediate intervention. In a sense, also the low number of Small and Medium Enterprises (SMEs) innovating in-house is just another side of the same coin. As we have seen from Chapter I, there is a good deal of firms that have suffered from hard financial constraints

in the last decade (**Figure 11** and **Figure 12**). Obviously, they have been not able to invest in innovative activities, especially if they were smaller in size. Once we discuss the external constraints in the Third Chapter, we will see how much it is difficult for most Italian firms to resort to external financial resources, especially if a firm is smaller in size. In the end, internal and external financial constraints make the odds appear against the chance that firms in Umbria could catch the wave of a digital revolution, albeit the many strong points of the regional productive system. A reform of the innovation ecosystem is needed such that the absorption capacity of the territory improves.

2.5 CONCLUDING REMARKS

Separation of a regional, national and international level is needed to understand the structural changes that determine the specialization patterns by manufacturing companies in Umbria. Economic globalization, with outsourcing/offshoring strategies, and technological progress, with robots and changing labor demands, have inevitably changed the landscape for manufacturing. Manufacturing is nowadays only about 17% of the total value added generated in Umbria. On top of that, a 'servitization' of manufacturing industries is underway, since up to 39% of manufacturing value is determined by the role of business services, which are key to improve the quality of the final goods. In this context, it is necessary to consider whole supply chains, where the activity of companies upstream has an impact on the outcome of other companies downstream, and vice versa. In fact, once we consider the representative firms along supply chains, we find that the bulk of the value is generated by pre- and post-production services. From this point of view, Terni has on average a lower value generation than Perugia in the segments where production tasks are more standardized, e.g. assembly lines and production of parts and components. To boost the generation of economic value in the region, companies should be able to catch the train of the digital revolution, but once we look at the performance in innovation strategies, we find strengths and weaknesses. The most relevant weakness is the scarce investment in R&D by companies, which in turn determines also a relatively

scant number of patent applications for the generation of new industrial knowledge. Eventually, we argue, both external and internal financial constraints make innovation difficult for companies in Umbria, especially if they are SMEs.

3. POLICIES IN TIMES OF CRISIS

In this Chapter, we provide a brief focus on some aspects that have been considered relevant by policy-makers in Umbria. In fact, at the beginning of our study, we circulated a questionnaire among fourteen informed policy-makers, who have answered on several aspects of the competitiveness of Umbria and its companies, while pointing at the most relevant constraints that need to be addressed. The reader can find the answers to the questionnaire at the end of this report. For the sake of briefness, we chose to elaborate on three important issues emerged from the answers to the questionnaire: i) the relationship between the local and the global economic scenarios; ii) the relatively smaller operating size of firms that need to face complex investment in internationalization and innovation; iii) the need of long-term financing resources, a so-called 'patient capital', which allows for less pro-cyclical investment by firms. Finally, we discuss latest results on how to better manage EU funds for the regional policy, as yet another form of 'patient capital', as they seem to fit particularly well in the context of Umbria, where some firms in financial distress struggle to invest in industrial restructuring.

3.1 THE LOCAL AND GLOBAL CONTEXT

The historical manufacturing area of Terni-Narni has been officially acknowledged as under industrial restructuring after a crisis faced by the chemical, metallurgic, and agri-food sectors[12]. According to a public rescue investment plan, the territory needs strengthening the production base, luring new investments, and supporting the redeployment of workers excluded from the labor markets. However, Terni-Narni is not the only area of industrial crisis in Italy for which a public rescue plan has been launched, and it will not be the last one in Italy or elsewhere. Other territories in the past suffered from industrial downturns when, for example, a sector becomes mature, its firms undergo profound transformations, and its hosting territory relies on it too much for economic

[12] After a program agreement on March 30, 2018, the Italian government, the region Umbria, and the municipalities of Terni and Narni have committed to spend about 58,25 million euro for industrial restructuring. See Terni-Narni (2018) for further details on the program agreement.

prosperity. Therefore, a transition from an industrial crisis does not need last forever, and we can learn from past crises as much about failure as success.

In the previous paragraphs, we briefly showed how Umbria and its firms, including Terni-Narni, have seen a deterioration in competitiveness in the last decade. Yet we also showed how the deterioration can be explained by the rise of inefficiencies in a segment of firms, generating a gap between most competitive firms that still exist in the region and some non-viable firms that sit next to them and pull down the regional averages. Financial constraints contribute to exacerbating the gap between smaller and medium enterprises (SMEs) and the rest of the economy.

Nonetheless, we argue, one should consider both the local and the global contexts before framing the policies that could efficiently tackle the industrial restructuring. Although the scale of the crisis seems local, there are global roots for the downturns that started after the latest twin economic crises in 2008 and 2011. In this context, any policy that just tries to revive the manufacturing industries as if recent waves of globalization and technological progress never existed can simply fail to attain the targets. Rather, longer-term movements in the global economy have an impact that is worth considering.

On one hand, we know that fragmentation of production across national borders is structural since local territories compete at the global level after the emergence of new actors on the world markets. Local producers do not only have to sell the best goods to final consumers, as in the past. Nowadays, they compete more than ever in the markets for intermediate goods and services. That is, territories can just host a segment of the tasks needed to deliver final goods. Outsourcing and offshoring strategies may be highly beneficial, whether they aim at attracting investors in Italy or at pushing Italian investors abroad, as long as they do not diminish the economic value generated in a country or in a region.

On the other hand, global technological progress is a further driver of change that one has to consider, for example in a relationship to the future of manufacturing jobs. Old-style traditional manufacturing jobs required a lower content of skills by workers,

providing a job for the many. Robots and artificial intelligence substitute human work in more standardized tasks while opening a window for jobs that require higher skills to operate them. The recent wave of technological progress adds on top of the concerns about the economic globalization, after the emergence of new competitors on world markets.

Against the tide of gloomy scenarios, according to which turmoil will arise because of distributional conflicts, we rather prefer a more constructive stance. Eventually, many will benefit if we prepare properly for both technological change and international economic integration. In the case of Umbria, besides the plan for investments and restructuring in Terni-Narni, other sources can be exploited for compensating the downturns of the last decade, starting from the Cohesion Policy of the European Union and its Structural Funds. On top of that, structural reforms at the national level would be of help in reducing the gap with regions of other European countries, including a modernization of the financial system and an improvement of the innovation ecosystem, which would boost the growth of the most dynamic strands of the economy in Italy and in Umbria.

3.2 SMALL IS NOT BEAUTIFUL

A fundamental characteristic of the Italian manufacturing industry, including companies in Umbria, is its reliance on small and medium enterprises (SMEs), which have been a source of national pride in the past for their flexibility and adaptability, for example after an agglomeration around industrial districts with a regional scope.

On the contrary, the relatively smaller size of Italian firms can be a disadvantage for an upgrade in internationalization and innovation, when a minimum efficient scale is required to reach foreign markets and invest in new products and new production processes.

A recognition of the needs by consumers in foreign countries, the search for partners abroad and the compliance with foreign laws all entail some fixed sunk costs that are better supported by companies when they can take advantage of higher cash flows.

Similarly, investment in innovation activities require some upfront costs, when the outcome of the innovation is not yet evident, which need time to be recovered. Eventually, a company needs either broad shoulders to stand the risk, thanks to some self-financing, or it should get easier access to credit by financial institutions, mainly based on the future profitability of its investment projects. Obviously, in either case, a relatively bigger company has a competitive advantage over a smaller company, especially when financial constraints are an issue.

Things can get only worse when there are some efficiency losses because at least some companies have become less productive, as we discussed from **Figure 8** where we showed the performance of manufacturing firms in Umbria. Smaller and less efficient firms obviously enter in a more critical situation when financial constraints become tighter, as we showed in **Figure 12**. In the aftermath of a period of financial turmoil, following the twin crises in 2008 and 2011, firms that have been in trouble before entered in a spiral of industrial run-down, especially if operating in mature industries and thin profit margins.

This is the case of the area Terni-Narni, which has been included in a program of industrial restructuring ("*crisi industriale complessa*", see Terni-Narni, 2018) based on the negative performances of the chemical, metallurgic and agri-food sector. In fact, the metallurgic industry has suffered the most in the last decade, having registered a confidence level by producers around 74 in the period since 2014, while the average manufacturing producer in Italy has been running industrial facilities[13] with a confidence level of 77 in the same period. On the other hand, companies in the chemical industry suffered from strains in the credit markets that were considerably higher than the rest of the manufacturing[14]. The agri-food industry, in general, has been the one that has most switched its target from the domestic to the foreign markets, i.e., when crises depressed the demand at home, companies were able to rely relatively more on foreign demand.

[13] The confidence level of producers in Italy is estimated by ISTAT following an indicator that considers how much intensive is the use of industrial facilities, taking a reference industry and the total manufacturing.
[14] The sectoral strain in credit markets is measured by ISTAT after considering the results of a survey that collects the sentiment by business operators.

From this perspective, an international comparison is useful, for example with similar competitors in Germany, where there is an established industrial tradition of the metallurgic and chemical sectors. The small and medium enterprises (SMEs) in Germany have a specific translation, they are collectively called Mittelstand. The Mittelstand include companies up to 499 employees and 50 million euro per year. Companies of such a size in Italy are already considered quite large. In fact, according to data from the OECD Structural Business Statistics, Italian manufacturing firms above 20 employees are more productive than German companies of similar size, all things being equal. The comparison is more difficult when we consider companies from services industries, where the notion of labor productivity is a bit more evanescent. According to the same OCSE (2014) report, the Italian economy lacks so-called *gazelles*, i.e., some innovative start-ups[15] that grow fast while changing the industrial landscape where they operate.

There is some optimism coming from the front of startups. Although Italy seems to have lagged behind their European counterparts in recent past, it is now catching up when it comes to generating successful startups and raising venture capital funding. According to Startup Italia, in 2018, startups raised €522 million compared to just €140 million in 2017.

In the case of Umbria, we can expect more in the next years since local institutions have been paying specific attention to provide the financial support that is needed by innovative startups by means of the funds allocated for the regional policy[16] by the European Union.

3.3 CREDIT ACCESS AND LONG-TERM INVESTORS: A CASE FOR 'PATIENT CAPITAL'

The twin financial crises, in 2008 and 2011, notoriously exacerbated a problem of credit access in Italy that was already relevant in the period before (OECD, 2014). The

[15] For a discussion on the regional determinants for the emergence of start-ups, see also Rungi (2012).

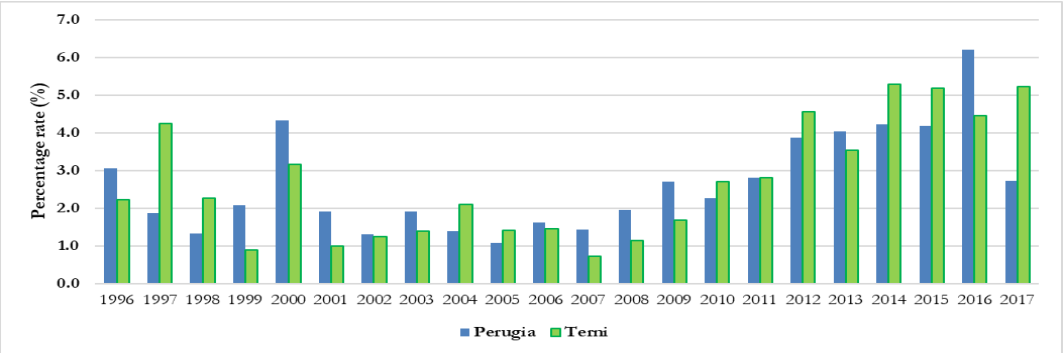
[16] The region Umbria recently established the fund 'Equity, quasi Equity', which is devoted to SMEs and innovative startups that invest in complex projects in R&D, tapping into the European Regional Development Fund, on the budget 2014-2020. See also following pages for a discussion on the general impact of the EU regional policy.

industry in Italy has been traditionally bank-oriented, hence from the beginning the fear had been that any difficulty in inter-banking markets, like the ones experienced since 2008, would start a contagion and jeopardize the principal source of external finance for the firms, especially the SMEs. This is what actually happened, although the banking system had been partially shielded at the beginning of the crises from a bigger turmoil, thanks to a more traditional banking model that was relatively less exposed to international volatilities. In other words, as soon as Italian banks had difficulties in obtaining finance on inter-banking markets, i.e. where the crisis started, they ended up by starting a credit crunch that affected both consumers and firms, either because there was a substantial increase in the cost conditions imposed to the borrowers or because loan applications were turned down by the banks.

The credit crunch in Italy has unevenly affected some regions more than others. The main consequence has been an uneven distribution of loan defaults on the national territory. At the peak of the crisis, in 2011, on average 4 percent of loans in Italy were in default, although the most difficult situation was in Marche with a 7.8%, while on the opposite side we find Trentino-Alto Adige where only 2% of loans were in default.

In **Figure 26**, we focus on the default rates on cash credit in Perugia and Terni. From a general point of view, this indicator can give us an idea of how risky is giving access to credit, at least in the short term.

Figure 26: Loan default rates for cash credit in Perugia and Terni, 1996-2017, source: authors' elaboration on data from ISTAT.



In the period 2001 – 2008, default rates on cash credit had been on average 1.3% in Perugia and 1.4% in Terni. Thereafter, a maximum was reached by Perugia in 2016, when more than 6% of cash loan were defaulting in Perugia and about 4.5% in Terni. The latest available year is 2017, when we observe a decreasing trend in Perugia (2.8%), while Terni still travels on a percentage above 5%.

If we considered the underlying balance sheets of the firms in Terni, we know that most of the deterioration in solvency (**Figure 12**) and profitability (**Figure 11**) comes from less efficient and innovative firms, which struggled to stay on the market. This is the segment of economic activities where bad financial performances and lack of innovation have been most correlated. From another point of view, this is a segment made of firms that most need innovating to stay on the market, although they cannot possibly afford it if they do not find an external financial resource that believes in the success of an investment project.

Whether it is the case of incumbent companies or startups that need investing in innovation activities, there is an increasingly short supply of long-term investors (OECD, 2018), which could instead benefit Umbria and its companies, while improving financial stability and boosting local economic growth. More in general, Italy suffers from a lack of so-called 'patient capital' by private equity investors if compared for example with other EU member countries. About 12.8% of Italian firms (Eurostat) would like to finance innovation and R&D but 0.3% thinks about asking for venture capital. Indeed, so-called 'patient capital' encourages less pro-cyclical investment strategies. Long-term investors (institutional investors, private equity, venture capital, business angels) through equity finance could afford to provide funds for some most innovative projects that require time before first benefits become visible. In this way, they could have an impact on areas under financial distress, exactly like the ones that need industrial restructuring. Unfortunately, according to Eurostat surveys (Eurostat, 2013), the main reason why potential equity investors do not participate in the risk of Italian companies is that they cannot realize the potential in the project (29.8% of cases) or that the company has accumulated too many debts (another 29.8% of cases).

3.4 HOW TO BETTER MANAGE WITH THE EU REGIONAL POLICY

In the latest years, Umbria has put in place a suitable plan to better exploit the EU budget 2014-2020 for regional policy[17]. We will not discuss here at length the difficulties encountered by Italian regions, including Umbria, in using all the resources that are made available by the EU regional policy. There is a structural divide between what is actually spent in Italian regions and what could have been spent. In **Figure 27** and **Figure 28**, we just report updated statistics on the actual cumulative payments made up to the end of 2017, and what is their contribution to public investments. In either case, Italy locates well below the EU average usage, although the funds made available for the regional policy could well represent yet another type of the 'patient capital' we were discussing in the previous paragraphs.

The nature of 'patient capital' of EU funds is well grounded as from the onset of the European economic integration. A European 'cohesion policy' had been developed to offset the imbalances that could benefit some regions in the geographic core of the continent at the expense of regions at its periphery, after trade barriers were gradually eliminated across countries. In other words, the aim of the regional policy is to avoid that economic disparities among regions would become large as a result of geographic remote distances. In a wider sense, the goal of regional policy has always been to boost competitiveness and economic growth, while providing people with better services, job opportunities and a better quality of life. For this purpose, in the latest running budget 2014-2020, European regions can rely on a third of all the budget funds (EUR 351.8 billion out of a total EUR 1,082 billion). Regional policy is the second largest budget item after the Common Agriculture Policy (CAP).

[17] For further details, see Programma Operativo Regionale FESR 2014-2020, available at http://www.regione.umbria.it/documents/18/1261878/POR+FESR+aggiornamento+agosto+2018/ca0b652f-115c-48c8-93b9-7e5ba2851dd2

Figure 27: Regional Policy 2014-2020. Cumulative payments (percentage) made from the beginning of the programming period (2014-2017), source: European Commission, DG Regio.

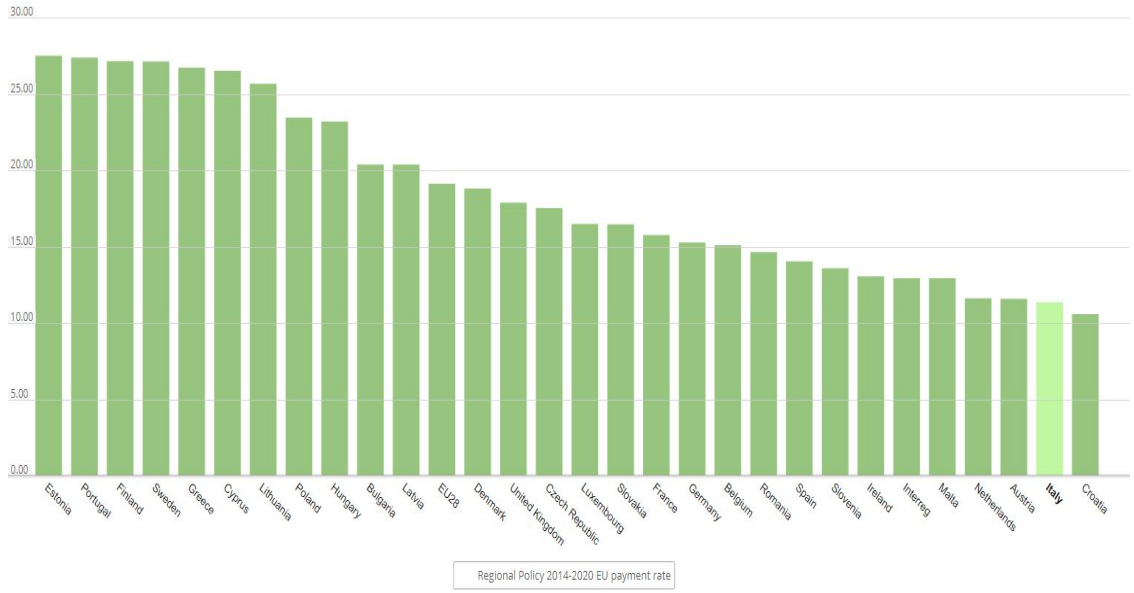
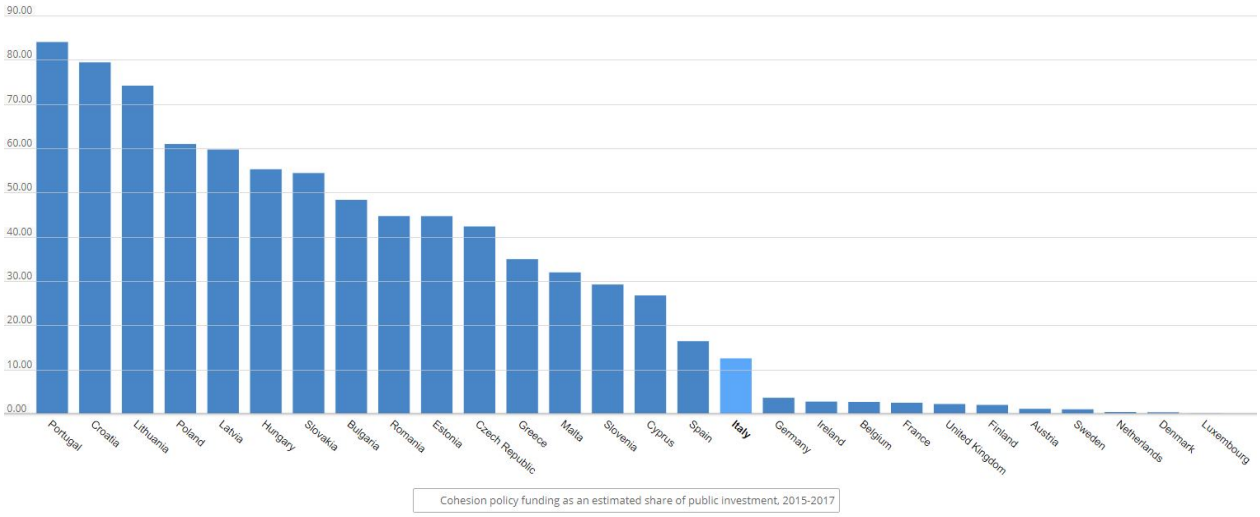


Figure 28: Regional Policy 2014-2020. Funding as an estimated share of public investments (2015-2017), source: European Commission.



Over the recent years, there has been an important debate on what the real impact of EU regional funds is, i.e., whether they are able to fulfill their promises to catch up with

most advanced regions or, else, developing regions could revive a path of economic growth no matter what the EU contribution is.[18]

More recently, a study made by Fattorini et al. (2018) underlines that most of the short-term impact of the EU regional policy actually comes from one specific measure, the support to Research, Technology, and Development (RTD) by the European Regional Development Fund (ERDF). Results from that study are of particular interest to firms in Umbria. In fact, when looking at firm-level performances, the authors find that the benefits of the ERDF are much stronger in the first quartiles of the regional productivity distributions. That is, the benefit of expenditures for RTD are stronger for firms that are relatively less productive in a region, while it fades away when companies are already more productive. Other measures by ERDF, for example in the case of overall Business Support, have a less clear-cut impact on the competitiveness of firms, at least in the short run.

In this respect, let us remember the regularity found in the case of Umbria and other European regions (**Figure 8**, **Figure 9** and **Figure 10**). We do find that the distribution of firms' productivity in Umbria is essentially bimodal, because a bunch of inefficient firms sits next to relatively more productive firms. In that case, according to findings by Fattorini et al. (2018), firms that are most in need of RTD expenses are the ones located on the left tail of **Figure 8**. Those are the firms that could better use the EU funds to boost innovation and finance their plan for an industrial restructuring.

Accordingly, we argue that the better strategy that Umbria and its companies should pursue is: i) first, to spot which firms have a better potential for industrial restructuring through investment in R&D; ii) second, to prefer the RTD measure by ERDF as a priority over other measures, since the lack of innovation activities is exactly the weakness of firms in Umbria, as registered elsewhere in this report.

[18] For some coordinates on the fruitful debate about the efficacy and efficiency of the EU regional policy, see OECD (2018). For example, there is no doubt that many European regions, especially among new EU Member Countries in Eastern Europe, have benefitted from a period of stable economic growth, and they are now richer than in the past. Is it because of the EU funds or would they become richer also in absence of these?

3.5 CONCLUDING REMARKS

The twin financial crises in 2008 and 2011 exacerbated some long-term trends that have invested more advanced economies, including a fundamental rethinking of the way manufacturing production is organized. From this point of view, Italy and Umbria make no exception. The establishment of global value chains allow companies to focus on a segment of the entire production process, where they can benefit more from competitive advantages, while offshoring/outsourcing the other tasks at home or abroad. Although we can register some timid signs of re-shoring back home some activities by companies that were too optimistic in the last decade, make no mistake because outsourcing and offshoring strategies are here to stay. National and foreign investors will still consider foreign countries as a valid alternative to invest, for example, in Umbria. In this case, one should focus more than ever to build on the local competitive advantages that the territory can offer. On top of that, manufacturing jobs increasingly require a higher content of skills in times of a digital revolution. Hence, investment in human capital is key for the next future.

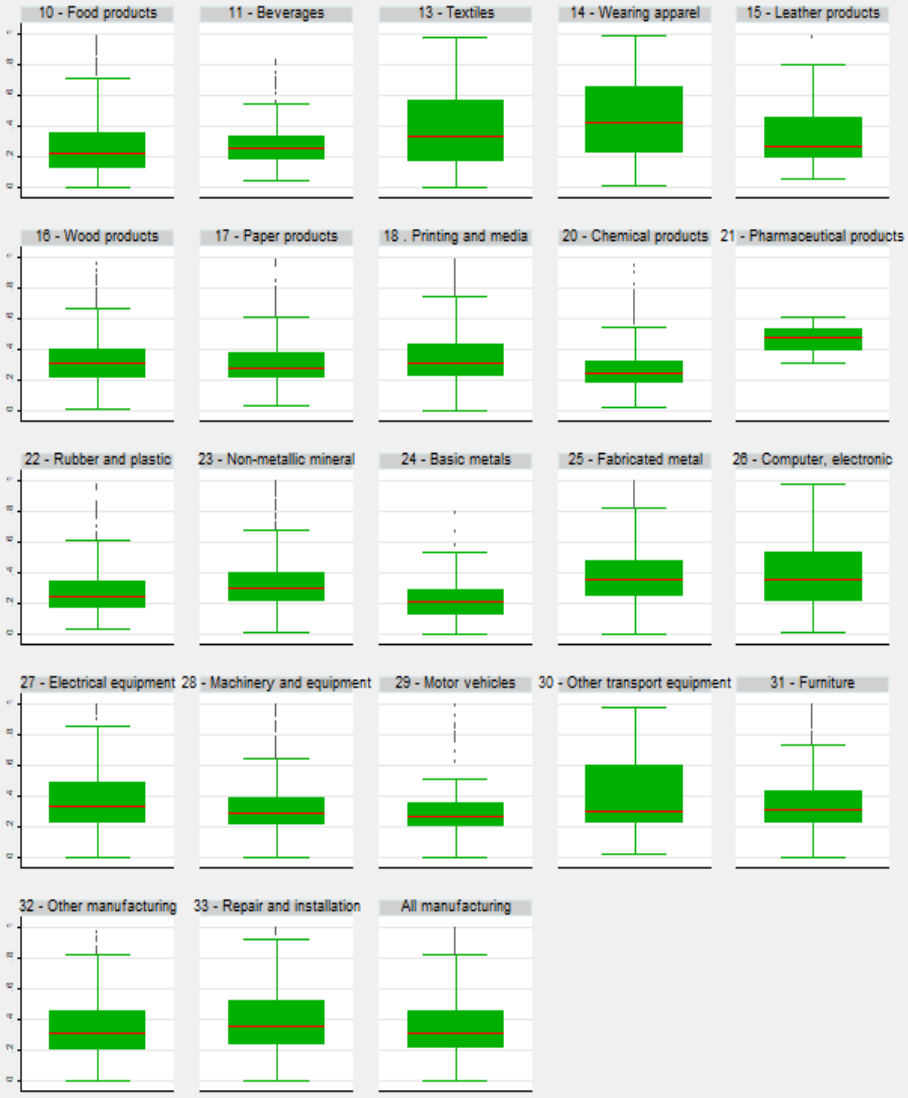
As we observed from the first Chapter, the peculiarity of Umbria is that there is a number of firms that are relatively less efficient and they are responsible for the aggregate negative outcome regarding (labor) productivity. In this case, the relatively smaller size of manufacturing firms does not help, because investment in internationalization and innovation need a good deal of financial support. Firms that cannot rely on high cash flows for self-financing must resort to financial markets. Unfortunately, in Umbria as in other parts of Italy there is a lack of 'patient capital' that could help in addressing resources towards longer-term objectives, including investment in innovation and industrial restructuring in times of crises. Part of the financial relief can actually come from the EU funds for regional policy, especially when they are used specifically for R&D expenditures. In fact, the latter have shown a stronger impact already in the short term with respect to other measures financed by the ERDF, as from an assessment made on all EU regions. In particular, ERDF R&D expenditures do benefit more companies that are most in need of industrial restructuring, when the investment target is clear.

Appendix A: Tables and Graphs

Appendix Table 1: Our sample of firms in Umbria in the period 2007 - 2017, source: Orbis by Moody's Analytics

Industries	Large companies	Medium sized companies	Small companies	Total
Agriculture, forestry and fishing	35	202	13,472	**13,709**
Mining and quarrying	1	7	28	**36**
Manufacturing	181	871	4,472	**5,524**
Electricity, gas, steam and air conditioning supply	13	50	229	**292**
Water supply; sewerage, waste management and remediation activities	10	35	72	**117**
Construction	34	529	7,541	**8,104**
Wholesale and retail trade; repair of motor vehicles and motorcycles	124	968	13,811	**14,903**
Transportation and storage	19	159	1,117	**1,295**
Accommodation and food service activities	3	206	4,222	**4,431**
Information and communication	6	75	1,253	**1,334**
Financial and insurance activities	20	42	1,417	**1,479**
Real estate activities	26	297	2,232	**2,555**
Professional, scientific and technical activities	27	143	1,889	**2,059**
Administrative and support service activities	15	117	1,863	**1,995**
Other service activities	28	159	4,186	**4,373**
Total	**542**	**3,860**	**57,804**	**62,206**

Appendix Figure 1: Value added content across manufacturing firms in Umbria in 2016, Source: authors' elaboration on Orbis by Moody's Analytics



Appendix Table 2: Import and export patterns to/from Perugia.
Source: authors' elaboration on ISTAT.

Activities and products	Import 2015	Import 2016	Import 2017	Export 2015	Export 2016	Export 2017	Intra-industry trade 2015	Intra-industry trade 2016	Intra-industry trade 2017
Agriculture, forestry and fishing	7.74%	8.15%	9.07%	5.08%	5.62%	5.48%	0.91	0.89	1.00
Extractive activities	0.06%	0.07%	0.09%	0.00%	0.05%	0.06%	0.10	0.89	0.93
Food, beverages and tobacco	31.61%	32.65%	31.80%	14.97%	15.24%	14.73%	0.92	0.91	0.87
Textiles, apparel and leather products	11.80%	11.58%	10.51%	20.79%	20.24%	20.38%	0.48	0.48	0.47
Wood and wood products	5.55%	5.06%	4.61%	3.92%	4.20%	3.90%	0.88	0.80	0.83
Coke and petroleum products	1.41%	0.72%	0.97%	0.15%	0.10%	0.20%	0.33	0.42	0.51
Chemical products	4.38%	4.20%	4.11%	3.43%	3.58%	3.49%	0.83	0.79	0.83
Pharmaceutical products	1.32%	1.27%	1.33%	4.43%	3.72%	3.11%	0.28	0.32	0.41
Rubber and plastic products	5.95%	5.70%	5.29%	3.56%	3.32%	3.32%	0.96	0.98	0.98
Metals and metal products	7.23%	6.17%	6.67%	4.55%	4.24%	4.57%	0.93	0.90	0.94
Electronic products	2.86%	2.75%	2.86%	2.69%	2.26%	2.26%	0.74	0.81	0.87
Eletric machinery	2.47%	2.74%	2.59%	2.79%	2.26%	2.24%	0.66	0.81	0.82
Machinery and equipment	11.57%	12.41%	13.23%	22.38%	23.21%	23.71%	0.44	0.46	0.50
Transportation means	3.14%	3.76%	3.77%	7.80%	8.22%	8.98%	0.36	0.41	0.40
Other manufacturing activities	1.99%	2.15%	2.21%	3.00%	3.40%	3.40%	0.54	0.52	0.56
Electricity, gas and steam	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-
Waste treatment	0.63%	0.37%	0.37%	0.06%	0.04%	0.02%	0.31	0.32	0.16
Publishing activities	0.06%	0.06%	0.00%	0.25%	0.11%	0.09%	0.22	0.44	0.06
Professional and research activities	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	0.09	0.00
Arts and entertainment	0.02%	0.03%	0.02%	0.10%	0.16%	0.03%	0.22	0.20	0.53
Totale	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%			

Appendix Table 3: Import and export patterns to/from Terni. Source: authors' elaboration on ISTA

Industries and products	Import 2015	Import 2016	Import 2017	Export 2015	Export 2016	Export 2017	Intra-industry trade 2015	2016	2017
Agriculture, forestry and fishing	0.53%	0.52%	0.73%	0.78%	1.98%	1.92%	0.78	0.34	0.48
Extractive activities	2.81%	3.23%	2.84%	0.14%	0.08%	0.07%	0.10	0.06	0.06
Food, beverages and tobacco	2.77%	2.98%	2.55%	4.30%	4.39%	4.07%	0.75	0.70	0.69
Textiles, apparel and leather products	0.99%	1.71%	1.57%	10.34%	11.10%	10.56%	0.16	0.22	0.22
Wood and wood products	1.55%	1.71%	1.35%	0.15%	0.05%	0.07%	0.19	0.08	0.11
Coke and petroleum products	0.00%	0.09%	0.00%	0.06%	0.00%	0.00%	0.05	0.00	0.09
Chemical products	6.61%	7.62%	7.86%	6.60%	6.75%	6.92%	0.96	0.94	0.98
Pharmaceutical products	0.41%	0.37%	0.37%	0.15%	0.07%	0.01%	0.57	0.37	0.05
Rubber and plastic products	4.14%	4.69%	4.31%	11.38%	10.93%	8.90%	0.51	0.51	0.58
Metals and metal products	56.88%	50.38%	55.50%	57.41%	54.39%	60.42%	0.96	0.84	0.87
Electronic products	0.59%	0.76%	0.56%	0.41%	0.46%	0.41%	0.86	0.87	0.93
Eletric machinery	1.41%	1.83%	1.46%	0.49%	0.20%	0.25%	0.55	0.25	0.33
Machinery and equipment	12.02%	10.95%	8.97%	5.78%	6.00%	4.03%	0.68	0.82	0.70
Transportation means	1.65%	3.78%	3.55%	0.98%	1.00%	1.09%	0.78	0.50	0.54
Other manufacturing activities	0.68%	0.94%	0.81%	0.54%	2.20%	0.53%	0.92	0.50	0.88
Waste treatment	6.91%	8.41%	7.56%	0.14%	0.21%	0.15%	0.04	0.06	0.04
Publishing activities	0.01%	0.02%	0.01%	0.23%	0.15%	0.54%	0.08	0.19	0.03
Professional and research activities	0.00%	0.00%	0.01%	0.08%	0.00%	0.02%	0.02	0.01	0.29
Arts and entertainment	0.01%	0.01%	0.01%	0.01%	0.02%	0.04%	0.83	0.79	0.22
Totale	100%	100%	100%	100%	100%	100%			

Appendix Table 4: Patents registered by firms in Umbria. Top 20 industries.
Source: authors' elaboration on Orbis data by Moody's Analytics

Nace rev. 2 industries	Total patents
Wholesale of other household goods	367
Manufacture of fasteners and screw machine products	297
Buying and selling of own real estate	115
Manufacture of other general-purpose machinery	93
Operation of gravel and sand pits; mining of clays and kaolin	90
Manufacture of furniture	88
Manufacture of basic iron and steel and of ferro-alloys	77
Manufacture of paper stationery	53
Renting and operating of own or leased real estate	52
Manufacture of plastics products	49
Manufacture of other fabricated metal products nec	42
Retail sale in non-specialised stores with food, beverages or tobacco predominating	42
Machining	40
Construction of residential and non-residential buildings	37
Activities of head offices	36
Wholesale trade, except of motor vehicles and motorcycles	35
Electrical installation	31
Manufacture of motor vehicles	31
Construction of roads and motorways	30

Appendix Table 5: Trademarks registered by firms in Umbria. Top 20 industries. Source: authors' elaboration on Orbis data by Moody's Analytics

Nace rev. 2 industries	Total trademarks
Manufacture of oils and fats	44
Processing and preserving of fruit and vegetables	40
Growing of grapes	31
Manufacture of wearing apparel, except fur apparel	31
Activities of head offices	29
Non-specialised wholesale of food, beverages and tobacco	27
Manufacture of vegetable and animal oils and fats	26
Manufacture of perfumes and toilet preparations	25
Manufacture of other outerwear	24
Manufacture of furniture	23
Manufacture of soft drinks; production of mineral waters and other bottled waters	23
Manufacture of irradiation, electromedical and electrotherapeutic equipment	21
Computer programming activities	20
Manufacture of knitted and crocheted apparel	20
Manufacture of machinery for textile, apparel and leather production	17
Manufacture of assembled parquet floors	16
Manufacture of other knitted and crocheted apparel	16
Manufacture of games and toys	15
Business and other management consultancy activities	13
Manufacture of macaroni, noodles, couscous and similar farinaceous products	13

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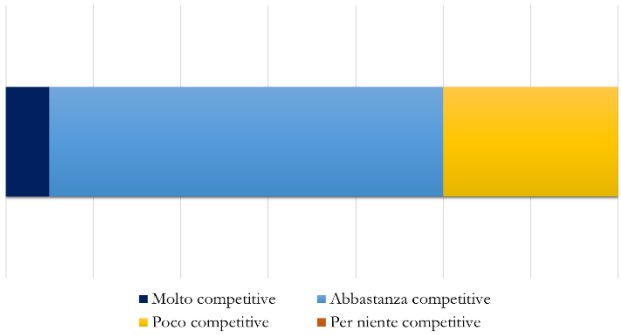
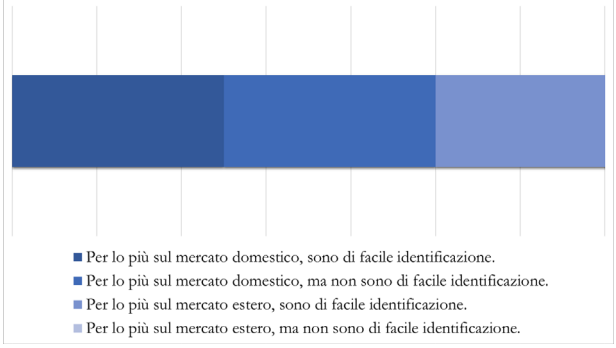
Questionario per le interviste – Risultati

Prima Sessione: Internazionalizzazione e Innovazione

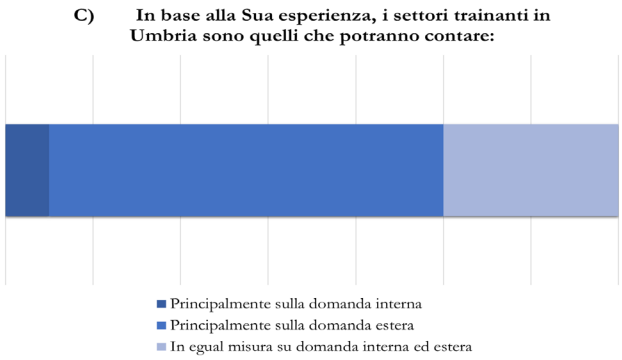
A) In base alla Sua esperienza, le imprese in Umbria sono:



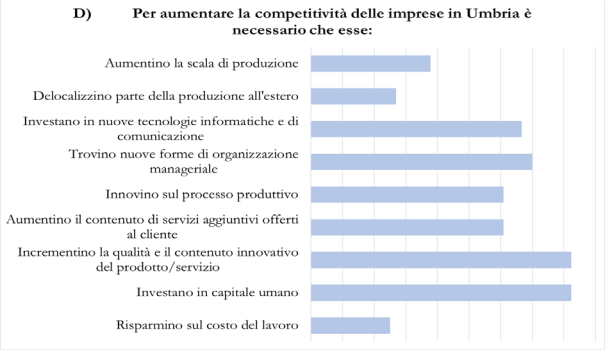
B) In base alla Sua esperienza, i concorrenti delle imprese umbre sono da ricercarsi:



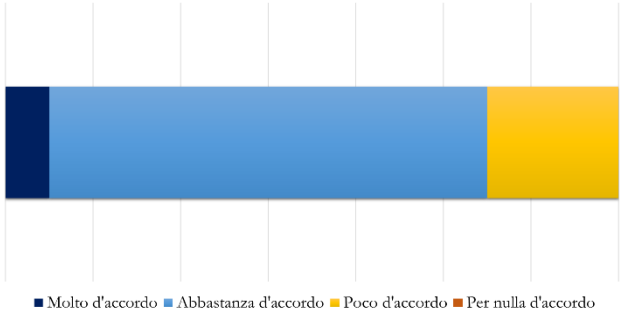
C) In base alla Sua esperienza, i settori trainanti in Umbria sono quelli che potranno contare:



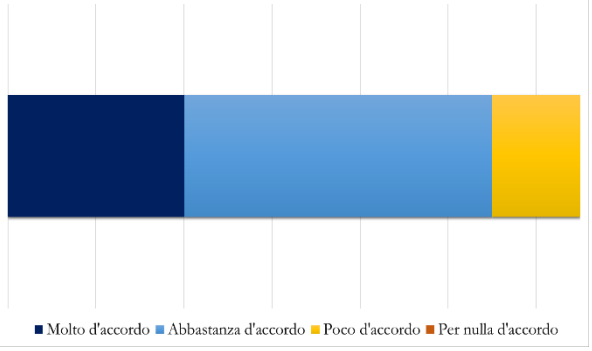
D) Per aumentare la competitività delle imprese in Umbria è necessario che esse:



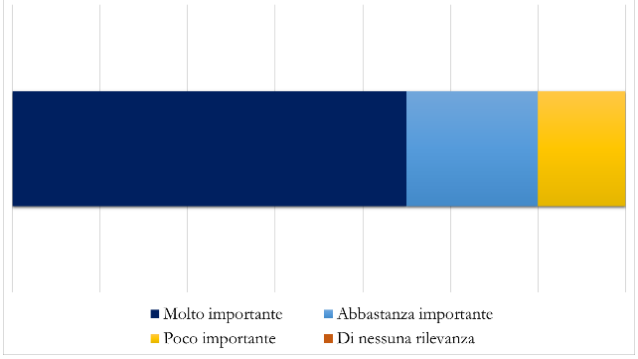
E) Per aumentare la competitività delle imprese in Umbria è necessario che esse attirino investimenti dall'estero:



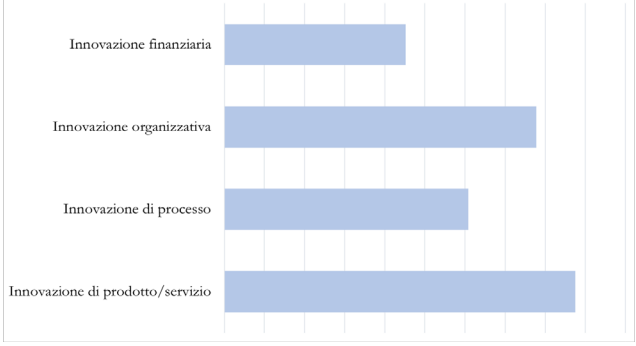
F) Per aumentare la competitività delle imprese in Umbria è necessario che esse investano di più all'estero:



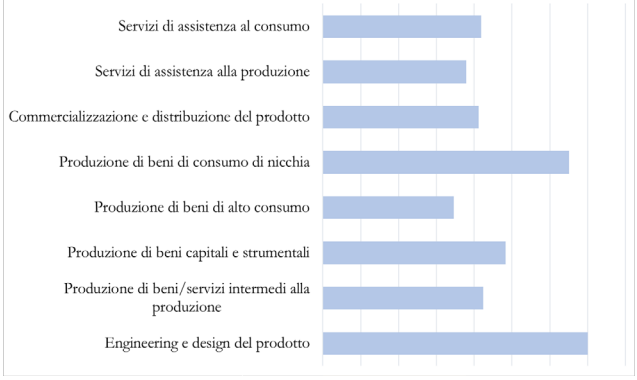
G) In base alla Sua esperienza, per le imprese umbre l'innovazione è una priorità strategica:



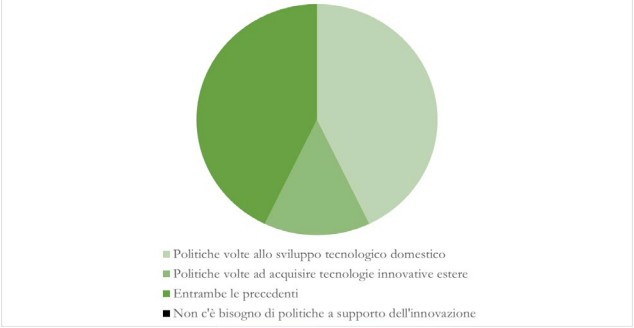
H) Quale tipo di innovazione contribuirebbe ad incrementare la competitività del sistema produttivo italiano?



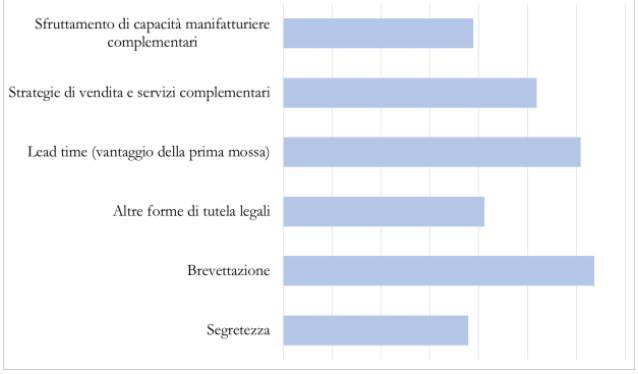
I) Su quali delle seguenti fasi della filiera le imprese italiane dovrebbero puntare ad essere più innovative?



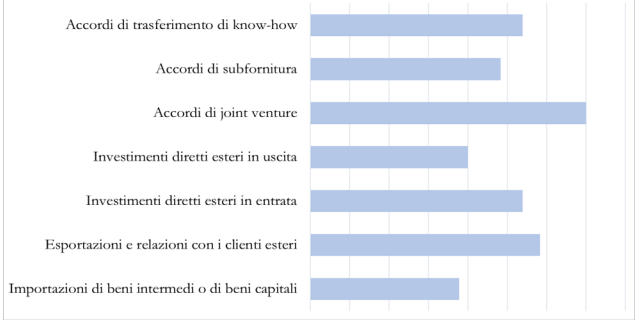
J) Quale delle seguenti politiche orientate all'innovazione dovrebbe essere maggiormente supportata perché considerata più efficiente?



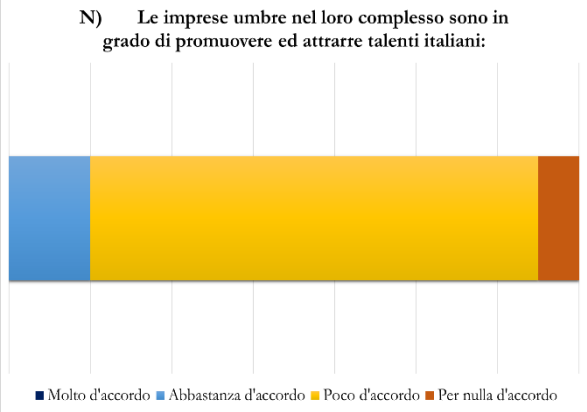
K) Fra i seguenti strumenti di tutela della proprietà intellettuale, quale a suo parere, risulta essere efficace?

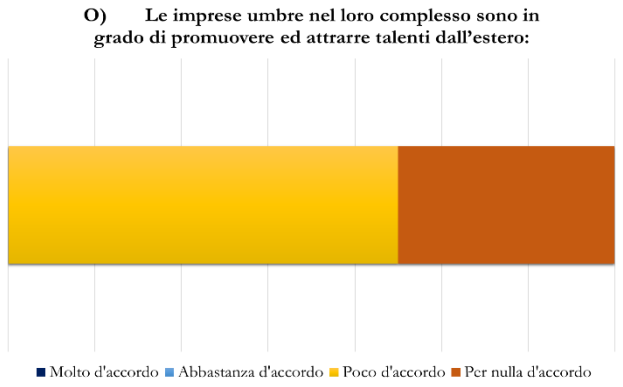


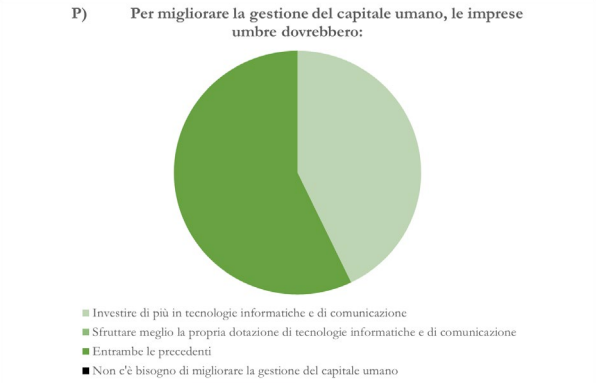
L) Fra le seguenti modalità di accesso alle tecnologie innovative estere, quali produrrebbero vantaggio al sistema produttivo nel suo complesso?



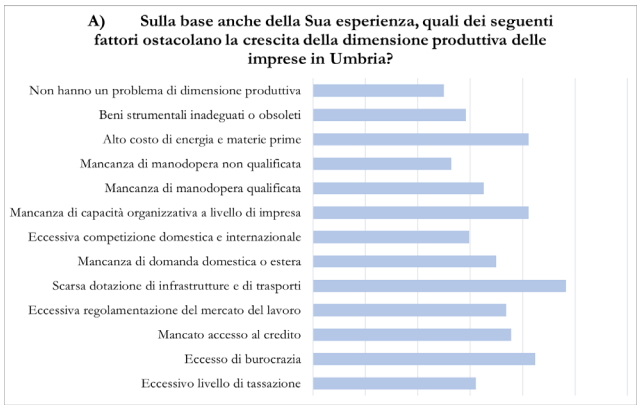

M) Le imprese umbre nel loro complesso sono in grado di valorizzare le risorse umane che hanno a disposizione, promuovendo i talenti:
Molto d'accordo
Abbastanza d'accordo
Poco d'accordo
Per nulla d'accordo

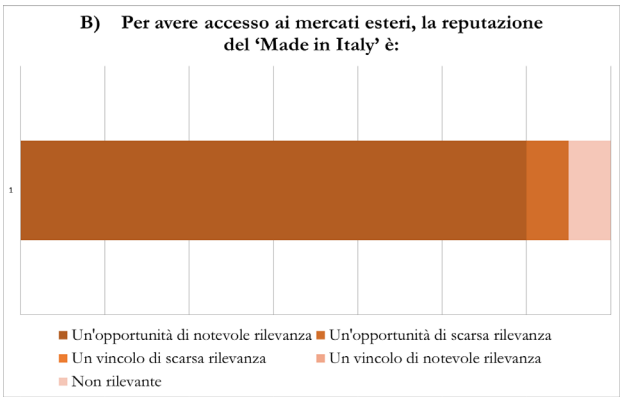

N) Le imprese umbre nel loro complesso sono in grado di promuovere ed attrarre talenti italiani:
Molto d'accordo
Abbastanza d'accordo
Poco d'accordo
Per nulla d'accordo

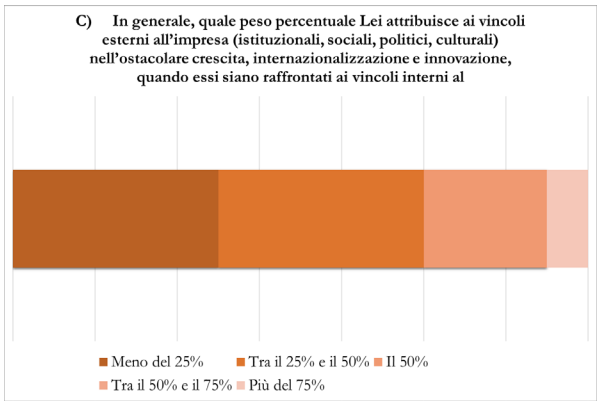

O) Le imprese umbre nel loro complesso sono in grado di promuovere ed attrarre talenti dall'estero:
Molto d'accordo
Abbastanza d'accordo
Poco d'accordo
Per nulla d'accordo

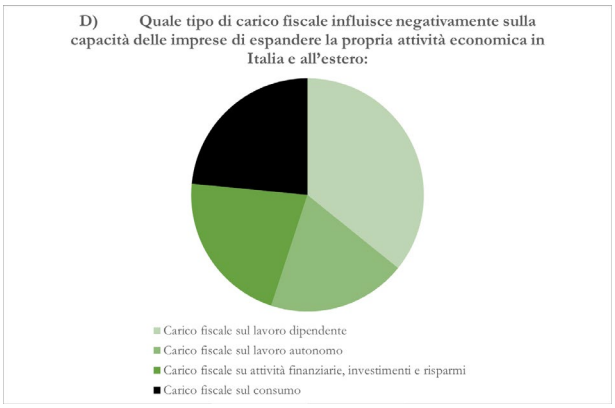

P) Per migliorare la gestione del capitale umano, le imprese umbre dovrebbero:
Investire di più in tecnologie informatiche e di comunicazione
Sfruttare meglio la propria dotazione di tecnologie informatiche e di comunicazione
Entrambe le precedenti
Non c'è bisogno di migliorare la gestione del capitale umano

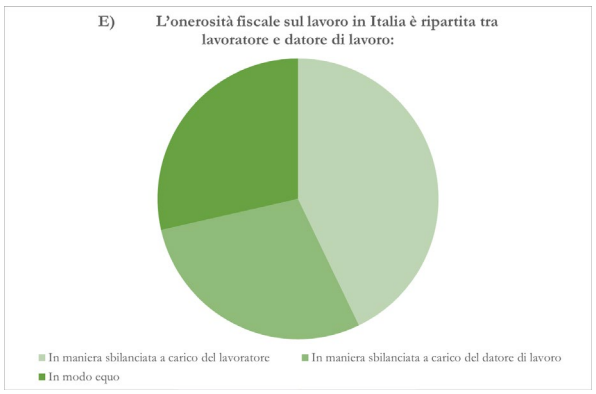
Seconda sessione: Vincoli alla competitività e allo sviluppo

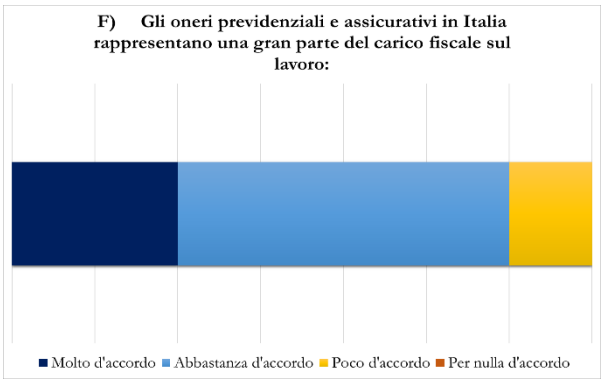


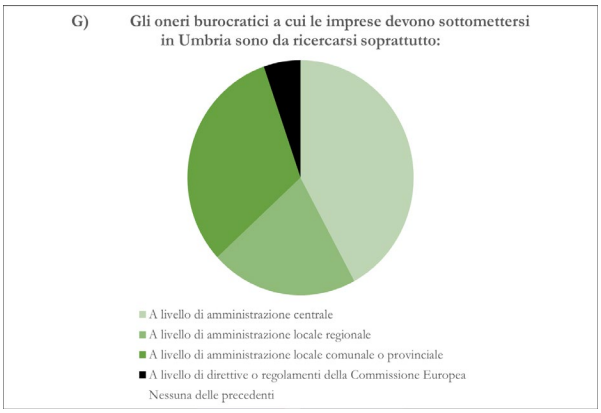


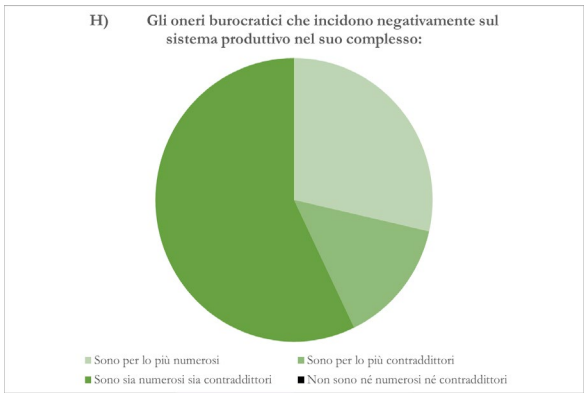


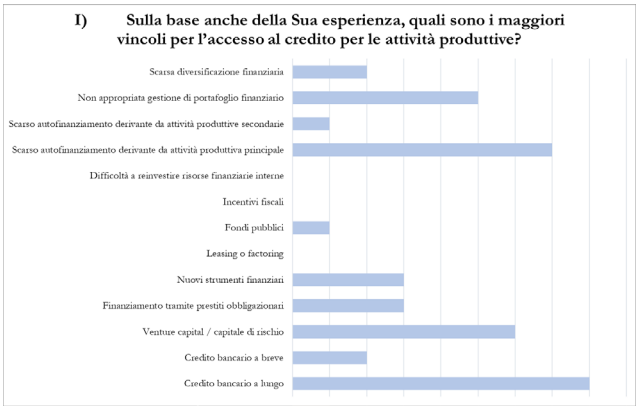


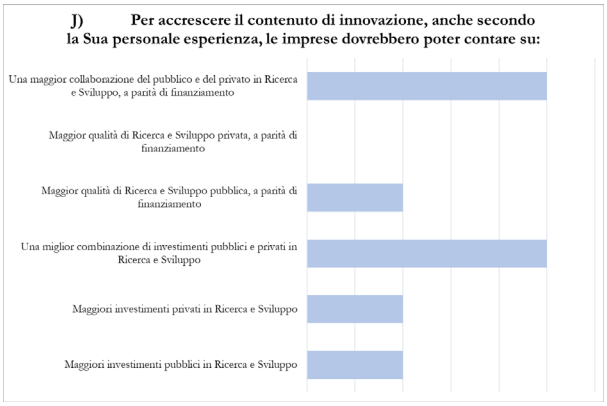


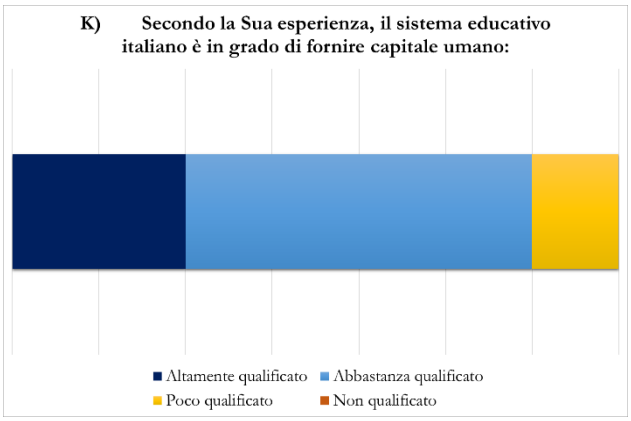


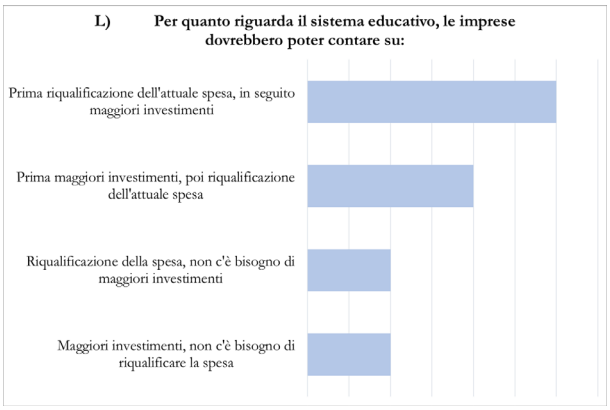

G) Gli oneri burocratici a cui le imprese devono sottomettersi in Umbria sono da ricercarsi soprattutto:
A livello di amministrazione centrale
A livello di amministrazione locale regionale
A livello di amministrazione locale comunale o provinciale
A livello di direttive o regolamenti della Commissione Europea
Nessuna delle precedenti


H) Gli oneri burocratici che incidono negativamente sul sistema produttivo nel suo complesso:
Sono per lo più numerosi
Sono per lo più contraddittori
Sono sia numerosi sia contraddittori
Non sono né numerosi né contraddittori


I) Sulla base anche della Sua esperienza, quali sono i maggiori vincoli per l'accesso al credito per le attività produttive?
Scarsa diversificazione finanziaria
Non appropriata gestione di portafoglio finanziario
Scarso autofinanziamento derivante da attività produttive secondarie
Scarso autofinanziamento derivante da attività produttiva principale
Difficoltà a reinvestire risorse finanziarie interne
Incentivi fiscali
Fondi pubblici
Leasing o factoring
Nuovi strumenti finanziari
Finanziamento tramite prestiti obbligazionari
Venture capital / capitale di rischio
Credito bancario a breve
Credito bancario a lungo

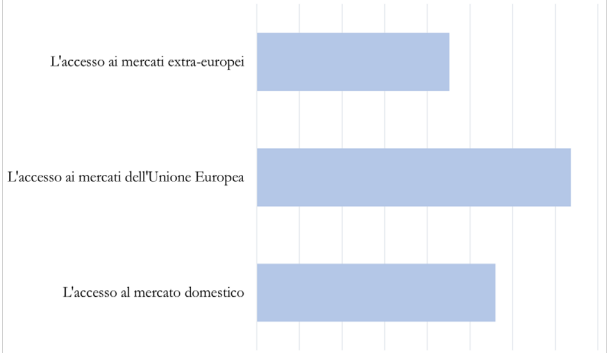

J) Per accrescere il contenuto di innovazione, anche secondo la Sua personale esperienza, le imprese dovrebbero poter contare su:
Una maggior collaborazione del pubblico e del privato in Ricerca e Sviluppo, a parità di finanziamento
Maggior qualità di Ricerca e Sviluppo privata, a parità di finanziamento
Maggior qualità di Ricerca e Sviluppo pubblica, a parità di finanziamento
Una miglior combinazione di investimenti pubblici e privati in Ricerca e Sviluppo
Maggiori investimenti privati in Ricerca e Sviluppo
Maggiori investimenti pubblici in Ricerca e Sviluppo


K) Secondo la Sua esperienza, il sistema educativo italiano è in grado di fornire capitale umano:
Altamente qualificato
Abbastanza qualificato
Poco qualificato
Non qualificato

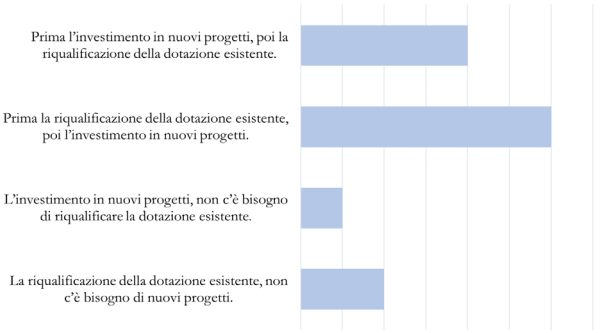

L) Per quanto riguarda il sistema educativo, le imprese dovrebbero poter contare su:
Prima riqualificazione dell'attuale spesa, in seguito maggiori investimenti
Prima maggiori investimenti, poi riqualificazione dell'attuale spesa
Riqualificazione della spesa, non c'è bisogno di maggiori investimenti
Maggiori investimenti, non c'è bisogno di riqualificare la spesa

M) Secondo la Sua esperienza, le imprese in Umbria possono contare su una dotazione di infrastrutture e trasporti:

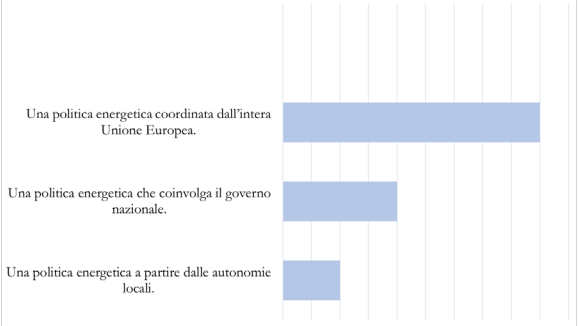
N) Per le imprese in Umbria, la priorità da seguire per gli investimenti in infrastrutture e trasporti è:



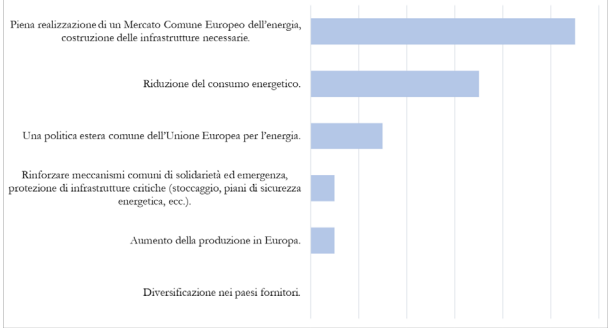
O) Per favorire l'accesso ai mercati nazionali e/o esteri, la priorità per gli investimenti in infrastrutture e trasporti é:



P) Affinché vi sia la possibilità di una riduzione del costo energetico per il sistema produttivo italiano è necessaria:



Q) L'Unione Europea ha individuato nel tempo alcuni obiettivi chiave in grado di assicurare forniture energetiche ininterrotte e stabilità dei costi. Secondo Lei, quali di queste sono prioritarie:



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