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An assessment of research and innovation policy in the Marche region: the results of the EC Regional Innovation Monitor

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Abstract

The adaptation capacity of industrial clusters in the Marche region and the creativity of local SMEs have been sufficient to allow a satisfactory economic performance over a long period of time, most notably in the nineties and until the early two thousands. Subsequently, the loss of competitiveness caused by the introduction of the common currency and then by the international crisis exposed and magnified some regional weaknesses related to the research and innovation system as well as to wider framework conditions. The regional approach to innovation policy improved over time (e.g. more selectivity, greater focus on collaborative research). However, due to the crisis, some of the policy novelties were watered down under the urge to safeguard employment and keep afloat SMEs going through hard times. If the region had been less short-sighted during the boom years and had invested more significantly in strengthening an innovation friendly environment, the condition for competing in the global markets would already have been in place. In the next years, a focused effort is necessary to address the most important regional challenges: increasing R&D intensity and strengthening cooperation networks; enhancing the quality of human capital and facilitating its absorption; finding an optimal balance between traditional specialisations and a "smart diversification". The new smart specialisation strategy and the operational programmes seem suited to fulfil these needs but further initiatives are recommended.

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Keywords: *Research and Innovation System; Innovation Policy; Regional Policy; Structural and Cohesion Funds; SMEs; Smart Specialisation Strategy; Europe 2020.*

Affiliations and acknowledgements

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1 Main Trends and Challenges in the Regional Innovation System

1.1 Recent trends in economic performance

Marche is a strongly industrialised region in central Italy inhabited by slightly more than 1.5 million people and with a relatively low population density of approx. $160/km^2$.[1] It is bordered by the Adriatic Sea to the east, Emilia-Romagna and the Republic of San Marino to the north, Tuscany to the north-west, Umbria to the west, Lazio and Abruzzi to the south-west and south. Marche is mostly mountainous and hilly with an over 170km-long coastline.

Marche has been severely hit by several crises in the last decade: the textile and clothing sector was affected first in 2002-2003[2], then footwear in 2005 and, finally, the international crisis, which erupted in 2008, produced negative impacts across all economic sectors. These events and, beforehand, the introduction of the Euro in 1999, which resulted in the inability to resort to currency devaluation to boost competitiveness, were key turning points in the recent economic history of the region.

Marche had been characterised by one of the best economic performances in Italy in the 90s and in the early 2000s despite a very low R&D input (see following section on innovation performance). The main driver of the competitiveness of regional industry was incremental innovation based on learning by doing and by interacting rather than on systematic and formalised R&D activities. At the same time, the economy could benefit from the boost in export driven by the currency devaluations in Italy before the Euro. With the recent and dramatic drop in international demand and without the option of devaluation, the competitiveness of the region deteriorated drastically.

The so-called industrial districts have been one of the most important, distinctive features of the economy, traditionally used to explain the efficiency of a model of "innovation without research". Prevailing specialisations in Marche districts have traditionally been in typical Made in Italy products such as leather and shoes, clothing, furniture, electrical appliances and machinery.

In Italy, Marche has the highest share of employees in local manufacturing systems characterised by a high specialisation and prevalence of SMEs, according to census statistics. The degree of sectoral concentration, measured in terms of number of local units, is 0.50 in Marche, compared to 0.36 in the EU27 (see Figure 1)[3]; the level of employment in strong clusters[4] is also higher than the European average (see Figure 1 and statistical data in the Appendix).

Business agglomerations are meant to generate externalities which benefit other enterprises

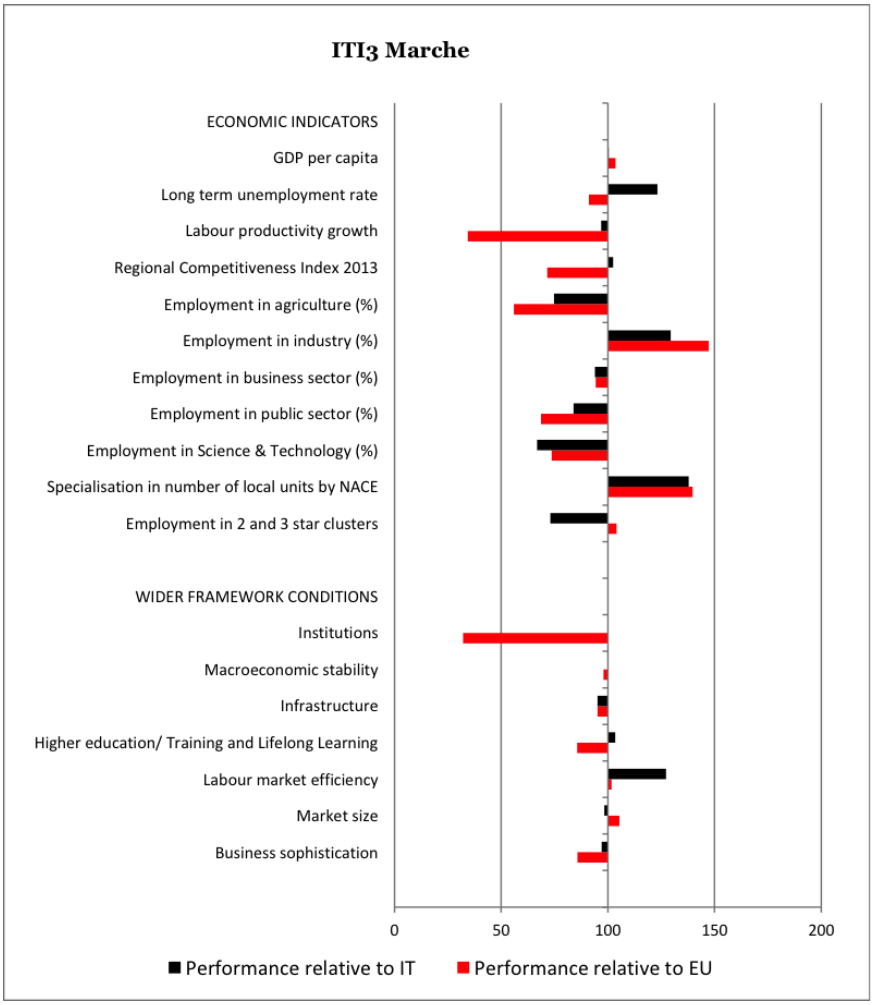
[1] The crisis of textiles and clothing was closely related to the gradual dismantling of the quotas that existed under the Multi-Fibre Arrangement which governed world trade in textiles and garments from 1974 through 2004.

[2] The last devaluation took place in 1992.

[3] Region X has a sectoral specialization of Y (with 0: no concentration and 1: maximum concentration), measured in terms of number of local units. For example 0.36 for EU27 means modest sectoral concentration. Source: Fraunhofer-ISI based on data from Eurostat.

[4] Employment in 2 and 3 star clusters (strong clusters). Source MERIT based on data from the Cluster Observatory (CO). The CO does not refer to regional clusters as supported by cluster policies. The CO groups regions according to a specific methodology based on employees in the defined cluster fields. For example 31.4% of the employment in the clusters, identified by CO in Europe, is in 2 & 3 star clusters. The sectors are available at: http://www.clusterobservatory.eu/.

Figure 1: *Economic performance indicators and wider framework conditions*



Source: Eurostat, JRC and MERIT (see Appendix for details).

that belong to a cluster. Benefits are linked to both static (lower costs of production) as well as dynamic efficiency, namely higher capacity to adapt to market changes and external shocks, and to generate product and process innovation. Regional industrial clusters were characterised by a remarkable capacity to evolve and adapt to the new challenges emerging from the changes in the international context. The main adaptations which characterised the clusters include the emergence of medium enterprises and of hierarchical relationships (Balloni and Iacobucci, 1997, 2004) and their progressive internationalisation (Conti *et al.*, 2007; Iacobucci and Spigarelli, 2007).[5]

The international crisis changed a seemingly untroubled picture. The GDP decreased more

[5] The article by Conti et al. analyses how delocalisation strategies were pursued in the Marche traditional footwear clusters to safeguard competitiveness. The article by Iacobucci and Spigarelli (2007) shed light on the extent medium enterprises play an active role in internationalisation processes. Their work is based on balance sheets data (2001-2005) concerning 197 firms located in Marche, Emilia-Romagna, Veneto and Tuscany, with 250 to 2,500 employees as well as a turnover ranging between EUR 50 and 1,000 million. The work highlights, inter alia, that firms belonging to clusters tend to shift more frequently from an export intensive strategy to an "internationalisation strategy" which implies a significant effort in terms of foreign investments.

than the national average in 2008-2013. The % change was -2.4 in 2008 and -4.9 in 2009. Positive but very low rates of growth were registered in 2010 (0.4%) and 2011 (0.6%) while a new drop took place in 2012 (-2.5%).[6] Nonetheless, the regional GDP per capita (EUR 26,100 in 2011) is in line with the Italian average and slightly higher than in EU27.

The importance of the industry, the prevalence of micro-enterprises, mostly small suppliers, and the traditional specialisations which are exposed to international competition and suffer from the reduction in household expenditure as well as from the decreasing house sales (e.g. home furnishings), made the regional economy particularly vulnerable during the recession. In general the reduction in household expenditure negatively impacted all commercial activities.

Since 2008, industrial production in construction and in the fashion sector has declined considerably, with a particularly negative trend for small firms. Only internationally known brands and medium-large enterprises managed to have a satisfactory performance in this turbulent period.

Currently the number of house transactions is approx. half the 2006 peak level. The percentage change in construction value added was -13.9% in 2009 and, after a recovery in 2010 (+6.1%), it dropped again in 2011 (-6.4%).

The number of businesses which went bankrupt increased considerably more than the national average. The insolvency ratio rose from 45.4 in 2008 to 83 in 2012 (per 10,000 existing firms). Enterprise fixed capital formation decreased too (-13.2% in 2012) and no improvement is expected in the short term (-2.7% estimated in 2013). The credit crunch is a significant problem for local firms and the number and total value of loans continued to decrease, especially to the detriment of small enterprises. The construction sector suffered most acutely from these issues.

While the internal demand has continued to weaken in the last few years, the only moderate support has come from export even though it remains below the pre-crisis level. The share of household furnishings and appliances, the most important sector for regional export, was approx. 35% of total exports in 2004. It dropped to 20% of total export in 2011, mostly due to the crisis of white goods.

The performance of tourism has not changed greatly in recent years; the same holds for transportation even though the commercial traffic in the Ancona port has declined slightly due to the reduction of shipments from Greece and a decrease in the trade of oil products.

The unemployment rate increased dramatically from 4.7% in 2008 to 11.1% in 2013. Youth unemployment went up from 11.6% to 36.1% between 2008 and 2013; this concerns not only low educated workers but is widespread. Unemployment is now in line with the national average while before the crisis it was at least two percentage points lower. Long term unemployment was 5.6% in 2013 (5.1% in the EU27).

As regards employment structure, the share of employment in industry (including construction) is considerably higher (37% in 2011) than in Europe, while it is lower in other sectors such as services in general.

It is worth noting that one of the most important, and predictable, transformation which has characterised the region in the last 25 years was the progressive decrease of employment in traditional sectors such as food, furniture, leather and shoes, textiles and clothing, compensated by a significant increase in the employment share in other manufacturing sectors such as, in particular, mechanics. This structural change reduced the exposure of the regional economy to the competition of low labour cost countries. At the same time, thanks to the expansion

[6] Bank of Italy (2013).

of the mechanics industry which requires wider and more easily transferable technological competences, it favoured spillovers, sectoral cross-fertilisation, product diversification and creation of new enterprises (Russo, 2008).

In other words, the distinctive traditional specialisation of industrial districts was progressively replaced by a balanced combination of diversity and similarities, with respect to markets as well as technological knowledge, which facilitates exchanges, mutual learning, innovation and growth.

This evolution is coherent with the concept of related variety which explains innovative performance and growth of regional systems (Frenken *et al.*, 2007; Boschma and Iammarino, 2009; Neffke *et al.*, 2011). Obviously this approach has significant policy implications because it involves replacing interventions focused on specific clusters or sectors with initiatives which enhance the relationships among the stakeholders in the territory. Some policies carried out by the Marche region, such as the support to the cluster of house automation, as well as the Smart Specialisation Strategy (S3) go exactly in this direction (see following section on policy mix).

The structural change which has characterised the region in the last two decades or so was not enough to shelter the economy from the negative consequences of the crisis. The dwarfism and excessive individualism of the business sector, and its long term reliance on exogenous competitive factors such as the practice of currency devaluation can in part explain the negative performance of recent years. Other reasons are to be found in the institutional weaknesses which characterise the national context.

A snapshot of wider framework conditions in Marche[7], in comparison to national and European performance, is provided in Figure 1.

The indicator on institutions merges two "pillars", a regional and a country pillar. At a regional level, it aims to capture the perceived quality of governance in terms of corruption, rule of law, government effectiveness and voice & accountability, based on survey data (Charron *et al.*, 2012). At country level, it takes into account property rights and intellectual property protection, efficiency of the legal framework, crime and police service reliability, which is a selection of indicators included in the Institutions pillar of the Global Competitiveness Index 2012-2013.[8] The regional institutional performance which combines these pillars is in line with national average but substantially lower than EU27 level.

The performance indicator on infrastructure takes into account regional data on the potential accessibility of motorway and railway (DG Regio) and number of passenger flights (Eurostat). In this case the regional performance is lower than both national and European levels.

As regards higher education, training and lifelong learning, Marche performs better than the national average but still worse than EU27. This indicator is built on the basis of regional data from Eurostat (population 25-64 with higher education and lifelong learning) and from Nordregio/EuroGeographics (accessibility to universities).

Labour market efficiency is higher in Marche compared to the EU27 and much better than the national average. This indicator includes several regional statistics from Eurostat on unemployment, gender balance in unemployment/employment and the indicator on the share of population aged 15-24 not in education, employment or training. However, it does not capture problems of labour skills mismatch which are an important regional issue which will be mentioned later in the report.

The performance as regards market size is better than in EU27 but below the Italian level.

[7] Based on RCI pillars (Annoni and Kozovska, 2010). The pillars are constructed by equally weighted averages.
[8] World Economic Forum, Global Competitiveness Index 2012-2013 (Schwab and Sala-i Martin, 2012).

The indicator includes regional data from Eurostat/DG Regional Policy (disposable income, potential market size expressed in GDP and potential market size expressed in population).

Finally, a business sophistication indicator is built on the basis of regional data from Eurostat on employment and Gross Value Added for K to N sectors (K: Financial and insurance activities; L: Real estate activities; M and N: Professional, scientific, technical, administration and support service activities.). Marche performance in this respect is roughly in line with the Italian average but below the EU27.

In conclusion, the indicators included in Figure 1 (see Appendix with statistical data) show that Marche's strengths consist of the relative importance of industry in the economy and the concentration in strong clusters. On the other hand, while some wider framework conditions are in line or even better than in EU27 (e.g. market size, labour market efficiency), the region suffers from a particularly poor institutional performance, a national hallmark, weak infrastructures as well as frail higher education, training and lifelong training conditions.

1.2 Recent trends in regional innovation performance

The Marche regional innovation system is characterised by several distinctive features; the most important include:

- Business R&D propensity is very low due to prevailing specialisations, average size of firms, as well as entrepreneurial culture and history. The business R&D expenditure as % of GDP was only 0.4 in 2011, slightly more than half of the Italian average (0.7%) and far below the EU27 level (1.3%).
- The share of SMEs which are product, process, organisational and marketing innovators is relatively low. The share of SMEs innovating in-house is minor while most of technological advances rely on the purchase of machinery. Nonetheless, the share of turnover of newly introduced innovations, new to the market, was nearly 7%, compared to an average of less than 5% in EU27, which demonstrate that despite the weaknesses, the Marche business sector is creative and capable of delivering innovation, especially thanks to its clusters of SMEs.
- There is a limited number of semi-public technology transfer intermediaries which link enterprises and research. In general, the degree of networking and the propensity of local firms to collaborate is very low. For instance, only 3.43% of innovative SMEs collaborated with others in 2010 compared to 8.89% in EU27 (CIS data).
- Existing research centres consist almost exclusively of universities. There are no private non-profit research organisations while public national research institutions are few and far between. This is part of the reason behind an inertial trend in GERD which has not changed significantly during the last decade, despite an improvement in the business component (i.e. the share of business R&D increased from 0.2 to 0.4% of GDP).

Even though the regional R&D expenditure was characterised by an increasing trend in the 2000s, at least until the outbreak of the international crisis in 2008, it is still lower than in comparable Italian regions such as Tuscany, Veneto and Emilia-Romagna.

This is paralleled by the number of R&D workers in relation to the population which is significantly lower than the Italian average. These features confirm that the region relies on a model of innovation without research where advances are generated by creativity, design solutions, organisational and market innovation rather than by R&D and collaboration with

research organisations. All this makes it difficult to capture and measure innovation activities through existing statistics and traditional indicators such as research expenditure and patents.

The universities are actually the most important regional research organisations. These are: the Marche Polytechnic University, the University of Urbino, the University of Camerino and the Macerata University which is specialised in humanities and law. There are approx. 60 university departments and institutes which work in basic sciences and technology, excluding those which operate in social sciences and humanities. The number of research departments and institutes have decreased considerably due to recent national reforms which favoured aggregation and dimensional growth of departments. About 2/3 of the researchers working in scientific and technical departments carry out applied research and technological development.

In the light of these features, the following data on recent trends must be taken with a pinch of salt since they tend to provide a very biased picture of the regional system which is far more complex than the available statistics can portray.

Figure 2 shows the performance of Marche in comparison with the national average and with EU27 in relation to a set of innovation indicators. As regards research and technology, Marche performs considerably below EU27 in all indicators except in terms of employment in medium-high and high tech manufacturing where it is higher than average. However, there has been a decrease since the beginning of the crisis and the reduction in employment in medium-high and high tech manufacturing was greater than in EU27. The relative strength of Marche in manufacturing is counterbalanced by a weakness in knowledge intensive services. In general, while the regional performance is satisfactory in terms of S&T graduates, it struggles to absorb them. The unemployment rate of graduates under 35 is high (16% in 2013) and above the national average, while the regional capacity to retain them is low: approx. 20% of graduates and more than 30% of PhD holders find work in other regions, a performance in line with southern Italy.

Total R&D personnel is considerably below national and European levels. The % of employees with ISCED 5-6[9] is much lower than in Europe but above the national average.

Business, government and higher education R&D expenditure as % of GDP are much lower than the European average and also below the national level. The very low R&D intensity is confirmed by the performance as regards structural funds (per million population) on business innovation and core RTDI, as well as the share of innovators receiving public financial support.

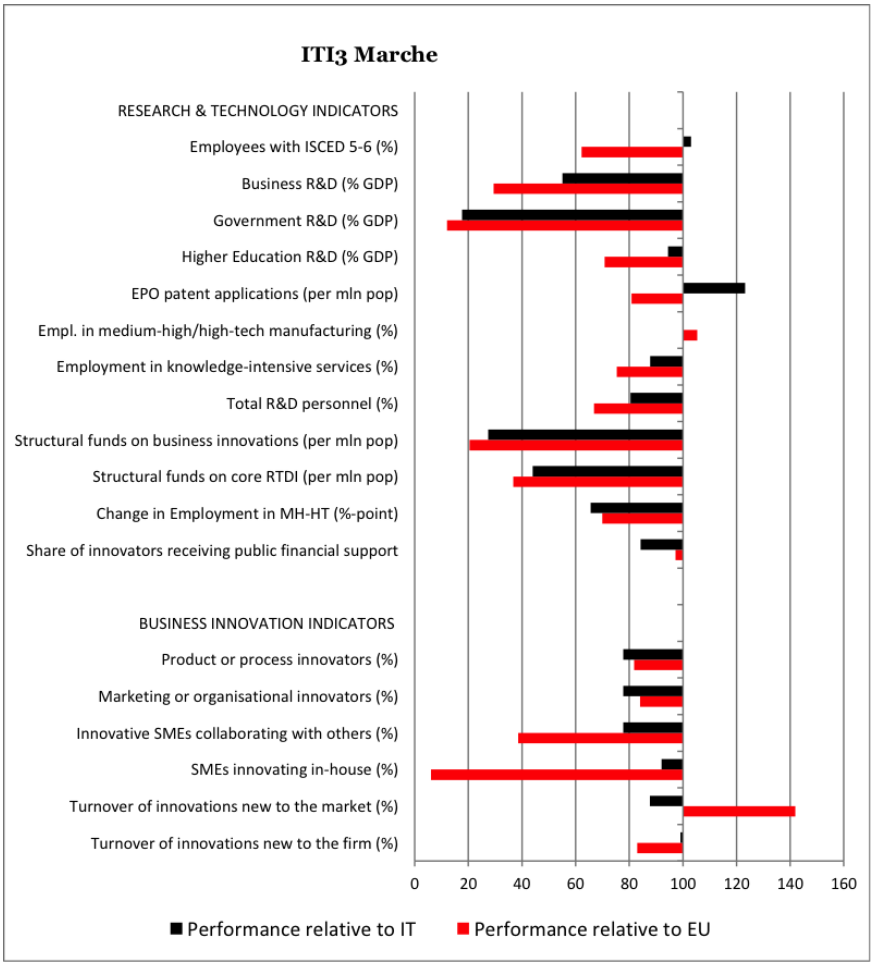
The number of EPO patents in Marche is limited, it was 89.3 per million of population in 2009 which is above Italian average but substantially lower than the performance of northern regions, even though it has increased considerably since early 00ies (it was 50.7 in 2001). The total number of international patents, both EPO and PCT, held by Marche inventors was 7.4% of the total international patents held in Italy in 2007; this share has increased significantly since the early 2000s and is, in any case, higher (approx. double) than the regional share of national GDP.

An article on inventive productivity in Marche highlights that patent quantity and quality are rather independent phenomena (Schettino *et al.*, 2013). The inventors' productivity does not significantly influence the average quality of their inventions which is positively affected by individual features such as age, level of education and gender, as well as organizational characteristics such as the presence of an inventive team.[10] This has policy implications and

[9] International Standard Classification of Education (UNESCO Institute for Statistics). Coding of education programmes: 5 (Short-cycle tertiary education); 6 (Bachelor's or equivalent level).

[10] The article analyses inventive productivity and patent quality of Marche inventors who contributed to 743 patent applications filed to the EPO during the period 1991-2005.

Figure 2: *Innovation Performance Indicators*



Source: Eurostat and ISTAT for EPO patent applications.

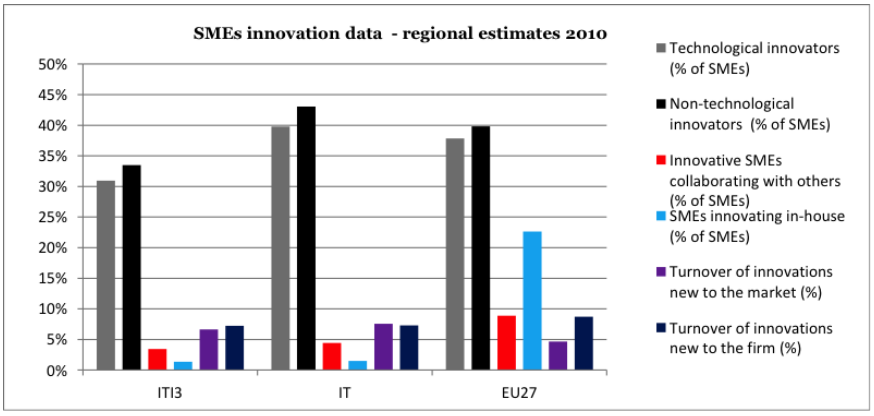
strengthens the idea that patent count as an indicator of performance must be taken with a pinch of salt.

An analysis of the IPC codes carried out in a joint report of Marche Polytechnic University and Marche Region (2011) shows that patenting activity is concentrated in typical traditional sectors[11] while new technological areas are not very strong. In particular, there was no nanotech patent held in 1998-2007 and the number of international patents in biotech were very few (only 8). There is more activity in relation to ICT and environment but the performance is considerably lower than that of nearby regions such as Emilia-Romagna and Tuscany. The geographical distribution of international patents reflects the territorial specialisations with mechanics prevailing in the province of Ancona, furniture in Pesaro-Urbino, leather goods and shoes in Macerata and Fermo.

As regards business innovation indicators (see Figure 3 and Appendix), the performance of Marche is also much lower than EU27 average. The turnover of innovations new-to-the-firm is below European level, while only the % of turnover of innovations new-to-the-market is higher than average.

[11] Technologies for furniture and electrical appliances, mechanics and metals, shoes; electronics is present but only to a much more limited extent.

Figure 3: *Technological and non-technological innovators*



Source: Community Innovation Survey, 2010.

The % of product or process innovators and the share of marketing or organisational innovators is below the national and European averages.

The performance in terms of innovating SMEs and in relation to their capacity to collaborate with others is also unsatisfactory.

The low R&D intensity of Marche reflects a trend which has not changed significantly in the last decade (see Figure 4).

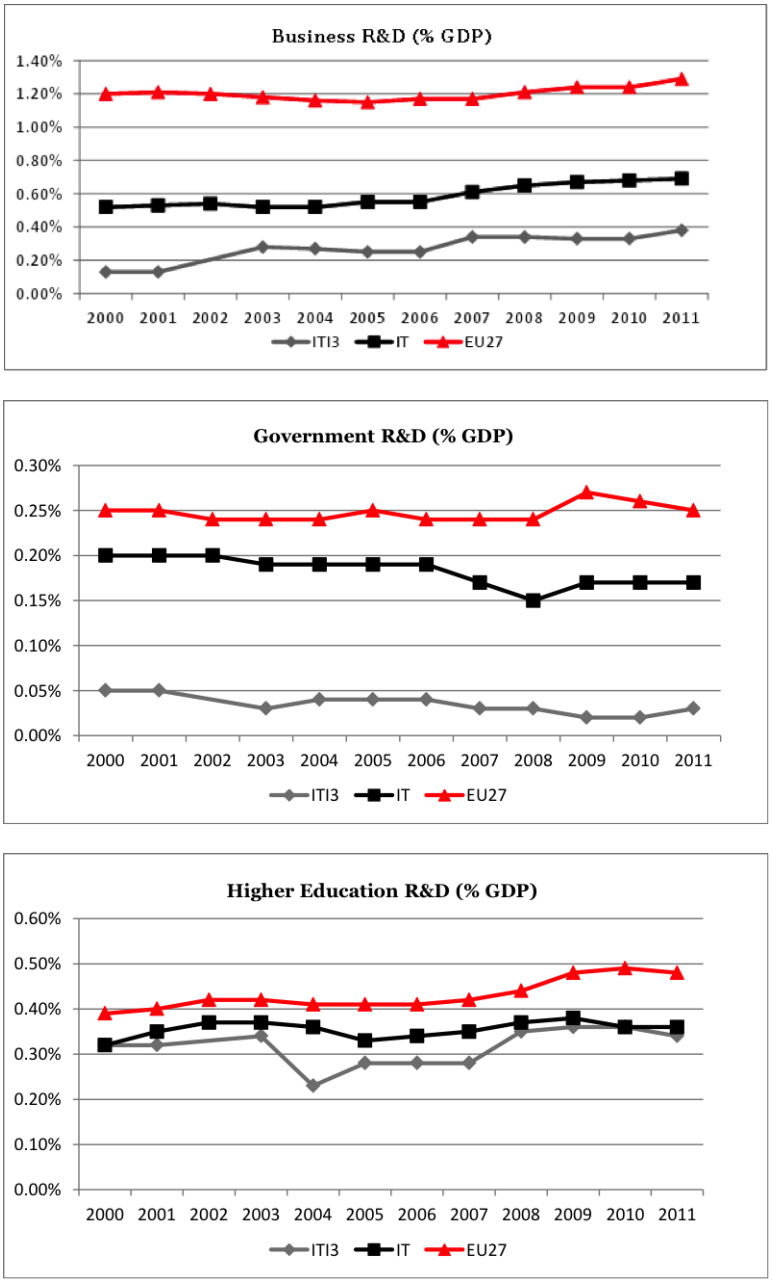
Even though there was an increase in business R&D as percentage of GDP, which doubled from something below 0.2% in 2000 to nearly 0.4% in 2011, this remains far below the European level and also the Italian average. Such mild growth is due mainly to the structural change which characterised the regional industry and to the larger amount of resources made available to support private R&D investments, especially in the 2007-2013 programming period (see Section 3). Unlike business research and development expenditure, government and higher education R&D intensity were characterised by a stability in the last decade (see the following graphs). Higher education R&D as % of GDP is more or less in line with the Italian average but lower than in EU27, while government R&D as % of GDP is around 1/4 of the national average, about 20% of the European level and has even decreased in the considered period.

Figure 5 confirms the inertia of government and higher education R&D over the years. This poor performance seems to highlight that, even before the crisis and the increasing fiscal constraints, the public sector was unable to invest more on research and innovation, or to compete more actively for resources allocated at EU level (e.g. thought European Framework Programmes for RTD). The amount made available by these programmes increased during the 2000s and could have had a considerable leverage effect on higher education and government expenditure, in case of a stronger participation of Marche.

Overall, even if the total R&D intensity went up from 0.5% to over 0.7% between 2000 and 2007, mostly thanks to the modest increase in business R&D, it is still way below the European average and far from the EU2020 target.

Figure 6 shows the percentage change of gross domestic expenditure on R&D in the period 2000-2010. GERD seems much more volatile and sensitive to the business cycle in Marche than in Italy and Europe on average. This in part reflects the highlighted dependency of total expenditure on business R&D, as well as the lack of a long term RDI strategy with definite and stable financial resources. There was an increase in 2000-2003, followed by a drop in 2004

Figure 4: *R&D expenditure per sector of performance*



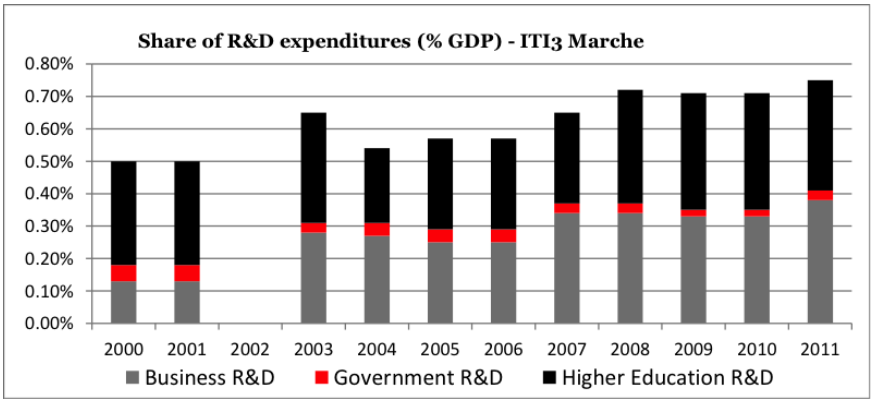
Source: Eurostat.

and again an increase in 2005-2007. In the midst of the international crisis, in 2008-2009, there was basically no change in GERD while a recovery was registered in 2010, together with a recovery in GDP growth.

1.3 Identified challenges

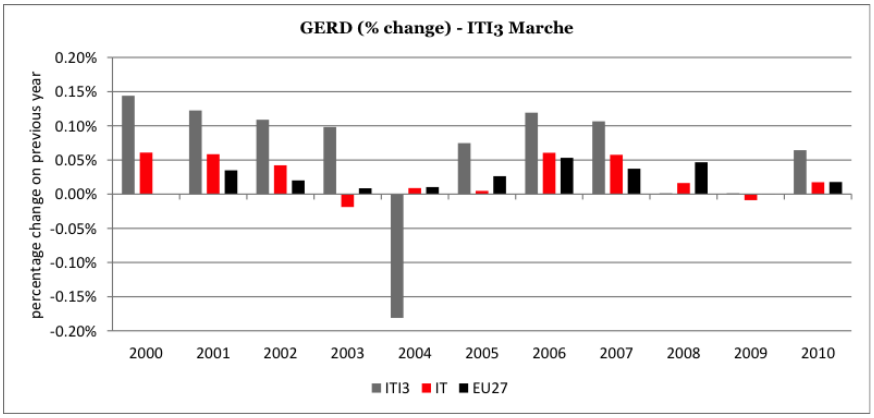
Marche is characterised by a prevalence of SMEs, organised in industrial clusters, operating mainly in traditional sectors, whose innovation activity is mostly informal and linked to the

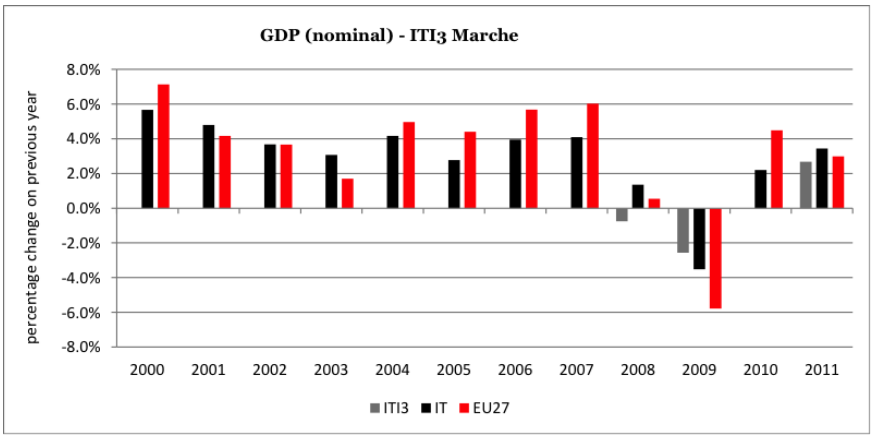
Figure 5: *Share of R&D expenditure per sector of performance*



Source: Eurostat.

Figure 6: *GERD and GDP trends*





Source: Eurostat.

continuous interaction between suppliers and producers. The innovation capacity cannot be fully captured by means of statistical indicators concerning, for instance, R&D expenditure and patents. Nonetheless, the available statistics help to provide a picture of the main regional strengths and weaknesses.

While the adaptation capacity of industrial clusters and the creativity of regional SMEs have

been sufficient to allow a satisfactory economic performance over a long period of time (most notably in the 90s and until early 2000s), the loss of competitiveness caused by the introduction of the Euro and later by the international crisis exposed and magnified the regional weaknesses.

The main weaknesses of the Marche innovation system include: a low capacity of the region to invest in R&D, a small share of employment in high technology sectors, a low percentage of firms which are technological or non-technological innovators, an insufficient propensity of SMEs to collaborate with others and of the higher education sector to interact with business, an extremely small % of firms innovating in-house, and a low level of high-tech exports compared to other regions. Wider framework conditions such as institutions and poor infrastructure facilities also affect the competitiveness of the Region adversely.

Challenge 1: need for increasing the regional R&D intensity and strengthening cooperation networks between the system stakeholders.

In a globalised world and after having been hit hard by the international crisis, relying on interaction between suppliers and producers and on their creativity is not enough to ensure competitiveness and growth. During the boom years in the 90s, regional policy was rather short-sighted and aimed at supporting firms unselectively while little or nothing was done to boost R&D. That was probably a missed opportunity to facilitate structural change. Now, in a time of crisis and austerity, regional policy is called to take a significant step forward and to focus mainly on research and technological development. The challenge concerns all components of the so-called triple helix but especially business and government expenditure.

It is worth noting that the insufficient propensity to invest in R&D is not an issue which policy can easily mitigate. There are important cultural reasons behind the incapacity of firms to grow and invest. However, policy can create friendly conditions for a step forward; for instance, it can support growth of enterprises more resolutely by facilitating access to credit in the key development stages of an organisation. Moreover, it can support the higher education sector in engaging more actively in cooperation activities with business firms.

As highlighted in the section on policy instruments, very important steps were taken in 2007-2013 in this direction compared to the previous programming period. However, this remains a critical challenge and more should be done in 2014-2020. With the approval of the Smart Specialisation Strategy and the finalisation of the ERDF OP, the Region is expected to address the issue of low R&D intensity vigorously.

Challenge 2: need for enhancing the quality of human capital and facilitating the absorption of highly educated people

The share of employment in S&T, the percentage of R&D personnel and the share of population in lifelong learning are unsatisfactory and lower than in EU27. This challenge is strictly related to the one before: it is necessary to facilitate the qualitative improvement of the stock of human resources in order to increase the propensity to invest in research and technology permanently and, at the same time, higher R&D investments are a necessary condition for absorbing a larger stock of high-educated human capital.

Addressing this challenge is not straightforward and exposes significant tensions which exist in the labour market. There is a considerable mismatch between the regional labour demand and supply. The former is still oriented towards manual workers with low education to be employed in traditional tasks and it is increasingly being satisfied by immigrant workers. On the

other hand, local labour supply, especially young generations, are not willing to fill traditional vacancies and are often confronted with two options: leaving or staying unemployed. A shift towards a more R&D based innovation system, together with greater attention to lifelong learning could mitigate this mismatch.

Challenge 3: finding an optimal balance between existing, traditional specialisations and a smart diversification, to foster competitiveness

This is a difficult challenge and there is no ready-made blue-print solution. The regional assets consist of specialisations in traditional manufacturing. As stressed, there has been a structural change in the last 20-25 years characterised by a progressive shift from clothing, furniture, leather and shoes towards mechanics. At the same time, there has been a physiological reshaping and, in general, a reduction of the weight of manufacturing which, nonetheless, still absorbs a higher share of employment in comparison with national and European averages.

In order to nurture regional competitiveness in a sustainable way, it would be strategic to strengthen the knowledge base of local industry, e.g. by facilitating the reinforcement of competences, know-hows and clusters operating in the applications of combinations of mechanics and electronics (e.g. mechatronics, smart manufacturing, home automation). At the same time it is essential to safeguard the niches where knowledge can only be based on research to a very limited degree, if at all. This is the case, for example, of quality shoes and some home furnishings, where the demand and therefore the competitiveness of producers increasingly depends on hand-made capacity and tradition as well as on design, while the possibility to benefit from applications of key enabling technologies (e.g. advanced and new materials) is limited and cannot produce advantages beyond a certain threshold or outside specific markets (e.g. sports equipment).

Strengthening the knowledge base of local industry implies fostering research and technology cooperation among firms as well as between industry and university, facilitating R&D investments, boosting the creation of new innovative firms in fields which are new-to-the-territory. Moreover, it is worth noting that this process cannot flourish without an advanced knowledge intensive service sector which is currently non-existent in the region and whose consolidation deserves policy attention.

On the other hand, safeguarding the traditional know-hows (e.g. hand-made, high quality, high-end products, luxury goods) requires investments in non-standard educational and training paths which attract young talents and are conducive to career opportunities in successful niches.

2 Innovation Policy Governance

The 2001 constitutional reform gave Italian Regions full autonomy in RTDI policy, as well as in other policy areas (e.g. business investment support, transport, energy and environment, tourism and cultural heritage). As a consequence of this reform and of the launch of the Lisbon Strategy, RTDI has acquired a central role in regional policy since the beginning of the 2000s.

The main operational instruments to ensure vertical co-ordination between regional and national authorities are Framework Programme Agreements signed between the Regional Administration, the Ministry of Economy and Finance and the Ministry of University and Research. These identify regional priorities and allocate national resources accordingly. The

Conference of Regions and Autonomous Provinces is the main interregional coordination mechanism. It aims to improve dialogue between local authorities and between these and the Central Government.

The most important opportunities of this institutional framework are those stressed by the advocates of subsidiarity: matters are best handled (i.e. more effectively and efficiently) by the closest level of policy makers. The main constraints which are worth highlighting include the risk that resources are distributed more or less equally among territories (e.g. provinces) and groups of stakeholders, regardless of actual needs and opportunities, for reasons mainly linked to political consensus. This prevents selective intervention and, in particular, may hamper an unbiased selection of priorities oriented towards the future as opposed to short-term and often short-sighted political advantages.

Such constraint is particularly significant in time of austerity in which policy became very dependent on European resources and, if regions make imbalanced choices, there is less money available to reward innovation. Another key risk is overlapping of intervention (Ciffolilli, 2010). Without a clear division of competences both the Central and the Regional Governments may intervene in the same policy areas. For example, in RTDI, both levels can (and actually do) finance industrial research projects, support technology transfer, as well as the creation of new firms etc. The consequences are often inefficiency, ineffectiveness and crowding out.

It must be stressed that the problem of overlapping mainly concerns southern regions (notably Convergence areas) which receive a considerable amount of resources from the Central Government and the European Union, while central and northern regions have to rely to a much greater degree on their own (e.g. there are no dedicated National Operational Programmes). However, the consequences in terms of displacement can still be significant, for instance in the case of aid schemes for industrial research and financial engineering instruments which, at a regional level, tend to be less selective and to crowd out national as well as European initiatives.

The coordination mechanisms mentioned before (e.g. Conference of Regions, framework agreements) are not always sufficient to fully mitigate these risks. They ensure a dialogue between different levels of government but the experience of 2000-2006 and the recent 2007-2013 programming cycle show that a more clear cut division of competences would have produced less overlapping and, ultimately, would have made available more resources to be invested on the strengths of the Italian research and innovation system.

The table below gives an overview of the innovation policy governance in Marche. While this framework is common amongst Italian regions, each regional authority followed its own path, introduced its own instruments and pursued its own strategies in relation to RTDI. The specific features of innovation policy governance in Marche are described in the following paragraphs.

In 2003, Marche approved a regional law (L.R. no. 20/2003) to regulate regional policy initiatives in the industry, crafts and service sectors with the objective of supporting regional production and growth. The interventions envisaged in the sectors disciplined by the Law are defined and detailed in the Plan for Production Activities which is a triennial document. On the basis of this, the Region approves annually the implementation procedures concerning individual intervention fields.

The regulated fields of interventions include: support to business investments and business creation, environmental sustainability of production, use of renewable sources, safety in the workplace, support to local typical productions and quality marks, research, scientific development and innovation, competitiveness of local clusters, internationalisation, credit access, technical assistance.

Table 1: *Innovation Policy Governance*

	Description	Comment
Degree of general regional autonomy	Full regional autonomy in all policy areas except for defence and macroeconomic policy, following the 2001 Constitutional reform, but low financial autonomy.	Subsidiarity is a potential advantage. Diverging political interests of regions, provinces and municipalities may cause inefficient allocation of resources.
Degree of autonomy with regard to innovation policy	Full autonomy but universities are financed by the Ministry of Education, University and Research.	Risks include overlapping of interventions and biased selection of priorities due to pressure by groups of stakeholders and political opportunism.
Set-up of regional governance system (centralised/decentralised/fragmented)	Centralised.	The regional Services for Production Activities and its Structures are responsible for managing research and innovation policy.
Nature of the process of strategy development (top-down/bottom-up/participatory	Mainly participatory.	The S3 was developed following an inclusive participatory process. Marche does not have a strong tradition of innovation strategy development. S3 is basically the first experience.
Intra- and inter-regional co-operation	Framework Programme Agreements signed by the Regional Administration and the Ministry of University and Research, and the Conference of Regions and Autonomous Provinces are the main coordination mechanisms.	The existing mechanisms ensure dialogue but the influence of regions and local authorities on investment choices is often excessive.

The policy design and implementation is coordinated by the regional Structure "Innovation, research and competiveness of production sectors" (P.F. Innovazione, ricerca e competitivita' dei settori produttivi) which is part of the Regional Service for Production Activities, Labour, Tourism, Culture and Internationalisation. The Structure also supports SMEs by providing technical assistance for research and innovation projects, by encouraging new start-ups in high-tech sectors and by facilitating the consolidation and internationalisation of regional business.

The Regional administration is assisted by Sviluppo Marche Spa (SVIM), an in-house company which was set up in 1999 to provide technical support in the implementation and management of economic development initiatives. The activities of SVIM cover the following themes: technology, innovation and project financing, mobility, infrastructures and logistics, eco-sustainable development of territory, rural development, culture and tourism, European projects and internationalisation, ICT.

More detailed information about the innovation policy institutional set-up and available

human resources is provided in Table 2. According to the information obtained from the (Marche regional administration, 2013), no relevant change in this set-up has occurred in recent years and the total number of personnel directly involved in the activities has remained roughly stable.

As summarised in the table, the Structure "Innovation, research and competitiveness of production" defined the S3, taking into account the regional legislature programme (*IX Legislatura*) which is rolled out by the Regional Government after the elections.

Regional programming is a competence of the Service for production activities; this Service defines a triennial integrated plan on production and labour (2012-2014). Coherently with this plan and the S3, the Managing Authorities (of ERDF and ESF) develop the Operational Programmes which also include an intervention strategy (addressing all policy areas and not only innovation) and identify the actual measures to be financed.

The S3 is an ex-ante conditionality for the approval of the 2014-2020 Operational Programmes, hence the documents are closely related. The Marche S3 was approved by the Regional Government in February 2014[12]; the ERDF OP, the key operational document for business support, research and innovation intervention, is currently being developed and the approval of the final version of the programme is expected by the end of 2014. The process of strategy development was mostly participatory: the Regional Administration consulted with other levels of government (e.g. Provinces, the Ministry of Education, University and Research, the Ministry of Economic Development) and other stakeholders (e.g. business associations) during the definition of the documents.

Several formal consultations were organised starting in late 2012 to present draft documents and collect reactions and recommendations of stakeholders. A series of 5 focus groups with business stakeholders were arranged to facilitate an "entrepreneurial process of discovery" which is an essential feature of the S3 process. The focus groups provided insights into the possible future scenarios, development trends in relevant national and international markets, territorial challenges, technological priorities, challenges for the integration and collaboration between innovation stakeholders, promotion of entrepreneurship, new opportunities provided by advanced sectors and ICT, obstacles to the growth of the regional production system etc. A scientific committee supervised the strategy development process and provided guidance.

In February 2013, the strategy was presented at a peer-review workshop organised by the S3 Platform in Majorca. In November 2013, a national event aiming at presenting the strategy and diffusing its contents was organised in Recanati (province of Macerata). The participants included: representatives of the EC, the National Government (e.g. representatives of the Ministry of Economic Development), the local universities and technology centres, business associations, national and European experts on innovation and smart specialisation etc.

Before the event, a public consultation was launched by the Region, in collaboration with the company providing technical assistance, to collect the views and opinions of citizens, students, researchers, firms and non-profit organisations. The best 10 ideas emerging from the consultation were selected by a pool of experts and received an award during the national event. This extended interaction between stakeholders is expected to continue also in the phases of strategy implementation.

The development of the S3 was a very important and unprecedented experience in relation to priority setting and planning innovation initiatives in Marche. The universities were directly

[12] http://www.impresa.marche.it/Portals/0/Documenti marco/Ricerca e innovazione/Piastrellini/Strategia Smart Specialisation.pdf.

Table 2: *Innovation Policy Institutional Set-Up and Available Human Resources*

Policy stage	Primary organisation	Number of personnel directly in charge	Total number of employees	Summary assessment
Strategy development	Regional Government (Giunta 2010-2015) Structure "Innovation, research and competitiveness of production"	5	8	The Structure "Innovation, research and competitiveness of production" develops the S3 strategy in coherence with the regional legislature programme (IX Legislatura) defined by the Government
Programming	Service for Production activities, Labour, Tourism, Culture and Internationalisation.	7	22	The Service for production activities defines a triennial integrated Plan on production activities and labour (2012-2014)
	Managing Authority for Community Cohesion Policy 2014-2020 (ERDF and ESF)	5 (+ technical assistance external staff)	20	The ERDF and ESF MAs develop the Operational Programmes which identify actual measures
Implementation	Structure "Innovation, research and competitiveness of production", assisted by SVIM	8	8	The Structure drafts and launches tenders, decides selection criteria and implementation processes
Monitoring and evaluation	Managing Authority of ROPs ERDF and ESF 2014-2020	10 (+ staff of external company contracted for financial/physical monitoring)	20	The MAs manage physical, financial and procedural monitoring; carry out 1st level controls; appoint an independent evaluator to assess the results and effects of the interventions

Source: Regional Structure "Innovation, research and competitiveness of production".

involved in the debate, contributed to the analysis and provided guidance in the identification of priorities.

As already stressed, the actual implementation of policy is managed by the Structure "Innovation, research and competitiveness of production". For instance, the Structure drafts and launches calls for tenders, decides selection criteria and implementation processes etc.

Monitoring and evaluation is a competence of the Managing Authorities of the Operational Programmes. Independent evaluators are appointed by the MAs on the basis of public calls for tenders.

As shown in the description of the strategy development process, the other fundamental

players of the regional innovation system are: the universities, the regional technology transfer structures and the business sector. These participate and may influence, to a varying degree, priority setting and policy mix choices.

The four universities are the main research actors of the regional system with a relevant number of departments and schools operating in basic and applied research as well as in science and technology. Overall the universities employ approx. 1,500 professors and researchers.

Marche Polytechnic University is the largest regional high education organisation with nearly 85% of the teaching personnel working in scientific and technical areas. The University of Camerino is also focused on scientific and technical areas while humanities and social sciences prevail in the University of Urbino and in the University of Macerata, especially in the latter.

Approximately 70% of all the researchers involved in scientific and technical disciplines carry out applied research and experimental development activities, as opposed to basic research. These work mostly in the Marche Polytechnic University, in the University of Camerino and, to a more limited extent, in the University of Urbino. These differences impact on the capacity of the universities to participate in regional as well as European initiatives aimed at supporting public-private collaborative research and innovation; indeed, participations in research cooperation projects are concentrated in the Marche Polytechnic University.

Several regional centres are also involved in technology transfer: a Technology Park (Tecno-Marche), four public-private centres (ASTERIA, COSMOB, MECCANO, JesiCube) and the Industrial Liaison Offices (ILOs) of the universities.

TecnoMarche is located in the Ascoli Piceno province. It is a S&T park which was set up in 1992 as an initiative of regional industrial associations and the regional development and finance company. TecnoMarche is a consortium which includes the Ascoli and Macerata Provincial Administrations, the Macerata chamber of commerce, and some local business associations. Overall the private partners own approx. 60% of TecnoMarche capital. The S&T park carries out research and technology transfer activities in the fields of electronics and ICT by means of specialised labs.

ASTERIA is also located in the Ascoli Piceno province. It carries out research and technological development and provides technology transfer services in the fields of agro-food, environment, energy efficiency and renewable energy sources. ASTERIA is a consortium which includes the Ascoli Provincial Administration and the chamber of commerce, some municipalities, the Marche Polytechnic University, the University of Camerino, some local business associations, as well as firms and banks.

COSMOB carries out applied research and provides technology transfer services, mechanic and chemical tests, quality control, design services and specialised training in the furniture sector. It is a public-private consortium set up in 1984 and located in Pesaro. The partners include: the Pesaro-Urbino Provincial Administration, the local business associations, SVIM and a considerable number of local firms producing furniture, components and machines for wood carving.

MECCANO is located in Fabriano, in the Ancona province, and provides technology transfer, prototyping, quality certification, tests, internationalisation and technical training services to firms working in the mechanic and electronic sectors. It is an innovation centre set up in 1988, whose partners are the Ancona Provincial Administration, the local business associations, the Ancona chamber of commerce, some municipalities, SVIM and a considerable number of mechanic and electronics firms.

JesiCube is a technology transfer centre and a business incubator. It hosts testing and prototyping labs, as well as facilities for holding meetings and events. JesiCube provides basic

pre-incubation services (e.g. support to business plan preparation) and more advanced services such as: tax and administrative consulting, business modelling, (e.g. business model canvas, pitching, prototyping, customer development, analysis of strategic positioning), marketing services, business coaching, assistance to accessing public support and financial engineering instruments, economic/financial planning, IPR consulting etc.

All the regional universities have set up an industrial liaison office (KTO – knowledge transfer office in the University of Urbino). Their mission is to diffuse information on research activities carried out by the universities, identify cooperation opportunities in relation to research and innovation challenges, support participation in regional, national and European research programmes, consulting in relation to IPR management. Given the specialisations of the Marche Polytechnic University and of the University of Camerino, these two institutions host the most relevant ILOs for strengthening university-industry linkages in Marche.

Another important organisation which provides a linkage between the business sector and research and innovation policy is the "Marche Manufacturing" association. This is particularly relevant for advanced manufacturing and is described in the following section.

3 Innovation Policy Instruments and Orientations

3.1 The Regional Innovation Policy Mix

Main trends in the last two programming periods (2000-2013)

The regional innovation strategies and the innovation support measures which are currently in place in Marche are still related to the 2007-2013 programming period and in particular to the ERDF Operational Programme. This OP included a comprehensive intervention strategy for research and innovation which was characterised by significant differences in comparison with the past.

In 2000-2006, the Region supported research and innovation by means of three main tenders: a 2004 tender aimed at facilitating knowledge diffusion and technology transfer in SMEs by financing applied research projects carried out by young technologists and researchers inside firms or universities (this initiative was financed by ERDF as part of the Regional Programme of Innovative Actions); a 2005 tender, consisting of business aid schemes (a mix of non-repayable and repayable grants) for industrial research and technological development which targeted, in particular, firms belonging to the "fashion" sector as well as enterprises located in deprived areas; a 2007 tender, supporting collaborative research and innovation investments in key value chains such as house automation, new materials, ICT, mechatronics etc.

The 2000-2006 initiatives were few and biased on innovation and technology transfer. Despite the labels and the intentions, selectivity was limited and even the initiative for boosting industrial research was, to a certain extent, "reserved" for supporting micro and small firms in traditional sectors. Overall, the Region disbursed nearly EUR 20 million of public contribution to finance the mentioned interventions.

The 2007-2013 strategy was much wider and balanced, also thanks to the greater availability of resources: approx. EUR 108 million allotted to the implemented initiatives. The strategy focused on strengthening both the demand and supply side of the innovation system, with particular attention on business research and innovation, on developing industry-university

linkages and on facilitating knowledge diffusion and technology transfer.[13]

The related policy mix consisted of initiatives aiming at: boosting R&D in SMEs; fostering growth by means of collaborative research grants; facilitating the technology transfer in SMEs, in particular by strengthening their competences; supporting process innovation; financing technological upgrade and fixed capital investments; supporting the creation and growth of new innovative enterprises.

In relation to business R&D, two initiatives were undertaken. A 2007 tender financed industrial research and technological development projects submitted by individual SMEs and consortia of SMEs, universities, technology transfer centres. A share of the available resources were earmarked for "non-traditional" sectors such as advanced mechanics, advanced materials, ICT. At the same time there was a reserve for clothing, leather and shoes sectors. In 2008, a call for tenders was launched to support R&D in key regional value-chains. The initiative financed investment programmes submitted by groups of firms in collaboration with universities and technology transfer centres, and focused on strategic areas for regional competitiveness such as house automation, mechatronics, advanced materials, energy efficiency and renewable sources. As part of this measure, a second tender was launched in 2012.

As regards knowledge technology transfer, a 2008 call for tenders supported knowledge diffusion from universities to SMEs, enhancing entrepreneurial capacities of human capital and enhancing competences of young researchers and PhD students by subsidising their employment.

In relation to business innovation and upgrade, a 2008 call was launched to promote process, organisational, market innovation in firms. In 2009, a similar call for tenders on process innovation was published by the Region to support competitiveness in the "fashion sector". This was an initiative mainly taken to mitigate the negative impacts of the crisis and financed the creation and development of new collections. Still in 2008, the Region provided business aid schemes for technological investments, acquisition of machinery, ICT solutions for design and production; the initiative covered the investments in technologies which improve productivity, eco-efficiency, reduce energy consumption etc.

New business creation was also supported through a 2008 tender which co-financed the set-up and growth of academic spinoffs. The investment programmes were financed in the strategic areas of house automation, mechatronics, biotech, new materials, ICT, energy efficiency and renewable energy sources.

The support measures which are still ongoing are listed in Table 3. In addition to the 2012 tender supporting the creation of technological clusters of firms in key regional value-chains, there are two running initiatives. The first supports the clustering of SMEs in so-called Made in Italy productions; the second initiatives supports collaborative research projects, involving large enterprises, SMEs and universities, aiming at developing integrated platforms for active ageing and ambient assisted living.

[13] The objective of Axis 1 "Innovation and Knowledge Economy" was to improve the competitiveness of the regional economy by promoting targeted and selective measures to support industrial research and innovation in local business. As a consequence, the regional innovation policy is strongly focused on the following priorities: Technology Transfer; Support sectoral innovation and research efforts in SMEs. Compared to the past, the strategy is built around four key principles on which the main RTDI regional initiatives are based: Concentrate and focus financial resources on a few strategic objectives and large projects of regional interest; Promote collaboration and networking among all public and private actors operating in the regional innovation system; Stimulate and support the development of an innovation and entrepreneurial culture in local industry; Promote the growth of the most innovative regional SMEs also through the design of innovative financial engineering instruments.

The Smart Specialisation Strategy and the 2014-2020 programming cycle

As mentioned in the previous paragraph, 2014 is a key turning point for regional research and innovation policy since the Smart Specialisation Strategy was recently approved while the ERDF OP, which is the key instrument for implementing the strategy, is expected to be finalised by the end of the year and new measures will presumably be launched starting in 2015.

It was highlighted that the 2007-2013 intervention strategy differed significantly from the previous policy approach in terms of scope, breadth and resources. However, due to the crisis, some of the novelty in the approach (e.g. increased selectivity, greater focus on industrial and collaborative research as opposed to incremental and often low level innovation) were watered down under the need to safeguard employment and keep afloat SMEs going through hard times in traditional sectors. The 2009 tender targeted to the fashion sector is an example of this adjustment.

The new Smart Specialisation Strategy is an attempt to resume the work which was prematurely abandoned because of the crisis. The approved S3 is a solid policy guiding document which includes: an analysis of the context, of the regional assets and the economic as well as scientific and technological specialisations; an identification of the policy priorities; an action plan to pursue the set priorities; a description of the monitoring system and of the chosen set of indicators.

The Strategy stresses that the main regional strength is a diffused manufacturing system characterised by a high export propensity. The research system can count on some excellences but overall it is penalised by a low R&D intensity, both in the public and in the private spheres. Fostering the integration between the research and production sectors is an opportunity that must be pursued to support growth and to enhance qualified human capital.

As highlighted in Section 1 of this report, the S3 underlines that Marche perform relatively well in terms of availability of human capital, for instance in relation to the number of graduates in scientific and technological disciplines. However, the system struggles to absorb them. Other notable weaknesses such as the small average size of firms, exposed to increasing global competition, the international crisis, the credit crunch and the rationing of public resources in general hinder knowledge transfer and technology diffusion in the production system. This is a threat for the future competitiveness of the region which will be increasingly called to address also global challenges such as energy security, climate and demographic change.

In light of these issues, the main message of the Strategy is that the regional industrial system should evolve from a "labour intensive" structure towards a knowledge and innovation based system. In order to do so, the policy will aim at facilitating the interaction between production, science and technology, and the development of networks and collaborations between firms.

Four cross-sector strategic areas of interventions were identified, based on the results of the analysis and of the participatory debate which took place in the territory (see the section on governance):

- house automation,
- mechatronics,
- sustainable manufacturing,
- health and well-being.

These strategic areas take into account the scientific and technological strengths, the existing economic and commercial specialisations, the global technological and market opportunities.

Table 3: *Existing regional innovation support measures (active ongoing initiatives)*

Title	Duration	Policy priorities	Budget	Organisation responsible
Promotion of R&D in key regional value-chains.[1] (Intervention 1.1.1.4.2)	2007-2015	2.1. R&D cooperation projects between academy and industry 4.1. Direct funding to business R&D and innovation 5.1. Cluster development	Total regional public resources allocated: €31,778,737.59 Structural funds: €27,788,726.33	Structure "Innovation, research and competitiveness of production"
Support to SMEs value chains and "Made in Italy" sectors.[2] (Intervention 1.2.1.05.08)	2013-2015	4.2.Organisational, process and other non-R&D innovation 4.5. Knowledge transfer and cooperation between firms (incl. technology acquisition) 4.7. Design for innovation	Total regional public resources: €5,692,989.18 Structural funds: €4,696,104.09	Structure "Innovation, research and competitiveness of production"
Intelligent housing, for active and independent aging.[3] (D.G.R. n. 649 - 09.05.2011)	2012-2015	2.1. R&D cooperation projects between academy and industry 2.4. Demonstration projects, prototypes and proofs of concepts 7.2. Social innovation initiatives	Total regional public resources allocated: €8,858,387.24	Structure "Innovation, research and competitiveness of production"

Source: Regional Structure "Innovation, research and competitiveness of production".
Note:
1 The initiative finances investment programmes submitted by groups of firms in collaboration with universities and technology transfer centres, and is focused on strategic areas for regional competitiveness such as house automation, mechatronics, advanced materials, energy efficiency and renewable sources. The projects financed by a 2012 tender are still ongoing and expected to be completed by June 2015. The initiative foster the creation of technological clusters of firms. More information: http://www.impresa.marche.it/Ricercaeinnovazione/.
2 Aid schemes for aggregation of SMEs in value chains and in the Made in Italy productions. More information: http://www.impresa.marche.it/Ricercaeinnovazione/.
3 Support to collaborative research projects, involving large enterprises, SMEs and universities, aiming at developing integrated platforms for active ageing and ambient assisted living. More information: http://www.impresa.marche.it/Ricercaeinnovazione/Domotica.aspx; http://www.inrca.it/inrca/Mod_Ric_News.asp?ID=50.

In relation to the last strategic area, the INRCA – the National Research Institute on Care for the Elderly – is worth mentioning. It is located in Ancona and carries out socio-economic and life-sciences research on ageing, provides training to health professionals as well as actual care services to old people.

The strategy also identifies ten policy priorities and then details an action plan on how to pursue them. The priorities are:

1. boosting collaborative research and innovation involving firms, universities and research centres;
2. innovative solution to address local community challenges;
3. creation of new innovative firms, both academic and industrial spinoffs;
4. foster engineering and industrialisation of research results;

5. promote an upgrade of the production system in relation to management and organisational quality, internationalisation, marketing, design capacity;
6. enhance Made in Italy value chains and facilitate cross-sector fertilisation;
7. develop ICT infrastructure and promote the use of new advanced services;
8. support projects aiming at facilitating access of networks of firms to cleaner and cheaper energy sources;
9. systemic actions for internationalisation;
10. initiatives in agriculture and in the agri-food sector aiming at sustainable competitiveness and at addressing the Europe 2020 challenge of food security.

The strategy also provides a description of the monitoring system set up to follow and steer implementation, a set of performance indicators and an evaluation plan. Overall, the new strategy seems able to address the most important regional challenges pointed out in Section 1. The ERDF Operational Programme which is being finalised also contains an outline of the intervention strategy in research and innovation, as well as information on the specific measures to be launched to pursue the strategy itself.

The ERDF OP allocates nearly EUR 110 million to the thematic objective "Strengthening research, technological development and innovation" (approx. 33% of the total budget) and will be much more focused than in the past on themes such as social innovation and design for innovation which are addressed directly by policy priorities 2 and 5 of the strategy. The approved OP will provide operational details on the extent to which these priorities are pursued and how.

The initiative currently in place which supports collaborative research projects between large enterprises, SMEs and universities, and aims at developing integrated platforms for active ageing and ambient assisted living is also a relevant example of social innovation. A tender was launched in 2012 and the projects are expected to be completed by 2015. The initiative has not been evaluated yet but policy makers are satisfied with the good response and the degree of innovation of the technologies being developed as well as of the measure itself. A prototype of "intelligent house" is part of the project; this is the demonstrator to commercialise the developed technologies and is expected to become a key centre where innovative e-health solutions can be proposed, aiming at facilitating the interaction of the elderly with the domestic environment.

As regards innovation for design, the intervention aimed at promoting process innovation in the "fashion sector" is an example of an initiative in place. This co-financed the conception of new collections characterised by innovative features related to design, quality and marketing. This initiative has already been assessed: despite the good intentions and fancy description, the tender was not very selective and its main rationale was to provide a support to traditional sector firms hit by the crisis.

3.2 Regional policies and initiatives in support of Advanced Manufacturing

Advanced manufacturing for clean production is defined by the European Commission[14] as technologies and production processes which have the potential to enable manufacturing industries to improve productivity (production speed, operating precision, and energy and

[14] Commission Staff Working Document "Advancing manufacturing – Advancing Europe" (Brussels, 19.3.2014 SWD(2014) 120 final).

materials consumption) and/or to improve waste and pollution management in a life-cycle perspective.

From a broad range of technologies both for discrete and for continuous process manufacturing, the following can be taken as examples: Sustainable manufacturing technologies, such as technologies to increase manufacturing efficiency in the use of energy and materials and drastically reduce emissions (e.g. process control technologies, efficient motor systems, efficient separation technologies, novel sustainable process inputs, product lifecycle management systems); ICT-enabled intelligent manufacturing, such as integration of digital technologies into production processes (e.g. smart factories); High performance manufacturing, combining flexibility, precision and zero-defect (e.g. high precision machine tools, advanced sensors, 3D printers).

The **main technology areas** in which the region has a specific competitive advantage in the advanced manufacturing field are those relevant to the growth and competitiveness of Made in Italy sectors such as shoes, textiles and clothing, wood products and furniture, machines for wood carving, mechanics etc. The most relevant technologies are those linked to sustainable manufacturing and to the development of new systems for an "intelligent factory". That is a factory characterised by automation, greater efficiency, lower environmental impact, and which produces eco-sustainable products, uses and develops new materials. Other essential features of an intelligent factory include: eco-design, integrated design, design for disassembly, design for recycling, de-manufacturing, human centred manufacturing.

The **main regional organisations** that are involved in supporting advanced manufacturing technology development, education and training, industrial R&D and innovation include: Marche Manufacturing in Ancona, MECCANO Spa. in Fabriano, COSMOB in Pesaro and TecnoMarche in the province of Ascoli Piceno (MECCANO, COSMOB and TecnoMarche were described in the section on governance).

Marche Manufacturing[15] is an association which was set up recently to strengthen the linkages between the needs of the business sector and the regional policy for research and innovation. The final goal is to boost competitiveness of regional firms, support cooperation, facilitate knowledge and technology transfer across sectors. Another important objective is to improve the inclusiveness of the regional innovation system by attracting also firms with limited research capacity and facilitate their participation in regional as well as national initiatives.

Marche Manufacturing is composed of four categories of partners:

- Founding organisations: the Polytechnic University of Marche and a group of regional firms (HSD Spa, AEA Srl, Eurosuole Spa, Zannini Spa).[16] These organisations submitted a joint strategic development plan in response to the call for tender of the Ministry of Education and Research (30 May 2012), in order to participate to the national technology cluster initiative (see below).
- Industrial and service partners: both SMEs and Large Enterprises active in the manufacturing sector and in the provision of products, applications and processes relevant for developing an "intelligence factory".
- Research, innovation and technology transfer partners: public and private research organisations as well as existing technology transfer service centres.

[15] http://marche-manufacturing.diiga.univpm.it/content/marche-manufacturing.

[16] HSD is a mechatronics company; AEA develops measure and test solutions to improve the quality of products and processes for the manufacturing and service industry; Eurosuole produces rubber and polyurethane soles for any kind of shoe; Zannini manufactures turned parts and high precision mechanical components.

- Associates: other relevant organisations for the manufacturing sector such as national and local industrial associations.

Marche Manufacturing participates in the coordination of the **national technological cluster on "intelligent factory"**. This is a national policy initiative which funds large RTD projects, minimum EUR 10 million each, carried out by national networks of firms, universities and research centres from different regions (Emilia-Romagna, Liguria, Lombardy, Piedmont, Puglia and Veneto in the case of intelligent factory).

The national cluster initiative aims at supporting technological development and strengthening national specialisation in robotics, new materials, advanced devices, virtual prototyping and applications of digital solutions to all manufacturing phases (design and planning, production, business organisation and distribution).[17] In synthesis, the main ongoing activities of the cluster include: carrying out industrial research projects and technology transfer, sharing of research and mobility infrastructures, providing support to smart and sustainable entrepreneurship, carrying out technological foresight, providing support to human capital development.

Four research projects were included in the 5-years strategic plan of the "intelligent factory" cluster and a number of Marche firms contributed to its development. Marche Manufacturing operates as interface between the regional firms and the rest of the network stakeholders.

The interregional projects foreseen as part of the strategic development plan are:

1. "Sustainable Manufacturing". This project deals with the research topics: environmentally friendly manufacturing; de-manufacturing; human centred manufacturing.
2. "Modular and adaptive approach to the digital factory". This second project focuses on: reconfigurability and flexibility of robotic cells; flexible, modular and adaptive manufacturing systems; human-machine adaptive and efficient interfaces.
3. "Smart Manufacturing 2020". This collaborative project deals with: smart monitoring planning; smart maintenance; smart products and services; virtual product and production design. 4. "High Performance Manufacturing". The last project focuses on: methodologies to improve machines and processes; high performance low cost machining centres and components; data fusion for the supervision of flexible systems; high performance deformation systems; high performance packaging; additive manufacturing, micro- and nano- systems, MEMS (microelectromechanical) testing systems.

These initiatives are worth approx. EUR 48 million. The eligible expenses include human resources, equipment and infrastructure, consulting services, general expenses.

The "intelligent factory" is the most relevant current initiative supporting advanced manufacturing in the region but it is not the only one. As specified in the description of the policy initiatives, several 2007-2013 tenders focused on mechatronics and sustainable manufacturing. One of them is still ongoing: the R&D support in key regional value-chains (Intervention 1.1.1.4.2). This initiative finances investment programmes submitted by groups of firms in collaboration with universities and technology transfer centres, and focuses on strategic areas such as house automation, mechatronics, advanced materials, energy efficiency and renewable sources. The projects financed by a 2012 tender are expected to be completed by June 2015.

[17] The "National Technological Clusters" initiative finances interregional industrial research projects involving enterprises (SMEs and LE), universities and research centres. Projects are part of a Strategic Development Plan that each partnership had to submit to participate. The assessment process involved international qualified experts. The National Clusters are 8 (https://www.researchitaly.it/en/understanding/press-media/news/national-technological-clusters-266-million-allocated-to-30-applied-research-projects/).

Advanced manufacturing plays a **key role also in the new innovation strategy**. As previously highlighted, most of the strategic areas identified by the Smart Specialisation Strategy are priorities for advanced manufacturing, in particular mechatronics, sustainable manufacturing and house automation technologies.

Regional priorities for advanced manufacturing are to a certain extent embedded in human capital development policy as well as in the initiatives for improving energy efficiency and usage of renewable energy sources in production processes. Intervention in these policy areas has a significant impact on manufacturing. For instance, a recent regional decree (D.G.R. n. 1182 del 02.08.2013) was approved to regulate research apprenticeship and involvement of young researchers in advanced knowledge transfer activities in production processes.

A support scheme for energy efficiency investments and energy production from renewable sources was also introduced recently (D.D.P.F. n. 41 del 24.05.2012). This initiative affects several areas of advanced manufacturing.

As regards **interregional actions**, apart from the mentioned national technology cluster, individual Marche business firms participate in the EFFRA initiative (i.e. an enterprise specialised in wood carving machines and a mechatronics firm from Pesaro) as well as in Manufuture (i.e. a shoe maker from the province of Fermo). A greater involvement of Marche Manufacturing in these initiatives is envisaged by the Regional Administration in the years to come.

The main **challenges** for advanced manufacturing, in the opinion of the interviewed stakeholders, to contribute to the industrial future of the region include:

- Contrast the decline of manufacturing and increase international competitiveness by improving quality of production processes and high value added regional products. In particular it is essential to improve the capacity of firms to incorporate new technologies in processes, products and services.
- Strengthen the sector of innovative and advanced services which are crucial for: organisational and commercial innovation, re-training of management, IPR protection, development of internationalisation and marketing strategies, diffusion of design for innovation.
- Increase quality of human capital involved in production processes, to facilitate development of specialised competences, knowledge diffusion and technology transfer.

3.3 Appraisal of Regional Innovation Policies

Currently, the Region is in the middle of an important transition as the new programmes concerning the 2014-2020 period are being developed and are expected to be approved in their final version by the end of 2014. The Smart Specialisation Strategy, an ex-ante conditionality for the current programming period, was recently finalised. Therefore, the appraisal provided in this paragraph is focused mostly on the appropriateness of 2007-2013 initiatives and on the suitability of the interventions foreseen in the new strategies and programmes which are, nonetheless, still "under construction".

The Marche Region implemented a balanced mix of research and innovation policies in the 2007-2013 period: R&D in SMEs; strengthening of specific value chains and clusters; technology transfer and enhancement of competences; process innovation; technological investment of firms (mostly machinery and ICT); creation of spin-offs. Due to the negative consequences of the crisis, a countercyclical incentive to support the fashion sector (shoes and clothing) was also introduced.

The launched measures (some of them still active) seem fit to address the first challenge highlighted in Section 1, namely a need for increasing R&D intensity. For the first time in 2007-2013, the regional intervention focused significantly on boosting industrial R&D and technological development, with particular attention on SMEs and clusters. As previously stressed, in the 2000-2006 period the support was concentrated on R&D only to a much more limited extent and it was less selective. A 2005 regional tender was the only initiative which supported R&TD carried out in SMEs in the previous programming period. Moreover, 43% of available resources were earmarked for firms located in deprived areas and 20% of the funds were reserved for firms in the "fashion sector". Very limited was also the support to business innovation and technology transfer.

Despite the increasing focus on business R&D and the increasing selectivity of support, there is still room for strengthening regional policy in this respect. In particular, as highlighted in the first section, the regional system is deficient also as regards the R&D intensity of government and higher education. So far, the policy was too weak to be able to pursue these objectives. A cultural change is also necessary to facilitate a shift towards a knowledge based economy. Certainly, the Smart Specialisation Strategy is an important first step for the region to guide the next generation of policies (2014-2020), making sure that they go in the appropriate direction.

The regional policy measures have been less fit so far to address the second challenge listed in the first section of this report, namely the need for increasing the quality of human capital, with particular attention on the mismatch in labour demand and supply. The policy maker is aware of this challenge and also of the importance of supporting education and training of entrepreneurs and all personnel involved in innovation. Boosting the education and training of young talents and top managers is essential to facilitate the generational renewal and the emergence of a strong knowledge based economy. In 2007-2013 this goal was pursued by means of a tender aimed at supporting technology transfer and the promotion of new knowledge and competences (2008). This initiative benefited SMEs; by facilitating knowledge diffusion from universities to firms, it attempted to reinforce professional and entrepreneurial capacities, furthermore, it subsidised hiring of young researchers. The new generation of programmes aim to pursue these objectives with more determination. Certainly there is a need for a greater integration between the initiatives financed by ERDF and ESF. So far, this integration has been unsatisfactory, also due to differences in regulations, administrative burdens etc., and this is a weakness of the governance which needs to be tackled.

So far the policy mix has also been appropriate, to a certain extent, to address the third challenge, namely the need for finding a balance between existing, traditional specialisations and a "smart diversification". This was mainly done by supporting the creation of new innovative firms and co-financing technological investments in SMEs. In particular the creation of new innovative firms and spin-offs focused on strategic sectors such as home automation, mechatronics, biotech, new materials, ICT, energy efficiency and renewable sources. The diversification in these sectors is pursued also by the new strategy.

On the other hand, the policy did not "abandon" typical specialisations and traditions which may still be important competitive assets in the future. For instance, the 2009 tender on promotion of process innovation in the fashion sector was aimed at this objective. Despite the intentions, according to the opinion of some stakeholders, this initiative turned out to be more of an emergency help to keep businesses afloat by financing new collections rather than really fostering innovation in traceability, novel design approaches etc.

In conclusion, it is worth nothing that there were important changes in the 2007-2013 policy approach which allowed the region to deal more directly and effectively with the underlined

challenges. This "upgrade" in the quality of the policy approach was characterised by a greater focus on R&D, and more attention on finding a balance between traditional specialisations and new technological niches.

Unfortunately this effort was somewhat hindered and slowed down by the crisis which forced to allocate a relevant share of resources to safeguard existing jobs, to help the survival of firms at risk of bankruptcy, and to mitigate the credit crunch.

The region should have been less short-sighted during the boom years and invested more significantly in R&TD as well as in strengthening a more innovation friendly environment. If that had been the case, the condition for competing effectively in the global markets and for sustained growth would already have been in place and the recovery from the recession would have been quicker. Even though that was a missed opportunity, it must be highlighted that the new strategy and related programmes seem to point in the right direction and the evidenced challenges will be addressed appropriately in the next years.

Regardless of the appropriateness of the strategy, the effectiveness of the 2014-2020 policy will obviously depend greatly on the quality and selectivity of the measures which will be launched. From this point of view, the past experience with regional innovation policy and the existing evidence on outputs, results and effects provide important lessons.

The analysis of the regional innovation system carried out by the Marche Polytechnic University and Marche Region (2011), drawing mainly from regional monitoring data provides important insights into the outputs of regional policy. As stressed by the report, 1,762 projects were financed and 2,171 firms benefited from EUR 179.5 million of regional support for research and innovation in 2007-2013; cooperation between firms was boosted and about 100 value chains were strengthened; 381 collaborations between firms, universities and technology transfer services were activated.

The region participates in two national technology cluster initiatives on "intelligent factory" and "household environment technologies"; overall, EUR 635.7 million were invested for developing innovative products, services and solutions.

An **evaluation of the interventions for research and innovation** co-financed by the first axis of the ROP ERDF 2007-2013 was recently published (T33, 2013).[18] The study focuses on business aid schemes. It analysed the results and impacts of regional intervention on business performance: change in turnover, employment, R&D personnel, product and process innovation in the period 2007-2010. Furthermore, the evaluation analysed the effects of the interventions in terms of behavioural additionality, change in production and innovation mechanisms.

A mix of methods was used. Primary data were collected by means of a structured questionnaire sent to beneficiaries and counterfactual evaluation techniques applied. A number of case studies were conducted to shed light on the effects.

In synthesis, the counterfactual analysis points out that the impact of interventions on turnover and employment were mild while the most significant effects consist of development and strengthening of networks, increased collaboration between firms, universities and technology transfer centres. Moreover, the study highlighted an increase in the number of contracts for the provision of services to firms by qualified personnel of universities (e.g. researchers, young graduates).

The results of the case studies, even though they cannot be generalised, allowed to highlight important conditions of success of research and innovation projects in the Marche context. These are notably the availability and quality of the human resources and the quality of

[18] http://www.impresa.marche.it/Ricercaeinnovazione/Valutazionideirisultatidegliinterventi.aspx.

horizontal networks between business firms and university departments. When these conditions are met, financed projects tend to be successful and foster product innovation; in some cases, radically new products were marketed thanks to regional support.

The study also highlights that success is correlated to the existence of a solid business strategy and a consolidated innovation network, meaning that the support tends to be more effective when it is selectively allocated to "capable" beneficiaries.

In conclusion, while the Analysis of the Regional Innovation System and the Annual Implementation Reports highlighted that there was a very positive response by beneficiaries and even that available resources were barely sufficient to cover demand, the available evaluation evidence highlighted positive results and effects. These suggest that measures were well designed and a continuation of the instruments is to be hoped for, at least as far as business support is concerned, even though they need to be strengthened in terms of available resources and better integrated to effectively address the existing challenges. In particular, more attention should be given to enhancing the quality of human capital, mitigating the skills mismatch and facilitating a smart diversification of the territory by fostering creation and growth of new innovative enterprises.

The participation of Marche in the national technological clusters initiative is an example of **synergy between the national and regional innovation support**. As previously highlighted, this joint initiative involves the Ministry of University and Research and the Regional Administration and aims at creating national networks of scientific and technological stakeholders in key priority areas for the development of competitive research and innovation platforms.

This positive example, however, does not downsize the issues of blurred division of competences and consequent overlapping which were a by-product of the 2001 Constitutional reform and were discussed in Section 2 of this report. The stakeholders of the Marche research and innovation system are well aware of this problem and highlight that the most important governance weaknesses which hinder effective synergies between national and regional intervention are: the lack of a clearly defined division of work between the different governmental levels and unsatisfactory coordination mechanisms; the lack of a comprehensive national industrial policy.

A national long-term industrial policy was launched by the Ministry of Economic Development in 2006 (Industria 2015) but soon abandoned after the 2008 government change, the eruption of the international crisis, budget constraints, the push towards austerity and the noticeable reduction in the availability of national resources for economic development policy (e.g. FAS/FSC funds). This gap has not been filled so far, mainly as a consequence of national political choices.

3.4 Good practice case

The regional initiative for the promotion of R&D in key regional value-chains is an example of good practice due to its outputs, results and also in consideration of its relevance to the development of advanced manufacturing in Marche.

Through this initiative the Region intended to support cooperation and networking amongst all actors of the regional innovation system, facilitating the aggregation and partnerships of private and public organisations. Two public tenders were launched in 2008 and 2012. Overall, approximately EUR 31.8 million were allocated to the intervention. The tenders set out the participation and selection criteria of the projects to be submitted by networks of organisations which may include SMEs, universities, research centres and also large enterprises. The measure

uses a combination of instruments, including non-refundable aid schemes and grants to subsidise employment and training of high skilled personnel.

The supported R&D projects aimed at developing innovative products or processes, capable of generating growth and new employment in strategic "techno-productive" value chains such as house automation, ambient assisted living, advanced mechatronics, biotech for human health, new eco-compatible materials, energy efficiency and renewable energy sources.

The key feature of these projects is that, besides focusing on advanced technology areas, they pull together organisations operating over the entire value chain. The partnerships, set up to carry out the projects, involved 174 firms of different size operating at a different stage of the value chain. Through the partnerships, the participants managed to exploit important synergies as regards competences and technologies, and to achieve critical mass for credit access etc.

During the implementation of the projects, 93 collaboration contracts were signed between universities and firms. The objects of the contracts were mainly the following: provision of knowledge; provision of highly specialised human resources; formal innovation partnership implying joint development of innovation. As a result of the initiative, 179 young graduates were hired and 151 researchers involved in the projects by means of PhD scholarships, grants, apprenticeship contracts etc.

In synthesis, the main positive effects of the initiative which justify its re-launching are related to cross-fertilisation, improvement of synergies between science and production, and enhancement of human capital.

Cross-fertilisation

The initiative favoured the development of "horizontal" value-chains, different from the traditional vertical value-chains of related activities within the same sector. The firms involved in horizontal chains belong to different sectors but operate in the same or in similar technological specialisation areas.

This boosts cross-fertilisation and allows micro- and small-enterprises to participate, in some cases, in designing, planning and engineering the projects rather than, as usual, giving in to the initiatives and the decisions of specialised suppliers.

Synergies between science and production

According to the Regional Administration, on the basis of the monitoring information and of the findings of the ROP evaluation, the linkages between innovation demand and supply were strengthened. The development of new technological solutions was fostered and at the same time were applied in business processes.

The intense university-business cooperation allowed to combine a scientific research approach with a market orientation, one of the major weaknesses of European research where most of the results of research endeavours get lost in so called "death valley" and fail to reach the market.

The participation of universities was crucial to facilitate the upgrade of technical competences in the firms and to help businesses to follow a more strategic and long-term approach to research and innovation projects.

Enhancement of human capital

One of the most important result was the quantitative and qualitative enhancement of human capital assets in participating enterprises.

The involvement of young talents in the activities of analysis, design, planning, experimenting and prototyping allowed young researchers and graduates to undertake high level and specialised training paths, besides benefiting the innovation activity of the hiring firms.

The firms could count on highly skilled specialists and incorporate knowledge developed in various scientific and technological areas in their production activities.

Multi-disciplinary teams of researchers, technicians, specialised blue collars, engineers, entrepreneurs, are a powerful interface between academia and industry. The synergies, the cross-contamination of competences, the identification of systematic and sustainable collaboration modes are deemed essential by the participants to facilitate a shift towards more R&D based productions.

3.5 Possible Future Orientations and Opportunities

The future orientations of the regional innovation policy are those envisaged in the Smart Specialisation Strategy. The analysis of the innovation potential carried out as part of the development of the S3 allowed to highlight strategic specialisation niches which can provide a competitive advantage to Marche in the near future.

These areas are the cornerstones of the strategy. They are based on a combination of science and technology assets and traditional economic specialisations such as mechanics, furniture, house furnishings and appliances, fashion products etc. Traditional specialisation are fertilised by the scientific-technical know-how.

The advanced application areas or strategic niches identified by the strategy include house automation, mechatronics, sustainable manufacturing, health and well-being. ICT, as a horizontal key enabling technology, plays a central role in all of them.

Facilitating an inclusive "entrepreneurial process of discovery" in 2014-2020 as a basis for strengthening these niches is essential for regional development and prosperity. Specifically the regional strategy is oriented towards:

- Developing new activities in the selected high tech / high value added areas;
- Supporting traditional vocational productions but with an improvement in their quality and a substantial technology upgrade;
- Exploiting the advantages that can arise from "related variety" and a "smart diversification" of economic activities;
- Strengthening regional competitiveness in global markets.

The third point, namely the relation between specialisation and variety at regional level, poses theoretical and implementation problems (Iacobucci, 2014). Specialisation and concentration of resources is a way to obtain economies of scale while variety at local level is important to promote radical innovations. When the specialisation domains are selected, special emphasis should be given to assessing to what extent these domains promote knowledge exchanges and cross-fertilization of new ideas. Moreover, a region needs to analyse the potential links with other regions. This identification of linkages within and across regions raises several challenges, because there is no commonly agreed set of indicators. Therefore a substantial amount of work needs to be done in this respect.

In the light of the orientations of the smart specialisation strategy and of challenges pointed out throughout the analysis, the main opportunities for regional innovation policy include the ones described below.

Further reinforcing the investment propensity and the systemic integration of regional research and innovation

The analysis carried out here and in other papers, including the regional strategy document, highlighted that the regional system is structurally weak. It does not invest enough, it suffers from the lack of critical mass, of solid and long-lived public-private networks.

Much has been done in recent years to facilitate an increase in R&D intensity and to boost collaborations. More needs to be done with respect to Government and Higher education investments whose levels are currently very low. Research and innovation should become really pervasive, meaning that any initiative taken in any policy area (e.g. from transport to health, from territorial safeguarding to tourism) should reward innovative solutions. A greater focus on demand-side innovation policy is also possible. For instance, more attention should be paid to public procurement of innovation and pre-commercial procurement, support to final private demand of novel products, social innovation initiatives etc.

Finally, particular attention should be given to research and technology infrastructure which are currently insufficient in the region.

As regards collaboration in research and innovation, the region has the opportunity to facilitate participation in Horizon 2020 through technical assistance services. So far, Marche participation in FP6 and FP7, in science and technology areas relevant for the industry, has been unsatisfactory. This is an Italian problem since the country is a net contributor, namely it provides a substantially higher share of resources than it obtains back through projects. The causes are mostly lack of information and incapacity to set up adequate partnerships.

Facilitating the development of a knowledge intensive service sector

As the data of value added seems to indicate at present there is no advanced, knowledge intensive service sector in the region. The development of advanced services deserves policy attention since this is instrumental for increasing innovation culture and research investment propensity, for assisting cooperation among firms as well as between industry and university, for boosting the creation of new innovative firms in fields which are new-to-the-territory.

A strong knowledge based service sector can provide a crucial contribution to absorb high-skilled and high-educated human capital and hence mitigate the existing labour market mismatch as well as contrast the brain drain.

It is worth noting that, apart from business services, all service sectors, most notably tourism and transport desperately crave an innovation upgrade. Currently, they still operate according to obsolete pre-Internet approaches: they are unable to provide clear, coherent and integrated online services, they are not customer oriented, they fail to connect to international platforms and to carry out effective and up-to-date marketing initiatives. The poor performance of tourism in the region reflects these conditions. Existing technological solutions would allow a step forward but a cultural change is also needed; policy can facilitate such change by devising appropriate sets of incentives.

Improving governance as regards synergies and integration between sources of funding

A more clear-cut division of work between the national and regional levels, in relation to RDI policy, would be desirable but at the moment this is rather beyond the sphere of control of a single Region. Considering the political debate and the strong push towards devolution which was advocated for many years before the crisis, it is unlikely that the regional autonomy in development policy in general and innovation in particular will be somehow restricted. What a Region can do is to ensure synergy between different strategies and sources of funding (e.g. ERDF, ESF, EAFRD) by strengthening unitary planning. Integration is currently deficient due to different regulations, administrative burdens etc. However a simplification in this respect is a process that regional administration can boost.

References

Annoni, P. and Kozovska, K. (2010). EU Regional Competitiveness Index 2010. European Commission, Joint Research Centre.

Balloni, V. and Iacobucci, D. (1997). Cambiamenti in atto nell'organizzazione dell'industria marchigiana. *Economia Marche*, **16**(1), 29–66.

Balloni, V. and Iacobucci, D. (2004). The role of medium-sized and large firms in the evolution of industrial districts. The case of Marche. In G. Cainelli and R. Zoboli, editors, *The Evolution of Industrial Districts*. Physica-Verlag, Heidelberg.

Boschma, R. and Iammarino, S. (2009). Related variety, trade linkages, and regional growth in italy. *Economic Geography*, **85**(3), 289–311.

Charron, N., Lapuente, V., and Dykstra, L. (2012). Regional governance matters: A study on regional variation in quality of government within the EU. *Regional Studies*, **48**(1), 68–90.

Ciffolilli, A. (2010). Expert Evaluation Network Delivering Policy Analysis On The Performance Of Cohesion Policy 2007-2013. Policy Paper on Innovation in Italy, A Report to the European Commission Directorate-General Regional Policy.

Conti, G., Cucculelli, M., and Paradisi, M. (2007). Internazionalizzazione e strategie delle imprese nei settori tradizionali. *L'industria. Rivista di economia e politica industriale*, (1), 121–162.

Frenken, K., Van Oort, F., and Verburg, T. (2007). Related variety, unrelated variety and regional economic growth. *Regional studies*, **41**(5), 685–697.

Iacobucci, D. (2014). Designing and Implementing a Smart Specialisation Strategy at Regional Level: Some Open Questions. *Scienze regionali*, **13**(1), 107–126.

Iacobucci, D. and Spigarelli, F. (2007). I processi di internazionalizzazione delle medie imprese italiane. *L'industria. Rivista di economia e politica industriale*, **28**(4), 625–652.

Marche Polytechnic University and Marche Region (2011). Il Sistema della ricerca e dell'innovazione nelle Marche. Fondazione Aristide Merloni.

Marche regional administration (2013). Annual implementation report of ROP ERDF. Ancona.

Neffke, F., Henning, M., and Boschma, R. (2011). How do regions diversify over time? Industry relatedness and the development of new growth paths in regions. *Economic Geography*, **87**(3), 237–265.

Russo, M., editor (2008). *L'industria meccanica in Italia. Analisi spaziale delle specializzazioni produttive 1951-2001*, Roma. Carocci.

Schettino, F., Sterlacchini, A., and Venturini, F. (2013). Inventive productivity and patent quality: Evidence from Italian inventors. *Journal of Policy Modeling*, **35**(6), 1043–1056.

Schwab, K. and Sala-i Martin, X. (2012). *The global competitiveness report 2011-2012*. World Economic Forum, Geneva.

T33 (2013). POR CRO FESR Regione Marche 2007-2013, servizio di valutazione degli interventi attuati a favore della ricerca e dell'innovazione. rapporto finale.

Stakeholders consulted

1. Patrizia Sopranzi, Manager of Research and Innovation Policy, Structure for Research, Innovation and Competitiveness of Production, Marche Regional Administration (26 June 2014).
2. Alberto Piastrellini, Policy Official, Structure for Research, Innovation and Competitiveness of Production, Marche Regional Administration (26 June 2014).
3. Donato Iacobucci, Professor of Applied Economics and Organisation of Firms, Department of Information Engineering, Marche Polytechnic University (10 June 2014).
4. Alessandro Iacopini, Researcher and Official at the Industrial Liaison Office of the Marche Polytechnic University (10 June 2014).
5. Francesco Venturini, Researcher on economics of innovation, Department of Economics, Finance and Statistics, the University of Perugia and member of EBAM – Marche Regional Observatory on Crafts (22 July 2014).

Statistical data

	ITI3 Marche	Country	EU27	Year	Source	Performance relative to EU27	Performance relative to IT
ECONOMIC INDICATORS							
GDP per capita (Euros)	26100	26000	25200	2011	Eurostat	103.6	100.4
Long term unemployment rate	5.6	6.9	5.1	2013	Eurostat	91.1	123.2
Labour productivity growth (%)	0.75	0.78	2.19	2001-2011	Eurostat	34.3	96.8
RCI 2013	-0.42	-0.44	0	2013	JRC	71.5	102.5
Share of employment in agriculture	0.03	0.04	0.05	2011	Eurostat	55.9	74.7
Share of employment in industry (including construction)	0.37	0.28	0.25	2011	Eurostat	147.2	129.4
Share of employment in business	0.28	0.3	0.3	2011	Eurostat	94.2	93.9
Share of employment in public sector	0.17	0.2	0.25	2011	Eurostat	68.6	83.9
Share of employment in S&T	0.07	0.1	0.09	2011	Eurostat	73.6	66.8
Specialisation in number of local units by NACE	0.5	0.36	0.36	2012	ISI-Eurostat	139.7	137.9
Employment in 2 and 3 star clusters (strong clusters)	32.65	44.73	31.39	2010	MERIT-CO	104	73
WIDER FRAMEWORK CONDITIONS							
Institutions	14	14	43.55	2010	RCI	32.2	100
Macroeconomic stability	57	57	58.2	2010	RCI	97.9	100
Infrastructure	71	74.67	74.64	2010	RCI	95.1	95.1
Higher education/ Training and Lifelong Learning	60	58.05	70.07	2010	RCI	85.6	103.4
Labour market efficiency	56	44	55.03	2010	RCI	101.8	127.3
Market size	53	53.95	50.27	2010	RCI	105.4	98.2
Business sophistication	37	38.1	43.16	2010	RCI	85.7	97.1
It is important to think new ideas and being creative			0.54	2010	MERIT-ESS	100	100
RESEARCH & TECHNOLOGY INDICATORS							
Employees with ISCED 5-8 (% all employees, ISCED 2011)	20.9	20.2	33.5	2013	Eurostat	62.2	103
Business R&D (% GDP)	0.38	0.69	1.29	2011	Eurostat	29.5	55.1
Government R&D (% GDP)	0.03	0.17	0.25	2011	Eurostat	12	17.6
Higher Education R&D (% GDP)	0.34	0.36	0.48	2011	Eurostat	70.8	94.4
EPO patent applications (per mln population)	89.3	72.47	110.48	2009	Eurostat	80.8	123.2
Employment in medium-high & high-tech manufacturing (% total employment)	5.9	5.9	5.6	2012	Eurostat	105.4	100
Employment in knowledge-intensive services (% total employment)	29.4	33.5	39	2012	Eurostat	75.4	87.8
Total R&D personnel (% active population) - all sectors	1.11	1.38	1.66	2011	Eurostat	66.9	80.4
Structural funds on business innovations (Euros per mln population)	15.86	57.92	77.74	2007-2013	Eurostat	20.4	27.4
Structural funds on core RTDI (Euros per mln population)	23.15	52.66	63.01	2007-2013	Eurostat	36.7	44
Change in Employment in medium-high & high-tech manufacturing (%-point)	-1.67	-0.09	-0.38	2008-2012	Eurostat	70	65.6
Share of innovators receiving public financial support (SMEs, CIS 2010)	9.68	11.5	9.95	2010	MERIT-CIS	97.3	84.2
BUSINESS INNOVATION INDICATORS							
Technological (product or process) innovators (% of all SMEs)	30.96	39.8	37.85	2010	MERIT-CIS	81.8	77.8
Non-technological (marketing or organisational) innovators (% of all SMEs)	33.48	43.04	39.83	2010	MERIT-CIS	84.1	77.8
Innovative SMEs collaborating with others (% of all SMEs)	3.43	4.41	8.89	2010	MERIT-CIS	38.6	77.8
SMEs innovating in-house (% of all SMEs)	1.37	1.49	22.63	2010	MERIT-CIS	6.1	92
Share of turnover of newly introduced innovations new to the market	6.63	7.56	4.67	2010	MERIT-CIS	141.9	87.7
Share of turnover of newly introduced innovations new to the firm	7.23	7.29	8.71	2010	MERIT-CIS	83	99.1

Executive Summary

1 Main Trends and Challenges in the Regional Innovation System

Marche is an export oriented region characterised by a diffused manufacturing sector and a prevalence of SMEs, mainly organised in traditional industrial clusters, whose innovation activity is mostly informal and linked to the continuous interaction between suppliers and producers. The adaptation capacity of industrial clusters and the creativity of regional SMEs have been sufficient to allow a satisfactory economic performance over a long period of time (most notably in the 90s and until the early 2000s). Subsequently, the loss of competitiveness, caused by the introduction of the common currency (i.e. no possibility to resort to devaluation) in a context of increasing global competition, and then by the international crisis, exposed and magnified the regional weaknesses.

The main weaknesses of the innovation system include: a low capacity of the region to invest in R&D, a small share of employment in high technology sectors, an insufficient propensity of SMEs to collaborate with others and of the higher education sector to interact with business, an extremely small % of firms innovating in-house, a low level of high-tech exports compared to other regions, a demand-supply mismatch in the labour market which struggles to absorb high skilled and educated resources. Wider framework conditions such as institutions and poor infrastructure facilities also affect the competitiveness of the Region adversely.

Challenge 1: need for increasing the regional R&D intensity and strengthening cooperation networks between the system stakeholders.

In a globalised world and after having been hit hard by the international crisis, relying on interaction between suppliers and producers and on their creativity is not enough to ensure competitiveness and growth. During the boom years in the 90s, regional policy was rather short-sighted and aimed at supporting firms unselectively while little or nothing was done to boost R&D. It is worth noting that the insufficient propensity to invest in R&D is not an issue which policy can easily mitigate. There are important historical and cultural reasons behind the small scale of firms and their incapacity to grow. However, policy can create research and innovation friendly conditions; for instance, it can support growth of enterprises more resolutely by facilitating access to credit in the key development stages of an organisation.

At the same time it is essential to enhance collaboration beyond the "standard" vertical links in the value chain (e.g. supplier-producer links) and facilitate the development of regional and trans-regional knowledge networks involving higher education and enterprises.

Challenge 2: need for enhancing the quality of human capital and facilitating the absorption of highly educated people.

The share of employment in S&T, the percentage of R&D personnel, the share of population in lifelong learning are unsatisfactory. This challenge is strictly related to the one discussed above: it is necessary to facilitate the qualitative improvement of the stock of human resources to be able to increase the propensity to invest in research and technology permanently and, at the same time, higher R&D investments are a necessary condition to be able to absorb a larger stock of high-educated human capital. At the moment there is a mismatch in the labour market: an unmet demand of low skilled labour, mainly satisfied by immigrant workers, and an excess supply of graduates.

Challenge 3: finding an optimal balance between existing, traditional specialisations and a smart diversification, to foster competitiveness.

In the last 20-25 years, the region has undergone a structural change characterised by a progressive shift from clothing, furniture, leather and shoes towards mechanics. At the same time, there has been a predictable reduction of the weight of manufacturing which, nonetheless, still absorbs a higher share of employment in comparison with national and European averages. In order to nurture regional competitiveness in a sustainable way, it is strategic to strengthen the knowledge base of local industry, reinforce competences, know-how and clusters operating in relevant application fields of key enabling technologies (e.g. mechatronics, smart manufacturing, home automation). At the same time it is essential to safeguard the niches where knowledge can be only to a very limited degree, if at all, based on research but that are still important for export (quality and luxury goods, hand-made fashion products, designer objects etc.).

2 Innovation Policy Governance

In Marche, as in all Italian regions, there is full autonomy as regards innovation policy. Subsidiarity is the main advantage of this set up while risks include overlapping between European, national and regional interventions and possible displacement effects, as well as a biased selection of priorities due to the pressure of groups of stakeholders and political opportunism.

There is a regional law (L.R. no. 20/2003) which regulates research and innovation interventions as well as business investments, credit access, internationalisation, environmental sustainability and use of renewable sources etc. The policy design and implementation is coordinated by the regional Structure "Innovation, research and competiveness of production sectors" which is part of the Regional Service for Production Activities.

The nature of the process of strategy development is mainly participatory. The Regional Administration consulted with other levels of government (e.g. Provinces, the Ministry of Education, University and Research, the Ministry of Economic Development) and other stakeholders (e.g. business associations) during the definition of the Smart Specialisation Strategy and related documents.

3 Innovation Policy Instruments

Over time the approach to research and innovation policy in Marche has changed: more selectivity, greater focus on research and on strengthening the cooperation between the different stakeholders of the system. The 2007-2013 intervention strategy differed significantly from the previous policy approach in terms of scope and breadth. However, due to the crisis, some of the novelties (e.g. greater focus on industrial and collaborative research as opposed to incremental and often low level innovation) were watered down under the urge to safeguard employment and keep afloat SMEs going through hard times in traditional sectors.

The new Smart Specialisation Strategy is an attempt to resume the policy approach cut short by the crisis. The main message of the Strategy is that the regional industrial system should evolve from a "labour intensive" structure towards a knowledge and innovation based system. In order to do so, the policy must facilitate the interaction between production, science and technology, and the development of networks and collaboration between firms. Four cross-sector strategic areas of interventions have been identified, based on the results of the analysis and of

the participatory debate which took place on the territory: house automation, mechatronics, sustainable manufacturing, health and well-being. Most of the key areas identified are priorities for advanced manufacturing which, therefore, plays a key role in the S3.

It is worth noting that 2014 is a key turning point for regional research and innovation policy. The ERDF OP, which is the key instrument for implementing the strategy, is expected to be finalised by the end of the year and new measures will be launched presumably starting in 2015. So far the policy mix has been adequate to deal with the regional challenges and it has clearly improved over the years. Certainly, if the region had been less short-sighted during the boom years (in the 90s and until the crisis) and had invested more significantly in R&TD as well as in strengthening an innovation friendly environment, the condition for competing in the global markets and for sustained growth would already have been in place and the recovery from the recession would have been quicker. That was a missed opportunity but the new strategy and the related programmes seem suited to address the pressing challenges appropriately in the next years.

4 Conclusions: future actions and opportunities for innovation policy

Further reinforcing the investment propensity and the systemic integration of regional research and innovation

Much has been done in recent years to facilitate an increase in business R&D intensity and to boost networking. More needs to be done with respect to government and higher education investments whose levels are currently very low. Research and innovation should become really pervasive, meaning that any initiative taken in any policy area (from transport to health, from territorial safeguarding to tourism) should give priority to innovative solutions. A greater focus on demand-side innovation policy is also possible. For instance, more attention should be paid to public procurement of innovation and pre-commercial procurement, support to final private demand of novel products, social innovation initiatives etc. As regards collaboration in research and innovation, the region has the opportunity to facilitate participation in Horizon 2020 through technical assistance services.

Facilitating the development of a knowledge intensive service sector

At present there is no advanced, knowledge intensive service sector in the region. The development of advanced services deserves policy attention since it is instrumental in increasing innovation culture and research investment propensity, for assisting cooperation among firms as well as between industry and university, for boosting the creation of new innovative firms in fields which are new-to-the-territory. Furthermore, a strong knowledge based service sector can provide a crucial contribution to absorb high-skilled and high-educated human capital, and contrast the brain drain.

Improving governance as regards synergies and integration between sources of funding

Synergies between different strategies and sources of funding (e.g. ERDF, ESF, EAFRD) can be ensured by strengthening unitary planning. Such integration is currently deficient due to different regulations, complex administrative procedures etc. However, a simplification in this respect is an essential and feasible objective.

Una valutazione delle politiche di ricerca e innovazione nella Regione Marche: i risultati del Regional Innovation Monitor della Commissione Europea

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Sommario

La capacita' di adattamento dei distretti industriali e la creativita' delle PMI hanno garantito alle Marche una performance economica positiva a lungo, in particolare negli anni novanta e fino all'inizio dei duemila. La perdita di competitivita', legata prima all'entrata nella moneta unica e poi alla crisi internazionale ha reso evidenti e amplificato alcune debolezze regionali collegate al sistema della ricerca e innovazione, al quadro istituzionale e alle infrastrutture. Le politiche per l'innovazione si sono evolute nel corso del tempo (interventi piu' selettivi, una maggiore attenzione alla ricerca collaborativa). Tuttavia, a causa della crisi, alcuni cambiamenti hanno subito un rallentamento negli ultimi anni e alcune novita' sono state sacrificate all'urgenza di salvaguardare l'occupazione e sostenere le PMI in difficolta'. Certamente se la regione fosse stata meno miope ai tempi del boom e vi fossero stati investimenti maggiori nel rafforzamento di un ambiente favorevole all'innovazione, le condizioni per competere nei mercati globali sarebbero gia' presenti. Nei prossimi anni e' necessario uno sforzo deciso per affrontare le sfide piu' importanti: aumentare l'intensita' della R&S e rafforzare le reti; favorire la crescita qualitativa del capitale umano, facilitandone l'assorbimento; trovare un equilibrio tra le specializzazioni tradizionali e una diversificazione intelligente verso nuovi settori e nicchie a elevato potenziale. La strategia di specializzazione smart e i programmi operativi appaiono adeguati ma ulteriori iniziative saranno necessarie per soddisfare i bisogni evidenziati.

Classificazione JEL: *H77; H83; O14; O25; O30; O38; P25; R58*

Parole Chiave: *Sistema della Ricerca e Innovazione; Politiche per l'innovazione; Politiche regionali; Politica di coesione; Fondi strutturali; PMI; Strategia di specializzazione smart; Europa 2020.*