PSL Quarterly Review

vol. 73 n. 294 (September 2020)
Article

Economic growth and productivity: Italy and the role of knowledge

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Abstract:

The COVID-19 crisis has hit Italy severely: by mid-2020, GDP had returned to the level observed in 1993. This is the result not only of its sharp collapse in the first half of 2020, but also of its weak growth since the 1990s. Addressing the problems that have restrained the economy for 30 years is, therefore, as important as tackling those created by the pandemic. In Italy, to return to a path of sustainable growth, implementing reforms aimed at creating a business-friendly environment is necessary but not sufficient. When a country approaches the technological frontier, growth depends on the capacity to incorporate and foster innovation and on the quantity and quality of investment in education. and knowledge. After documenting Italy's delays in innovation and education, we discuss their interrelation with the structure of the productive system and argue that achieving higher growth rates require a technological and cultural transformation.

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How to cite this article:
Visco I. (2020), " Economic growth and productivity: Italy and the role of knowledge", *PSL Quarterly Review*, 73 (294): 205-224.

DOI: https://doi.org/10.13133/2037-3643_73.294_1

JEL codes:
E00, O30, I20

Keywords:
Italy, stagnation, innovation, human capital

Journal homepage:
http: //www.pslquarterlyreview.info

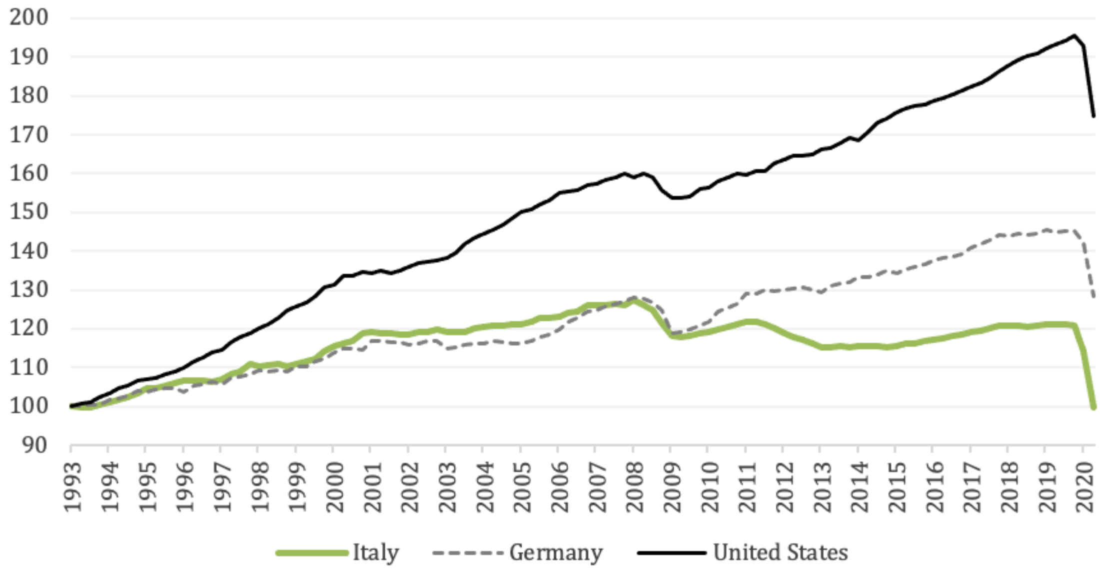
There is no need to emphasize how serious the public health emergency caused by the rapid spread of the new coronavirus all over the world has become. Almost 35 million people are estimated to have been affected, and over 1 million have lost their lives. Italy was the first western country in which the epidemic took hold, in early 2020. The toll has been very high, with more than 300 thousand people affected and 35 thousand deaths.

The drastic measures adopted to contain the propagation of the virus – which have included the limitation of people's movements and social interactions, the suspension of teaching in schools and universities, and the temporary shutdown of many productive activities – have hit

* I would like to thank Francesca Lotti, Marta De Philippis, Marilisa Guida, Massimo Sbracia, Roberto Torrini, and Francesco Zollino for their contributions and suggestions. I also thank seminar participants at the *EuroScience Open Forum 2020*, Stefano Fantoni for his kind invitation at that event, and Fiorella Kostoris for moderating the discussion. Of course, I remain the only person responsible for the ideas expressed.

the Italian economy profoundly. In fact, by mid-2020, GDP had returned to the level last observed in early 1993 (fig. 1).[1]

Figure 1 – *Real GDP in some advanced countries* (*quarterly data*; *1993 = 100*)



Sources: Eurostat and US Bureau of Economic Analysis.

The reason for this huge jump of about 30 years back in the past is twofold. The first is, of course, the striking extent of the collapse of the economy due to the pandemic: in the second quarter of this year, in particular, GDP fell by almost 13% with respect to the previous quarter. As a result, in just three months GDP lost more than during the whole 2008-2013 period, which includes the double-dip recession related to the global financial crisis and the euro-area debt crisis, which had already been the worst slump in peacetime since Italy's unification in 1861. The second reason why we went so far back in the past is that, since the 1990s, Italy's GDP growth has been extremely weak. While other advanced countries have suffered similar or even worse declines in GDP in the second quarter of 2020 (−9.1% in the United States, −9.7% in Germany, −13.8% in France, and −18.5% in Spain), no country has recorded such a huge jump back, because past growth has been much more robust elsewhere. GDP has returned, for instance, to the level observed in 2014 in the United States, 2010 in Germany, 2002 in France and in Spain.

Tackling the difficulties created by the pandemic all over the world is clearly the most urgent issue. With its diffusion, the prospects of long-lasting negative consequences for economic activity, employment, and the distribution of incomes have become more daunting. Not surprisingly, the global response of governments, central banks, and supervisory authorities in the majority of countries has been immediate and extraordinary. Central banks, in particular, have used a wide array of instruments to make monetary conditions more accommodative,

[1] By applying the most recent estimates on population available from ISTAT, it can be calculated that, in per capita terms, GDP dropped below the values recorded in the late 1980s.

counter the tensions in financial markets and support lending to households and firms, avoiding a credit crunch. The support of fiscal and monetary policy to aggregate demand will necessarily continue in the foreseeable future, also to counter the substantial increase in precautionary saving brought about by the surge in uncertainty produced by the pandemic.

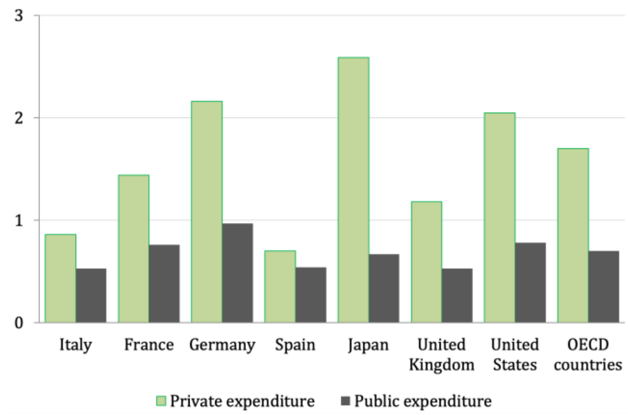
For Italy, however, addressing the problems that have restrained growth for about 30 years is equally important. To this purpose, as it has been extensively argued, it is essential to implement reforms aimed at creating a more business-friendly environment, by raising the quality and efficiency of public services, increasing the level of public investment, improving civil justice, reducing the administrative and bureaucratic burdens that hamper private investment, lowering the weight of tax evasion, corruption and other criminal activities. These reforms would yield important results but, for an advanced country like Italy, they would not be sufficient.

When a country approaches the technological frontier, its income and wages no longer allow for a development strategy based only on cost and price competition. In this context, economic growth depends on the capacity to incorporate and foster innovation, which requires adequate spending on new technologies, and on the quantity and quality of investment in education, from primary school to university. The delays accumulated in innovation and education and their interrelation with the structure of the productive system are most likely at the root of Italy's weak economic growth.

1. Innovation

A long-standing problem whose importance has increased in Italy in the more recent decades is the very low level of spending in research and development (R&D). The latest figures indicate that, in 2018, R&D expenditure as a share of GDP stood at just 1.4%, against 2.4% on average in the OECD countries (see OECD, 2020a); it stands at less than half of the level recorded in advanced economies like the United States and Germany (fig. 2). A comparison with China is also instructive: in the year 2000 the incidence of R&D on GDP was 0.1 percentage point lower than in Italy, at 0.9%; 18 years later it was almost a full percentage point higher than in Italy, at 2.2% (an even more impressive increase if we consider the striking growth of Chinese GDP).

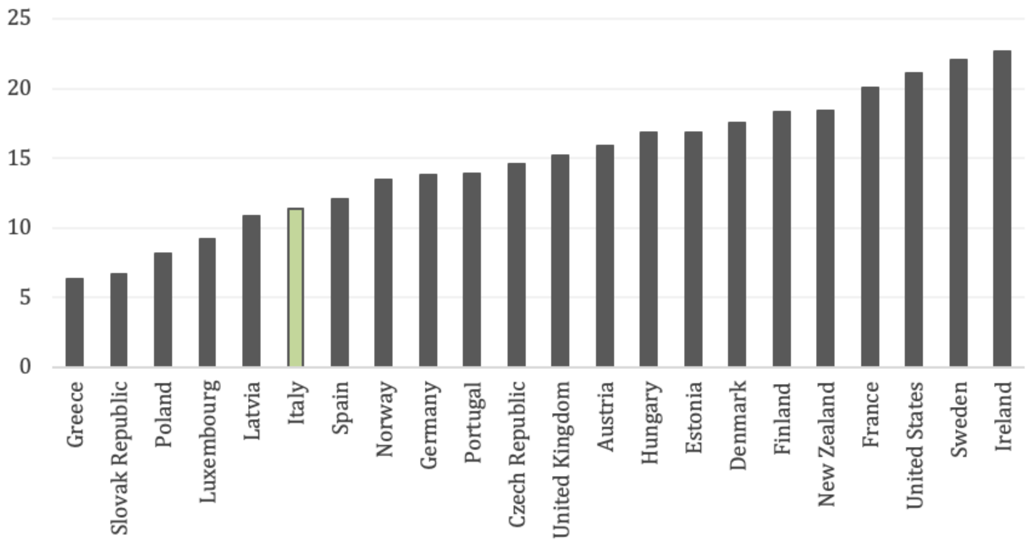
Figure 2 – *Spending on research and development as a share of GDP in 2018*



Source: OECD (2020a).

Although the problem concerns both the public and private sectors, the gap with developed countries is larger in the latter, where the share of R&D expenditure is 0.9%, about half of the OECD average (1.7%). The overall "investment in knowledge" of firms has been conveniently summarized in one single indicator, called "spending in knowledge-based capital", which includes expenditures for software, R&D, copyrights, design, marketing research, firm-specific training and organizational know-how (see OECD, 2017); this indicator sees Italy among the lowest-ranked countries in the OECD (fig. 3).

Figure 3 – *Business investment in knowledge-based capital as a share of GDP in 2015*

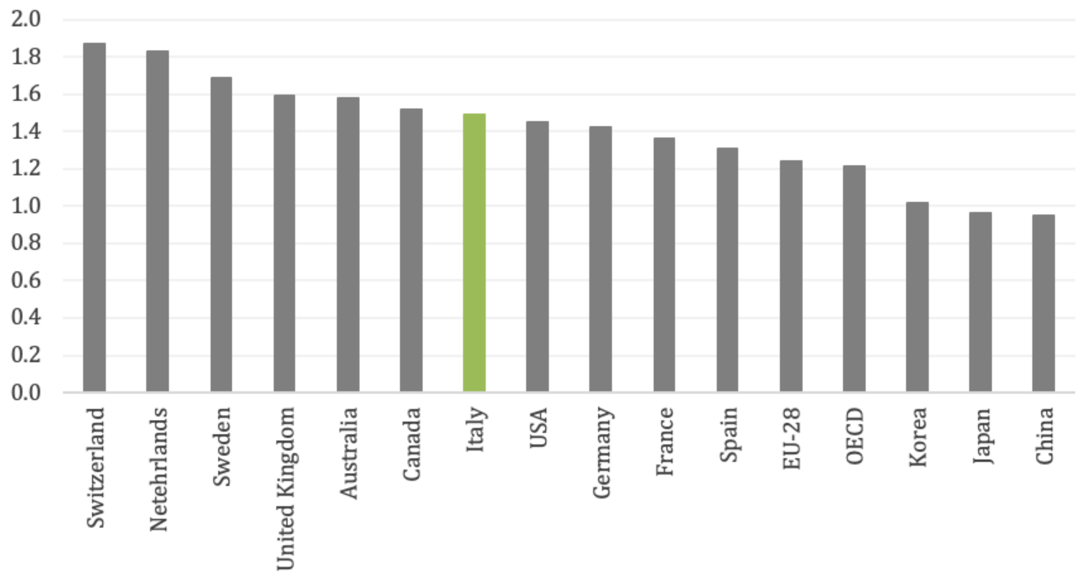


Source: OECD (2017).

The low private and public spending in R&D is reflected in the smaller number of researchers compared to the main advanced countries. In Italy, they are only 5.5 per thousand workers against almost 9 in the OECD. The number of patents normalized by the size of GDP reflects these deficiencies, standing at less than half with respect to the average for the OECD countries.

Despite these limitations, the quality of the research produced in Italy bears comparison with the main European countries. For example, the share of Italian journal articles ranking among the top 10% of the most cited publications in all fields of knowledge is higher than the shares of countries like France or Germany, and higher than the average share for the European Union (see European Commission, 2020a). In the natural sciences, the field-weighted citation impact of publications by authors working in Italy is higher not only than those by authors in France and Germany but also than those by authors in the United States (Anvur, 2018; see fig. 4). The Italian research system also stands out for its high productivity: its total number of publications in all fields of knowledge normalized by the amount of spending in R&D is, for instance, twice as high as in France or Germany.

Figure 4 – *Field-Weighted Citation Impact of scientific publications in 2015-2016*



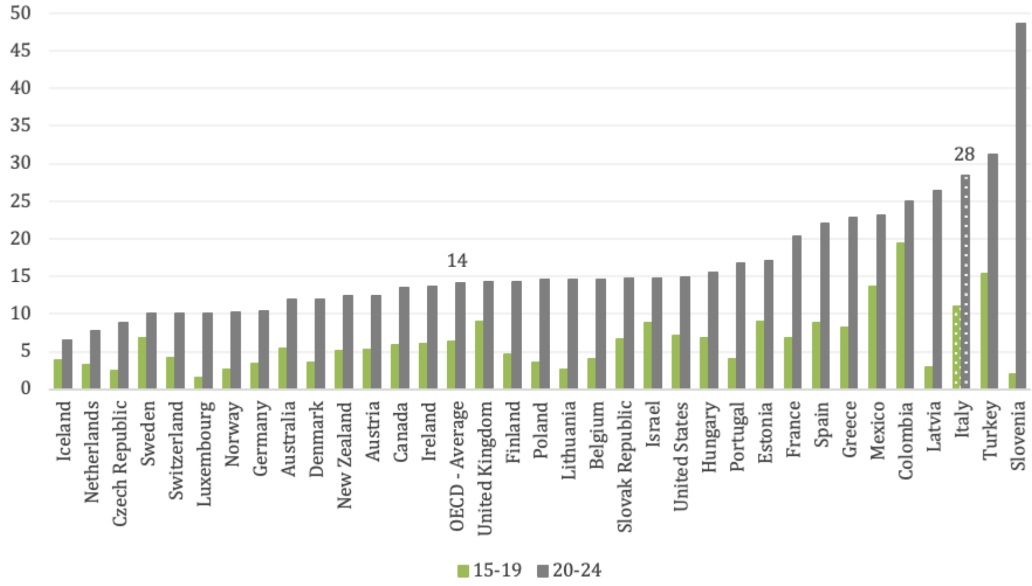
Source: Anvur (2018) based on Scopus data.

2. Human capital

Low spending in research is matched by insufficient investment in education, which depresses the level of knowledge and competence of the labour force – what economists usually refer to as human capital. This problem has both a quantitative and a qualitative dimension, whose importance has increased as Italy has moved closer to the technological frontier.

With regard to the quantitative dimension, data show that Italians do not attend school long enough. Italy is in the penultimate place in the OECD for the share of people between 25 and 34 years old with a tertiary qualification, at 28%, against an average of 44% for the OECD countries, with values above 60% in Canada, Japan, and South Korea (OECD, 2020b). Italy is the first country in terms of the incidence of population aged between 15 and 24 who are not in education, employment or training (so-called NEET): for people aged 20-24 in particular, this share stands at 28.4%, more than twice the average share of the OECD countries (fig. 5).

Figure 5 – *Share of the population not in employment, education or training, for different age groups in 2018*

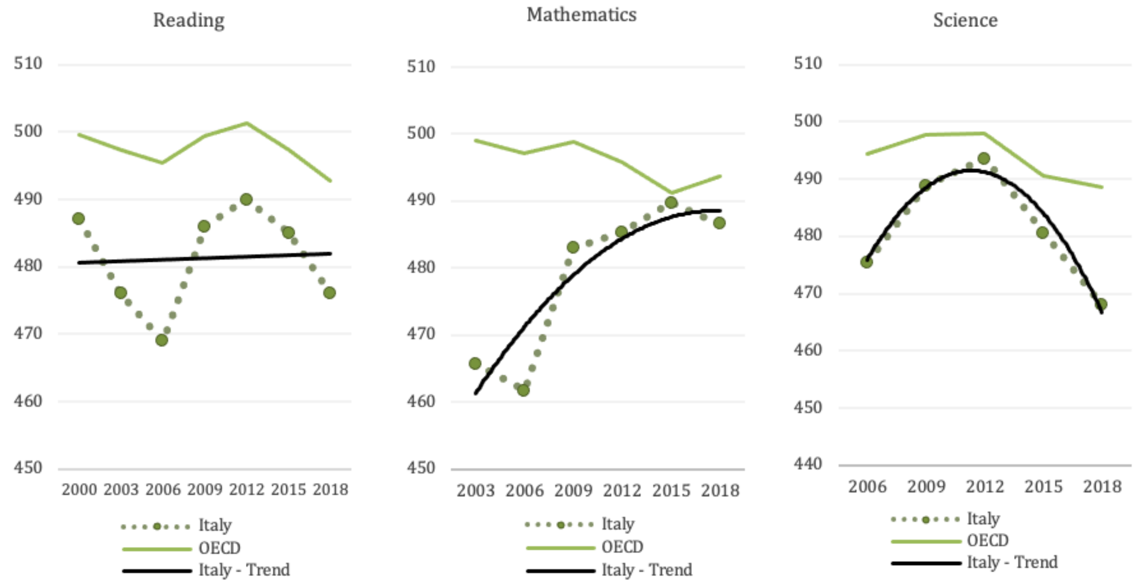


Source: OECD (2020b).

While the low incidence of young people in employment and training depends mostly on the persistent weakness of the Italian economy, the responsibility for the low number of those in education is also shared by households, who do not invest sufficiently in education. A key contribution to address this problem could come from an enlargement of the supply of tertiary level programmes with a vocational content, which are more suitable for students who would not attend more traditional courses. Professional tertiary programmes are still underdeveloped in Italy, a phenomenon that explains a large part of the Italian gap.

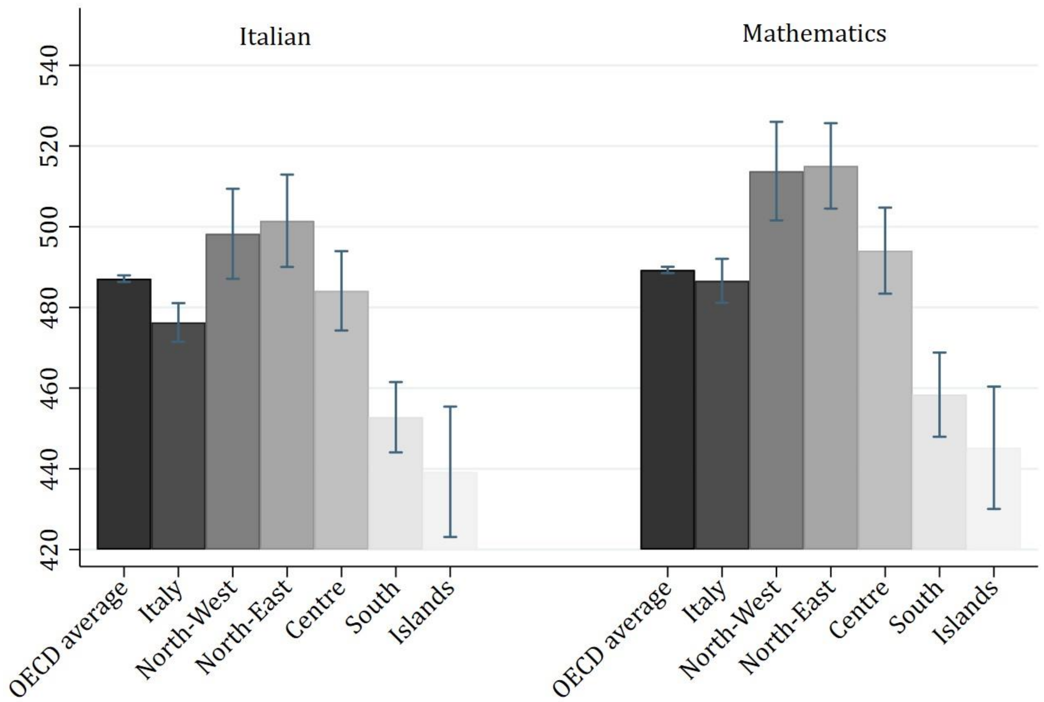
The qualitative dimension of the education problem concerns the fact that Italian students seem not to be learning enough. The Programme for International Student Assessment (PISA) documents, at each round, that 15-year-old Italian students fall below the OECD average in reading, mathematics and science – a disappointing outcome for a country that would need to grow faster that the main advanced economies in order to catch up to their level of income per capita (OECD, 2020c; see fig. 6). An in-depth look at the latest data (for the year 2018) shows that this dismal performance is largely the result of the delays in Italy's Mezzogiorno: while the North-West and the North-East of the country perform above the OECD average, the South and the Islands fall worryingly below it (fig. 7).

Figure 6 – *Results of the OECD PISA tests*



Source: OECD (2020c).

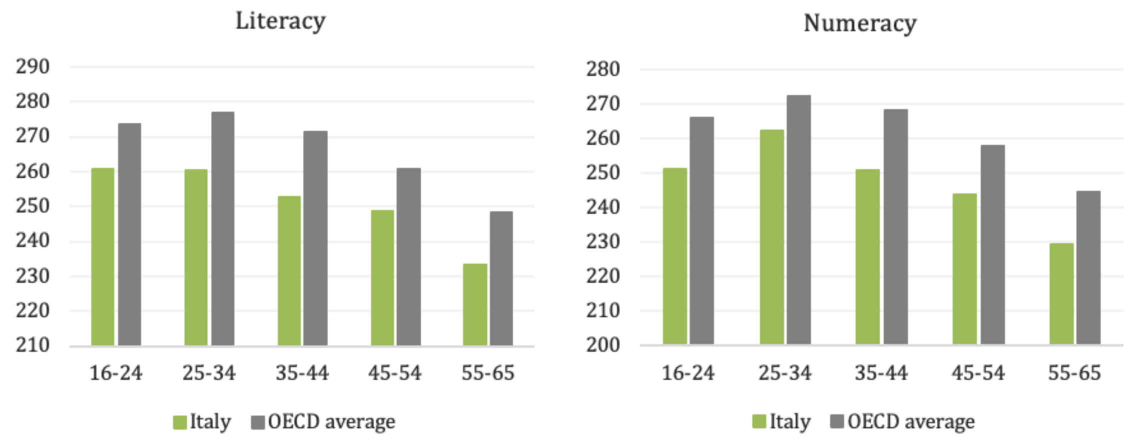
Figure 7 – *Results of the OECD PISA tests in 2018: the North-South divide*



Source: OECD (2020c).

These gaps translate into analogous gaps for Italian adults. The Programme for the International Assessment of Adult Competencies (PIAAC) carried out between 2013 and 2016 (see OECD, 2016) indicates that, at each age bracket, Italian adults perform invariably worse than the average adult in the OECD (fig. 8). In particular, the survey reveals in our country a widespread lack of those skills – reading and understanding, applying logic and analysing – that respond to modern life and work needs. For example, concerning literacy proficiency, about 70% of Italians appear to be unable to adequately understand long and articulated texts (a result that makes Italy one of the worst performers among the OECD countries participating in the test, in which this share is, on average, about 50%). In the numeracy test, a similar share turns out to be unable to successfully carry out relatively complex reasoning about quantities and data (against about 50% in the OECD average).

Figure 8 – *Results of the OECD PIAAC tests in 2013-2016* (*score*)



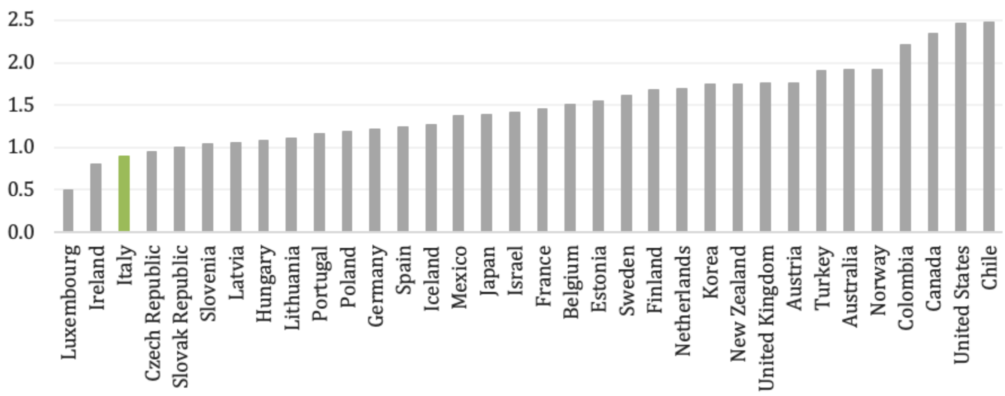
Source: OECD (2016).

Financial competencies are also low in the international comparison. According to the survey conducted by the Bank of Italy at the beginning of 2020 as part of an international programme started by the OECD, Italy ranks 23rd out of 26 countries according to a synthetic score that measures three areas of financial literacy: knowledge, behaviour, and attitudes (see D'Alessio et al., 2020). Italy's score is lower even than that of non-OECD countries with very modest levels of GDP per capita. These findings suggest that the gap in financial literacy with other countries is attributable only in part to lower levels and quality of education, or to other unfavourable social or economic conditions, and suggests that there is plenty of room for improvement across all the areas of financial literacy.

One of the reasons for the gaps that I have just described is linked to the modest level of spending in education, which is especially low at the tertiary level (fig. 9). In 2016 the incidence of expenditure on tertiary education on GDP was 0.9% in Italy, one of the lowest shares in the OECD. More effective and, in some cases, additional spending is required in many aspects. In primary and secondary education, the training and motivation of teachers are essential and should be adequately nurtured. Buildings and infrastructures are often obsolete and, at times, have problems with their overall security, when they should instead be technologically adequate and comfortable.

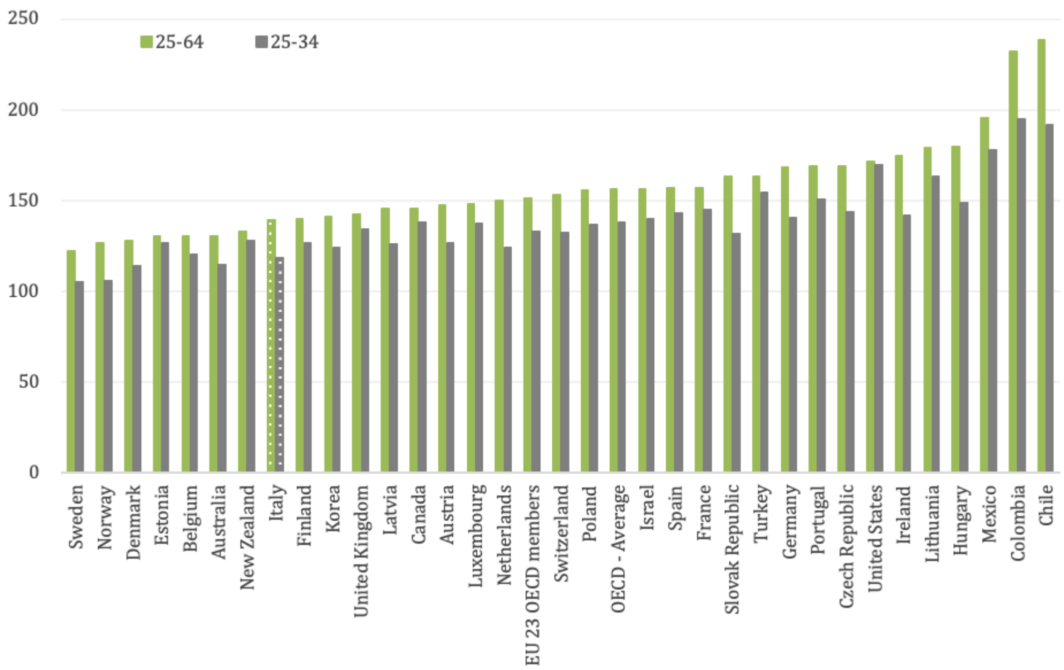
However, the obstacles to a better education are not only related to the supply side. Demand for skilled workers has proved to be weak as well. The ratio between the earnings of workers with a tertiary education and those with upper secondary education is lower in Italy than in the OECD (or the EU) average (OECD, 2020c; fig. 10). This is a paradoxical result, which we highlighted many years ago (see for example Visco, 2014): a lower endowment of human capital, like in our country, should in fact determine a higher return, as this production factor is in shorter supply (fig. 11).

Figure 9 – *Total expenditures in tertiary education as a percentage of GDP in 2016*



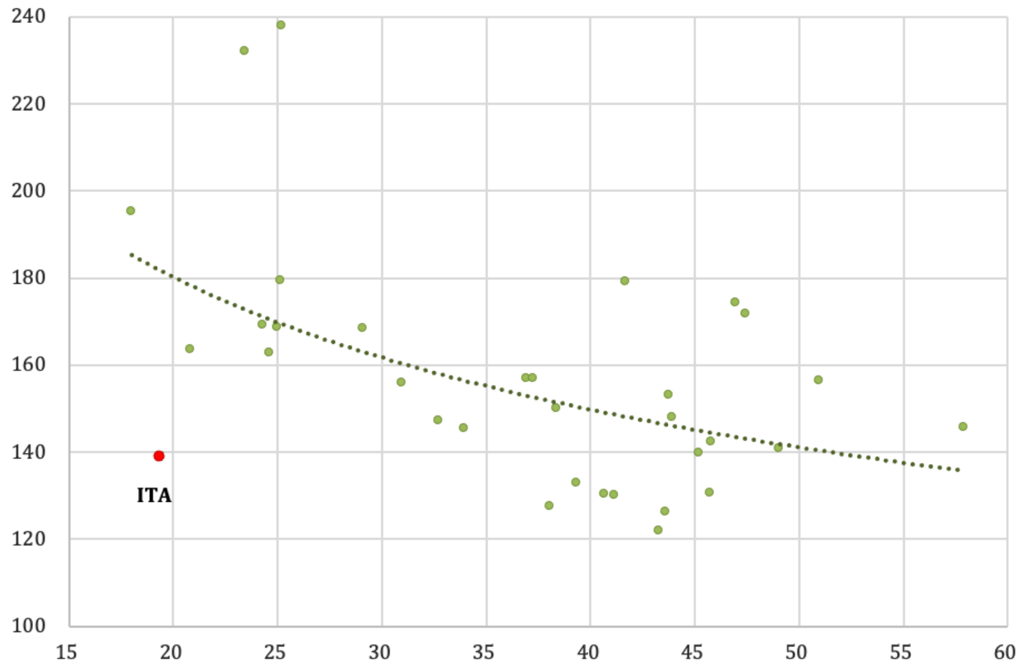
Source: OECD (2020b).

Figure 10 – *Earnings of workers with tertiary education relative to earnings of workers with upper secondary education, for different age clusters in 2017* (*percentages*)



Source: OECD (2020b).

Figure 11 – *Relative earnings of workers with tertiary education and share of population with tertiary education* (*aged 25-64*) *in 2017*



Source: estimates based on data from OECD (2020b).

In part, the paradox could be explained by the specialization of Italian firms in traditional sectors and by the predominant role of small firms, whose demand of highly educated workers is typically weaker.[2] The relatively low earnings of these workers, however, could also be the result of a vicious circle between demand and supply of human capital, triggered by the strategy of firms. Indeed, the latter may have reacted to the perception of a generally low quality of education with a generalized offer of low wages, which, in turn, would not have been sufficient to foster higher household investment in education. In addition, the difficulties in finding suitable skills in the labour market could have resulted in firms consolidating their low propensity to invest in new technologies, thereby containing the need for skilled labour.

Low returns and low demand for skilled workers are among the reasons that encourage a high number of Italians, especially highly educated young people, to migrate abroad. ISTAT data on migrations (*Trasferimenti di residenza*) indicate that between 2009 and 2018, 816,000 Italians moved their residence in a foreign country (against 333,000 who repatriated to Italy); among the 157,000 Italians who emigrated in 2018, about 30% had tertiary education while 25% had upper secondary education.

A large collective effort is required to reverse this vicious circle. Albeit low in the international comparison, highly educated workers still preserve a sizeable earning advantage with respect to less educated workers; moreover, they show a lower risk of remaining unemployed and generally have more stable careers. Families and students should therefore understand the importance of investing in knowledge, not only at school but also throughout

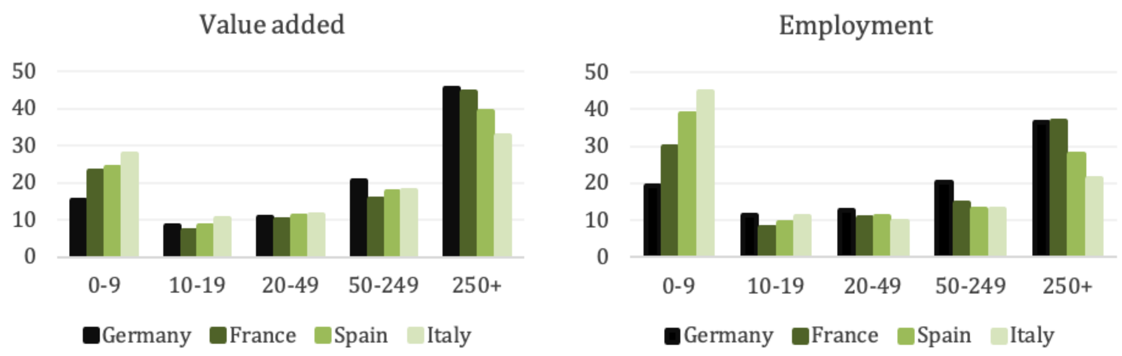
[2] For an in-depth discussion of this issue, see Visco (2014), especially chapters 2 and 4.

their whole lives. Additional investment by the State should aim at modernizing the infrastructures as well as at improving the training and motivation of teachers. Private firms also have a key role to play. Their reaction to the huge transformation induced by technological progress and globalization during the 1990s was a demand for lower labour costs, instead of higher and adequate investment in the new technologies. This would have spurred the demand for highly skilled labour possibly triggering a virtuous cycle of demand and supply of high education, to the benefit of the business sector as well as of society at large.

3. The structure of the productive system

Innovation and education are shaped by, and in turn shape, the structure of the productive system, which is extremely fragmented in Italy. A single observation well summarizes this problem. According to the latest available data (for the year 2016), 25,000 medium-large firms (with more than 50 employees) produce almost half of the value added of the industrial and non-financial service sector, with almost 6 million employees; the other half is produced by 4.3 million small firms, with 6 million employees, and 4.8 million self-employed workers.[3] In France, Germany and Spain, the share of value added produced by large companies is higher and the incidence of self-employed workers, small businesses and their employees is lower (fig. 12).

Figure 12 – *Value added shares and employment shares by firm size in 2016*



Source: Eurostat, *Structural Business Statistics*.

Literature has emphasized the possible role of institutional factors in hampering the dimensional growth of firms.[4] Regulation, for instance, can be more demanding for larger firms or may prevent them from entering specific markets (such as in the professions or in retail trade); tax evasion may be easier for smaller firms, reducing the incentives to expand their

[3] See Visco (2019), which updates the data and discussion in Visco (2018, chapter 2, and 2015, chapter 4).

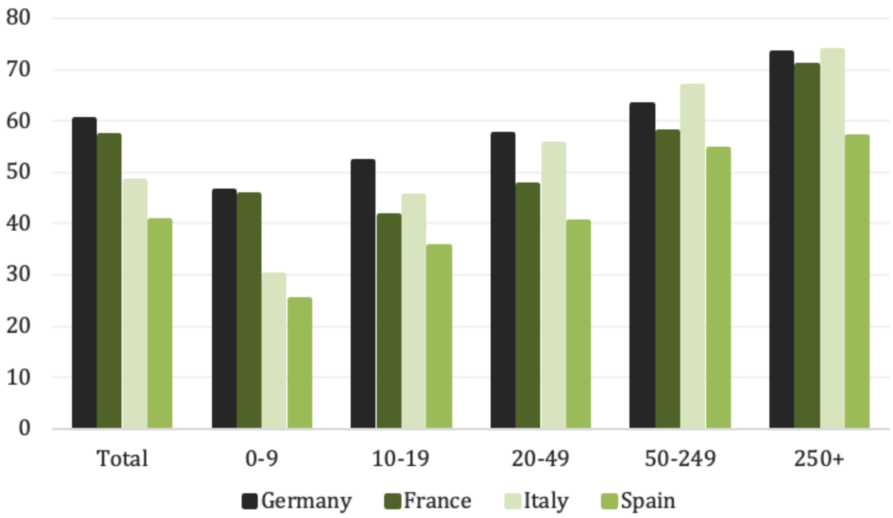
[4] Recent studies focusing on the case of Italy include Bugamelli et al. (2012), Bugamelli and Lotti (2018), Lotti and Sette (2019).

economic activity. More recently, many studies have also focused on the importance of the quality of management practice.[5] Their role is twofold. On the one hand, the quality of management depends on the size of firms; small firms, for example, have more difficulties in attracting the best managers. On the other hand, managers determine firms' performance, including their ability to grow.

Small firms around the globe are usually family-owned. In Italy, however, their managers are mostly selected within the local market and often coincide with the firms' owners or with their relatives (Visco, 2019). The family-based ownership *and* management structure is often a constraint on the growth of companies. For manufacturing companies with more than 10 employees, the share of firms belonging to an owner family (86%) is not much higher than the corresponding share in other European countries (between 80 and 90%), but it is only in Italy that two thirds of companies have their entire management made up of members of the owner family only (Visco, 2019).

Family firms and small firms typically rely less on good managerial practices, such as team working, performance-related pay, or workers' participation in the decision-making process (Baltrunaite et al., 2020). Data from the World Management Survey (WMS) developed by Bloom and Van Reenen (2007) suggest that the average quality of managers is, in Italy, lower than that in the top-performing countries, a result that reflects not only the scarce diffusion of high quality management, but also the lower level and quality of education in general.[6]

Figure 13 – *Average value added per worker by firm size in 2016* (*thousands of euros*)



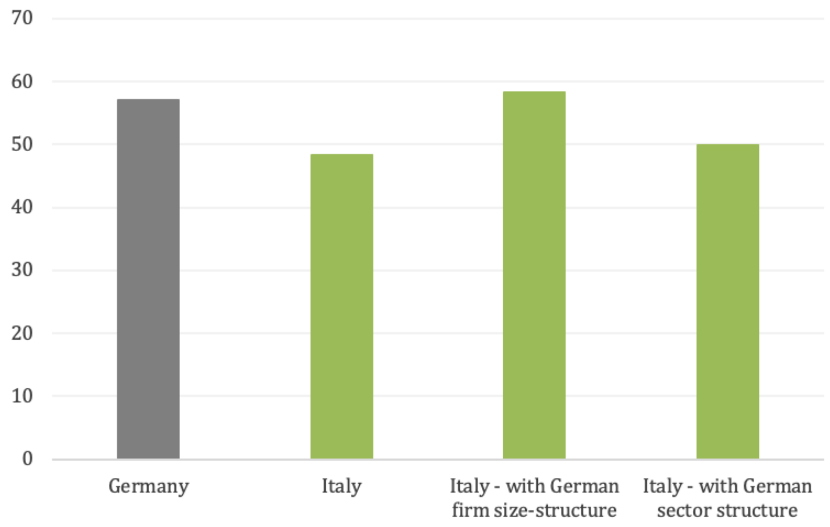
Source: Eurostat, *Structural Business Statistics*.

The "dwarfism" of the Italian productive system is strictly interrelated to the ability of firms to introduce good managerial practices, adopt new technologies in order to develop

[5] Here the standard reference is Bloom and Van Reenen (2007). For the case of Italy, however, see Schivardi and Torrini (2010), Pellegrino and Zingales (2017), Schivardi and Schmitz (2020).
[6] On the issue of managers' education and firm performance see also Morresi (2017).

innovation of products and processes, and invest in human capital (see Pellegrino and Zingales, 2017; and Schivardi and Schmitz, 2020). These features of our industries profoundly affect the average productivity of the economy (Pagano and Schivardi, 2003). Larger Italian firms are often more productive than the corresponding French and German firms, but the very numerous group of smaller firms, which are much less productive than those of the main competitors, brings the average down (fig. 13). Had Italy had the same firm size structure as Germany, its average labour productivity would have been more than 20 percentage points higher, surpassing the German level; differences in the sectoral composition between the two countries have, instead, a much smaller role in explaining the low productivity of Italian firms: had Italy had the same industry composition of Germany, its labour productivity would have increased, ceteris paribus, only by 3 percentage points (fig. 14).

Figure 14 – *Labour productivity under different assumptions*

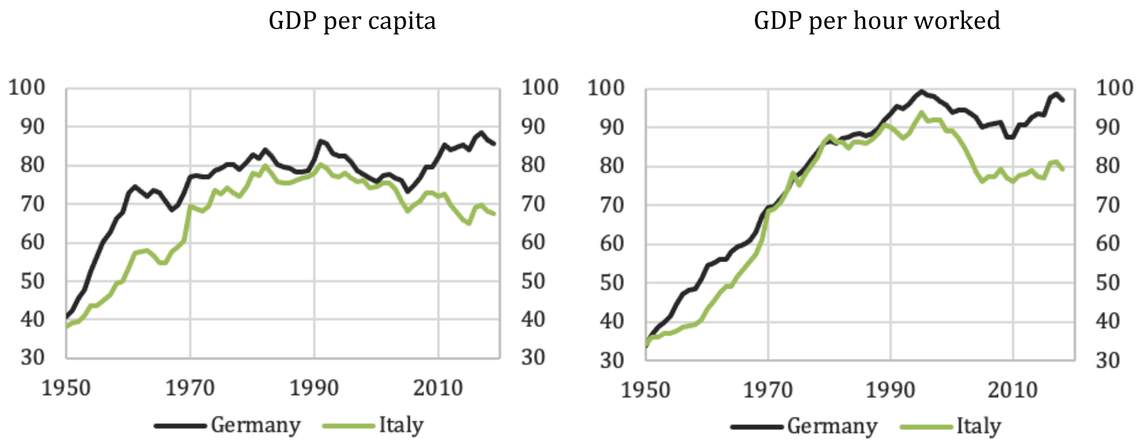


Source: estimates based on data from Eurostat, *Structural Business Statistics*.

4. Italy's old delays and its recent dismal economic performance

A weak capacity to innovate, a low level of human capital, and a predominant weight of small firms characterized Italy even when its economic growth was rapid and outpaced that of most other developed countries. We should not forget that, after the Second World War, Italy started a rapid process of catching-up growth with respect to the United States (usually identified as the country at the technological frontier). This process came to a halt in the late 1980s, and since the mid-1990s the gap between the two economies has been widening (fig. 15). In a country with a similar product specialization such as Germany, instead, the process of catching-up with the United States was interrupted only temporarily, between the early 1990s and the mid-2000s, a period characterized first by the German reunification and then by a sharp rise in US productivity growth, but it resumed thereafter.

Figure 15 – *GDP per capita and GDP per hour worked relative to the United States*



Source: estimates based on data from OECD (*OECD Compendium of Productivity Indicators 2019*) and Penn World Tables.

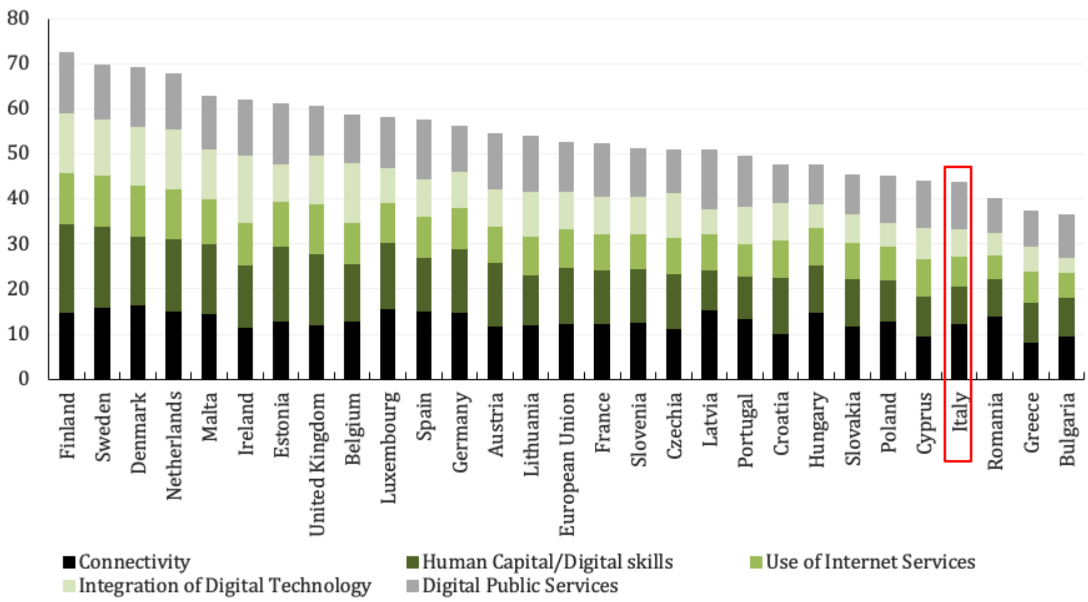
Two factors have contributed to halting Italy's catching-up and triggering its long-lasting decline. First, as I have already mentioned, when an economy approaches the technological frontier and its income and wages converge to those of the most developed countries, an autonomous capacity to innovate is needed to fuel economic growth. Second, the world has dramatically changed in the last 30 years, due to both the globalization of markets and the information-technology revolution, with the latter that is now driving the digital transformation of our economies and personal lives.

In this new context, the importance of innovation and knowledge has grown. Consider, for example, the quality of management: since the information-technology revolution, this factor has become highly correlated with productivity growth (see Schivardi and Schmitz, 2020, especially their fig. 3). More in general, Italy has paid the price of the delays that we have documented with respect to the main advanced countries in terms of innovation capacity, human capital, and fragmentation of the productive system.

With the recent development of digital technologies, Italy has unsurprisingly started to accumulate a new delay. This is similar to the one observed in the 1990s with reference to the rise and diffusion of information and communication technologies. Today as back then, also given their size, Italian firms seem unable to take advantage of the adoption of the new digital technologies, which require adequate skills and managerial capacities. As a consequence, not only is the production of digital goods and services low, but their use by firms and households is also modest. The index that summarizes the level of digitalization in Europe (the Digital Economy and Society Index, DESI, see European Commission, 2020b) places Italy in 25th place in the European Union this year (fig. 16). The gap with respect to the other countries is especially large in the use of Internet services as well as in the digital skills of the population.

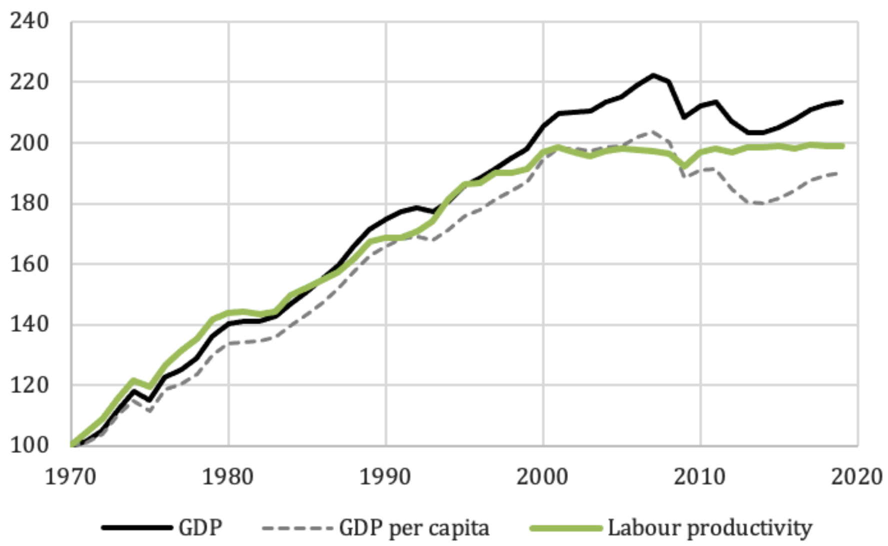
As a result of these dynamics, GDP per capita has slowed down since the mid-1990s and, after the double-dip recession due to the global financial crisis and the euro-area sovereign debt crises, it has never fully recovered (fig. 17). Labour productivity (measured by GDP per hour worked) started to stagnate in the mid-1990s and its weakness persists today.

Figure 16 – *Digital Economy and Society Index and its components in 2019*



Source: European Commission (2020b).

Figure 17 – *Economic growth and productivity* (*indices: 1970 = 100*)

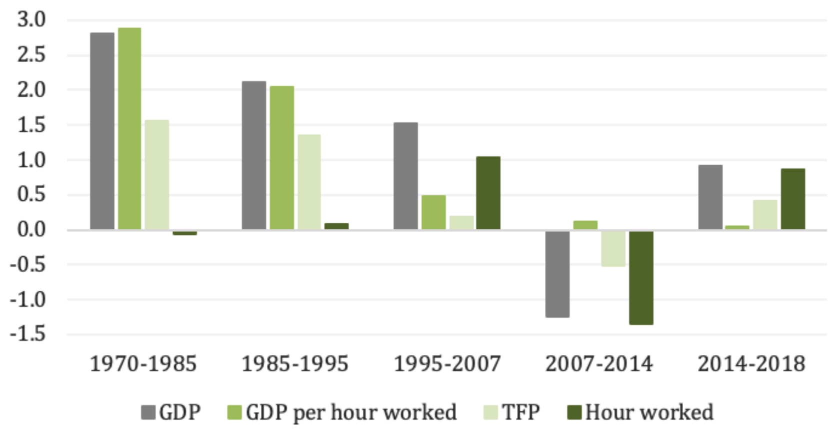


Source: European Commission, *AMECO Database*.

The key variable underlying the dynamics of GDP per capita and labour productivity is the so-called total factor productivity: the component of production that is not explained by the stocks of labour and physical capital employed in the production process. Changes in this variable measure, albeit imperfectly, the gains in the efficiency of production due, for example, to organizational changes, new technologies, or a better quality of human or physical capital not captured by the statistical measurement of accumulated capital (fig. 18).

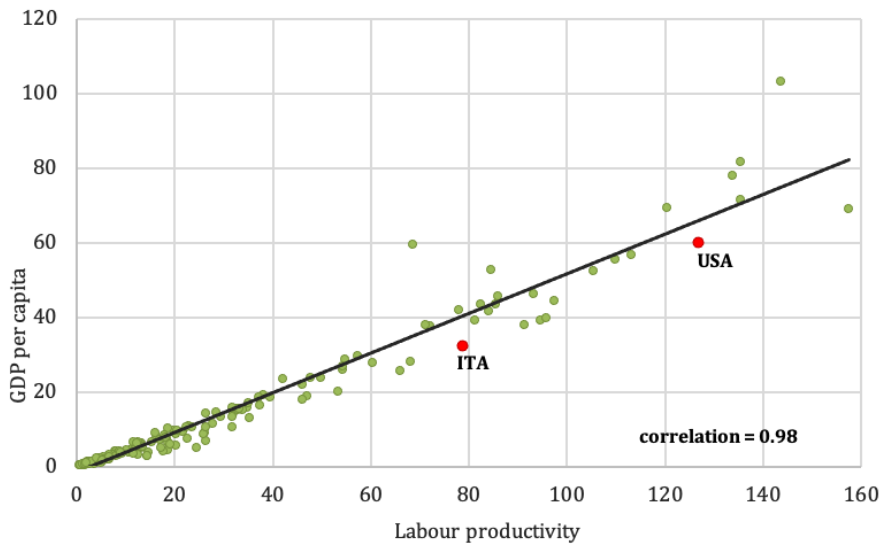
The current economic crisis has shown that, in the short term, economic growth depends on several, often unpredictable, factors. In the long run, instead, productivity improvements are the key ingredient for economic development and the most important factor explaining cross-country differences in income and GDP (fig. 19). It is for this reason that, in order to restore a path of sustainable growth, measures necessary to undertake the urgent problems created by the current pandemic crisis need to be flanked by interventions aimed at addressing the obstacles that hamper innovation.

Figure 18 – *Average growth rates of GDP, labour productivity, hours worked and total factor productivity* (*TFP*)



Source: European Commission, *AMECO Database*.

Figure 19 – *GDP per capita and labour productivity in 2017* (*thousands of 2011 US dollars*)



Source: estimates based on data from the Penn World Tables.

5. GDP growth matters

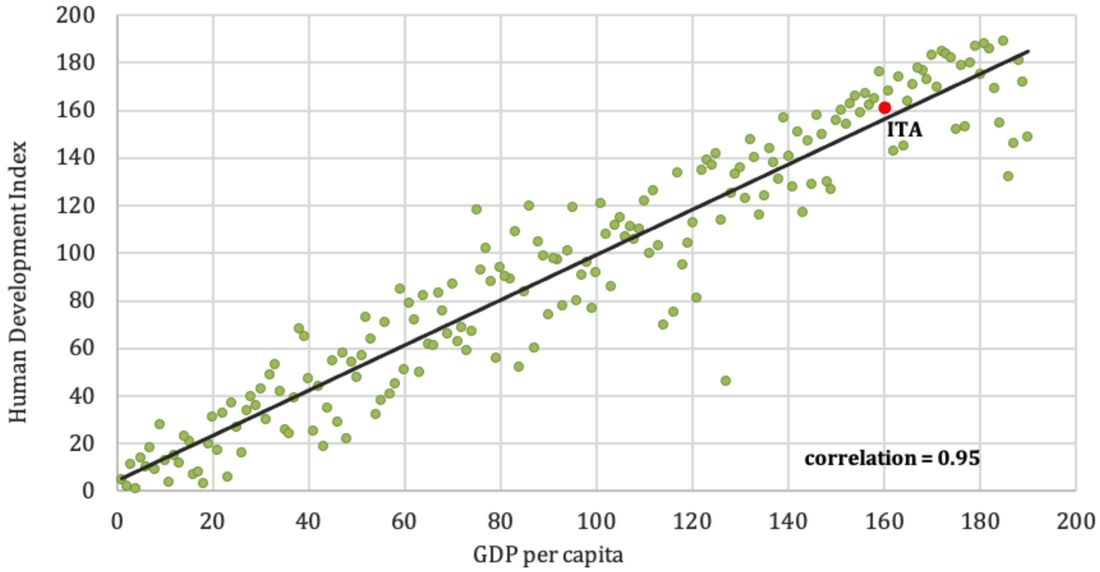
As most economists do, I have focused on GDP and its determinants. This indicator has been subject, not just in recent years, to various criticisms concerning its ability to grasp all the material aspects that define the conditions of an economy, and the fact that it neglects non-economic and intangible factors which, however, contribute significantly to the well-being of a country. Several projects have been undertaken in the past to provide a more comprehensive measure of welfare. In the early 1970s, for example, Nordhaus and Tobin built a new indicator (the “measure of economic welfare”) which adjusted GDP by including non-market activities, reclassifying government expenditures based on their impact on households’ access to key public services (such as transport, health, and education) and calculating amenity losses due to environmental pollution (Nordhaus and Tobin, 1973). However, their conclusion was that the broad picture of secular progress, which GDP conveys, remains valid even after the correction of its deficiencies.

Similarly, in the early 1980s Amartya Sen argued that a proper assessment of well-being should take into account people’s access to education, health, civil rights, freedom of opinion, as well as economic factors, such as income and consumption (see Sen, 1982, and 1999). The practical implication was the construction of the “human development index”, built by the United Nations (and available on their website), which integrates per capita GDP with other indicators to measure the degree of well-being achieved in the various countries.

More recently, high emphasis has been placed on the social costs of income inequality, the impact of digitalization, and the environmental sustainability of production. A set of guidelines for a comprehensive measure of well-being and social progress has been developed by the OECD (see Fitoussi et al., 2018). Experimental indicators are currently being produced in several countries under national initiatives. In Italy an “index of equitable and sustainable well-being”, which is based on both hard and soft indicators covering twelve dimensions (such as health, education, safety, work and leisure balance, social relationship, politics and institutions, environment) is now computed and regularly updated (see ISTAT, 2020).

Despite its limitations, GDP per capita appears to have a very strong link with the fundamental variables for the well-being of a country. Considering data for almost 200 countries referring to the year 2018 available from the United Nations, there is in fact a very high correlation (of over 90%) with the human development index (fig. 20). This close relationship does not arise only from the fact that GDP per capita is one of the three main components of this index. Correlation is in fact high also with the other two variables, life expectancy (i.e. the average lifespan expected at birth) and the level of education as measured by the United Nations (which is the simple mean between the average years of schooling for adults and the expected average years of schooling for children; fig. 21). The relationship with the latter in particular should not be surprising: on the one hand, a higher income allows a larger share of the population to study; on the other hand, higher levels of education tend, as we have discussed, to increase productive efficiency and the level of GDP. The link with life expectancy depends on the fact that rising levels of GDP per capita are associated, among other things, with better nutrition, higher hygienic conditions, and more effective health systems.

Figure 20 – *Human development index and GDP per capita in 2018* (*ranking positions*)

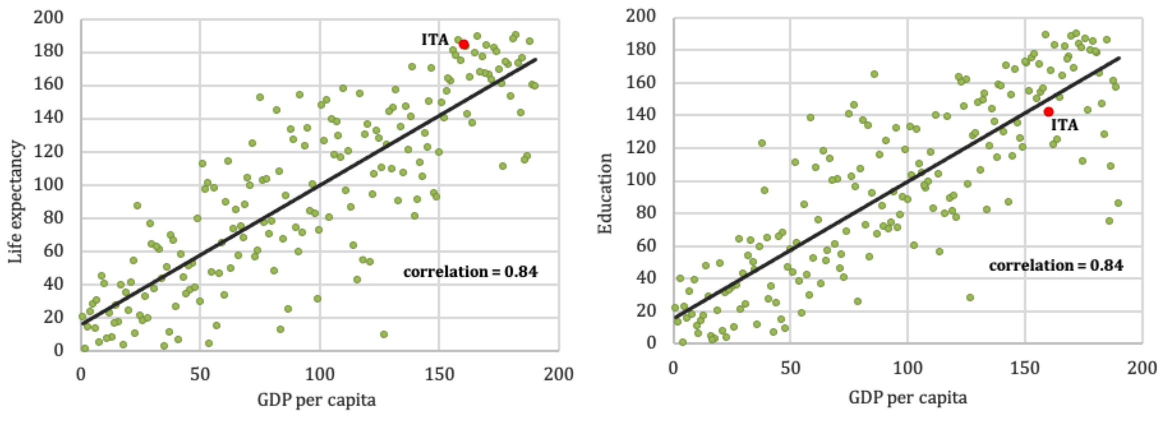


Source: estimates based on data from the United Nations, *Human Development Report 2019*.

Figure 21 – *Correlations of GDP per capita*

A. *Life expectancy and GDP per capita in 2018* (*ranking positions*)

B. *Education and GDP per capita in 2018* (*ranking positions*)



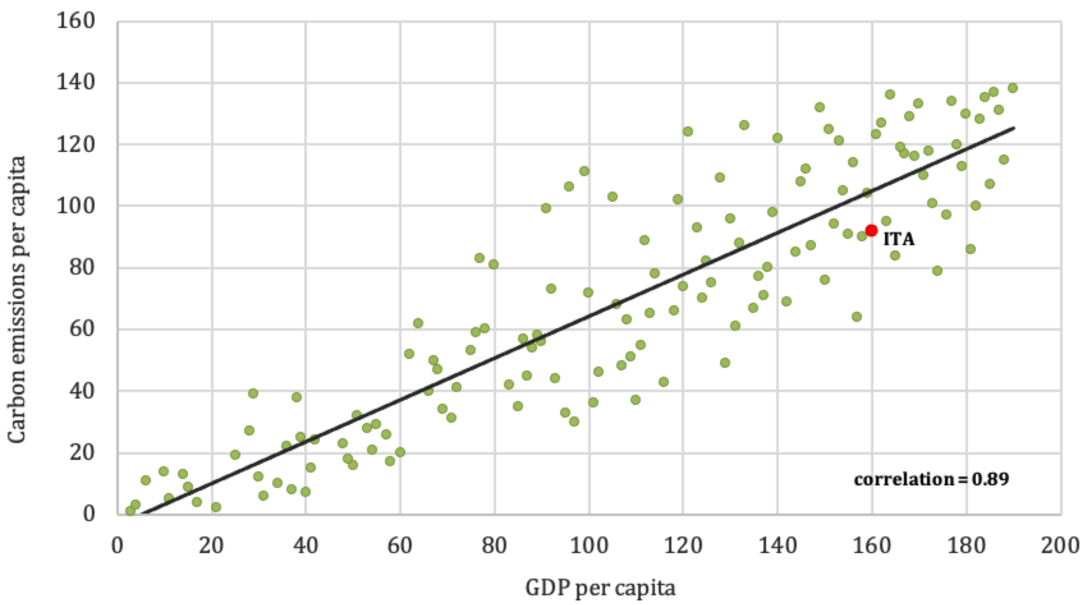
Source: estimates based on data from the United Nations, *Human Development Report 2019*.

There is one dimension in which GDP, however, does not perform well as a measure of well-being, which stems from its impact on the environment. United Nations data also show, in fact, a dangerous correlation between GDP per capita and carbon emissions, which are harmful both for the health of human beings and for the planet (fig. 22). This cost of economic development can no longer be borne. In the absence of more adequate incentives for "green" investment, more stringent regulation, or higher taxation of the most polluting energy sources, the rise of greenhouse gas emissions would lead to a worrying increase in the temperature of the planet.

The main climatic models predict that, absent changes, the global temperature would overcome the 1.5 degree increase threshold, with, according to the United Nations Intergovernmental Panel on Climate Change, catastrophic effects for our planet. This is a problem that, of course, goes well beyond national borders. Yet, the speed at which the temperature is rising and the apparent inexorability of this trend are such that a quick and strong response from all countries is required. Scientific research has a clear role to play in addressing this unprecedented challenge.

It is time to direct increasing resources and efforts to address these side effects of economic development. Knowledge is once again the key asset in which we need to invest to make further economic progress, while protecting the environment.

Figure 22 – *Carbon emissions per capita and GDP per capita in 2018* (*ranking positions*)



Source: estimates based on data from the United Nations, *Human Development Report 2019* and *Environment Statistics*.

6. Conclusions

Recovering the path of GDP growth that Italy interrupted 30 years ago is a question with implications that go beyond the mere economic sphere. They affect the health of its citizens, the quality of their leisure time, their overall standard of living. The urgency of the problems posed by the pandemic should not make us lose sight of this longer-term issue. In order to overcome this challenge, our economy needs an intense technological and cultural transformation.

References

Anvur (2018), *Rapporto biennale sullo stato del sistema universitario e della ricerca*, Rome: Agenzia Nazionale di Valutazione del sistema Universitario e della Ricerca.
Bloom N. and Van Reenen J. (2007), "Measuring and Explaining Management Practices across Firms and Countries", *Quarterly Journal of Economics*, 122 (4), pp. 1351-1408.
Bugamelli M., Cannari L., Lotti F. and Magri S. (2012), "Il gap innovativo del sistema produttivo italiano: radici e possibili rimedi, *Questioni di economia e finanza*, n. 121, Rome: Bank of Italy.
Bugamelli M. and Lotti F., eds., (2018) "La crescita della produttività in Italia: la storia di un cambiamento al rallentatore", *Questioni di economia e finanza*, n. 422, Rome: Bank of Italy.
Baltrunaite A., Bovini G. and Mocetti S. (2020), "Opening the Black-Box of Managerial Talent", *Temi di discussione*, forthcoming, Rome: Bank of Italy.
D'Alessio G., De Bonis R., Neri A. and Rampazzi C. (2020), "L'alfabetizzazione finanziaria degli italiani: i risultati dell'indagine della Banca d'Italia del 2020", *Questioni di economia e finanza*, forthcoming, Rome: Bank of Italy.
European Commission (2020a), *European Innovation Scoreboard*, Brussels: European Commission.
European Commission (2020b), *The Digital Economy and Society Index: DES 2020*, Brussels: European Commission.
Fitoussi J.P., Stiglitz J. and Durand M. (2018), *Beyond GDP: Measuring What Counts for Economic and Social Performance*, Paris: OECD Publishing.
ISTAT (2020), *BES 2019: Equitable and Sustainable Well-Being in Italy*, Rome: Istituto nazionale di statistica.
Lotti F. and Sette E. (2019), "Frontier and Superstar Firms in Italy", *Questioni di economia e finanza*, n. 537, Rome: Bank of Italy.
Morresi O. (2017), "How Much is CEO Education Worth to a Firm? Evidence from European Firms", *PSL Quarterly Review*, 70 (282), pp. 311-353.
Nordhaus W.D. and Tobin J. (1973), "Is Growth Obsolete?", in Moss M. (ed.), *The Measurement of Economic and Social Performance* (pp. 509-564), Boston: National Bureau of Economic Research.
OECD (2016), *The Survey of Adult Skills: Reader's Companion*, 2nd ed., Paris: OECD Publishing.
OECD (2017), *OECD Science, Technology and Industry Scoreboard*, Paris: OECD Publishing.
OECD (2020a), *Main Science and Technology Indicators*, Paris: OECD Publishing.
OECD (2020b), *Education at a Glance 2020: OECD Indicators*, Paris: OECD Publishing.
OECD (2020c), *PISA 2018 Results*, Volume IV: *Are Students Smart about Money?*, Paris: OECD Publishing.
Pagano P. and Schivardi F. (2003), "Firm Size Distribution and Growth", *Scandinavian Journal of Economics*, 105 (2), pp. 255-274.
Pellegrino B. and Zingales L. (2017), "Diagnosing the Italian Disease", *NBER Working Paper*, n. 23964, Cambridge (MA): National Bureau of Economic Research.
Schivardi F. and Schmitz T. (2020), "The IT Revolution and Southern Europe's Two Lost Decades", *Journal of the European Economic Association*, forthcoming.
Schivardi F. and Torrini R. (2010), "Structural Change and Human Capital in the Italian Productive System", *Giornale degli Economisti*, 69 (3), pp. 119-167.
Sen A. (1982), *Choice, Welfare and Measurement*, Oxford: Basic Blackwell.
Sen A. (1999), *Development as Freedom*, Oxford: Oxford University Press.
Visco I. (2014), *Investire in conoscenza. Crescita economica e competenze per il XXI secolo*, 2nd ed., Bologna: Il Mulino.
Visco I. (2015), *Perché i tempi stanno cambiando*, Bologna: Il Mulino.
Visco I. (2018), *Anni difficili. Dalla crisi finanziaria alle nuove sfide per l'economia*, Bologna: Il Mulino.
Visco I. (2019), "L'economia italiana: tra 'sviluppo tardivo' e declino demografico", lecture given at the *Lezione Giorgio Fuà 2019*, Università Politecnica delle Marche, Ancona, 20 September.