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Blockchain for SMEs and entrepreneurs in Italy

Marco Bianchini and Insung Kwon

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This report investigates the development of the blockchain ecosystem in Italy, against the background of the SME and entrepreneurship structure and trends in the country. The report analyses in particular the characteristics and trends of companies introducing blockchain-based services in the Italian market, opportunities and challenges to their business development, sectors and firms being targeted, and relevance for enhancing digitalisation and productivity in the SME population at large. The report also illustrates recent trends in regulation and policy, and provides policy recommendations.

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Acronyms

AI	Artificial Intelligence
AML	Anti-Money Laundering
BA	Business Angels
BFT	Byzantine Fault Tolerance
DLTs	Distributed Ledger Technologies
EBP	European Blockchain Partnership
EBSI	European Blockchain Service Infrastructure
ECB	European Central Bank
GDPR	General Data Protection Regulation
IoT	Internet of Things
IP	Intellectual Property
KYC	Know Your Customer
M2M	Machine to Machine
MEF	Ministry of Economy and Finance
MiPAAF	Ministry of Agricultural, Food and Forestry Policy
MiSE	Ministry of Economic Development
MIUR	Ministry of Education, University and Research
SSI	Self-Sovereign Identity
VAT	Value Added Tax
VC	Venture Capital

Executive summary

The diffusion of blockchain[1]-based technology solutions is advancing rapidly and Italy has the potential to be an important player in this nascent market. With a large, diversified and export oriented industrial base and strong competitive firms operating in manufacturing and services markets at national and international level, Italy is well positioned to access the benefits of Distributed Ledger Technologies (DLTs) applications and infrastructures. However, there are important policy challenges to be addressed in order to fully take advantage of this technological transition, especially in relation to the uptake of digital technologies by SMEs. The government has taken action with several programmes to provide SMEs with incentives, financing, trainings and knowledge transfer.

This report illustrates the current state of development of the blockchain industry in Italy, focusing on the Italian start-ups and innovative SMEs that are developing DLT-based applications and infrastructure. The report also discusses the possible impact on "traditional" SMEs in the country and provides an overview of the main relevant blockchain-related policies and regulations that have been put in place by Italian decision makers in recent years, including insights from international experiences.

The Italian blockchain industry has developed rapidly, with a large number of entrepreneurs developing, testing and commercialising DLT-based infrastructures and applications. Entrepreneurs are exploring business opportunities for blockchain technology with numerous use cases (e.g. supply chain management, IP & Copyright protection, human resources, procurement) targeting a large number of sectors (e.g. agri-food, ICT, arts and entertainment, healthcare). Leveraging data from the government (Ministry of Economic Development) and a local academic research centre (Osservatorio Blockchain & Distributed Ledger of the Politecnico di Milano), the study identified a total of 67 companies developing DLT-based products for the market (excluding crypto-exchanges and wallet providers), which are mostly located in Milan and its surroundings. These companies answered an online survey and provided original evidence to better understand their products, business models and opinion on the main challenges they are facing in conducting their business.

The report is structured in three parts, providing an overview of the "entrepreneurial landscape", of the "development of the blockchain ecosystem" and of "recent trends in regulations and policies".

- The first part of the report focuses on the "entrepreneurial landscape" in Italy, providing an overview of the structure of the business sector in terms of size and productivity, in comparison with other OECD countries. The report illustrates the level of digitalisation of Italian SMEs, presenting evidence about their access to digital infrastructure and use of different digital technologies. The report also comments on some main policies to strengthen SME digitalisation.
- The second part of the report presents the recent "development of the blockchain ecosystem". While Italian players had a marginal role in the ICO hype at the end of 2017, the report illustrates

1 The terms "blockchain" and "DLTs", although referring to slightly different concepts, will be used interchangeably in this report, for the sake of simplicity.

the intensified activity by the private sector players over the last two years, highlighting main activities and projects. The results of an original online survey of start-ups providing DLT-based solutions in Italy is presented, illustrating sectorial focus and use cases. The report also provides detailed information about these start-ups, such as their financing, business processes, main clients and products (e.g. selected blockchain infrastructure, level of development) and the main barriers they face in doing business in Italy.

- The third and last part of the report aim at providing an overview of the policy framework and programmes at national and international level, which contribute in shaping the DLT industry in Italy, with a focus on its industrial applications rather than on the regulation of "crypto-assets". In particular, the report comments on the main regulatory choices and policies undertaken by the Italian government and financial authorities in recent years. The report focuses on the initiatives of the Italian institutions, while mentioning the relevant provisions at European or International level when necessary.

The report concludes with a set of actionable policy recommendations for the Italian government to support the diffusion of productive DLTs in the Italian business sector. These policy recommendations are based on the OECD analysis and on international experiences. The areas addressed by these recommendations are "education and awareness", "data for informed policy-making", "delivery of public services to SMEs through DLT infrastructures", "financing of innovative SMEs and start-ups" and "international cooperation".

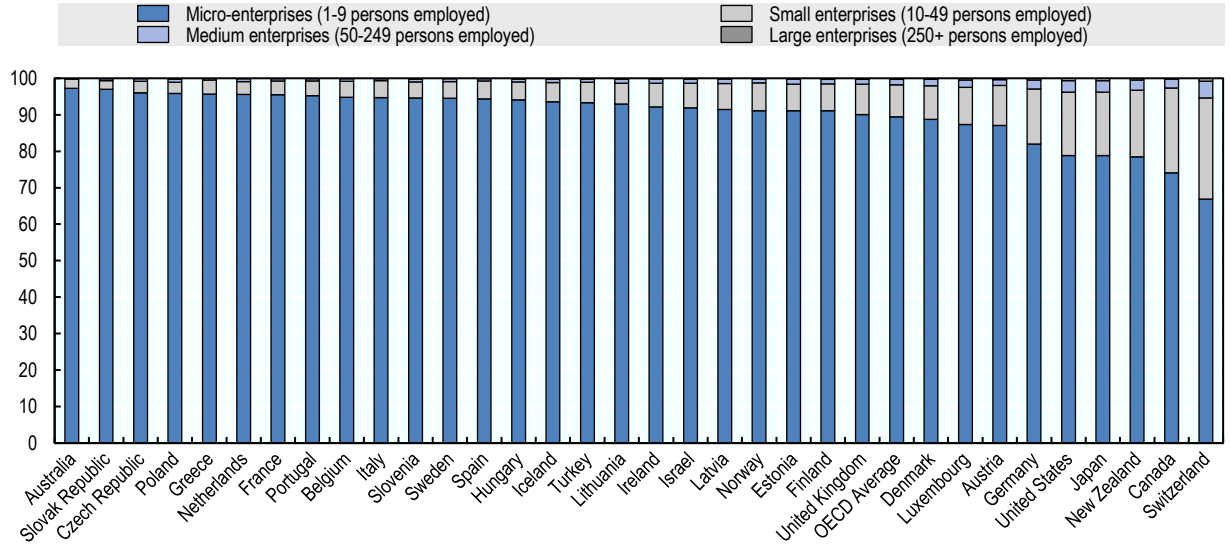
1 The entrepreneurial landscape in Italy

Structure of Italian MSME sector

Italian business sector is characterised by a very high number of SMEs, with a predominance of micro-enterprises and a relatively low share of medium enterprises. In Italy, small and medium-sized enterprises (SMEs) account for 99.9% of the total business (Figure 1). This share is second highest among the OECD countries, after Greece. Micro-enterprises, which employ between 1-9 persons, account for 94.7% of the businesses in the country, a share that has gradually decreased after reaching its peak in 2014. The business structure is relatively common across OECD countries, where the majority of the businesses in the economy employ less than 10 people. However, the proportion of both small and medium-sized companies in Italy is low compared to the OECD average. Small enterprises (with 10-49 employees) in Italy account for 4.7% of the businesses, which is about half of the OECD average (8.9%). With regards to medium-sized enterprises (with 50-249 employees), Italy has one of the lowest share (0.5%) among the OECD countries. This is about one percentage point less than the OECD average, which places Italy in a similar position with the Slovak Republic and Greece.

Figure 1. Number of enterprises by size in the business economy

Percentage of total number of enterprises, 2017 or latest available year



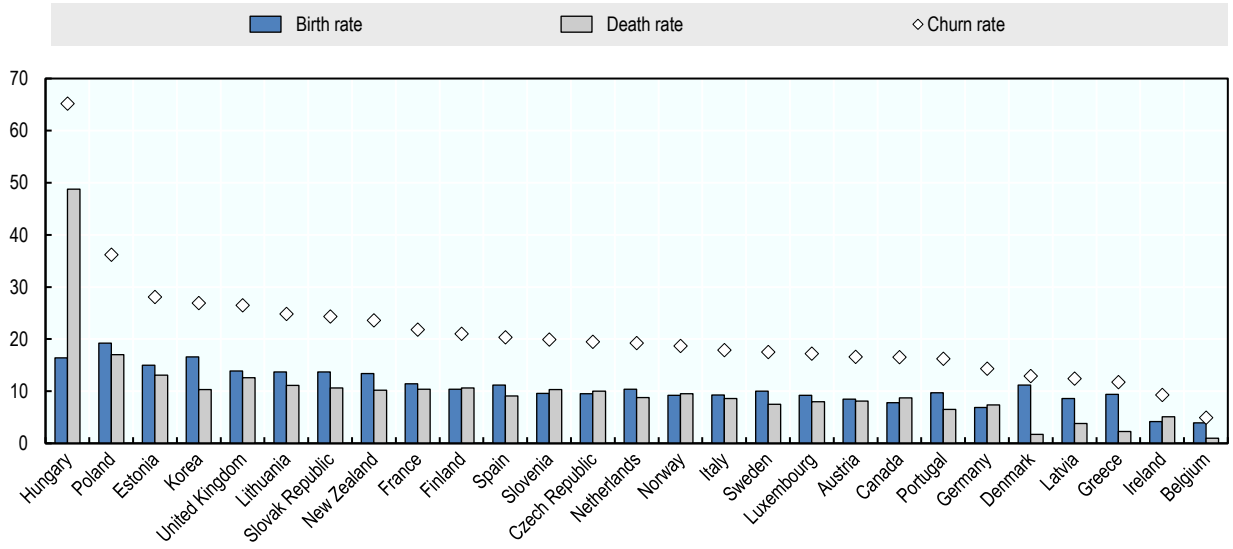
Note: In the OECD definition of "business economy", companies in financial and insurance activities are not included. Data for Israel refer to 2018, Denmark and Japan for 2016, and the United States and Canada for 2015.
Source: OECD Structural and Demographic Business Statistics (ISIC Rev. 4) (accessed March 2020).

The size of the SME population in Italy has been on decline. Between 2010 and 2017, the number of Italian SMEs has decreased by 4.0%. In the OECD area, Greece and Italy are the only two countries, which exhibited a shrinking SMEs population over this period. The declining number of businesses with less than 50 employees has been the main contributing factor to the trend, while the number of medium-sized businesses slightly increased during the period. However, the proportion of SMEs in the business economy has been relatively stable, due to the shrinking of overall business population since 2010.

Furthermore, new business creation has been limited, with a negative effect on net job creation. Birth rate of enterprises, which indicates new business entries compared to active businesses, is low among the OECD countries (Figure 2). Birth of new enterprises is an important indication of economic dynamism, as new enterprises are drivers of job creation and economic growth (OECD, 2019[1]; Calvino, Criscuolo and Menon, 2015[2]). There has been a steady increase in new firm creation in Italy for the past few years, but the level of new business entries in the economy is still below the pre-crisis level (OECD, 2019[3]). The number of bankruptcies remain higher than 2007 level despite the decline since 2014. In addition, churn rate[2], which provides a useful indicator of the dynamism of the business sector, is also low in Italy (17.9%) compared to the OECD average (20.9%).

Figure 2. Churn rate of employer enterprises

As a percentage of total enterprises, 2017 or latest available year



Note: Data for Poland, Korea, Slovak Republic and New Zealand refer to 2016, and Canada for 2014.
Source: OECD Structural and Demographic Business Statistics (ISIC Rev. 4) (accessed March 2020).

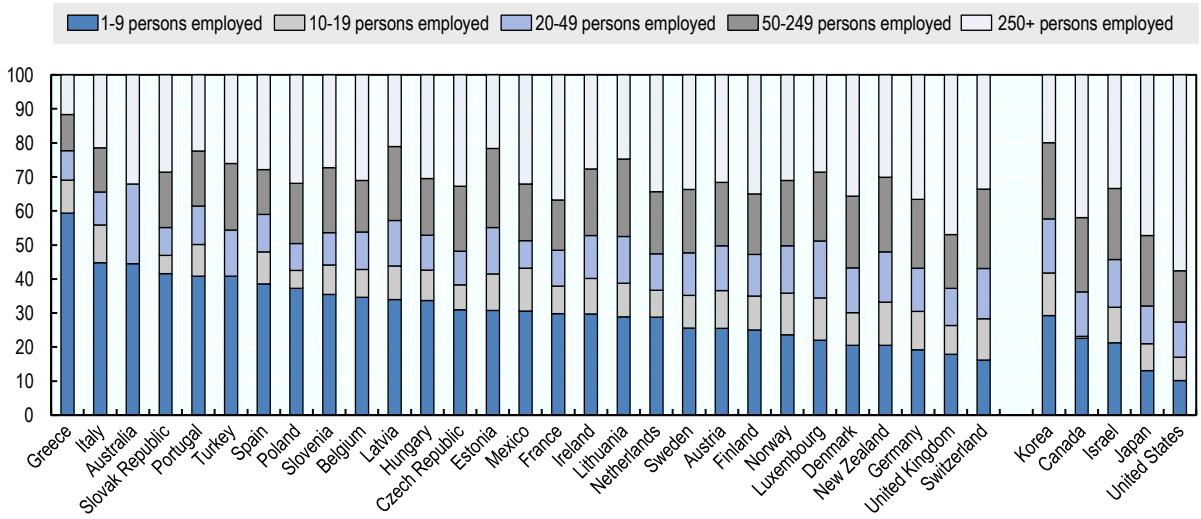
Employment is highly concentrated in micro-businesses. 78.6% of the persons employed in Italy are working in SMEs (Figure 3). The figure is relatively high compared to the OECD average of 70.2%. A deeper look at the statistic indicates signs of Italy's productivity problem. 44.8% of the total employment comes from micro-enterprises, which is significantly higher than employment by small and medium enterprises combined (33.8%). Large businesses employ an even lower share of workers, the remaining 21.4%. Share of micro-businesses' employment is large compared to France (29.8%), Germany (19.2%) and the United Kingdom (17.9%). Strong concentration of employment in micro-enterprises pose

2 The churn rate is the sums of the birth rate and the death rate of employer enterprises in the economy, following the definitions recommended by the Eurostat-OECD Manual on Business Demography Statistics (2008).

challenges regarding productivity, as these businesses tend to be less productive than larger ones (OECD, 2019[1]).

Figure 3. Employment by enterprise size, business economy

As a percentage of total employment, 2016 or latest available year

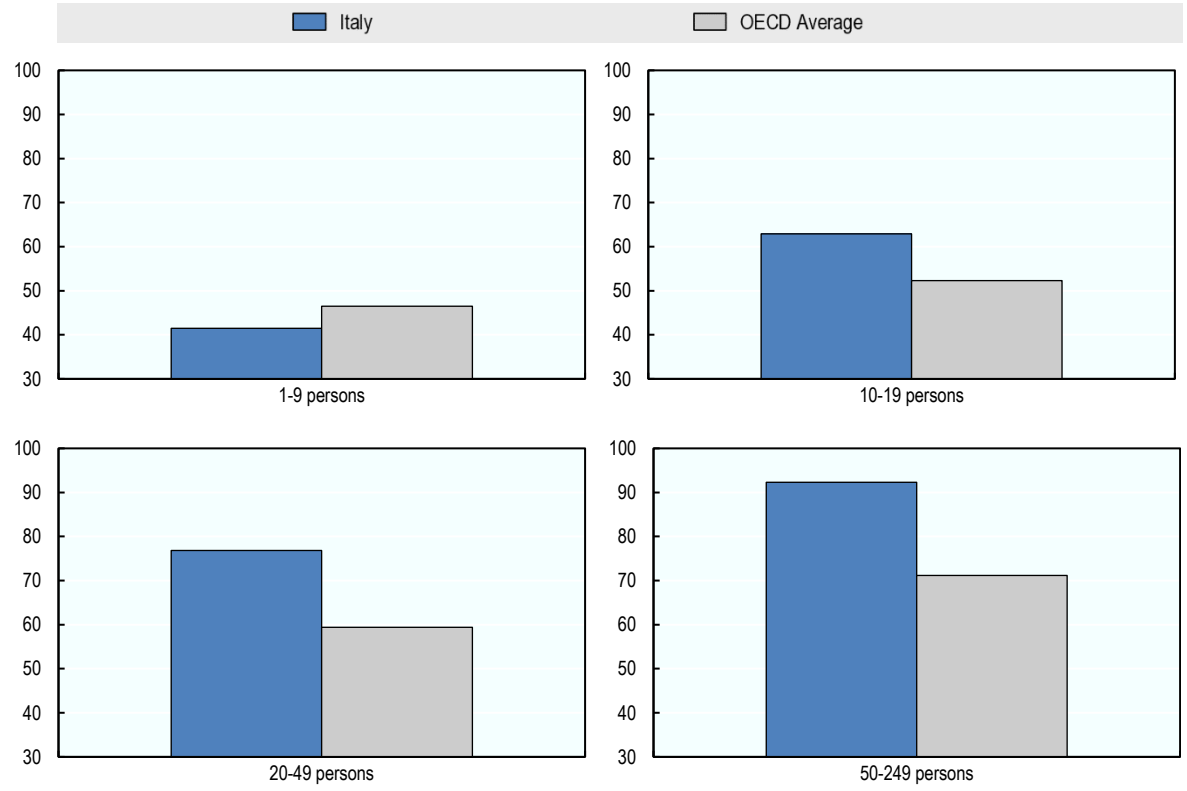


Note: Countries are grouped based on different employment measures, which are percentage of number of persons employed (left) and employees (right). For detailed information of data, refer to the source.
Source: OECD SME and Entrepreneurship Outlook 2019.

Italian small and medium-sized businesses are more productive than the OECD average. At the aggregate level, labour productivity of Italian firms show similar trend with other OECD countries, where companies in larger population brackets exhibit larger productivity (Figure 4). Interestingly, Italian SMEs, with exception of micro-businesses, show strong performance at the aggregate level when compared to the OECD average. Labour productivity of Italian small-sized and medium-sized firms has increased noticeably between 2010 and 2016. In case of medium-sized enterprises, the productivity level is 30% larger than the OECD average, and are on par with US businesses in sectors such as professional, scientific and technical activities, and even performing better than their US counterparts in wholesale and retail trade sector (OECD, 2019[1]).

Figure 4. Labour productivity by firm size, business economy

Value added per person employed, thousands of USD, current PPPs, 2016 or latest available year

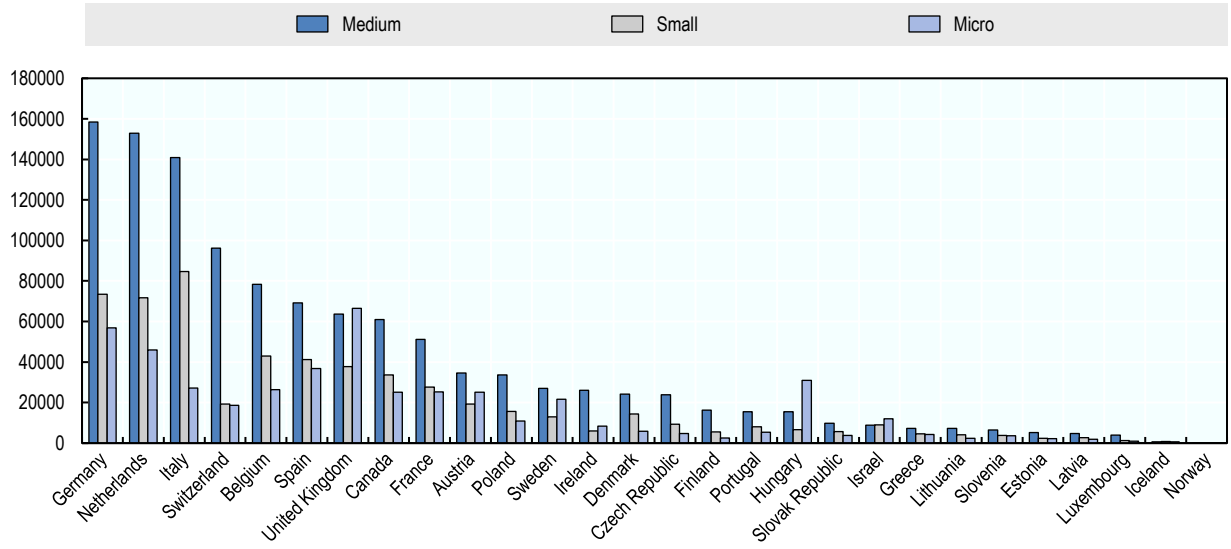


Note: Data for the United Kingdom exclude small unregistered businesses; these are businesses below the thresholds of the value-added tax regime and/or the "pay as you earn (PAYE)" (for employing firms) regime. For detailed information of data, refer to the source.
Source: OECD Compendium of Productivity Indicators 2019.

Furthermore, small and medium-sized businesses engage actively in export activities, which is a driver of growth for the Italian economy. Direct export activities by Italian SMEs in sectors including manufacturing contribute significantly to GDP (European Commission, 2019[4]). Furthermore, Italian SMEs that engage in export activities generate more value added than non-exporting SMEs. In 2017, Italian medium-sized businesses exported USD 140 948 million worth of goods and services, which is after Germany (USD 158 470 million) and the Netherlands (USD 152 871 million) in the OECD economies. The amount is noticeable when taking into account the size of the business population, as number of mid-sized businesses in Germany is three times larger than of Italy's. For small-sized businesses in Italy, the total export amount was USD 84 592, which was the largest in the OECD area, followed by Germany (USD 73 475 million) and the Netherlands (USD 71 722 million) (OECD, 2020[5]).

Figure 5. Exports by business size

Million USD, 2017

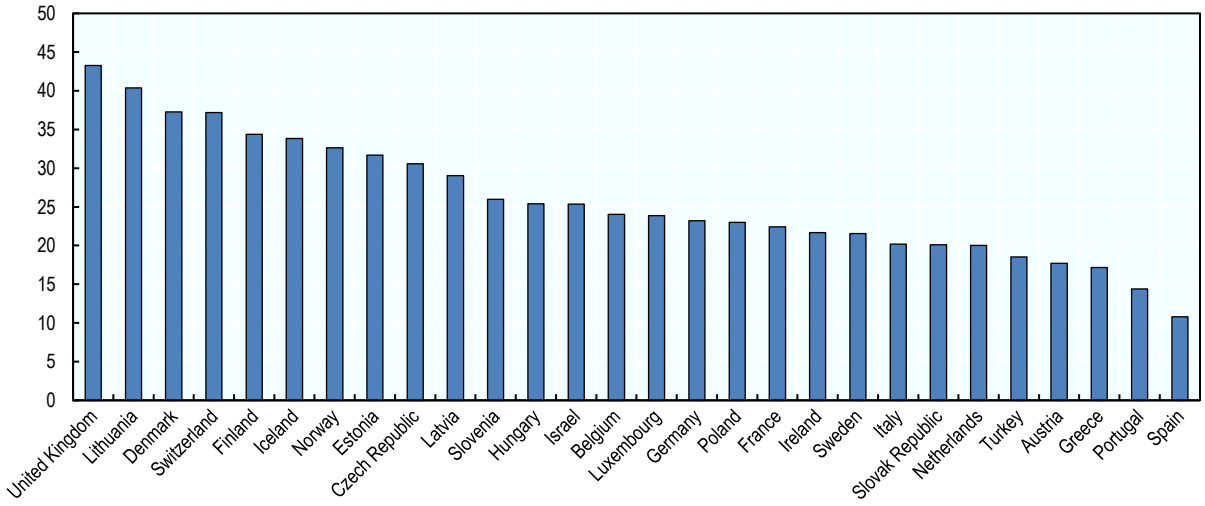


Source: OECD Exports by business size (indicator) (Accessed on March 2020).

On the other hand, micro-businesses suffer from low productivity. Despite productive small-sized and medium-sized businesses, their contribution to the economy is limited due to their small share in the business population and employment. Level of productivity differences between various firm size classes in Italy is larger compared to the OECD average. Italian micro-enterprises, which account for about a quarter of the national employment, fare below the OECD average by 10.8%. Low productivity of the micro-businesses, along with dearth of small and medium-sized firms suggest lack of economies of scale in Italy's business sector (OECD, 2014[6]). Low productivity also translates into lower labour compensation for the workforce (OECD, 2019[1]).

Figure 6. Percentage of jobs created by births in sectors with above-median productivity

As a share of all employment created by employer enterprise births, 2016 or latest available year

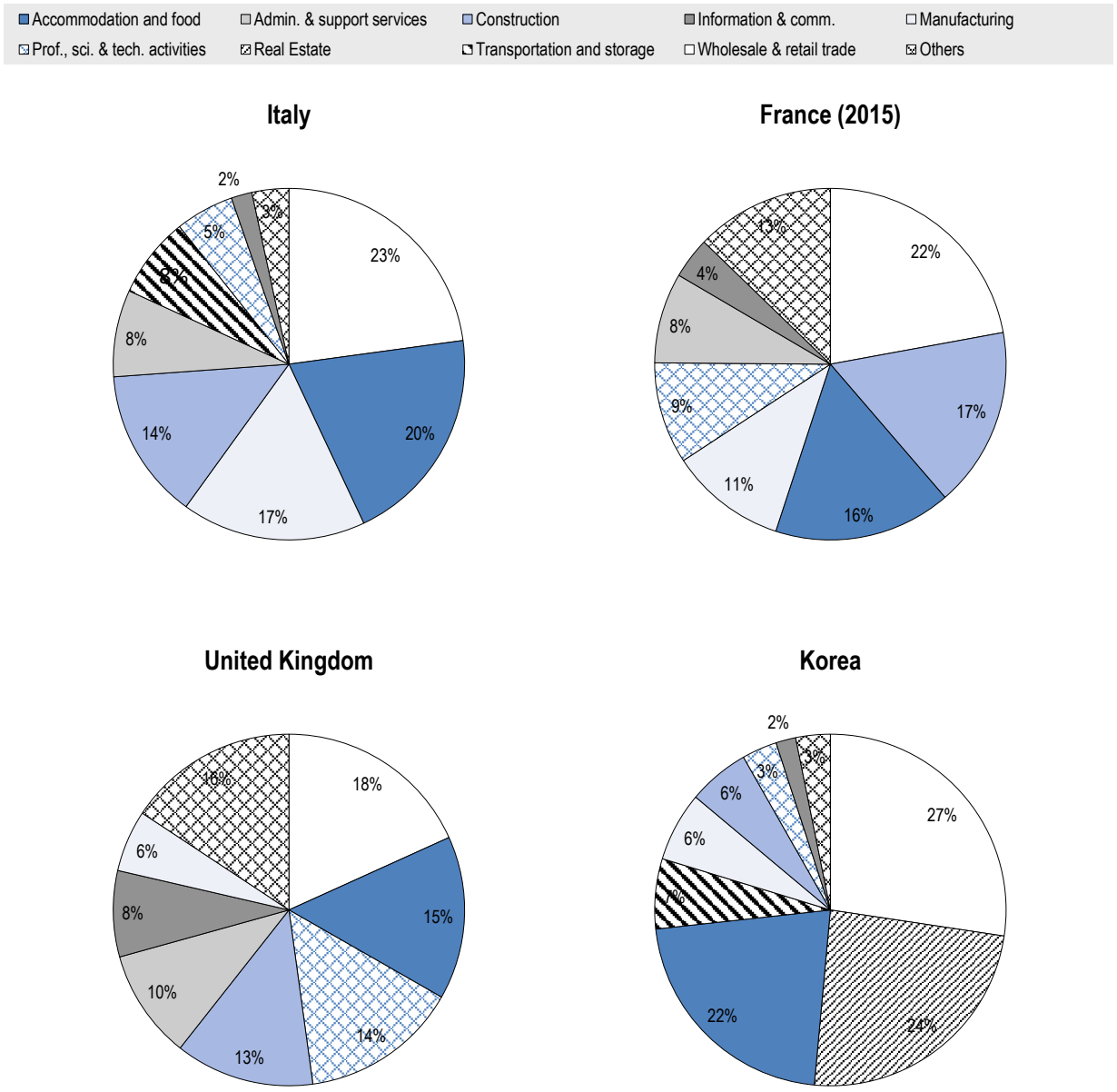


Note: Median productivity (value added per person employed) was calculated at the sectoral level (in ISIC REV.4: section-level and a selection of division-level manufacturing sectors) separately for each country and year. For detailed information of data, refer to the source.
Source: OECD SME and Entrepreneurship Outlook 2019.

Furthermore, a significant share of the new jobs in Italy are created in low productivity sectors. New business entries contribute to a significant part of the new jobs created in the economy (OECD, 2019[1]). However, large share of the newly created jobs in the OECD countries are mainly from below-median productivity sectors (Figure 6), with accommodation and food services, and construction as typical examples. In the case of Italy, job creation in the lower productivity sectors accounts for around 80% of new jobs from start-ups in 2016. As it can be observe from Figure 7, share of these sectors is especially large in Italy compared to other OECD countries with similar economy size. New jobs created in low productivity sectors include wholesale and retail trade (22.9%), accommodation and food services (20.1%), and construction (13.9%). Furthermore, job creation by new firms in high-productivity sectors, such as professional, scientific and technical activities and ICT services are limited, accounting for 5% and 2% of the job creation respectively.

Figure 7. Job creation by new enterprises, selected countries

Sector share in total job creation by new enterprises, 2016 or latest available year



Note: The figure compares Italy with other three OECD countries that are roughly similar in size in terms of GDP and population. For detailed information of data, refer to the source.
Source: OECD SME and Entrepreneurship Outlook 2019.

Digitalisation of SMEs in Italy

Digital technology offers SMEs an opportunity to enhance productivity and pursue innovative activities. Digital products enable small businesses to use their resources efficiently and organise their business process in a leaner way. Although adopting technology in a business requires time and effort, reduction of costs and wide diffusion of complementary technologies can make it affordable for smaller

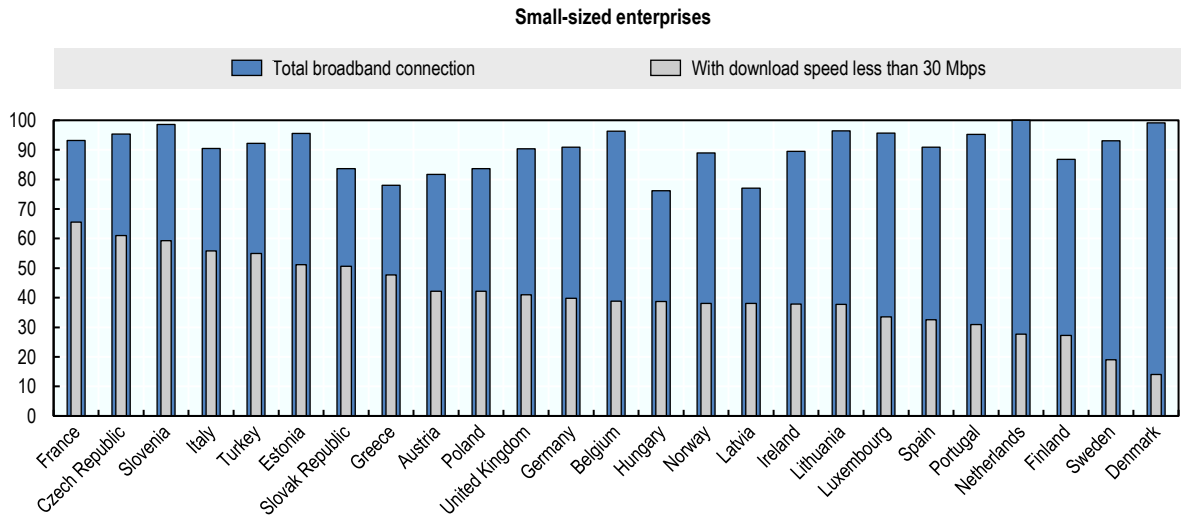
and more constrained businesses to adopt digitalisation process. With the use of digital-based products and systems, SMEs have the potential to overcome the barriers they currently face in scaling up and innovating (OECD, 2019[1]). However, the digital gap between large businesses and SMEs is increasing, which could further contribute to the widening of the productivity gap.

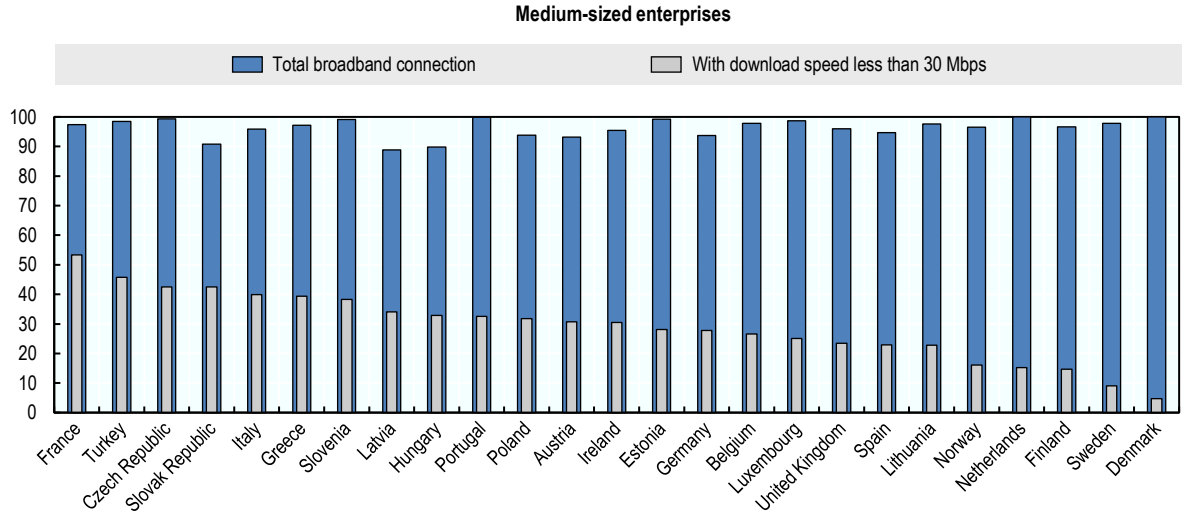
Access to digital infrastructure is a prerequisite for SMEs' digitalisation. Availability of such infrastructure paves the way for facilitated use of digital services and systems by small businesses. Firm-level and industry-level studies suggest positive effects of broadband connection on productivity (Sorbe et al., 2019[7]). While coverage is an important factor of measuring accessibility of digital infrastructure, speed, reliability and affordability also need to be taken into account when assessing overall accessibility of the infrastructure. High-speed internet connection, i.e. more than 100Mbit/s, is an important infrastructure for SMEs as it allows the small businesses to build digital capacity at lower cost and is critical to firms' adoption of digital technology (Akerman, Gaarder and Mogstad, 2015[8]; Andrews, Nicoletti and Timiliotis, 2018[9]; Banca d'Italia, 2018[10])

Almost all Italian SMEs have access to the internet, but a very large share have a relatively low-speed connection. Despite 97.6% of Italian businesses being connected to the global network, some firms are not able to benefit fully from the connection. More than half (53.7%) of Italian firms have internet connection with less than 30 Mbps (i.e. 3.75 MB/s) of download speed, which is also referred to as "basic" broadband (European Commission, 2010[11]). The percentage of small and medium-sized businesses with low-speed internet connection is high among the OECD countries (Figure 8). Especially, there is a large share of small-sized enterprises equipped with low-speed connection, where 55.9% of the businesses have access to basic broadband.

Figure 8. Small and medium-sized enterprises with broadband connections, by speed

As a percentage of enterprises in each employment size class, 2019



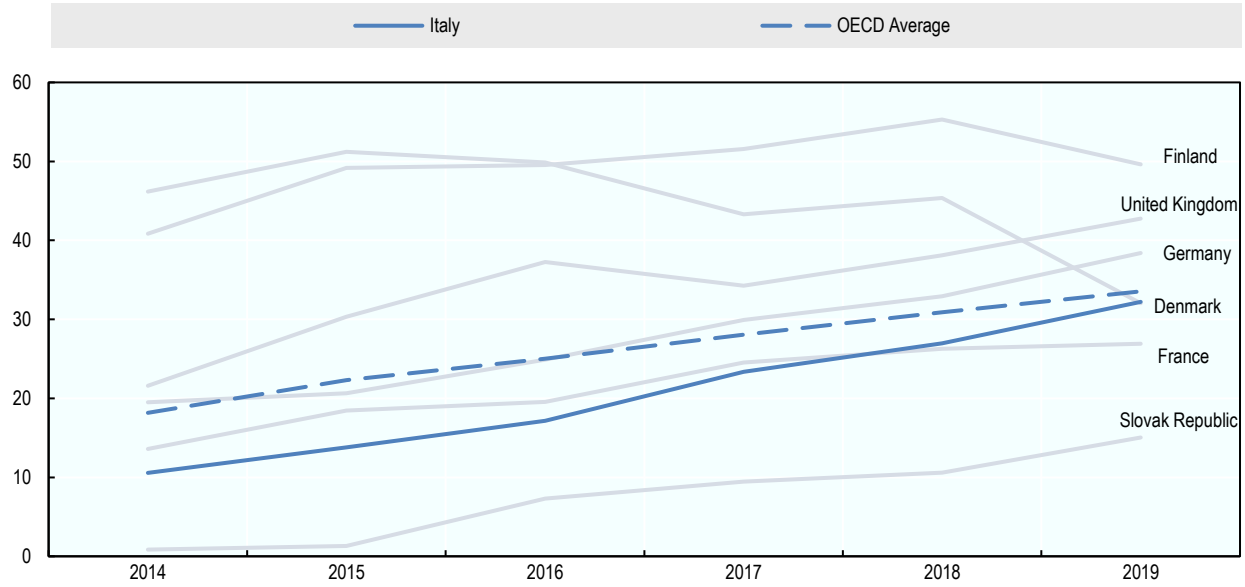


Note: Data for Portugal refer to 2017.
Source: OECD ICT Access and Usage by Businesses (accessed March 2020).

Although high-speed broadband penetration gap between small and large firms in Italy is lower than the OECD average, the spread is widening. As in most OECD countries, Italian SMEs face a growing digital gap in access to high-speed internet in comparison to large firms (Figure 9). The spread between small and large firms reached 32.3%, which is slightly lower than the OECD average of 33.6% in 2019. However, adoption rate of high-speed internet across the business population, including large companies, is among the lowest in the OECD area. In 2019, the share of Italian businesses with access to broadband speed of more than 100 Mbit/s was just above 10% (12.6%), while the OECD average reached 26.6% (OECD, 2020[12]). In case of large companies, diffusion rate is at 42.9%, 13.8% lower than the OECD average. For small-sized and medium-sized enterprises, the adoption rate is 23.6% and 10.7% respectively, with the OECD average at 38.1% and 23.5% respectively.

Figure 9. Difference in high-speed fixed broadband penetration rates between small and large firms

As a percentage of enterprises in each employment size class, 2014 – 2019



Note: High-speed fixed broadband penetration rate is the percentage of businesses with a broadband download speed of at least 100Mbit/s.
Source: OECD ICT Access and Usage by Businesses (accessed March 2020).

Geographic disparity in access to broadband connection between urban and rural areas is an important factor. A study by the European Court of Auditors (2018[13]) presents the differences in quality of internet connection between urban and rural areas. Since the European Commission's adoption of Europe 2020 strategy in 2010, the Italian government has made efforts to improve the country's 30 Mbps broadband coverage to achieve Europe 2020 broadband objectives. While around 80% of the population is covered by fast broadband, coverage in rural area drops to around 40%, which is one of the largest gap coverage in the EU. At the regional level, only three provinces, including Milan, present 100% fast internet coverage, whereas the coverage rate is below 35% in most of other provinces (Figure 10). Although this is based on population coverage, the figure suggests that businesses in rural area could also have limited access to fast internet relative to urban areas, missing the economic benefit of digitalisation.

The Ultra Broadband Strategy (Strategia per la Banda Ultra Larga - BUL), adopted in 2015, has significantly increased the efforts made by the Italian government to expand the coverage of the Ultra Broadband thus reducing the existing infrastructure and market gap. Public intervention in this area is deemed necessary to regulate economic, social and geographical inequalities, fostering social and territorial cohesion through access to high-speed connection. The implementation of the strategy is entrusted to Infratel Italia, an in-house company of the Ministry of Economic Development (MiSE). The first implementation phase of the Strategy concerns the market failure areas (the so called "white areas") across the country. So far, about 2 770 municipalities have been reached, which is 41% of the overall target. The evolution of this trend is constantly monitored by the Committee for Ultra Broadband spread (Comitato

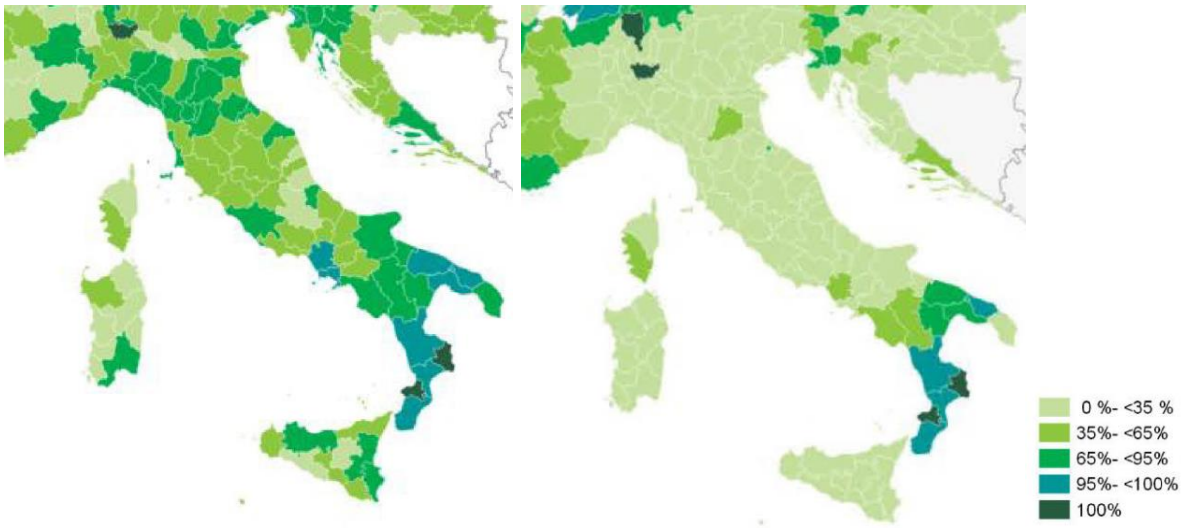
Banda Ultra Larga - CoBUL) through a dashboard. The data[3] is extracted from the Geo4wip platform, an operating IT tool shared between Infratel and Open Fiber[4], and updated twice a day.

The CoBUL has also recently adopted the "Plan for Schools" that will allow public high and middle schools to be connected through the 1 Gbps fibre-optic broadband and use distance learning to face the COVID-19 emergency. A similar intervention will focus on primary and childhood schools located in the so-called "white areas". The Plan is expected to mobilize EUR 400 million over the next two years and will be jointly managed by the Ministry of Education, the MiSE, Infratel Italia and local IT companies.

From September 2020, additional EUR 1 146 million will be released in the form of vouchers to be allocated to families and businesses, depending on their income brackets as a response to increased connectivity needs. Through these vouchers, the beneficiaries will be able to purchase connectivity services, useful to support distance learning of both students and teachers and agile work of workers and businesses. This project will be managed by Infratel Italia.

Figure 10. 30Mbps Coverage Map of Italy

Overall broadband coverage over 30Mbps (left) and overall rural broadband coverage over 30Mbps (right), 2016



Source: (European Court of Auditors, 2018[13]).

Across OECD countries, Italy scores in the top four for private sector ICT spending. Investment in digital technology is crucial at the firm level, as it supports firm productivity (OECD, 2019[14]). In 2016, the Italian business sector invested 17% of Non-residential Gross Fixed Capital Formation (GFCF)[5] on purchasing ICT goods and services, which was more than the average share of spending across the OECD economies (14.8%) (OECD, 2019[15]). In absolute terms, as illustrated in Figure 11, Italian firms invested

3 For example, indicators included are: "Advancement by municipality", "Advancement by housing unit", "Municipal details", "Municipalities with construction sites open by region", "Plan making infrastructures available to operators", "State permits for construction sites", "Plan for housing unit FTTH / FWA".

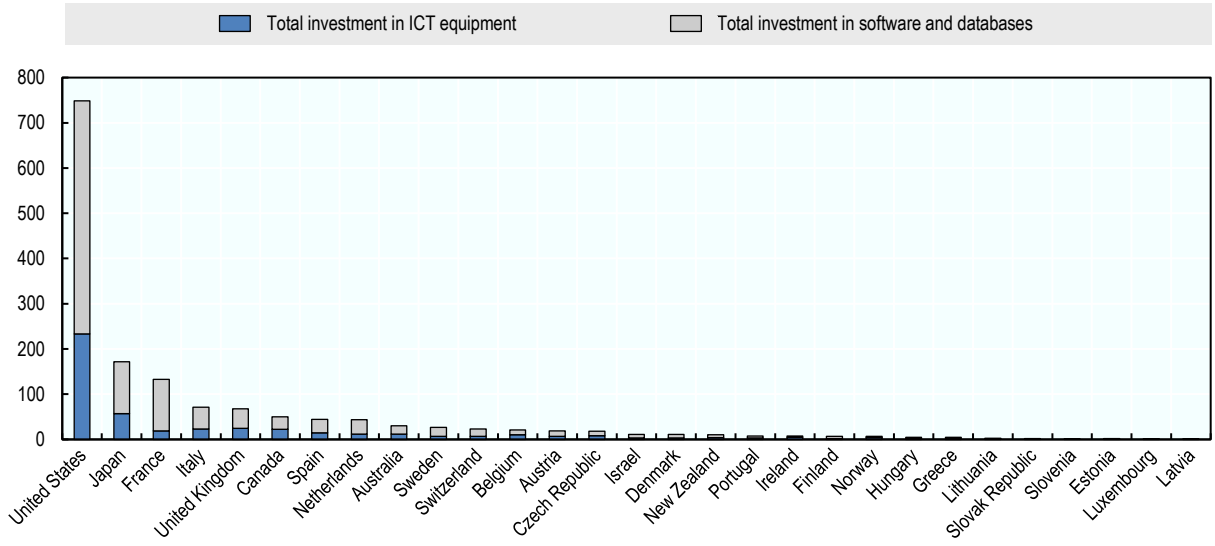
4 Open Fiber is a wholesale-only operator on the Italian network infrastructures market, founded to develop an Ultra Broadband (UBB) network entirely in FTTH (Fibre To The Home) optical fibre in all Italian regions.

5 Gross Fixed Capital Formation (GFCF) indicates acquisition of physical or intangible assets (whether new or second-hand) including the creation of assets by producers for their own use, minus any sales or disposals of such assets.

USD 71 billion, which was the fourth largest expenditure among the OECD economies, after the United States (USD 748.4 billion), Japan (USD 171.5 billion) and France (USD 132.5 billion). Break down of the figure shows that the investment was more weighted towards software and database than hardware, with 70% of the ICT investment spent on acquisition of services.

Figure 11. Investment in ICT equipment, software, and database

Total economy, USD billion, 2016



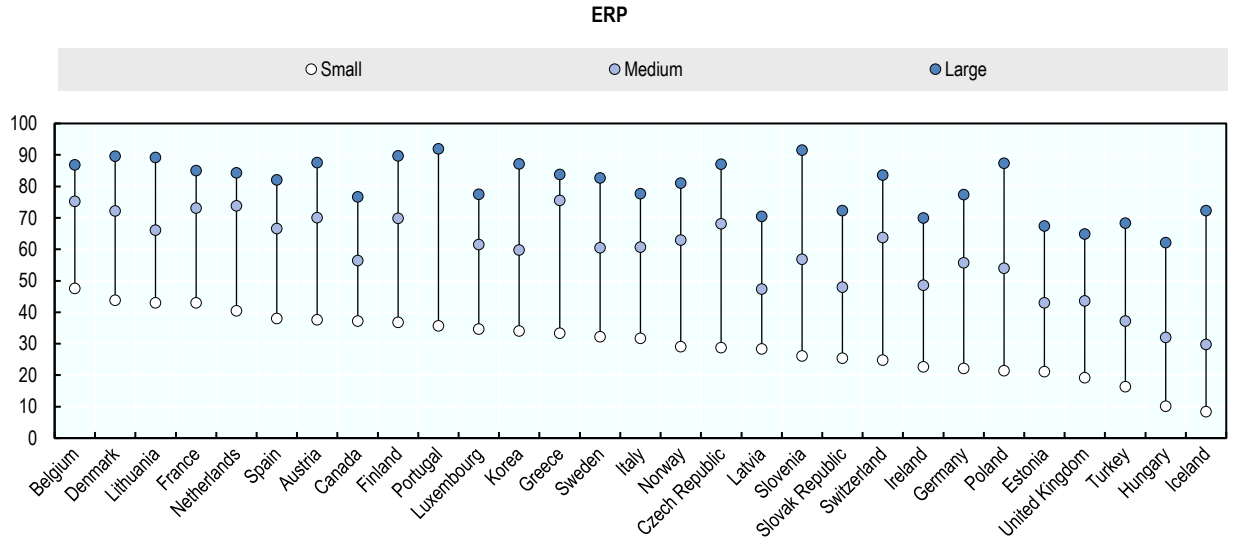
Source: Authors' calculation based on OECD Investment (GFCF) indicator (accessed February 2020) and OECD Measuring the Digital Transformation 2019.

The share of firms investing in advanced technologies is growing. Bank of Italy's "Survey of Industrial and Service Firms" shows that 20% of Italian firms in 2018 (up from 15% in 2017) benefited from the hyper-amortization measure, which is part of the national "Industry 4.0 Plan (Impresa 4.0)" to support investments in advanced technologies. The use of such instrument increased with firm size and was more widespread among manufacturing firms, in particular in the chemical and pharmaceutical sector. The share of firms that reported investment in advanced technology grew as well from 38% to 44%, even though for around half of these firms the investments accounted for 5% or less of their total investment. In addition, investment in digital technologies has been estimated to account for around 15% of the total investments (Banca d'Italia, 2019[16]).

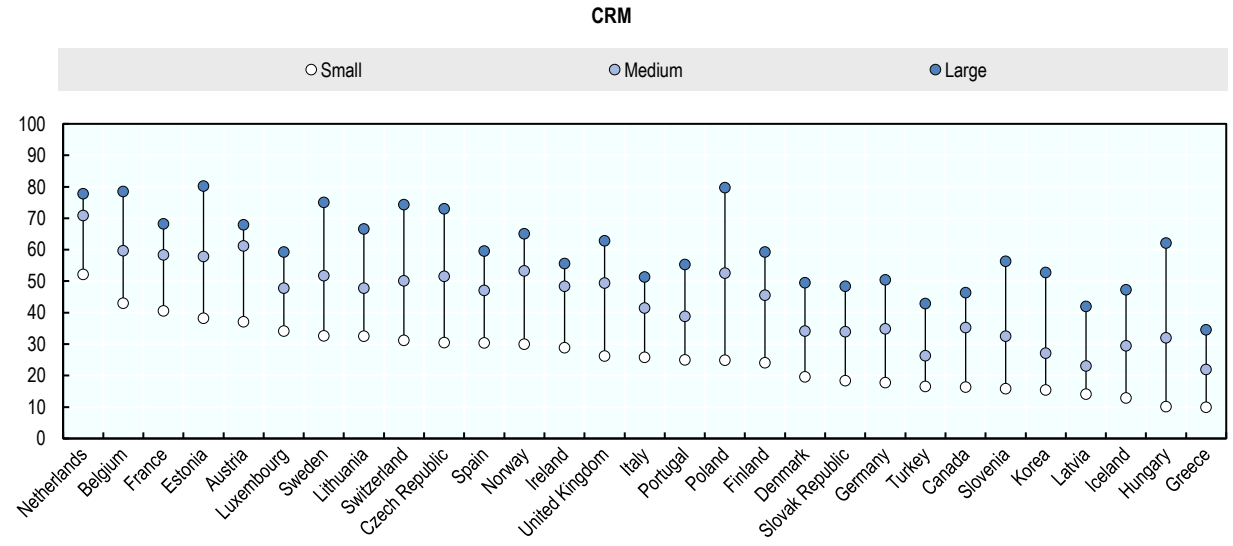
Italian enterprises are on par with the OECD average in integrating business-related ICT tools in their processes. Enterprise resource planning (ERP) and customer relationship management (CRM) software are two types of ICT tools that help businesses streamline their organisational processes. While the former is used for overseeing and managing back-office activities, the latter provides insights on sales related activities. The business intelligence software serves as basis for acquiring and maintaining structured data, which is essential in conducting data analytics (Bianchini and Michalkova, 2019[17]). Level of overall adoption of the aforementioned tools in Italian firms is similar to the OECD average (Figure 12). In case of the diffusion gap between large and small-sized businesses in using ERP, the spread in Italy (46.0%) is lower than the OECD average (50.2%). The figure is smaller than Germany (55.2%) and Korea (53.1%), but higher than that of France (42.0%) and United Kingdom (45.7%). While diffusion gap of CRM software is moderate than ERP software adoption across the OECD economies, the spread between large and small firms in Italy (25.6%) is among the lowest, just behind Greece (24.6%) and Luxembourg (25.1%).

Figure 12. Businesses using ERP and CRM software

As a percentage of enterprises with ten or more persons employed, 2019 or latest year available



Note: Medium-sized business data for Portugal not available.



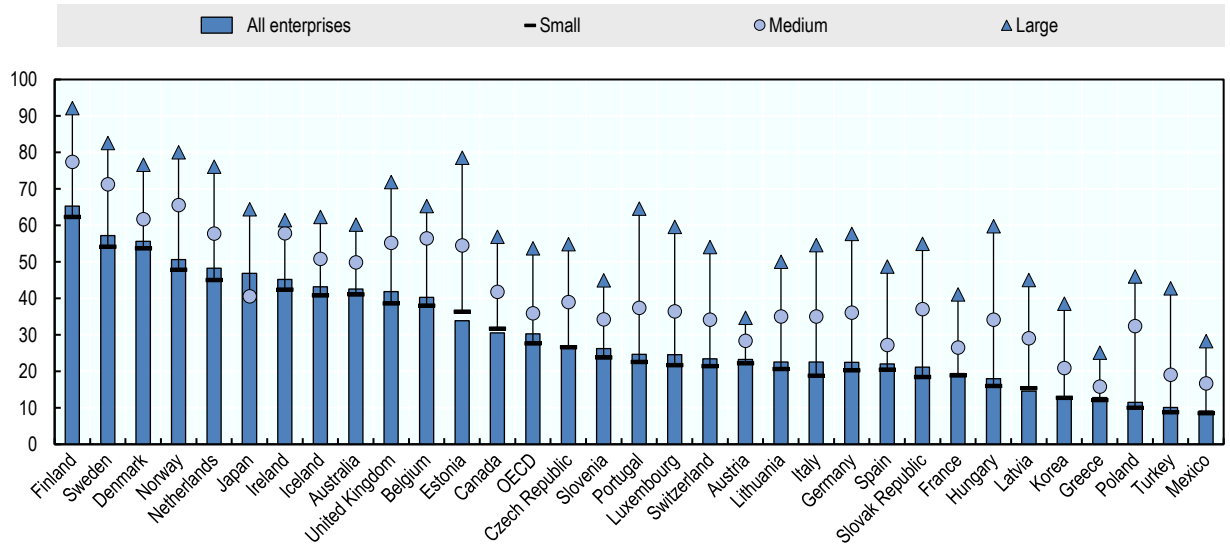
Source: OECD ICT Access and Usage by Businesses (Accessed March 2020).

Internet-based ICT services and systems present SMEs with new opportunities in overcoming size-related constraints. Cloud computing is a notable example of digital service that also serves as a basis for adoption of other digital technologies including software as a service (SaaS). Through integration of cloud computing, companies could benefit from the flexible use of its ICT resources, as storage capacity and computing process offered by service providers can be scaled up or down based on the organisational demand. With no need for upfront investment in hardware and regular investment on maintenance, SMEs are able to utilise same functions with low ICT expenses. In other words, uptake of the technology is strongly associated with reduced investment on ICT equipment (OECD, 2019[1]).

However, adoption of cloud computing by Italian businesses is lower than the OECD average. Despite the benefits of the digital service, adoption of cloud computing is low among Italian firms (Figure 13). While being slightly ahead of Germany and France, with about one fifth of the enterprises using cloud computing services, the figure is lower than the OECD average of 30%. Although enterprises in smaller business size class are less likely to adopt technology in general, the gap between large enterprises and small-sized enterprises in adopting cloud computing is relatively high in Italy. While the spread is 26.1% at the OECD level, it is 35.8% in Italy. The gap is slightly lower than in Germany (37.3%), but higher than in France (7.6%). The positive relationship between the connection rate and the use of the technology can be seen in companies in various size classes, from small to large (OECD, 2019[1]). This further suggests that low penetration of high-speed internet could be a contributing factor to Italy's low adoption rate, as internet-based ICT services and systems require both reliable and fast internet connection.

Figure 13. Enterprises purchasing cloud computing services, by size

As a percentage of enterprises in each employment size class, 2018

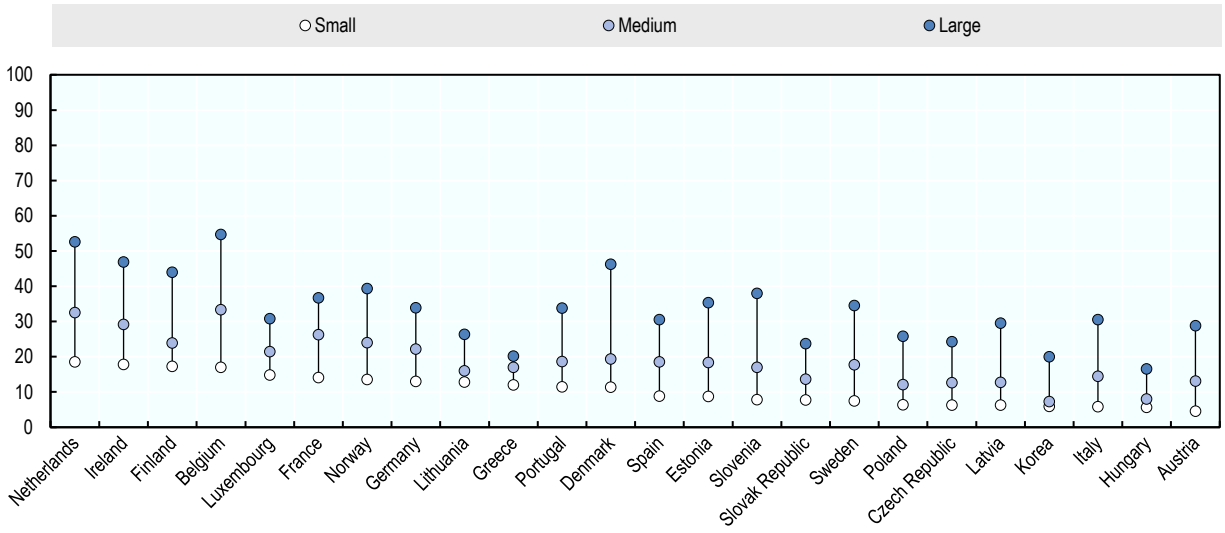


Note: Small-sized business data for Japan not available.
Source: OECD Measuring the Digital Transformation 2019.

In addition, Italian enterprises lag behind in exploring the potential of big data. Data analytics provide businesses a basis for making data-driven decisions. Studies show a positive relationship between the use of data analytics and labour productivity, with productivity level of firms integrating data analysis increasing at a faster rate than non-user firms (OECD, 2015[18]). In case of big data analysis, i.e. examining large sets of data to derive information, SMEs are increasingly outsourcing the process as they face limitations in conducting in-house analysis. For example, SMEs have the option to outsource the data analysis process to specialised companies via cloud-based services (Bianchini and Michalkova, 2019[17]). Cloud service providers offer storage and computing capacities needed in processing the data and conducting complex modelling. However, Italian firms are one of the least likely in the OECD economy to utilise such process within their business procedure, with less than 10% of the businesses having experience in big data analytics (Figure 14).

Figure 14. Businesses having performed big data analysis

As a percentage of enterprises with ten or more persons employed, 2018 or latest year available

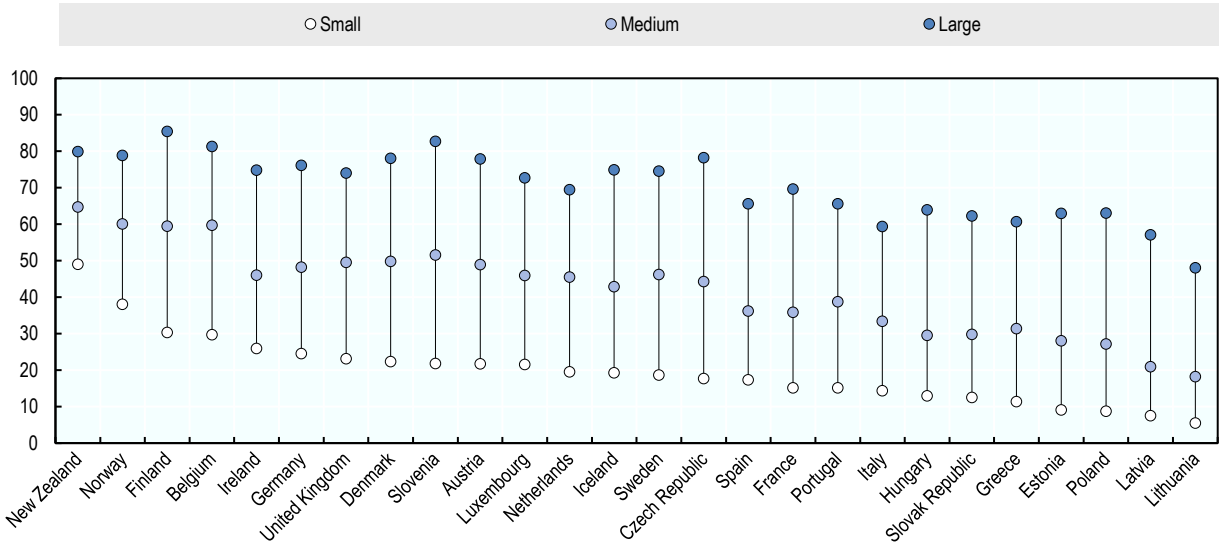


Source: ICT Access and Usage by Businesses (accessed March 2020).

Italian businesses are among the lowest in providing ICT training. Digitalisation of business requires more than simple adoption of digital solutions. Digital readiness of the employees is also an important pillar when addressing SME digitalisation as it indicates effective use of technology. Positive correlation can be observed between the offering of training on ICT skills and adoption of digital technology in a business (OECD, 2019[1]). Italy is one of the OECD economies where relatively large share of individuals experience lack of digital skills needed for their duties (OECD, 2019[15]). Despite the necessity of upskilling employees' ICT related capabilities, Italian enterprises fall short of the OECD average in providing training (Figure 15). Although the training gap between large and small enterprises is lower than most of the OECD countries, including the United Kingdom and France, this is due to relatively low rate of firms participating in ICT training across all business size classes, from small businesses to large enterprises.

Figure 15. Businesses providing ICT training to their employees

As a percentage of enterprises in each employment size class, 2018



Note: Data refer to businesses with 10 or more employees that provided any type of training to develop the ICT related skills of their employees within the last 12 months. Data for New Zealand refer to 2016 and Iceland to 2014. Data for medium-sized firms in Portugal refer to 2017.
Source: OECD SME and Entrepreneurship Outlook 2019.

Recent policies to support SME digitalisation

Efforts in supporting digitalisation of businesses in Italy has mainly been led by the MiSE. The policy measures come under the Ministry's broader "Industry 4.0 Plan", which is a four-year plan introduced in 2017. The plan aims to stimulate investment on R&D activities and development of new technologies. The plan focuses primarily on supporting integration of smart manufacturing practices, as a driver of SME growth in the manufacturing sector. According to the European Commission (2019[4]), the measure has resulted in an increase of SMEs' added value in the manufacturing sector, which accounts for 30.4% of the Italian SMEs' value added in the non-financial business economy. However, the supports provided are not limited to manufacturing sector, and the scope of digitalisation encompasses both investment in capital goods, intangible assets and processes, with policies conceived especially to guide and assist SMEs in pursuing digitalisation. In addition, the MiSE has set out Program Agreements with southern Italian regions in order to create positive synergies between national and regional funds in promoting digitalisation of the local SMEs.

Financing instruments are provided to foster SMEs' digitalisation and innovative activities. The MiSE, in cooperation with Cassa Depositi e Prestiti (CDP), an Italian investment bank and promotional institution for economic development, provides government guarantees to Italian SMEs for upgrading or expanding their digital capability. SMEs that plan to finance machinery purchases/leases or invest in capital goods, including digital hardware and software, can benefit from preferential interest rates and instalment up to 5-year period. The support is provided to ease SMEs' access to finance in most of the sectors, including agriculture and services sector. In addition, the Ministry plans to establish National Innovation Fund (NIF) with a budget of EUR 1 billion for start-ups, scale ups as well as SMEs in high-tech sector. NIF serves as a fund of funds, adopting a venture capital approach when investing in companies, with the aim to contribute in retaining talents and innovation assets. Moreover, the MiSE has introduced a scheme

called “Innovative Machinery (Macchinari innovative)”[6] to support technological, digital and green transition of the Italian SMEs. These measures focus in particular on southern regions in the country, to enable companies to purchase machineries and related software, which could help SMEs’ digital transition process and their shift towards more sustainable production. The scheme has been first introduced in 2018 and the next phase is planned to be open to SMEs in June 2020.

A voucher programme is in place to provide incentives for businesses to digitalise their processes. MiSE allocated EUR 95 million to be provided between 2019 and 2021 with aim to assist SMEs in receiving consultation on process innovation. The government supports a share of the expenses incurred from the consultancy activity, where the percentage, as well as maximum amount, varies by business size class. Micro and small businesses can receive 50% of the cost, or up to a maximum of EUR 40 000, whereas the share and maximum amount that medium enterprises can obtain equals to 30% and EUR 25 000 respectively. In order to benefit from the programme, SMEs are required to work with “innovation managers”, who are professionals identified by the MiSE, for more than 9 months. Modernisation of business processes includes application of technologies such as big data analysis, cloud computing and additive manufacturing.

In addition, technological hubs play a key role in digital knowledge transfer to SMEs. Digital Innovation Hubs (DIHs) and competence centres are being established to form a network that links companies with actors that can assist them in the digitalisation process. Eight competence centres were created within the “Industry 4.0” framework, through public-private partnerships. Each centre focuses on a field of technology, such as cyber security, robotics, and utility infrastructure. These competence centres are part of a broader European network of DIHs. The Hubs function as nexus between businesses and institutions that can assist firms, especially SMEs, in adopting digital technology. Italy has 37 of the Europe’s 322 fully operating DIHs, which is more than in Germany (29) and France (24). With its partners from both the regional and national level, these Hubs create networks and orchestrate actors in the network that encompass competence centres, science parks, investors, industry associations and start-up incubators. Businesses of all sizes, both in high-tech and non-high-tech sectors, can access the one-stop shop for digitalisation, and benefit from services such as market intelligence, advice on financing and consultation on technology testing and adoption.

In December 2019, the MiSE has launched the first “House of Emerging Technologies” to promote SME adoption of technologies including blockchain, Artificial Intelligence and IoT. These “Houses” are aimed at supporting start-ups’ R&D projects, where the technology developed could be transferred to traditional SMEs. The MiSE has designated the first “House” in Matera in December 2019. In March 2020, the ministry has dedicated additional EUR 25 million to launch a new open call to select additional locations of the “Houses” in municipalities where the 5G network is being rolled out (MiSE, 2020[19]; MiSE, 2019[20]).

[6] Ministerial Decree of 30 October 2018 and the new Ministerial Decree of 30 October 2019.

2 The Development of the blockchain ecosystem in Italy

Introduction

The large, diversified and export oriented Italian economy offers a conducive environment for the development, test and adoption of blockchain solutions in a variety of sectors. A large number of Italian SMEs are very active on international markets, accounting for 40% of the country's total export with USD 153 billion out of the total USD 379 billion in 2017 (OECD, 2020[5]). This peculiarity of the Italian business structure (see Chapter 1) opens a number of opportunities, as international trade is one of the most interesting areas of development of solutions based on Distributed Ledger Technologies (DLT).

Italian sectors in which the origin of products ("Made in Italy") carries an important market value can strongly benefit from the features of transparency, security and traceability offered by blockchain. SMEs compose the core of Italian industrial clusters (e.g. textiles, furniture, white goods, footwear) and other important export sectors as mechanics and agri-food (OECD, 2014[6]). Blockchain systems are inherently strong in ensuring optimal management of data provided by traditional quality assurance providers on provenance and quality of products, which could add significant value to production processes embedding this technology.

Innovative Italian SMEs are testing DLT solutions to serve these sectors, and some are starting to commercialise them. In this document, we do not dwell on explaining the technical features of DLTs[7]. It is sufficient to note that the technology derives from decades of evolution of cryptographic research and that created a decentralised, distributed system where information can be stored securely, transparently, and immutably. While the first known applications were in the area of crypto asset, new industrial applications are constantly emerging. In Italy for example, there is experimentation of the technology in ensuring that food products are cultivated in fields that are not overusing chemicals, or that meat is not sourced from intensive animal farming facilities, to ensure the quality of the final product.

Interesting innovations are being proposed as well in the financial, insurance and utility sectors. Large state-participated companies, financial institutions, associations and large Italian tech players are experimenting on distributed registries. Highly innovative experimentations are being carried out in Italy, for example by SIA (i.e. "SIAChain") or by the Italian Banking Association (ABI), which is building applications specific for the Italian market that are based on blockchain infrastructure offered by international market players (i.e. "Spunta Project"). In the utility sector, Enel has been experimenting different systems leveraging blockchain since 2016, although those results have not yet been convincing enough for large-scale implementation.

7 An ample literature is available on the topic. Some of the crucial papers can be found in note 12 to paragraph 69. For a simple explanation, consider (OECD, 2018[108]), and for comprehensive overviews for example (De Filippi and Wright, 2018[111]) or (Werbach, 2017[112]).

However, it is still too early to identify with certainty in which direction a possible Italian "Blockchain cluster" could evolve. The technology is still at a relatively early stage of development in non-financial applications. Its use in industrial projects is very limited at worldwide level as both large, medium and small providers of blockchain solutions compete to create, test and commercialise new applications that can outperform existing solutions. The "decentralised" industrial structure of Italy, with a high percentage of Small and Micro entrepreneurs in large, export-oriented, quality-focused industrial sectors, offers an interesting testing ground for the capabilities of DLTs.

Many challenges still need to be addressed both at a technical and at a regulatory level for the technology to be more widely used. The technology received an abnormal level of attention in the past due to the steep rise of price of cryptocurrencies and the consequent "bandwagon effect" at global level. However, the application of the technology outside of the domain of crypto-assets is proceeding slowly. In financial markets, innovation must go hand in hand with investor protection and the respect of KYC and AML rules. This is a challenge to the industry that regulators and market players are trying to tackle. In industry, business and in the public sector, developers, start-ups, large technological companies as well as public administrations at national and local level are launching pilot projects and experimentation to identify the most interesting applications. The proliferation of different DLT infrastructures and of projects with similar use cases based on different, non-interoperable platforms observed by researchers, might actually be detrimental to the long-term development of the "Internet of Value" that some experts see as the most important foreseeable development of the adoption of this technology at global level (Osservatorio Blockchain and Distributed Ledger POLIMI, 2020[21]).

Policy makers and regulators have been active to create balanced conditions for the development of DLTs, and government activity has accelerated in recent years. Regulators as Bank of Italy, CONSOB, and Tax Authority (Agenzia delle Entrate) have issued various official documents to clarify issues related to crypto-assets. Part of the objectives was also to align resolutions at European and international level with current laws and regulations in Italy. Their focus has been mostly on the crypto-assets policy area, while this paper focuses on the applications of DLTs in the real economy. In particular, on the strategic, long-term vision for the development of the sector that the MiSE has been developing since 2018, through multiple system-wide activities involving all stakeholders from the industry.

The potential of the blockchain industry in Italy

The Italian economy is characterised by a very large number of Small and Medium-sized enterprises in export-oriented industrial sectors that could benefit from DLT solutions. The share of employment in SMEs is above the OECD average in most sector, with more than 10% difference in important sectors such as manufacturing of furniture, food and beverages, machineries, chemicals, computers and electrical equipment (OECD, 2019[1]).

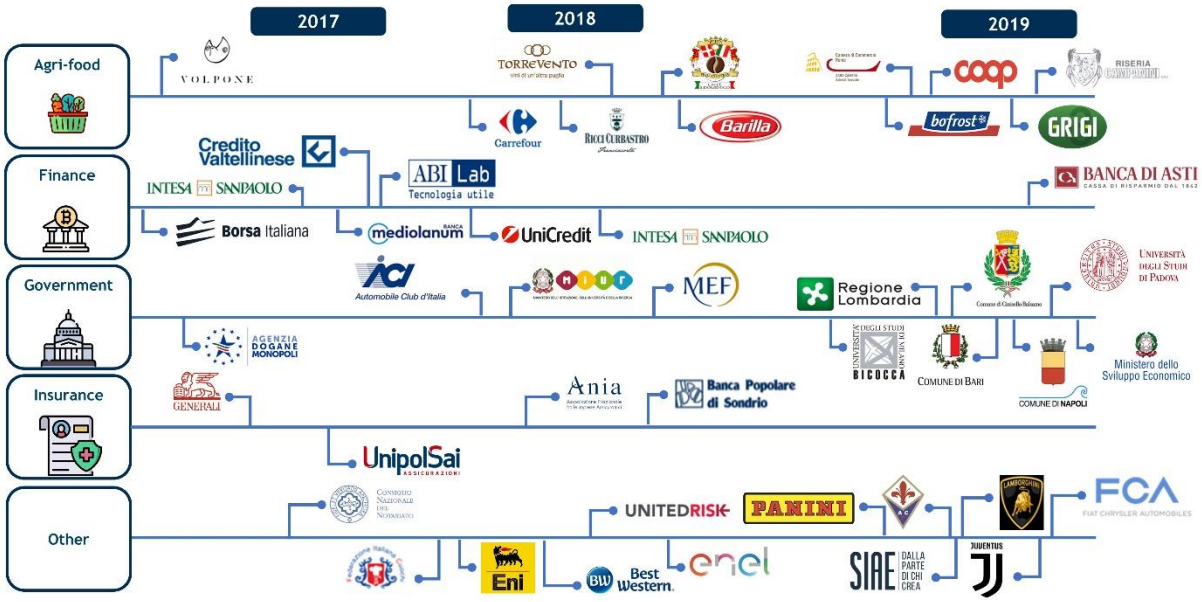
The adoption of digital technologies can improve firms' productivity, but it is a matter of capabilities and incentives. Evidence suggest that the uptake of digital technologies (e.g. cloud computing, front and back-office applications) in an industry is associated with productivity gains at firm level (Sorbe S., Gal P., Nicoletti G., 2019[22]). But policy makers should consider that diffusion is linked to SMEs' access to enabling physical infrastructures (e.g. high-speed broadband internet) as well as to functioning product, labour and financial market settings. In addition, managerial quality and worker skills have a strong effect on the rate of diffusion (Andrews, Nicoletti and Timiliotis, 2018[23]). Reflections on how policy could support Italian SMEs with traditional, non-digital business models to adopt solutions based on DLTs should take into account this evidence.

There are multiple DLT applications that are being developed but widespread applications in the business economy are still somewhat elusive, with many projects still in experimental phase. At the international level, there are projects to develop solutions in a multitude of functional areas from supply

chain management to privacy and security, from certification to identity management, from intellectual property to human resources management. In turn, these applications target clients in sectors spanning from healthcare to finance, from energy to education, from high-end manufacturing to public administrations (Casino, Dasaklis and Patsakis, 2019[24]). While this study focuses on innovative SMEs developing DLT based solutions, there have been many experiments by some of the largest and most important businesses in Italy in the agri-food, financial, insurance, and utility sector. These are beyond the scope of this paper, but Figure 16 offers a snapshot.

Figure 16. DLT experimentation by large firms in Italy

2017-2019



Source: (Politecnico di Milano, 2020[25]).

Supply chain management is a highly relevant case example for the application of blockchain solutions, and especially in connection with the Internet of Things (IoT). Documents and data stored in a blockchain are exchanged and tracked without the need to make electronic duplicates between the sender and the receiver, while ensuring immutability and transparency, hence trust. This makes the use of this technology in the supply chain particularly appealing. Some of the enabling elements of the use of IoT in supply chain management are RFID tags, Wireless Sensor Networks and data analysis platforms (Gubbi et al., 2013[26]). The high cost and the need of robust security standards for such IoT networks imply this is a very promising case for the application of decentralised peer-to-peer blockchain networks. Storing IoT devices configurations through cryptographic hashes, avoiding the reliance and risk of bottleneck-effects on single servers and the possibility to design Machine-to-Machine (M2M) communication messaging channels through automatic smart contracts all constitute interesting rationale for blockchain-based applications in supply chain management, which would also lower counterfeiting (Pournader et al., 2019[27]; Bahga and Madisetti, 2016[28]). One example is in the health sector, where the elimination of counterfeit medicine is a particularly important issue (Mackey and Nayyar, 2017[29]). In the United States, an open and decentralised blockchain network for the pharmaceutical supply chain is proposed by the Mediledger

project, which was also accepted as a pilot study for the Food and Drugs Administration (FDA) to meet the 2023 requirements of the Drug Supply Chain Security Act (DSCSA) (Mediledger, 2020[30]).

However, it would be difficult to point at a single DLT-based application that has already had a widespread impact on business practices worldwide. This is understandable as the technology is at an early stage of development and, differently from other technologies, it implies a fundamental architectural shift in the storing, access and management of core data for an organisation. This implies a cautious approach from stakeholders in the private and public sector before adopting such solutions at scale, which is confirmed by business leaders of large companies around the world. According to a 2019 survey, "Implementation (replacing or adapting existing legacy system)" (30%), "Regulatory issues" (30%), and "Potential security threats" (29%) are the main barriers to adoption of blockchain solutions. Interestingly though these percentages are lower than they were in 2018 (respectively 36%, 39% and 35%), pointing at an increased trust in the new technology (Deloitte, 2019[31]).

Many projects in Italy are targeting SMEs specifically, as transparency, traceability, security, immutability, timeliness and the possibility to cut middlemen are all features that can benefit them. Table 1 presents some examples of blockchain companies targeting specifically SMEs with their DLT solutions. Target sectors span from the biotech to agri-food sector, from the financial industry to manufacturing. Transversal use cases targeting multiple sectors include business administration and legal services. In economies with comparable economic structure like Germany, a recent public consultation has highlighted a similar focus on supply chain, streamlining business administration, intellectual property protection, but also logistics, mobility, and energy sector (BMWi, 2020).

DLT-solutions offer identifiable gains for SMEs in different parts of the business process and marketing practices, including for the "Made in Italy" market. The examples listed below (Table 1) show the added value for SMEs of specific applications across sectors and use cases. The enhanced traceability grants marketing advantages in offering consumers and clients access to production details and simplified quality control. For financial operations, the decentralisation and transparency of the technology increase the liquidity in the market for commercial invoices and can reduce the cost and time required for securing a loan. Another area of application of DLT solutions is copyright and authorship protection, where distributed, unmodifiable ledgers can offer sizeable benefits. A study on the topic has been elaborated and published in November 2019 by the MiSE in cooperation with IBM (see Section 3.3).

Table 1. Examples of SME-tailored blockchain solutions in Italy

Blockchain companies based in Italy

Company name	Description of service offering	Sector/use case	Rationale for use of blockchain	Added value for SMEs
Anticipay	Platform for exchanging short-term commercial invoice	Financial service	Decentralisation, transparency	Enhanced liquidity of commercial invoice with low-cost and simplified process
Bio Valore World	Certification of the use of patented biodegradable plastic	Biotech	Immutability, transparency	Consumers' possibility to verify use of biodegradable plastic in products
Brandzledger	Platform for supply chain tracking	Manufacturing	Immutability, transparency, traceability	Improved understanding of products' production process and enhanced traceability of products
EZ Lab	Platform for data management for farmers and companies in the food industry	Agri-food	Immutability, transparency, traceability	Facilitated certification process and consumers' simplified access to product details
Fluida	Platform for workforce management	Business administration	Immutability, security	Simplified HR administrative process

Foodchain	Platform for food product supply chain tracking	Agri-food	Immutability, transparency, traceability	Automated quality control of production process and easy quality verification for consumers
LoanXchain	Platform for secondary loan transaction	Financial service	Transparency, security	Reduced cost and time of loan transaction with enhanced market accessibility
Trakti	Platform for contract management	Business administration	Immutability, transparency	Enhanced accessibility and automated enforcement of contracts
Tutelio	Certification of intellectual property ownership for copyright protection	Legal service	Immutability, transparency	Simplified process of obtaining certificate of authorship and preventing copyright infringement

Note: The list presents some relevant examples to give a practical understanding of services targeted at SMEs, but it is not to be considered exhaustive.
Source: Authors' analysis.

Box 1. Agricultural product traceability through blockchain (1) – EZ Lab

Established in 2014 in Padua, EZ Lab provides an example of an Italian non-blockchain native start-up integrating blockchain to meet its business needs. The company began as a digital solution provider for farms, helping farmers digitalise their process. The initial area of business focus was on digitalising crop documentation, which was often done in paper with inaccurate information.

The start-up expanded its focus to supply chain of agricultural goods and developed an agricultural data platform called AgriOpenData, which incorporates blockchain technology. The platform is developed using Ethereum infrastructure, and is accessible for all actors in the supply chain to use. The platform also serves as a farm management platform for farmers, where they can input data concerning their agricultural produce.

Data is gathered from various data points both manually and automatically, with use of IoT sensors. Types of data collected include use of chemical treatment, weather condition and water resources that are closely related to measuring quality of agricultural produce. When certain conditions are met, certification is issued on the blockchain, which can be checked by all stakeholders. The platform provides a way for both industrial buyers and consumers to understand the quality of the product they are purchasing. Furthermore, farmers and producers could have better understanding of their product distribution and their end consumers through enhanced traceability.

EZ Lab has conducted more than 20 traceability projects on a wide arrange of agricultural products from wine to pumpkins. The company has also been working to use blockchain in enhancing business processes, such as machine maintenance. In 2018, the company recorded turnover of EUR 400 000 from its blockchain projects, which is noteworthy considering that the technology is relatively recent.

Source: OECD Interview, EZ Lab website (https://www.ezlab.it/).

Private investments and venture capital

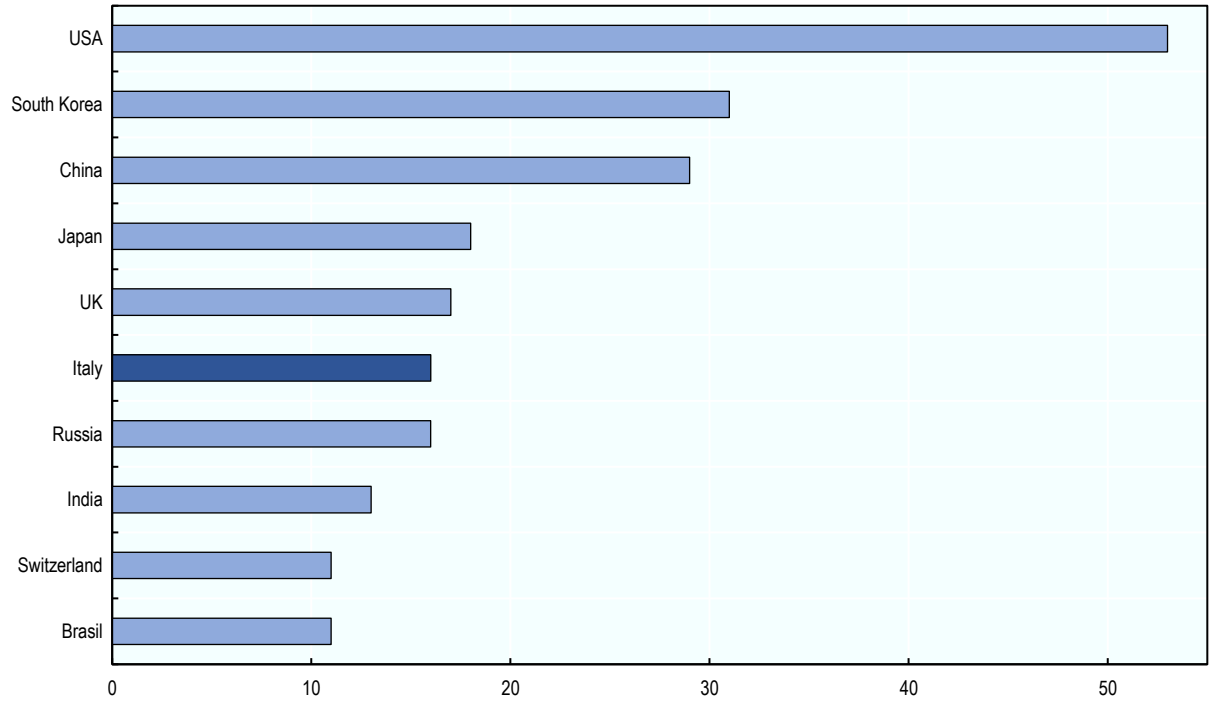
In Italy access to equity funding (venture capital - VC, early or late stage) is limited and among the lowest in the OECD as a share of GDP, but it is improving (OECD, 2019[1])**.** While it is true that the Italian VC market is one of the smallest as a share of GDP in OECD countries, when considering the last

five years the total amount on VC investments has more than doubled, from a total of USD 73 million in 2014 to USD 187 million in 2018[8] (OECD, 2020[32]). This feature of the Italian ecosystem constitutes a serious limitation for the development of blockchain projects, as most entrepreneurs have to rely on their own capital, which makes it challenging to achieve scale (see next section). Some Italian developers opt to headquarter their companies either across the border in Switzerland or in other countries where the VC market has higher capacity.

Italian companies have invested an estimated 30 million EUR in blockchain projects in 2019, up by 100% with respect to 2018. Financial and Insurance companies account for around 40% of the total and are increasingly focusing on systemic infrastructure accessible to all financial institutions (e.g. "Spunta" project). Applications in supply chain and product traceability account for another 30% of the total investments, and are often undertaken by SMEs in sectors such as agri-food and textile. In a recent estimate, Italy has been among the top 10 countries in the world for number of blockchain projects developed in 2019 (Figure 17). In total, researchers identified 488 blockchain projects at global level in 2019, a growth of 56% compared to 2018, which bring the total to 1 045 blockchain projects launched globally in the last four years. However, it should be noted that only 158 projects are being actually implemented, while the others have only been announced. Moreover, only 47 projects are currently in operation, with the majority still at an experimental or proof of concept stage (Osservatorio Blockchain and Distributed Ledger POLIMI, 2020[21]).

Figure 17. Italy is among the top 10 countries for blockchain projects in 2019

Total number of projects



Note: Considering a total of 215 implemented and/or announced new projects in 2019.
Source: (Politecnico di Milano, 2020[33]).

8 Total value including Seed, Start-ups and Later Stage venture financing.

The "Start-up Act" introduced in Italy in 2012 and its complementary instruments (e.g. "fast track" and "zero-cost incorporation", and simplified insolvency procedures) had a positive effect on innovative firms, but not on the funding available through VC investments. Counter-factual analysis shows that the policy led to increased revenues, value added and assets (10-15%) as well as an increased access to finance. However, descriptive evidence shows that while since the introduction of the Start-Up Act the number of VC deals involving young firms (5 years old or younger) has increased, no effect has been registered in the total funding amount (Menon et al., 2018[34]). Recent initiatives led by the MiSE to address this lack of development of the VC market in Italy will be discussed in the next chapter.

In Italy there are a few emerging VC funds that have decided to focus specifically on companies promoting the development of blockchain technology. While the VC market in Italy is relatively small, there are some funds that have decided to focus specifically on DLTs. As most of the applications of the technology are global by nature, such funds usually operate across Italy and other large markets to achieve scale[9] (e.g. the U.S., Germany).

ICOs and STOs

Initial Coin Offerings (ICOs) did not fill the funding gap, as the Italian ecosystem was not affected significantly by the 2017-2018 "ICO hype" and by subsequent ICOs. Evidence shows that 23 ICOs were launched by firms based in Italy, against 716 in the U.S., 582 in Singapore and 505 in the U.K., to cite the three countries at the top of the ranking worldwide. Moreover, funds gathered were very low, totalling only USD 7.6 million, against an estimated USD 7.3 billion in the U.S., USD 2.5 billion in Singapore and USD 1.5 billion in the U.K. In case of Switzerland, it hosted 263 ICOs that raised up to USD 1.8 billion (ICObench, 2020[35]).

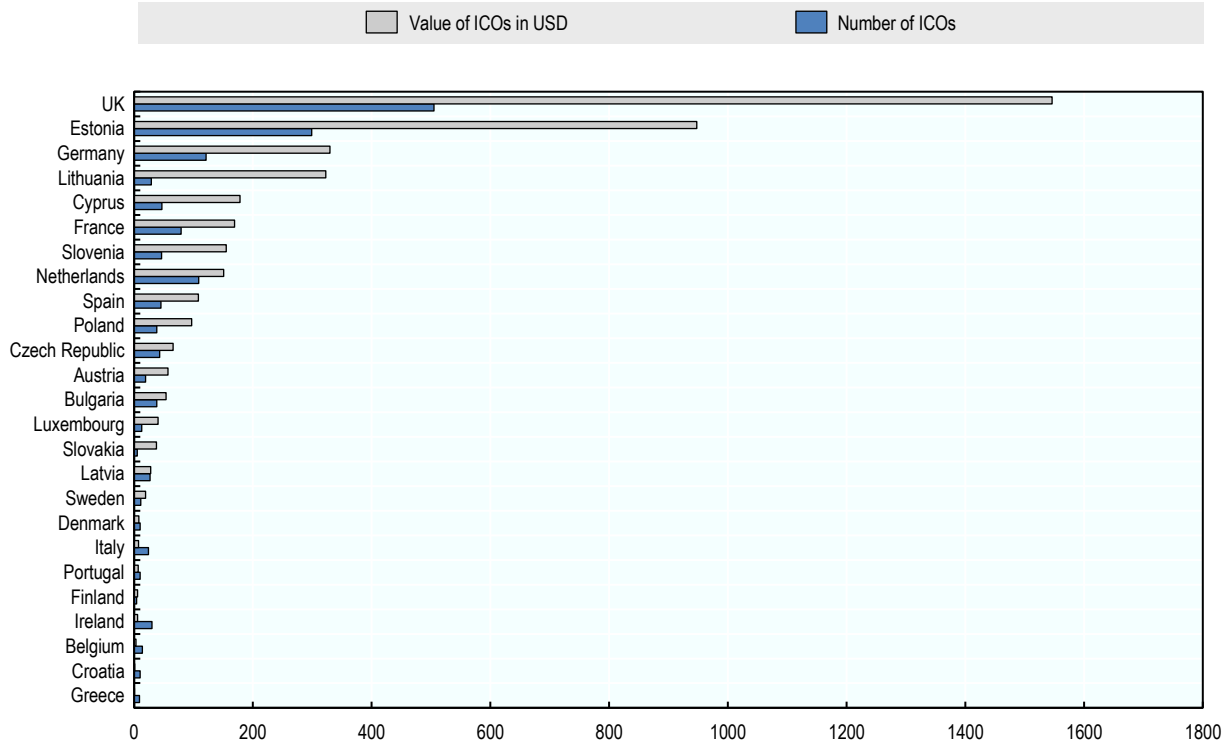
Italy had fewer ICOs and less capital raised than most comparable European countries. Other European economies showed a stronger activity than Italy and raised capital at a different scale. For example, in the EU, Spain had 45 ICOs raising a total of USD 108 million, France had 79 ICOs for USD 169 million and Germany recorded 121 ICOs for USD 330 million (Figure 18). Different regulations might have played a role, as between 2016 and 2018 there was not a common European regulatory framework for ICOs and crypto-assets[10].

9 An example of this type of specialised fund is Iconium, active since 2018.

10 The European Securities and Markets Authority (ESMA) has taken the lead in the area and is proposing a common EU-wide approach that would be shared by all National Competent Authorities, after consultation with them (ESMA, 2019[99]).

Figure 18. Number of ICOs in Europe and value in USD million

2016-2020



Note: Cyprus, Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".
Note by all European Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.
Source: (ICObench, 2020[35]).

The lack of ICOs in Italy is not only relevant for the missed financing opportunity but also for the lost potential networking effect. Platforms working on open source protocols need a strong community of developers and programmers to thrive, both for their contribution to the infrastructure and to create specific applications. This means that building a network of interested stakeholders around the idea is crucial for its success. Some projects have resorted to "airdrops"[11] exactly for this reason, even if also in this case the incentive structure might not be strong enough to ensure participation. The relatively low success of Italian ICOs might have also affected blockchain-based projects that would have needed the network effect provided by the distribution of hybrid tokens, offering both a financing channel and a use within the network (OECD, 2019[36]).

Some Italian entrepreneurs have launched ICOs outside of Italy. Most of these entrepreneurs were looking for more liquid markets that would allow them an easier access to capital. While there is no precise quantification of this phenomenon, anecdotal evidences give a sense of its importance. Four of the most

11 Free distribution of tokens issued through random allocation or based on specific criteria.

renowned ICOs of companies with Italian founders and managers were based in Switzerland[12] (Eidoo, Aidcoin and Friendz) and in the UK (Xriba) and were able to raise a bit more than USD 70 million, almost 10 times the total raised by ICOs based in Italy (Tresca, 2018[37]).

However, the ICO channel has not proven highly resilient, as the number and value of ICOs at global level are decreasing, making space for more regulated alternatives such as STOs (Security Token Offerings)[13]. STOs are similar to ICOs as in both cases the issuer provides investors with digital tokens. The difference is that with STOs the underlying tokens provide specific financial rights, being categorized as "securities" (e.g. stocks, bonds, dividends) and thus are fully regulated in most jurisdictions. This will also generally guarantee investor protection, KYC, AML standards and thus the possible participation of traditional financial players. While the number and value of ICOs dwindled by the end of 2018, the number of STOs rose: two pioneering STOs in 2017 raised USD 22 million, while in 2018 there were already 28 STOs raising USD 442 million and another USD 241 million were raised in the first 5 months of 2019 (PWC, 2019[38]). Market regulators in Europe and abroad are reacting to this rise, in the effort to attract the new market. In Switzerland, tax authorities have provided clarity in 2019 on how STOs will be treated in terms of taxations, with the recent BlockState's STOs ruled to be free from both profit tax and VAT, and subject only to security tax – an identical treatment to a standard capital raising. Germany's regulators also approved their first STO in 2019.

Italian SMEs could leverage STOs as a complementary channel to traditional VC, private equity and IPOs. Most STOs in the past two years were launched in the financial/real estate (62) and in IT sectors (28), but there were another 35 STOs launched for projects in sectors spanning from healthcare to e-commerce, from art to sports. It is interesting to see that most STOs chose Ethereum as the base protocol (94%). The tokens represented stocks in 75% of the cases, assets in 15% and debt in the remaining 10% (BlockState, 2020[39]). STOs could be appealing for SMEs as they have better cost efficiency as there is no need to rely on intermediaries when compared with traditional security issuance, and they also allow for a large participation beyond qualified investors, banks and brokerage firms, while ensuring legally binding investor rights. An interesting STO was conducted in Italy by two real estate operators, who issued equity tokens of an investment vehicle (Immobiliare Casati Srl, denominated RHC1) based on real estate properties that constituted the guarantee of a Non-Performing Loan (NPL) of Bank Unicredit, valued at EUR 3 million. The operation distributed 1 000 tokens and took place on BlockInvest, a dedicated platform that aims at creating a blockchain-based, transparent and KYC-AML compliant secondary market for real estate properties in similar legal situation in Italy (Cavicchioli, 2020[40]).

The start-ups introducing blockchain-based services in the Italian market

Most Italian companies lack detailed understanding of DLTs and blockchain applications. A 2019 survey shows that 14% of large companies have a deep understanding of the technology, and another 23% know them at a more superficial level. The shares decrease when considering SMEs (4% with a deep

12 Two of these companies, Eidoo and Aidcoin, are based in Chiasso, a town with less than 10,000 inhabitants at the border with Italy, less than 60 km from Milan.

13 Another form of emerging token offering are the so-called IEOs (Initial Exchange Offering). IEOs are similar to ICOs, but as the name suggests, the token offer is administered by an exchange (the most renowned example in 2019 was of Binance crypto exchange launching an offering for BitTorrent). The exchange/trading platform acts as the issuer on behalf of the company and as a direct seller of the token on the exchange. In this sense, the exchange provides a screening of projects before the offer goes to investor, but at the moment there are important regulatory problems as crypto exchanges are normally not licensed broker/dealers and in legislations in which tokens are considered securities this would be illegal (OECD, 2020[100]). It is still possible that this channel could expand in the future, as for regulators, it might be easier to check such exchanges, ensure the respect of international standards and financial regulations for such activities.

understanding, 16% with a superficial understanding). This is reflected in low levels of application, with only 2% of large companies and 1% of SMEs having ongoing experimentations and projects in the area (Osservatorio Blockchain and Distributed Ledger POLIMI, 2020[21]).

Box 2. Blockchain companies

The present report refers interchangeably to blockchain company or blockchain-based application provider/developer. The firms analysed are based (fully or in part, see next section) in Italy and are developing such services in the Italian market. Particular attention is accorded to firms developing blockchain-based applications aimed at serving SMEs in their business processes.

Landscape of businesses offering blockchain-based applications in Italy

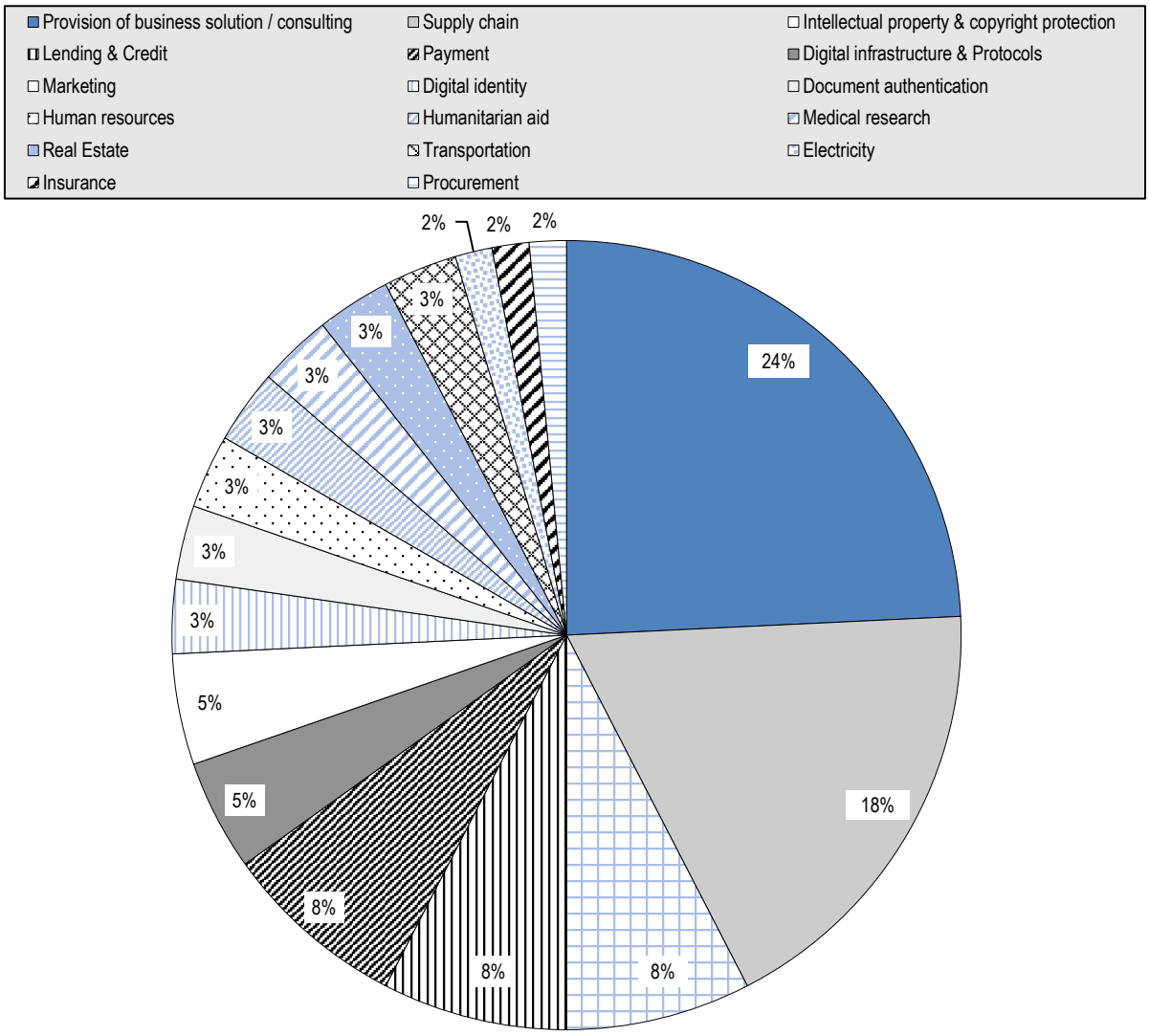
There is an important community of start-ups based in Italy conducting innovative blockchain-based projects and developing products for the Italian market. We estimated a total of 67 start-up companies working on blockchain projects in Italy in 2019. For the scope of our research, we focused on operating "Blockchain SMEs", which is different from other researches focusing on the number of projects carried on in the country by any player. These companies were identified by cross-checking data provided by the *Osservatorio Blockchain and Distributed Ledger Technology* of the *Politecnico di Milano* and the innovative SMEs and Start-ups registered on the database created by the MiSE in cooperation with *Infocamere* and *Camere di Commercio d'Italia* (the Italian Chambers of Commerce Association; (Registro Imprese, 2019[41]; Politecnico di Milano, 2020[25])).

To provide a clear overview of the activities of these "blockchain companies" in Italy, they are categorised according to the type of services they offer or develop, and for the economic sector they target. For most of the companies in the database, it is possible to identify a single main service/product they are developing or offering on the market. We identified 17 main use cases to categorize such services. We also identified 12 main business sectors targeted as possible clients for these DLT-based solutions. To do this, we leveraged the information provided by companies on their official websites. We confirmed this information by interviewing a subset of nine companies, which were particularly relevant for this study as they are creating products directed at SMEs.

The main type of services offered by Italian companies are in business solutions/consulting and supply chain but companies are developing solutions in at least other 15 areas. A bit less than half of the services are in the *business solutions/consulting* (24%) and in *supply chain* (18%). However, relevant use cases are also being developed in *payment* (8%), *IP and copyright protection* (8%), *lending and credit* (8%) sectors. Fewer companies are working on the development of products in *marketing* (5%) and in *digital infrastructures and protocols* (5%). Other relevant use cases are in a variety of areas in which a database technology such as blockchain can offer a competitive advantage, such as *document authentication*, *digital identity*, *transportation* and *real estate* and various other (Figure 19).

Figure 19. Blockchain companies in Italy categorised by type of services offered

100%=67 companies

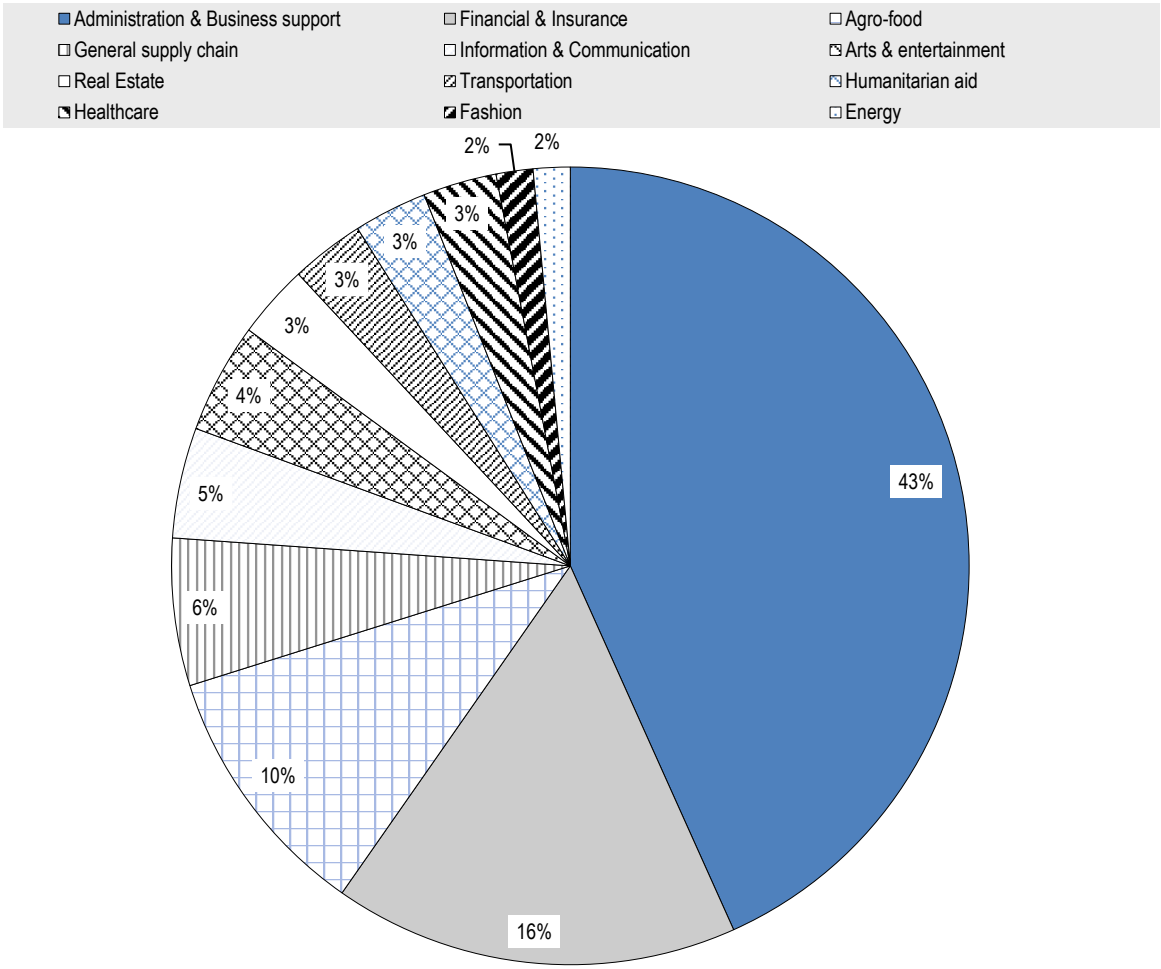


Source: Authors' analysis based on (Registro Imprese, 2019[41]) and (Osservatorio Blockchain and Distributed Ledger POLIMI, 2020[21]).

Almost half of the companies are targeting clients in administration and business support, while another relevant share is operating in finance, agri-food, supply chain and other eight economic sectors. In particular, *administration and business support* is the most important sector (43%) on which Italian blockchain companies are focusing, followed by *finance and insurance* (18%). A relevant share of companies are focusing on *agri-food* (10%) as well as *general supply chain* (6%), both very relevant for the "Made in Italy". Following the *IT sector* (5%) there is *arts and culture,* another sector of specific importance to the Italian economy (4%). One company case was also detected which serves the *fashion* industry (Figure 20).

Figure 20. Blockchain companies in Italy categorised by targeted economic sectors

100% = 67 companies



Source: Authors' analysis based on (Registro Imprese, 2019[41]) and (Osservatorio Blockchain and Distributed Ledger POLIMI, 2020[21]).

While some of the products are still under development, blockchain solutions seems to have a strong potential to serve sectors of the Italian economy that are dominated by SMEs. Blockchain is at its core a database technology, with peculiar characteristics linked to its distributed and decentralised nature that make it unique in offering increased transparency, security and traceability. As such, it has potential for application in value chains, in which it can guarantee provenance, transportation, handling, storage and in general supply chain management (Saberi et al., 2019[42]; Francisco and Swanson, 2018[43]; Kshetri, 2018[44]; Kim and Laskowski, 2018[45]). Relevant examples of such value chains for Italian SMEs spans from the agri-food "from farm to fork" process (Tian, 2016[46]; Caro et al., 2018[47]) to the textile industry (ElMessiry and ElMessiry, 2018[48]; Agrawal, Sharma and Kumar, 2018[49]), to advanced industries leveraging additive manufacturing/3D Printing. This application could be extremely relevant for the many Italian SMEs manufacturing high-end design products, where the protection of IP rights is of utmost importance (Mandolla et al., 2019[50]; Holland, Stjepandic and Nigischer, 2018[51]; Sher, 2019[52]).

Box 3. Supply chain management through blockchain – Brandzledger

Brandzledger is a blockchain technology firm based in Milan that creates supply chain solutions that are applied across heterogeneous sectors from manufacturing, logistics to retail. Brandzledger's solutions track the origin and transfer of items along a supply chain using data from IoT including sensors, GPS locators and connected devices, and stores them on the blockchain. Thus, allowing the share of transparent verified data to be accessible in real time. The data can be accessed at all stages of the supply chain, whether it be by suppliers, distributors, third-party providers or the end-customer.

Furthermore, Brandzledger's monitoring of the supply chain can trigger automatic notifications or actions and uses smart contracts to set specific conditions and prerequisites for operations to take place. It's solutions can render document filing and data storage immutable, permitting the secure indexing, sharing and rapid recovery of information. Moreover, the technology can be applied for anti-counterfeiting, with blockchain technologies allowing the unique product identity to be tracked and the origin of each product reliably recorded and any anomalies in the supply chain identified. Brandzledger's solutions have been applied to several industries including those trading in luxury goods, food and beverages, logistics and healthcare.

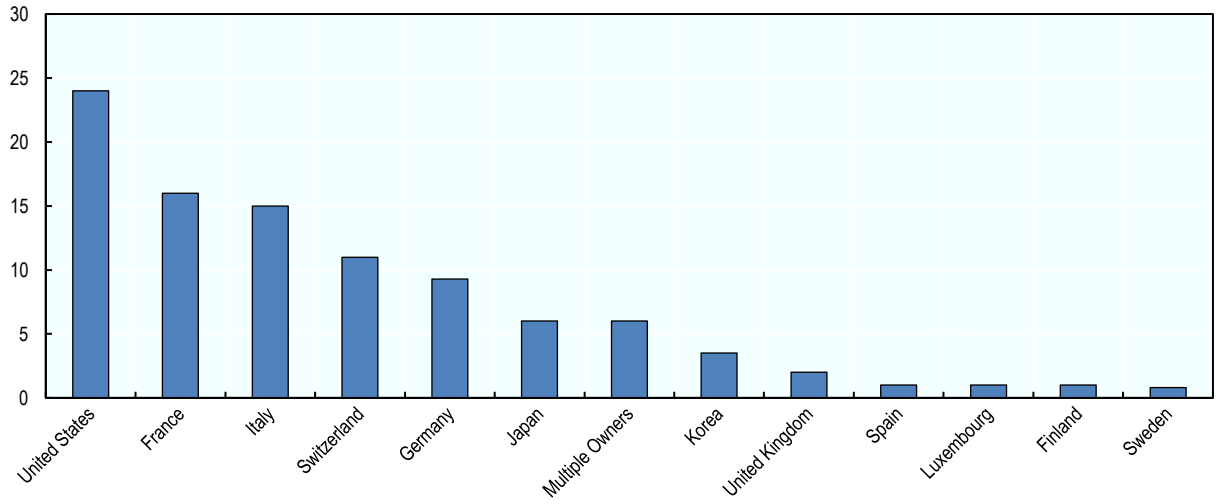
Brandzledger is part of Mangrovia Blockchain Solutions, a software technology firm providing consulting, development and support services for blockchain solutions. Mangrovia's services include data management, smart contract development and machine learning. Mangrovia partners with IBM and Oracle and is part of both the International Association for Trusted Blockchain Applications (INATBA) and European Telecommunication Standards Institute (ETSI).

Source: Brandzledger website (https://brandzledger.com/).

Applications based on blockchain technology in the area of supply chain management and IP protection are particularly relevant for Italy as its economy is one of the major global target for copyright infringements. Blockchain solutions can help Italian companies facing the challenge posed by counterfeiting and piracy. Italy is in fact the third country in the world, after the United States and France, as economy of origin of right holders whose IP rights have been infringed, with 15% of the seized counterfeited and pirated goods at global level (Figure 21). These practices impact heavily the Italian economy, amounting to an estimated EUR 24 billion, or 3.2% of the total sales in 2016. Industries which are characterised by a large population of SMEs in Italy are particularly affected, with estimated losses of EUR 3.75 billion in the clothing footwear, leather and related products sector and EUR 3.2 billion in the food, beverages and tobacco sector (OECD, 2018[53]).

Figure 21. Top economies of origin of right holders whose IP rights are infringed

As a percentage of total seized counterfeit and pirated goods, 2014-2016



Note: The terms "multiple owners" refers to seizures of IP-infringing products for which right holders are registered in multiple economies. Data are based on the value of global customs seizures of counterfeit and pirated products from 2014 to 2016.
Source: (OECD/EUIPO, 2019[54]).

Geographical distribution

Most companies have their full operations in Italy and only a small share have a presence outside Italy. Of the 67 companies identified, only nine have activities overseas. The most common outside location is the United States, with four of the companies having an office there. The other companies have operations in a single other European country: either Germany, Spain or the UK. Finally, two companies are in fact regional branches of companies based outside Italy (one in China and one in the United Kingdom).

Box 4. Product authenticity validation through blockchain – Genuino and ACF Fiorentina

Genuino is a start-up utilising decentralised protocol to provide asset certification services, which include asset provenance and ownership. Founded by two Italian entrepreneurs, the start-up operates in the United States and Italy. The company was established in New York during late 2018, after partaking in a blockchain-focused acceleration programme. After the incubation period of receiving mentorship assistances and completing proof-of-concept stage, the company set up its Italian office in Milan in early 2019.

The company's blockchain offering adopts Electronic Product Code Information Services (EPCIS), which is an interoperable data standard for supply chain, created by GS1. The International Organisation for Standardisation (ISO) approved standard records data on locations and events related to goods for enhanced visibility and regulatory compliance in production process. The company participated in Consumer Electronics Show (CES) 2020 as a part of "Made in Italy – The art of technology" series, which was sponsored by the Italian Trade Agency.

Although still at its early stage in commercialising its solution, Genuino has established an interesting partnership with ACF Fiorentina, an Italian Serie A soccer club. Under the partnership, the start-up has

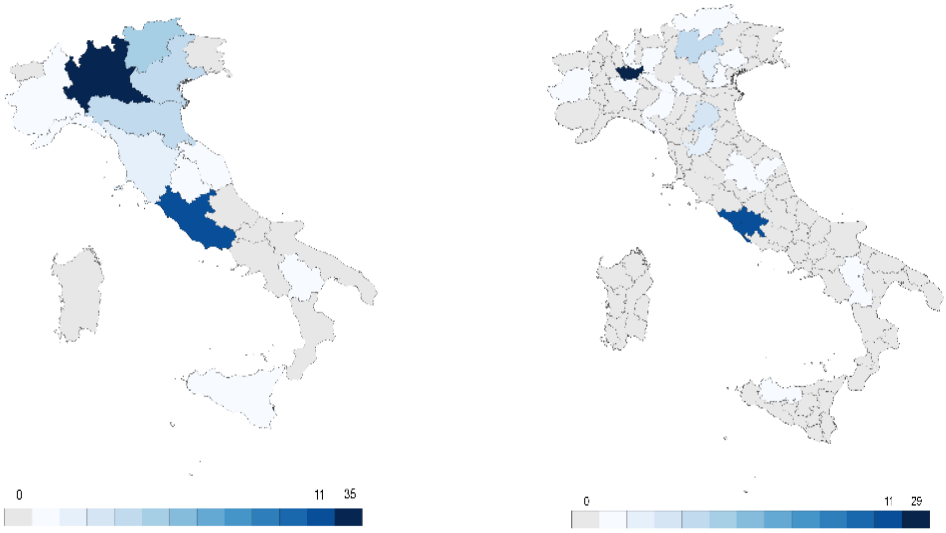
provided a blockchain-based solution for certifying jerseys worn by the players during matches. An asset tracking chip is woven into the garment, which is scanned by IoT readers during the match. The data is stored on Ethereum, which can be verified by scanning the QR code attached to the jersey. Transparency and auditability of the information regarding jerseys contributes in maintaining the clothes' scarcity after it is auctioned off to the public, where owners, as well as other parties interested in acquiring the jersey, can verify authenticity of the game-worn uniforms with the anti-counterfeit system.

Source: Genuino website (https://genuino.world/).

The large majority of companies are located in the Lombardy region and in particular in Milan, followed by Rome. The geographical distribution of Italian blockchain companies is relatively concentrated. Only four of the firms identified have at least an additional branch outside the province in which their HQ is located. Lombardy hosts more than half of all the blockchain companies active in Italy, namely 29 firms have their HQ l in the province of Milan and 34 firms in the region. The second region is Lazio, where all companies are based in Rome (11). The third most active regions, with 5 firms, are Emilia Romagna (4 in Bologna and 1 in Parma) and Trentino Alto Adige (4 in the Province of Trento and one in Bolzano). Four companies have their HQ in Veneto (two in Vicenza, one each in Padova and Treviso), two in Tuscany (Florence) and one company each in Piedmont (Torino), Liguria (La Spezia), and Umbria (Perugia). Only a few active firms have been identified in the south of Italy, one in Sicily (Palermo) and one in Basilicata (Potenza) (Figure 22).

Figure 22. Distribution of blockchain companies by province and region

100%=67 firms



Source: Authors' analysis based on (Registro Imprese, 2019[41]) and (Osservatorio Blockchain and Distributed Ledger POLIMI, 2020[21]).

Results of the survey

We developed an online survey to gather original information directly from the Italian "blockchain companies". The survey was submitted to the 67 active companies between September and November 2019, with a 45% response rate (i.e. 30 respondents). Respondents were for the most part CEOs, founders or co-founders of the firms. For some companies of particular interest, i.e. firms offering services specifically targeted at SMEs, the team conducted direct phone or in-person interviews to obtain information that is more specific and complement the survey results.

The companies were surveyed across five relevant dimensions to provide a clear picture of their specific cases and their relevance for the system as a whole:

- Company information – number of employees, year of activity;
- Product – stage of development, chosen type of blockchain architecture, competitive advantage;
- Business process – sources of finance, co-operations;
- Clients – type and location of clients;
- Policies – considerations related to the main barriers and suggestions for improvement

Entrepreneurs were also asked to provide general final comments, and a large share of respondents offered interesting insights to better understand the key feature of the Italian market.

The distribution across sectors of the companies that responded to the survey was representative to the population[14]. Of the 30 respondents, 55% were in administration and business Support (43% in the population), 19% in financial and insurance (16% in the population), 10% in agri-food (same as the population), 6% in arts and entertainment (4% in the population) and 3% each in general supply chain, healthcare and transport (respectively 6%, 3% and 3% in the population.).

Company information

All firms in the sample are SMEs, with an average of 5 full-time employees, with a minimum of 1 to a maximum of 20. The teams of the smaller firms are often composed by the founder/co-founders plus developers and programmers, while the slightly larger companies (above 5 employees) usually have also employees dedicated to other company functions such as sales, marketing, logistic etc. Out of the 30 respondents, 17 firms had part-time workers (3 on average, with a minimum of 1 and a maximum of 10).

Almost all respondents operate in young firms, in operation for an average of 2.8 years. This is expectable as most of these companies are focused exclusively on providing blockchain products and considering the relatively recent development of the technology. Only five of the firms identified started operations before 2017 (in 2015 and 2016). Only one innovative SME was already operating since 2009, in the provision of IoT services in manufacturing and logistics, and decided to develop a blockchain service to integrate its portfolio.

Product

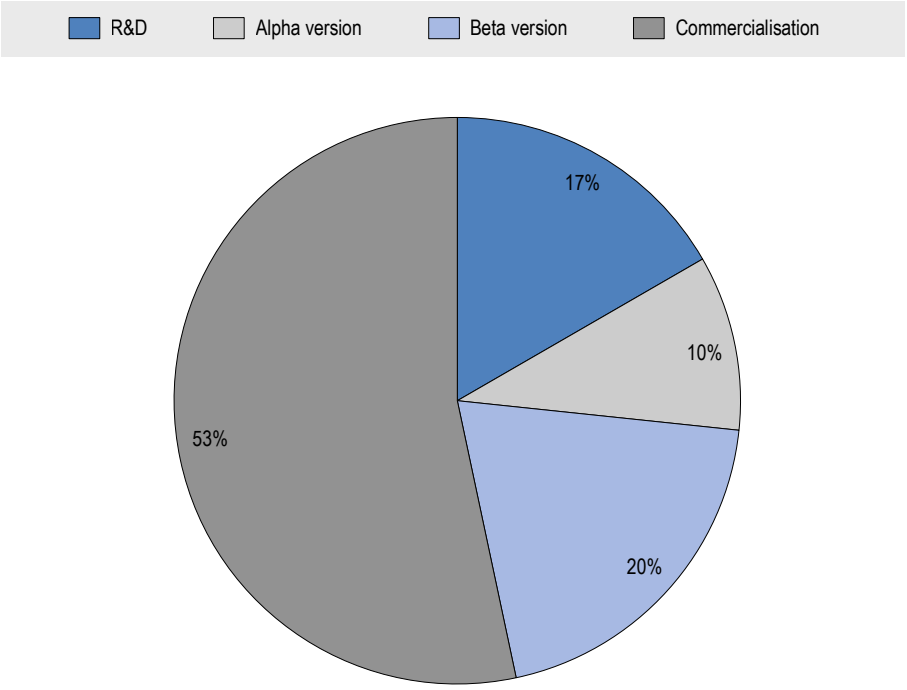
A large share of companies are already proposing their products on the market, even if at the moment most products have a limited reach. Companies surveyed were asked about the stage of development of their main blockchain-based product. We identified four level of development to categorise blockchain-based software (Figure 23):

14 Chi-square goodness of fit test robust for p-value = 1%.

- Research and Development (R&D) – still researching the best way to structure and deliver the service;
- Alpha version – first trial of the software, usually available for testing only to the employees of the firm or few selected stakeholders. Usually this version is unstable but is useful to show what the product could deliver at later stages;
- Beta version – after the Alpha version, the developers share and allow access to the software to a larger group of controlled stakeholders outside the company, to receive feedback and understand the issues related to scale, before its general release;
- Commercialisation – when the software is ready and officially released to the public, involving as well other operations in the company (e.g. sales, marketing etc.).

Figure 23. Stage of development of blockchain-based applications in Italy

100% = 30 respondents



Source: OECD Survey.

The majority (53%) of Italian companies surveyed are already commercialising their product, while the other (47%) are planning to get to market between 2020 and the beginning of 2021. From direct interviews, most companies are serving a very limited number of client, given the novelty of the technology. Use cases of products in the market differ widely, from financial applications (e.g. invoice tokenisation and trading, crypto-payments) to agri-food value chain (e.g. tracking of farm products), from business support (e.g. support in the integration of blockchain software into SMEs' legacy systems) to digital identity and tokenization of assets (e.g. creation and secure storage and management of "digital twins"). Companies that are still at the R&D (17%) or alpha version (10%) stage plan to complete their product and go to market between the second half of 2020 and the beginning of 2021 (e.g. tracing IoT devices to ERP system for smart-factory 4.0, smart invoicing). Most companies at beta version (20%) are planning to finalise their

product within the first half of 2020 (e.g. multilateral secondary marketplace for loans, protection of “Made in Italy”).

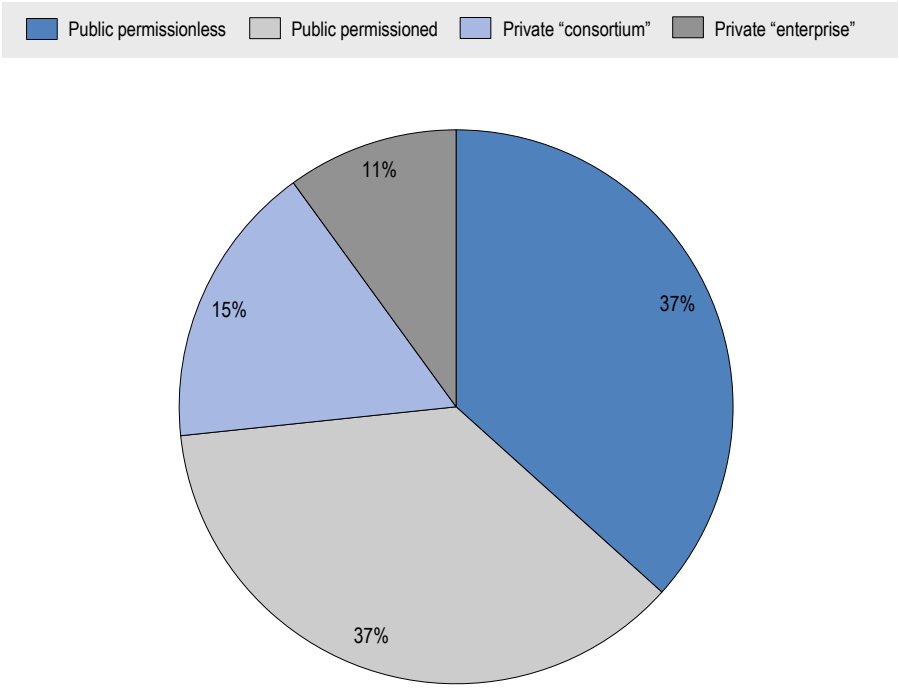
More than a third of companies opted for permissionless blockchain for their products to ensure disintermediation and transparency[15]. Permissionless blockchains allow anybody to become a “node” in the network and send and validate transactions (e.g. Bitcoin). Such networks exploit the full innovative potential of the technology, as they guarantee the highest level of decentralisation of decision power within the distributed network, with full disintermediation. The larger the network, the higher its resilience and reliability. Increased transparency and full automation are achieved as distributed consensus protocols guarantee Byzantine Fault Tolerance (BFT) and no double-spending, and any type of smart contracts can be added to the network (e.g. Ethereum being the most commonly used distributed platform). More than a third of surveyed firms in Italy decided to base their product on permissionless ledgers, both for authentication purposes or to introduce their own smart contracts with more advanced functions. The possibility to use the “time-stamping” properties of large, permissionless distributed ledger allow for the notarization of private and public documents in a transparent and nearly-immediate fashion, which opens a number of possibilities also to make the delivery of public services more efficient, both at national and at local level (see Box 6 below for an example). It could also be argued that using permissionless network SMEs have lower implementation costs and requires less resources to manage the node.

The majority of firms (63%) decided for different types of permissioned ledgers, which always imply a central administrator managing the network (Figure 24). This option has proven quite popular for business applications, as it ensures part of the benefits of the blockchain in terms of transparency but with the possibility to refer to a central “node” that can take decisions over the network. New nodes have to be approved by the central authority and added to the blockchain, and the protocols within the network remain in the hands of the administrator. This practice stymie the disruptive decentralisation of decision-making power embedded in the original blockchain of Bitcoin, as well as the security of the system as there is still a single point of failure. However, permissioned and private blockchains offer interesting applications for businesses and retail clients willing to trust the administrator, as products can be tailored more easily and time of execution can be drastically reduced with respect to permissionless alternative.

15 The technical and non-technical literature on the concept and functioning of blockchain technology expanded rapidly in the past years. In addition to the fundamental papers of (Nakamoto, 2008[103]) on Bitcoin, (Szabo, 1996[104]) on smart contract, (Haber and Stornetta, 1991[105]) on time-stamping and (Lamport, Shostak and Pease, 1982[106]) on the Byzantine Generals Problem, short recent overviews can be found for example in (Zheng et al., 2017[107]) or (OECD, 2018[108]).

Figure 24. Blockchain architectures chosen by Italian blockchain companies

100% = 30 respondents



Source: OECD Survey.

Some of the main large international players proposing permissioned blockchain solutions are offering blockchain-based solutions in some of the "Made in Italy" value chains. For many SMEs, the lack of understanding and trust in the new technology can be a strong deterrent for its integration in the company's operations. Some large international players with very recognizable brands are offering solutions based on proprietary permissioned blockchains, which allow clients to have a clear counterpart guaranteeing the functioning of the network. Two relevant examples are the "EY Ops Chain" proposed by Ernst & Young, based on the Ethereum blockchain, which in Italy was applied for example to the tracking of products of large retailers in the food & beverage sector, or IBM's DLT solutions based on "Hyperledger Fabric" (a protocol developed by the Linux foundation), which has been leveraged in Italy for a pilot project on "Made in Italy" in the textile sector.

Most businesses surveyed reckon that their clients mostly value novelty, impact on business processes, and increased security offered by their products. Asked about the key feature that clients valued in their blockchain-based product, most companies (20) indicate either the novelty or the possibility it offers to streamline business processes (e.g. contracting). This is consistent with the feedback received during interviews, as the management and registration of transactions and the exchanges of data with clients and suppliers is often quite resource-intensive for SMEs. The third most attractive feature is the expected increased digital security for the data registered in the distributed ledger (15), followed by the possibility to access new markets in Italy or internationally (10) and the lower price compared to existing alternatives (8). Fewer respondents (5) indicate the enhanced networking opportunities or the better financial management (4).

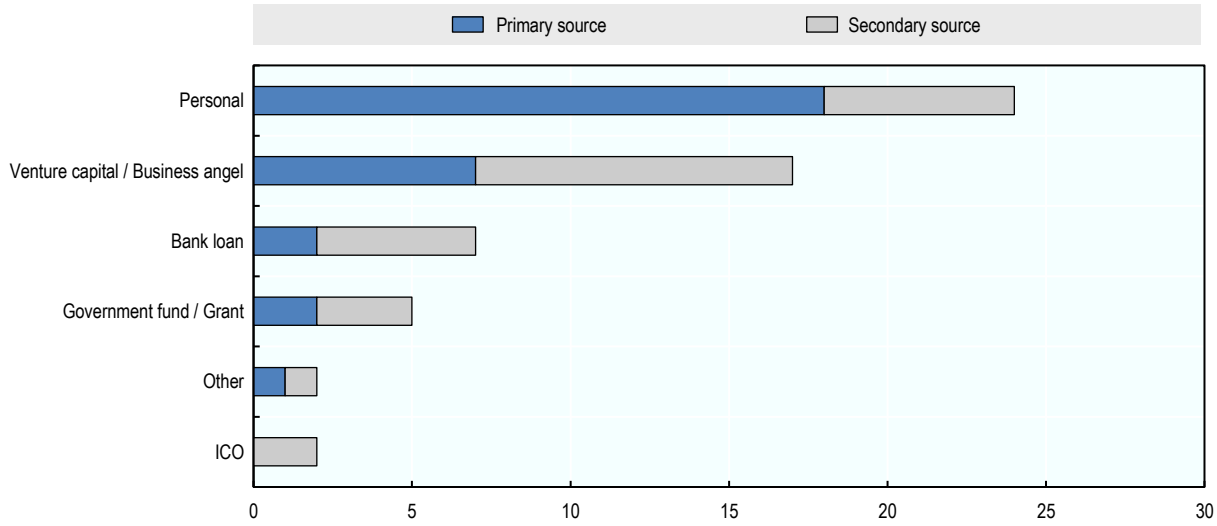
Business processes

Most Italian blockchain businesses resorted to personal investments as the primary source of financing, but more than half were able to attract VCs. The majority (60%) of Italian entrepreneurs surveyed in the blockchain space resort to personal funds as the primary source of financial resources to operate their business, with another relevant share (20%) relying on them as secondary sources (Figure 25). While this practice might indicate the difficulty in obtaining risk capital from the market, we note that VCs/Business Angels (BA) were involved in more than half of the projects in Italy. In particular, almost one fourth leveraged VC funds as the primary source and another third as a secondary source, with in total more than half the surveyed businesses receiving resources through this channel. This indicates that capitals were available for a large number of projects deemed worthy of attention by professional investors, indicating a vitality of the VC market. Furthermore, VC/BA funds often accompany the companies they finance with mentoring programmes by experienced business leaders, which can be very helpful for young businesses.

Some companies relied on traditional bank loans, while another few received public funding and/or grants, often European funds delivered through regional programs. Bank financing has been used mostly as a secondary source by a relatively low share of the companies surveyed (23%). Government funds and/or grants have been indicated as a primary (7%) or secondary (10%) source of financing by less than one company out of five. This indicates that while there are programmes that are supporting the development of the industry, their reach is still relatively limited. Companies indicated mostly public grants offered at local level by the regional administration, but that was delivering European funds. One good example cited by firms is the "Innodriver" project by Lombardy region, aimed at sustaining innovation among SMEs by delivering funds allocated by the European Regional Development Fund (ERDF). The public tender in 2019 distributed a total of EUR 7 million in small grants of EUR 25 to 30 thousands, depending on specific conditions (Regione Lombardia, 2019[55]).

Figure 25. Sources of financing for blockchain businesses

Absolute number of responses



Note: Respondents could indicate 1 primary and 1 secondary source (only 27 of 30 respondents indicated also secondary sources).
Source: OECD Survey.

Italian blockchain businesses cooperate closely with their clients, suppliers and consortia at national and international level. The large majority of surveyed businesses (77%) highlighted cooperation with "traditional", non-blockchain businesses, including clients and suppliers (Figure 26), which is perceived by most companies as a necessary step to develop a product that meets effectively market demand.

Most blockchain companies have a strong relation with researchers and Italian universities and are playing a major role in the development of the blockchain ecosystem. Almost two companies out of three (63%) indicated some sort of cooperation with local universities (see Box 5 for an example). Many of the interviewed companies indicated that the partnership with researchers in universities were organic and structural to the development of the products and of the businesses, and not just for single-shot consultancy support. This approach could also be seen in the relations with foreign universities and non-academic research centres, both indicated as partners by almost 30% of the surveyed companies. It is interesting to note that almost all players that indicated contacts with foreign universities were also cooperating with local universities, while only half of the businesses working with non-academic research centres had also contacts with academia.

Box 5. Agricultural product traceability through blockchain (2) – Foodchain

Created as a joint venture between two blockchain start-ups in 2016, Foodchain provides a platform for recording information of agricultural goods. With a system based on Quadrans, a public blockchain system developed from Ethereum, the company offers traditional businesses and farmers the possibility of integrating the platform with legacy enterprise systems such as ERP and IoT sensors. Information regarding the agricultural produce can be stored using QR code, NFC or RFID, where intermediate goods producers, as well as final consumers can view the information.

Foodchain represents a case of blockchain company that cooperates closely with researchers and local universities. It works closely with the Department of Mathematics and Cryptography of the University of Trento for the development of an innovative validation algorithm for their application. The start-up has its offices located in three incubators: ComoNExT - Innovation Hub, a MiSE certified incubator situated within a DIH established by Chamber of Commerce of Como (Lombardy), I3P, a business incubator operated by Polytechnic Turin (Piedmont), and Impact Hub situated in Trento (Trentino Alto-Adige).

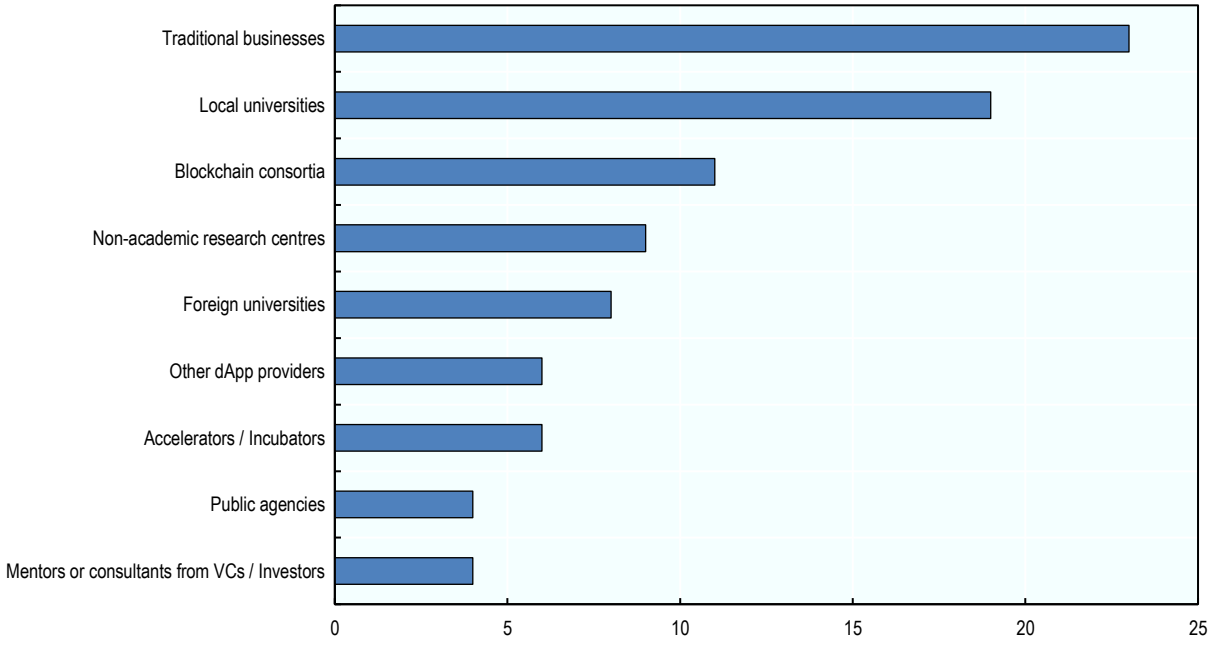
Source: OECD Interview, Foodchain website (https://food-chain.it/).

Italian companies are connected to international blockchain "consortia" but there are not many contacts ongoing within the Italian ecosystem. Many Italian players (33%) are also in close contact or leveraging international blockchain consortia (e.g. Hyperledger consortium, R3 consortium, Enterprise Ethereum Alliance), highlighting the connection of the Italian ecosystem with the international scene. However, it appears that only a smaller fraction (20%) of blockchain companies are cooperating with other distributed application (dApp) providers.

Cooperation with supporting public or private institutions is still limited in Italy. Only 13% of the businesses surveyed said that they were in contact with public agencies, the same level of influence of mentors or consultants provided by VCs. Accelerators and incubators seem to be playing a slightly more important role, with one out of five companies cooperating with them. However, in other OECD countries (e.g. Estonia), incubators and accelerators are a crucial source of finance and support for most start-ups and innovative SMEs.

Figure 26. Forms of cooperation of blockchain firms in Italy

Absolute number of responses



Note: Maximum of three responses allowed.
Source: OECD Survey.

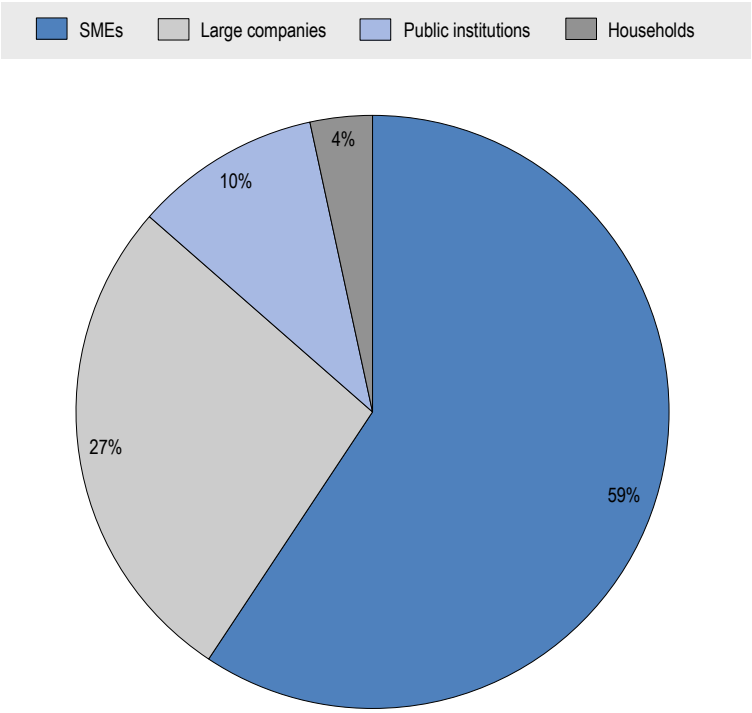
Clients

Most Italian companies are developing blockchain-based software targeting SMEs. In Italy, most companies seem to be working on B2B products focusing in particular on SMEs (58%, Figure 27). A relevant share of start-ups are focusing on large businesses (27%)[16] (Figure 28). Distributed ledger technologies can offer important innovations for database management, security and transparency, which are all very relevant features for stakeholders needing to manage complex operations. However, only 10% of Italian start-ups are working on applications or platforms for public institutions and agencies, which could strongly benefit from the use of this technology in a wide range of applications. To demonstrate this point, some public administrations at local level are developing interesting applications in-house, and the case of Lombardy Region's "Nidi Gratis" project presents an example of how a distributed ledgers architecture can support the delivery of important public services as childcare (Box 6).

16 It should be taken into account that there are cases of large retail operators experimenting applications based on proprietary permissioned blockchain proposed by large-scale consultancies, not included in our sample. One of the main example is the project of E&Y for Carrefour, for the tracking of poultries from farm to shelf.

Figure 27.Clients targeted by blockchain firms in Italy

100% = 30 respondents



Note: Responses do not distinguish between "primary" and "secondary" clients.
Source: OECD Survey.

Box 6. Lombardy Region's "Nidi Gratis" project, 2019-2020

Rationale and objectives of the programme

Nidi gratis ("free nest") is aimed at providing childcare services to families that are faced with economic and social vulnerability. The local government recognised lack of information sharing within the public sector as a challenge for citizens in accessing public services, as it puts a burden on individuals to provide similar information repeatedly when applying for government supports. The pilot project was set up to simplify application process to childcare services, where blockchain technology was selected as an enabler for streamlining the public service offering.

Challenges

Having recognised limits of creating a common database in current system where ownership of data is fragmented between different parts of the government, the regional government decided to create a data federation. On the contrary to data lake that are centralised data repository established and managed within enterprises, data federation refers to a system of heterogeneous databases that are interconnected via network. The programme focused on creating a blockchain-based meta-database system that could verify validity of the data stored across government functions. The system was developed to conform to the European General Data Protection Regulation (GDPR), especially when designing data ownership and privacy architecture.

Instead of creating region's own blockchain infrastructure, the choice was made to use Bitcoin network, which is one of the largest blockchain network. However, the system does not involve transaction of Bitcoin. When a government function certifies validity of information in their database, the data verifying authenticity of government-owned information is anchored to Bitcoin network. The anchored data is time stamped, which functions as verifiable claims that can be accessed by other counterparts. The regional government orchestrates the process to improve accessibility and interoperability of the system. Using pre-existing blockchain infrastructure provides benefits such as low system development and maintenance cost. In addition, Bitcoin network is the closest to the formal definition of blockchain in Italian legislature, which facilitates regulatory compliance.

Programme delivery

The pilot began in September 2019, with municipality of Cinisello Balsamo selected as a trial region. Citizens were also given an option to apply for the government support via mobile app, by logging in with the national public digital identity system credentials. Algorithm gathers information of the applicants from all relevant data providers in the federated system, and stores verified claims in their digital wallet. With automated verification process, families that met the requirements were provided with financial support in significantly short time.

Recent Progress

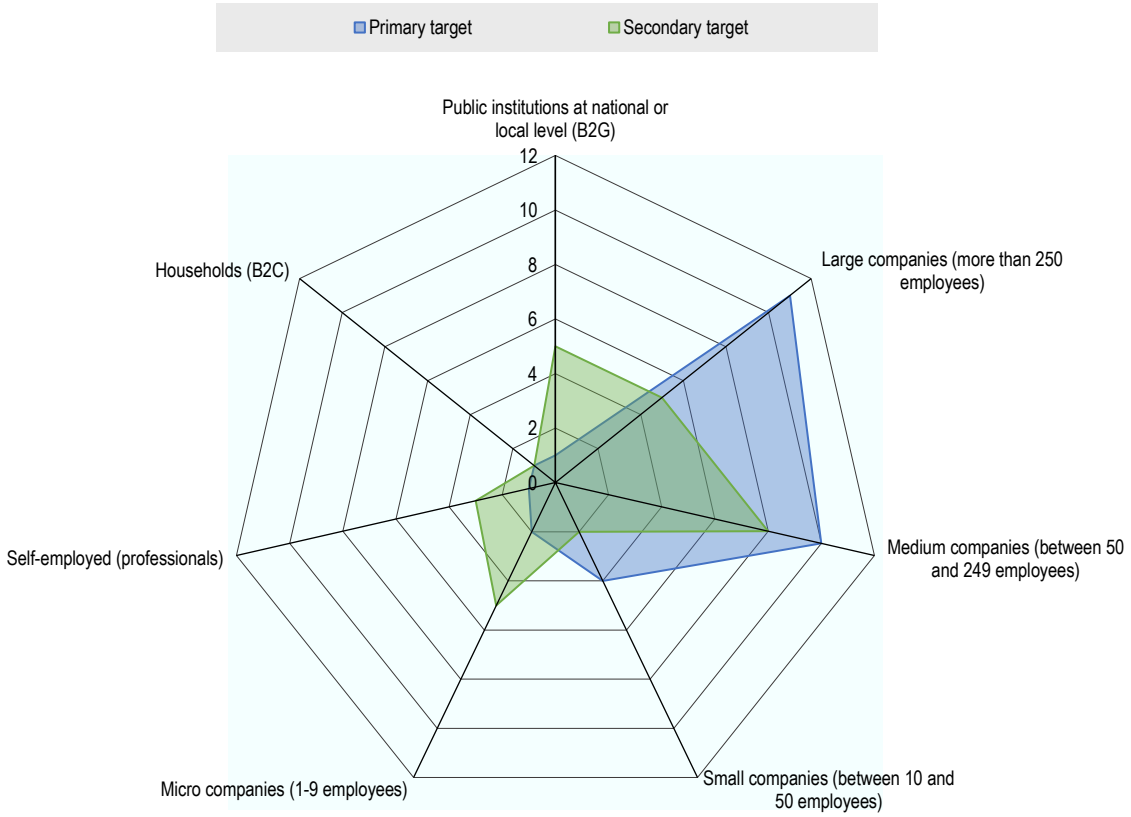
Around 300 families are benefitting from Nidi gratis programme, which involved reviewing approximately 1 000 documents. The regional government was able to automate 90% of the review process, where the whole process, from application to verification, took less than 10 minutes to complete. The project was designed with an ex post evaluation which will be conducted after one year of continuation. It was calculated that implementation of the blockchain-based system in Nidi gratis application process resulted in reduction of 3 900 hours of work in the administration. With the system being a relevant example of the "once-only" principle, the regional government plans to expand the use to other public services.

Source: OECD interview, Lombardy Region website (https://www.regione.lombardia.it/).

The large majority of Italian players are mostly targeting the Italian market. Even if a relevant number of applications are developed also in English from the start, the large majority of start-ups are at this stage aiming only at the Italian market (78%). This might be a consequence of the early stage of development or commercialisation of most of the products, needing to be tested and diffused in the domestic market before trying to make the leap to international markets. A lower share of companies are already targeting the European Union at large (15%), while only a very few are looking to markets beyond the EU (8%).

Figure 28. Type of clients targeted by blockchain firms in Italy

Absolute number of responses



Note: Respondents indicated if the clients were either "primary" or "secondary" targets for their product.
Source: OECD survey.

Box 7. Preservation of cultural heritage through blockchain - WEREA

WEREA is a start-up founded in 2014 and based in Politecnico di Milano's Polihub, the Innovation District & Start-up Accelerator. AerariumChain is the start-up's spinoff project based on its collaborative platform called Sweet Hive. The goal of the project is to help preserve archaeological and cultural heritage restoration needs through a platform that integrates blockchain, 3D scanning and Artificial Intelligence. AerariumChain aims to create a controlled database of artistic pieces to lower the risk of theft and counterfeiting, whilst centralizing restoration management information. Through the integration of blockchain technology, AerariumChain makes it possible to monitor each work of art overtime in a reliable and secure way.

Using innovative photogrammetry technologies, the selected artistic or archaeological piece is scanned and a univocal 3D virtual image is uploaded onto the AerariumChain. The image contains all available information on the artefact including details of the owner, location, relevant certificates and contracts

such as insurance details. The AerariumChain algorithms assign a quality score to the uploaded image, taking into consideration the reliability of relevant certificates.

By using blockchain technology, the database cannot be edited and the data can be distributed among many entities to ensure universal recognition of the pieces. By controlling the distribution of certificates of guarantee, the global verification of the state of conservation of the pieces as well as advanced support for needed restoration are better enabled. As well as locating and verifying the authenticity of digitized artworks, the technology makes it possible to sell the image rights for the creation of a thematic virtual museum.

The project is developed by relevant professionals in the fields of art, culture and technology including a partnership with Museo Egizio, Turin. AerariumChain participated in the Global Start-up Programme in London October 2019, hosted by the MiSE in collaboration with the Italian Trade Agency.

Source: AerariumChain website (https://www.aerariumchain.com/).

Barriers to business development

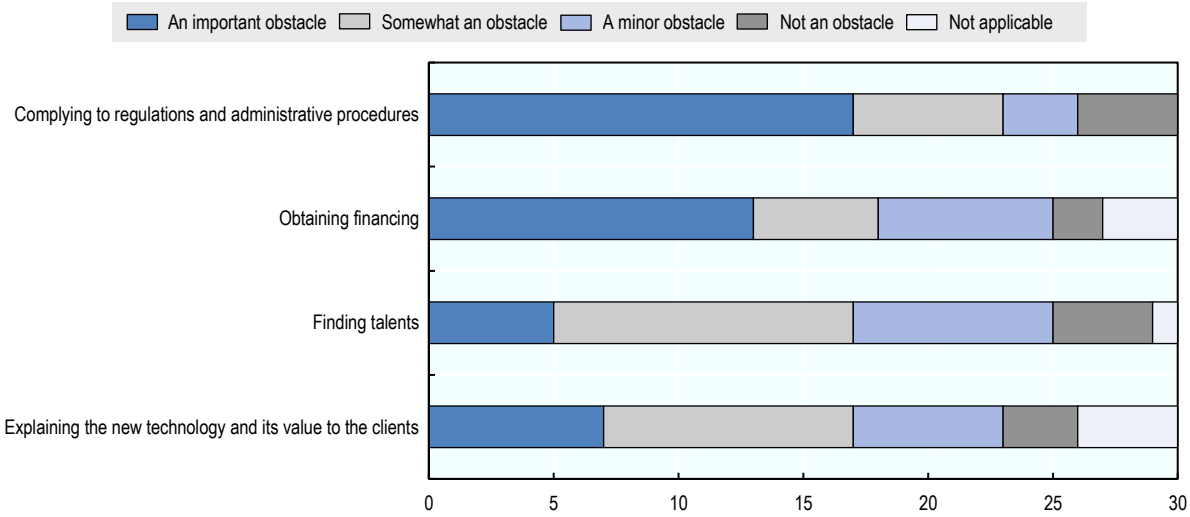
Italian blockchain companies indicated that complying with regulations and the complexity of administrative procedures were the most important barriers, in particular in relation to smart contracts, hash codes and digital signatures. When asked about the main barriers they were facing in doing business in Italy, "regulation and complex administrative procedures" were indicated as "an important obstacle" by the majority of firms (57%), and as "somewhat an obstacle" by another 20% (Figure 29). According to the OECD Product Market Regulation (PMR) index, the "administrative burden on start-ups" in Italy is one of the lowest in OECD countries and that general "complexity of regulatory procedures" is below the OECD average (OECD, 2019[56]). In fact, interviewed firms indicated mainly problems related specifically to the development and sale of blockchain products. The lack of a clear legal framework for the use of smart contracts was identified as a main issue (see following chapter). Other challenges include the complexity of managing hash codes registered on the blockchain in compliance with the General Data Protection Regulation (GDPR, EU 2016/679); and the different definitions at Italian and European level of "digital signatures". This situation is common to other EU members. For example in Germany, an online consultation showed that challenges with the legal framework are considered prominent by blockchain entrepreneurs. The Federal Ministry for Economic Affairs and Energy of Germany (BMWi) is thus conducting round table discussions on the topic of GDPR and blockchain, and the Ministry of Justice is evaluating the impact of blockchain on company law (BMWi, 2020).

"Obtaining financing" was the second most relevant barrier. Almost half of the firms interviewed (13 out of 30) indicated it as an "important obstacle", other five as "somewhat an obstacle" and seven as "a minor obstacle". Only five firms in the sample did not have problems related to finding the financial resources needed to run their business. These results are in line with the evidence about the main source of financing (Figure 25) and the large use by entrepreneurs of personal funds to finance their innovative business ideas.

Difficulties in explaining the new technology to clients and in finding talents were considered less important barriers. In particular, only 23% of companies identified as an "important obstacle" the need to explain the technology and highlight its value to clients. Even less (17%) pointed at a difficulty in finding talents to work in their company as an "important obstacle". This is encouraging, considering that the introduction of DLT solutions requires highly specialised staff, which seems to be available to entrepreneurs in Italy at this stage. At the same time, during interviews entrepreneurs highlighted that for the relatively early stage of development of their enterprises the need of talented staff was still relatively limited, which means that the situation might differ once the market reaches a larger scale.

Figure 29. Barriers to business in Italy

Absolute number of responses



Source: OECD Survey.

Surveyed businesses indicated the importance of the evolution of the regulatory framework at Italian and European level for the development of their business and of the industry. The interplay between regulation and innovation seems to be relatively ineffective at the moment, as entrepreneurs do not feel safe in trying to develop new solutions for the lack of clear basic guidelines. The development path of blockchain technology has been rather unique, as in 2017-2018 the hype around cryptocurrencies brought global attention and large financial flows towards financial application of the technology, which were often tied to projects that did not comply with basic investor protection, KYC and AML rules (if not outright scams), leading to a strong regulatory backlash in many administrations. In this context, regulation of key features of the technology for industrial applications of DLTs, as for example smart contracts and the use and management of data stored in hashes on the blockchain, were also stymied. In the Italian context, the complexity was also exacerbated by the overlapping of national and European regulation, which, despite evident coordination efforts recognised by the companies interviewed, still create some uncertainties for operators in the market (see next chapter).

Entrepreneurs highlighted specific problems, from the lack of a clear picture on the public financing opportunities to the unclear application of European directives. Interviewed entrepreneurs highlighted other specific issues that in their opinion should be tackled to ensure the development of the blockchain ecosystem in Italy:

- The complex regulation pertaining the use of DLTs in Italy and the missing clear picture of possible public financing opportunities offered at local and national level makes it difficult for SMEs to invest and adopt the new technology;
- The lack of the full legal recognition of Smart Contracts (to make them legally binding) limits companies from unleashing their innovation potential (see next chapter on the current Italian law and the ongoing discussion about the implementing decrees);
- The difficult procedure for the management and storage of hash codes in distributed public and private ledgers in compliance with GDPR hinders innovation;
- An additional effort would be needed in giving an uniform interpretation at European level of the Technical Rules of the PSD2 Directive in relation to the sharing of APIs between banks, where the

introduction of a minimal standard and basic authentication system could provide the base for further innovation by both incumbents and new firms;

- Despite the introduction of the “Work for Equity” concept and the incentivised use of stock options, that can be crucial for the development of start-ups, entrepreneurs still find a lack of knowledge among notaries, tax experts and public agencies which makes it very difficult to leverage these instruments.

3 Recent trends in regulations and policies

This section presents the main policy initiatives related to blockchain technology undertaken in Italy in the past few years, with a focus on industrial applications. It includes brief reference to regulation proposed by financial regulators and tax authorities in relation to crypto-assets, which were the first applications to gather strong attention at global level starting in 2016-2017. However, the main focus of this report is rather on the policies to sustain the diffusion of industrial applications of DLTs, notably among small and medium enterprises.

Evidence results from discussion with relevant policy makers, research institutions and experts in the country, as well as from independent researchers. Interviews were conducted in the last months of 2019 and in particular during a study mission to Milan and Rome in December 2019. Representatives of public authorities had the opportunity to provide feedbacks on the information included in the report.

We propose a distinction between the policies strictly related to the trading and use of payment and asset tokens with the policies and government's activities related to the diffusion of DLTs leveraging utility tokens in the real economy. The distinction between the financial applications of "crypto" and the use of DLT-based services by operators in the market is not clear-cut. From a theoretical point of view, digital tokens on blockchain systems are not technically distinguishable. However, in the literature and in the regulatory provisions of important administration, a distinction based on the use and scope of the tokens has been proposed. Hereafter we will refer in particular to the distinction proposed by FINMA (Swiss Financial Market Supervisory Authority), identifying three categories (FINMA, 2018[57]):

- Payment tokens: which are used "as a means of payment for acquiring goods or services or as a means of money or value transfer. Cryptocurrencies give rise to no claims on their issuer."
- Utility tokens: "intended to provide access digitally to an application or service by means of a blockchain-based infrastructure."
- Asset tokens: "represent assets such as a debt or equity claim on the issuer", and are thus regulated as securities.

Applying this distinction, we present first an overview of policies by financial regulators and institutions in Italy, related mostly to what we indicate as "payment" and "asset" tokens and to their diffusion, trade and impact on monetary policy and financial stability. We will move then to a more detailed analysis of the policies undertaken by the Italian government to support the diffusion of applications based on blockchain infrastructure in the Italian economy and society, and in particular among SMEs and entrepreneurs.

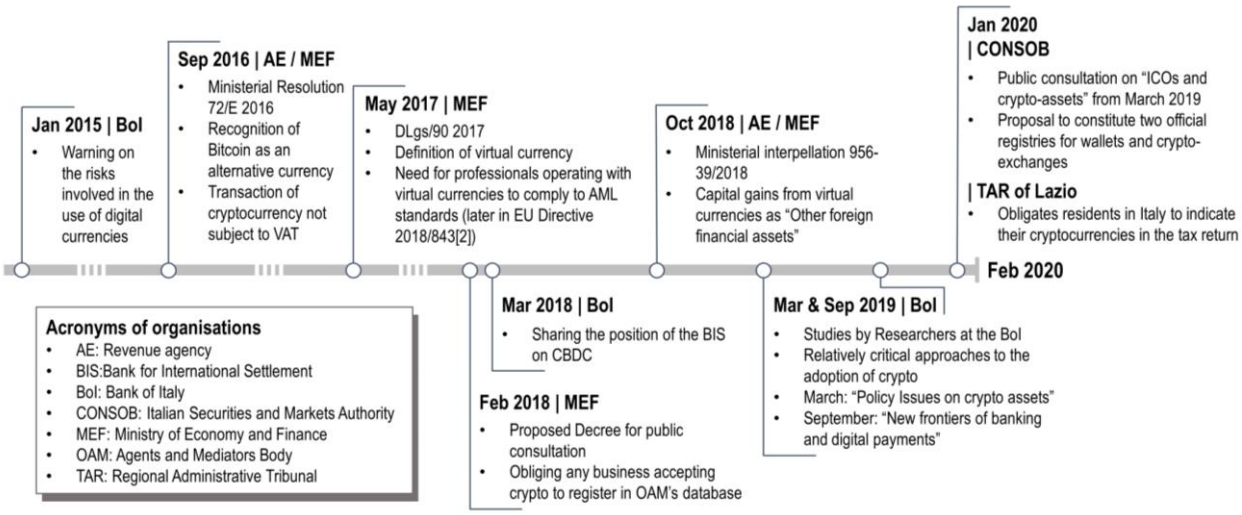
Regulatory approach to crypto assets in the financial sector

Figure 30 provides an overview of the activities of Italian financial and fiscal authorities in relation to the trading and holding of payment tokens. The policy initiatives more strictly related to the use, exchange, legal value and taxation of payment tokens *per se* do not constitute the specific focus of this

report. However, it is evident that these policies have also an impact on the Italian blockchain ecosystem as a whole, especially in terms of ensuring investor protection and the respect of international AML provisions, which in turn has an effect on the perception of the technology by the public. We have thus included a brief description of the main recent activities in this area by the *Agenzia delle Entrate* (Revenue Agency), part of the Ministry of Economy and Finance (MEF), by *CONSOB* (Italian Securities and Markets Agency) and by *Banca d'Italia* (Central Bank of Italy)[17].

Figure 30. Main regulatory actions on digital assets by Italian financial and fiscal authorities

2015-2020



Source: OECD Analysis integrated by phone interviews.

Italian financial regulators have been very active in following the evolution of the market of digital assets and cryptocurrency. As their first appearance was in financial markets, it is useful to give a brief overview of the regulatory approach chosen by regulators in the country for its possible direct and indirect effects on further diffusion of the technology, as the distinction among "security tokens" (investment instruments) and "utility tokens" (industrial applications) is not always and necessarily very clear.

The Italian Revenue Agency was the first authority to issue a specific directive in 2016, exempting buyers of Bitcoin from VAT and subjecting crypto-exchanges to normal corporate taxation (IRES e IRAP). With Resolution 72/E of 9 September 2016 (Agenzia delle Entrate, 2016[58]), the revenue agency answered to the question posed by a company willing to constitute one of the first Italian cryptocurrency exchanges, Conio[18]. The Revenue Agency, referring to a decision of the European Court of Justice (C-264/14, 22 October 2015) recognised that the acquisition of Bitcoin in exchange for "fiat" currency was to be considered a currency exchange and thus not subjected to Value Added Tax for the individual buyer[19].

17 In many cases, the decisions of these authorities were linked to policy stances at European level that will be cited when necessary.

18 The CEO of Conio was one of the experts that participated to the OECD's Working Group in Rome in December 2019.

19 Later, in 2018, it was stated that the capital gain made by the acquisition and disposal of cryptocurrencies by individuals (not companies) would be taxed following the regime of capital gains made on foreign currencies (Interpello n. 956-39/2018)

At the same time, the Revenue Agency stated that the margins made by crypto-exchanges in providing the service of buying and selling cryptocurrency should be subject to corporate taxation (*IRES* and *IRAP*). Consequently, it was stated that the crypto-exchange should not have acted as withholding fiscal agent (*sostituto d'imposta*) for its clients. In substance, the authority agreed with the main conceptual points raised in the request by the private sector operator, highlighting the important role that technology players can have in cooperating with regulation authorities in very innovative policy areas.

The Bank of Italy has aligned its position with European institutions (e.g. EBA, ECB) and international authorities (e.g. GAFI) with regard to virtual assets/currencies. Since the first appearance of virtual currencies in international financial markets, the Bank of Italy aligned to international practices on virtual currencies, as proposed by the ECB, EBA and FATF, sharing their indications for financial institutions under its regulatory oversight to avoid trading and holding Virtual Currencies in the absence of a complete legal framework (Banca d'Italia, 2015[59]; Banca d'Italia, 2015[60]; European Central Bank, 2012[61]; European Banking Authority, 2013[62]; FATF, 2014[63]; European Banking Authority, 2014[64]; FATF, 2019[65]). Later, the Bank of Italy has continued to contribute and align to the decisions on the matter taken at European and international level (Banca d'Italia - UIF, 2019[66]), and the effort made by the European Central Bank to regulate the phenomenon appropriately (European Central Bank, 2019[67]). In particular, the report of EBA of January 2019 with advice to the European Commission on crypto assets (European Banking Authority, 2019[68]), indicated the need for a comprehensive cost/benefit analysis, including anti-money laundering legislation and market development, to avoid the emergence of a plethora of different positions by national regulators at European level that would have a detrimental effect on the level playing field in the Union. Even if beyond the scope of this report, it is interesting to note that the European Central Bank is also continuing to "assess the costs and benefits" of the possible issuance of a Central Bank Digital Currency (CBDC) (European Central Bank, 2019[69]).

The Bank of Italy has also published recent studies on crypto-assets and their regulatory and legal value, making the distinction with DLT-based industrial applications. These works point at the increased relevance of cryptocurrencies in international financial markets and their disruptive potential for current payment systems due to their strong push towards decentralisation of authority. They also highlight the distinction between purely financial crypto assets and the possible uses that DLTs can have in the real economy (Caponera and Gola, 2019[70]). The Bank of Italy contributed to the international debate also with a comprehensive review of the effects of Fintech solutions, crypto-assets and digital solutions on the banking and payment industry (Banca d'Italia, 2019[71]).

There are various initiatives by the Bank of Italy, CONSOB, MEF to support the development of the Fintech industry in Italy. The Bank of Italy has created a "Fintech channel" to support financial innovation. This channel provides information on recent regulatory developments at national and international level. It also allows entrepreneurs and operators to contact directly the regulators with queries about their proposed business model (Banca d'Italia, 2020[72]). Italian public authorities launched as well a formal group called "Fintech Committee", to sustain a more collegial approach to the topic. The Committee meets regularly includes as permanent members regulatory authorities in financial markets (CONSOB, Banca d'Italia, IVASS), fiscal authority (MEF including Agenzia delle Entrate) and MiSE, among others (CONSOB, 2019[73]). The MEF has launched a public consultation, that closed in March 2020, about the regulatory framework for an Italian Fintech Sandbox, which was instituted by law in 2019. This type of sandboxes, providing a limited form of regulatory waiver, or flexibility for firms to test new products or business models with reduced regulatory requirements, while preserving some safeguards, are emerging as key components of many governments' efforts to support the development of Fintech (e.g. UK FCA's "Innovation Hub", Monetary Authority of Singapore (MAS); (OECD, 2018[74])). These sandboxes might also be used to develop and test DLT-based solutions, as for example in the case of Japan (Forbes, 2019[75]).

CONSOB launched public consultation in 2019 to discuss with industry players the means to ensure liquidity in the crypto-market while also ensuring the reliability and respect of regulation by crypto-exchanges. Both CONSOB and ESMA (European Securities and Markets Authority) have been

active with communications, studies and warnings since the first appearance of crypto-currencies and crypto- assets in the market. In January 2019, ESMA published a paper to set European standards on "Initial Coin Offerings and Crypto-Assets", building on a previous warning issued in 2018 (ESMA, 2019[76]). A few months later, CONSOB identified the possible need of a legislative effort at the national level to clarify the role of ICOs, crypto exchanges and wallets, to distinguish between different types of *tokens* and to integrate existing legislation on financial investments[20]. The effort was aimed at providing a clearer interpretation, and ultimately a better legal environment, for operators and investors in this fast growing industry, similarly to initiatives conducted in recent years in France and Germany (by AMF and BaFIN). The authority started a public consultation in March 19th (CONSOB, 2019[77]), 2019, including a public hearing held on May 2019 with more than 200 participants. The consultation ended on June 5th, 2019, with 61 responses (8 from academia, 4 from sector associations, 7 from Fintech associations, 2 incumbent market operators, 12 Fintech operators, 25 law firms, 3 physical persons). At the end of the consultation, CONSOB published the final document at the beginning of 2020 (CONSOB, 2020[78]), proposing to the national legislator the creation of two new public registries, one for crypto asset exchanges, and one for digital wallet service providers ("token custody"). This would ensure the respect of AML/KYC and investment protection provisions by players active in the Italian market. It is important to note that CONSOB works in close cooperation with its foreign counterparts and ESMA in order to ensure a coherent international approach.

Initiatives for leveraging DLTs in public service delivery systems…

Since 2015, the MEF launched two pilot projects to test the technology within the systems of the public administration - the first experimentation was SUNFISH (SecUre iNFormatIon Sharing in federated heterogeneous private clouds). The pilot was part of an EU Horizon project started in 2015 together with eleven other institutions in six countries (UK, Israel, Estonia, Malta and Austria) and financed with EUR 4.5 million. The project was concluded in 2017, and in the Italian use case, it dealt in particular with the sharing of secured information between the cloud systems of the MEF and of the Ministry of Interior. The Italian prototype used smart contracts on a blockchain infrastructure to ensure integrity and secrecy in the exchange of information between the MEF and the State Police, in particular in relation to the residence and status of Italian public security agents. The project was conducted in partnership with SOGEI (an IT company 100% controlled by the MEF). Interestingly, the project has been developed as a base for the renewal of the NoiPA, a payroll function for public sector employees, focusing in particular on the exchange of secured information between public and private clouds (MEF, 2017[79]; MEF, 2019[80]; Sunfish Project, 2017[81]).

The second ongoing experimentation of DLTs by the MEF is called PoSeID-on, a platform for Personal Data Management and Data Protection. The objective is to create an ecosystem platform using permissioned blockchain and smart contracts, for management and protection of personal data in compliance with GDPR[21]. The platform should at first be accessible to 2 million Italian public servants registered on NoiPA (legal-economic management service of the payroll within the Italian public administration), that will have the possibility to use an improved dashboard for the management of their data. The project has been co-funded by the European Commission in the Horizon 2020 "Digital Security" program, and the MEF heads a consortium of 10 European partners (universities, public and private entities from seven different countries). The project is due to conclude by the end of 2020.

20 The TUF (testo Unico della Finanza) at Italian level and the MIFID II at European level, already regulate "financial instruments", which include in the latest interpretations also Bitcoin and Ethereum.

21 Guaranteeing users the portability of data, the right of access, the right to be forgotten, and the restriction of personal data processing.

…and for the diffusion of Blockchain technology in the Italian economy

Since 2018, the MiSE has developed actions to sustain the uptake and development of DLTs in the Italian economy (Figure 31). Having identified blockchain as one of the key emerging digital technologies, the Ministry has launched several initiatives, to structure a long-term view of the development of the sector as well as to pilot key applications for Italian industries, in particular for the "Made in Italy" brand.

In 2019, the MiSE instituted a high-level expert group to discuss a National Blockchain Strategy. The group was constituted by 30 experts, of which "ten representing enterprises operating in the field of DLT and blockchain; ten representing research centres, public administration, academics, think-thanks; ten representing the labour market, the professions, the third sector, the consumers and in general the civil society" (MiSE, 2018[82]). The expert group started work in January 2019, organised in sub-working Groups, namely:

- SG1 - Use cases: infrastructure, mapping and replicability conditions
- SG2 - Regulatory framework: sandboxes and vulnerability
- SG3 - Digital coins, payment system and Fintech
- SG4 - Education, skills and awareness
- SG5 - Strengthening of public administration services

The draft document has been finalized by the experts and it will provide the basis for the Italian National Strategy on Blockchain. A summary will be published for public consultation. Other European and OECD countries have prepared National Blockchain Strategies to provide a long term vision on the uptake of DLTs in the economy, as for example Germany (Box 8).

Box 8. National Blockchain Strategy, Germany

Rationale and objectives of the strategy

The Blockchain Strategy of the German Federal Government was published in September 2019. It is a holistic strategy, which aims to use the opportunities in blockchain technology and to mobilise the areas of potential that it offers for the digital transformation. Besides putting forward concrete measures, the strategy lays out ten principles that guide the actions of the federal government. These principles are: Advancing innovations, giving an impetus to investments, guaranteeing stability, strengthening sustainability, making fair competition possible, deepening the digital single market, expanding international collaboration, integrating stakeholders, guaranteeing IT security and data protection and making provision for adaptions. The intention of the last principle is to check and further develop the strategy at regular intervals. The high speed of technological development can make further action by the Federal Government necessary. The young, innovative blockchain ecosystem in Germany is to be maintained and shall continue to grow. Germany is to be an attractive base for development of blockchain applications and for investments in scaling them up. Simultaneously, big companies, SMEs and start-ups, in addition to the public sector, the Laender (Germany's Federal States), civil-society organisations and individual citizens are to be enabled to make informed decisions about use of this technology. To reach this goal, we strive both to ensure the compatibility of blockchain-technology-based applications with current law and also to prevent misuse. Our aim is to create a regulatory framework directed at investment and growth, one in which market processes work without state interventions and the sustainability principle is safeguarded.

Challenges

The main challenges from the perspective of the strategy are maturing and commercialising of solutions and business models. In Germany, many pilot projects have been conducted using blockchain technology. The necessary next step is scaling up of pilot projects and proof-of-concepts. Only if the scaling up will happen, the high economic expectations related to blockchain technology will really come true. The aim of the strategy is further to set a level-playing field for solutions based on blockchain technology and solutions based on other technologies. Dissemination of knowledge is the basis for a level-playing field. Another challenge that has to addresses is the sector-specific question of enabling the use of blockchain technology for financial services while guaranteeing stability.

Programme activities and delivery methods

The blockchain strategy puts forward 44 measures in five fields of action:

- Securing stability and stimulating innovations: Blockchain in the finance industry
- Maturing innovations: Promoting projects and regulatory sandboxes
- Facilitating investments: Clear and reliable general conditions
- Applying the technology: Digital administrative services
- Disseminating information: Knowledge, networking and cooperation.

The delivery methods are manifold. They consist of adoptions of the regulatory framework, funding of pilot projects (especially in the energy sector, related to supply chains and on digital identity), elaboration of criteria for sustainable projects, studies on specific topics, supporting standardization processes, using the technology in the public administration, dissemination of knowledge and dialogues with external stakeholders.

Recent progress

The 44 measures are currently being implemented. The responsible ministries for each measure are outlined in the attachment of the strategy and each of them is working on them. The progress is regularly measured by the responsible ministries for the strategy (Ministry for Economic Affairs and Ministry of Finance). Work has started on 37 measures in March 2020, two measures have already been completed and on only 5 measures the work has not yet begun.

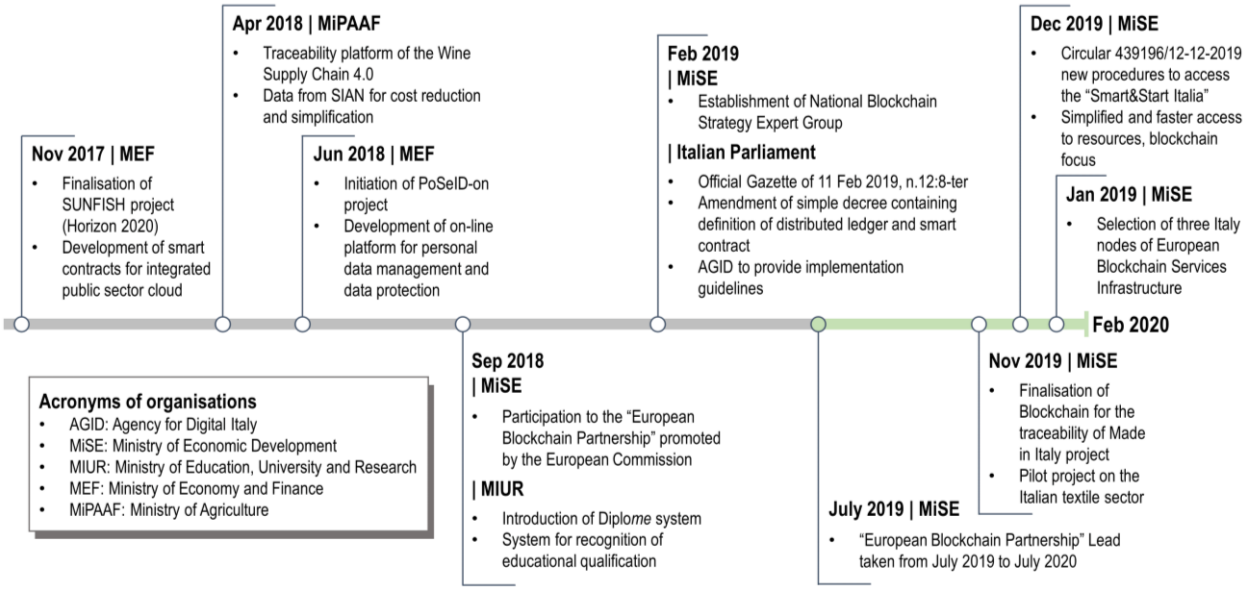
Relevance for Italy

The measures in the German Blockchain Strategy are intended to mobilise the potential of the blockchain technology for the German economy. The measures outline a possible approach to support the ecosystem. Some of the measures apply to general questions regarding the relatively new technology and its consistency with the existing framework conditions or the dissemination of knowledge about the technology, Italy could consider adopting similar measures.

Source: German federal government blockchain strategy website (www.blockchain-strategie.de).

Figure 31. Main policies for the test and diffusion of DLT technologies in the Italian economy

2017-2020



Source: OECD Analysis integrated by phone and in person interviews.

The MiSE partnered with IBM in 2019 to develop a first case study focusing on the traceability of the "Made in Italy" in the textile sector in Italy. The objective of the feasibility study was to test a platform, based on the private permissioned infrastructure of IBM Hyperledger Fabric, to provide a solution for the various stakeholders in the textile supply chain, one of the most important for the "Made in Italy". The project highlighted the potential value of using blockchain to support the "Made in Italy", as it could guarantee the quality and sustainability of products, providing a considerable value added to clients globally. The project elaborated a first prototype, available via cloud for participating companies, trade associations and certifying authorities, composed of two nodes and that was tested successfully by the five types of participating companies (MiSE and IBM, 2019[83]). The focus on the textile sector was particularly relevant as this is both one of the main targets of counterfeiting (estimated at EUR 3.75 billion/year in the clothing/footwear/leather sector; (OECD, 2018[53])) and characterised by a large number of SMEs. A blockchain infrastructure at national level for the operators in the sector would guarantee an easier standardization of practices, immutability of the input, reliability of the smart contracts and authenticity of data and documents stored therein.

The MiSE reviewed and simplified the "Smart&Start" program of Invitalia to provide incentives to innovative start-ups, including the ones working on blockchain technology. Some of the interviewed companies pointed at the "Smart&Start" programme of Invitalia as a source of financing. In general, the perception of the support provided by the agency was very positive, but entrepreneurs highlighted the cumbersome bureaucratic procedure and the restrictive need of co-financing as real obstacle for the full exploitation of the incentives. The new simplified modules to request the incentives were delivered starting from 20 January 2020 including a number of updates[22]: less bureaucracy, simpler evaluation criteria for the business plan, zero-interest rate financing of up to 80% of projects between EUR 100 000 and EUR

22 With the decree n. 439196 of 16-12-2019, the Ministry defined precisely the timing and process outlined by the decree of the Minister of Economic Development of the 30-8-2019 (published on the "Gazzetta Ufficiale" n.244 of 17-10-2019).

1.5 million (90% for women and people under 36 years of age), 30% grant to companies based in the south of Italy, 10 years to reimburse, up to 20% of the credit provided for working capital, and a special regime for start-ups based in the north of Italy willing to invest in the southern regions. The project includes a specific focus on "admissible projects" on AI, IoT and blockchain technology, evaluated by a technical committee (MiSE, 2020[84]; MiSE - Direzione Generale per gli incentivi alle imprese, 2019[85]). Additional resources could come from the EUR 15 million funds allocated for the year 2019-2020 and 2021 by the Budget Law 2019 at disposal of the MiSE for investments on these key technologies (AI, blockchain and IoT). Another incentive for the uptake of DLT solutions could come from the Budget Law 2020, which introduces the concept of "Transizione 4.0" (Transition), with 15% tax credit for investments in software up to EUR 500 000, extended to companies with "special" fiscal regimes, as start-ups and cooperatives.

Multiple programs directed at increasing digital skills and innovation potential in SMEs could have a significant impact on the uptake of blockchain technology. To tackle the lack of skills in Italian SMEs the government is proposing various measures, including:

- The introduction of the profile of "Innovation manager" (IM), professional figures registered with the MiSE to support SMEs in their digital transition, in particular by offering consultancy services. By December 2019, there were 8 956 certified IM in the MiSE's registry. The MiSE allocated EUR 50 million in "vouchers for innovation consultancy", covering part of the consultancy costs depending on the size of the firm: 50% of the cost up to EUR 40 000 for micro and small enterprises; 30% of the cost up to a maximum EUR 25 000 for medium enterprises; 50% of the cost up to EUR 80 000 for "business networks" (*reti d'impresa*). After financing the first 1 831 applications, the MiSE allocated additional EUR 45 million in 2020 to finance as well the remaining 1 784 applications (MiSE, 2020[86]).
- A tax credit for companies providing training to their employees within Industry 4.0. This provision is not solely for SMEs but it includes them: the tax credit is of 50% for small enterprises, up to a maximum amount of EUR 300 000; of 40% for medium size enterprises, up to EUR 300 000; and of 30% for large enterprises up to EUR 200 000 (MiSE, 2019[87]).
- The introduction of new functions in Competence Centres that will support SMEs in evaluating their level of digitalisation and will provide them with training and support for R&D and innovation (see also Chapter 1 on the policies to support SME digitalisation at large).

The Italian parliament approved in the "Decreto Semplificazioni" (DDL n. 989, 2019) a definition of DLTs and the legal validity of Smart Contracts, an innovative policy action at the international level. In an amendment proposed and approved by the Italian Senate, the legislator has introduced in Italy an innovative legal principle that recognises smart contracts as legal contracts in the Italian legal system. The Smart Contracts, defined as a software operating on DLTs and self-enforcing on the basis of rules pre-defined by the parties. Giving legal value to smart contracts can be a very disruptive measure unleashing important innovation in the Italian economy and a fast development of blockchain-based application. However, it is indeed crucial that the technical standards are well calibrated to avoid abuses, as the possibility of having a malevolent party exploiting a loophole in the smart contract could create serious consequences. International experience calls for caution in this regard[23]. The Agency for Digital Italy (AGID) has set up a working group (AGID, 2019[88]) in May 2019 for the definition of the technical

23 The DAO (Distributed Autonomous Organisation) case has had a strong impact on the evolution of blockchain at global level. Hackers were able to exploit a loophole in the smart contract managing the funds, syphoning out the equivalent of USD 70 million – and causing the Ethereum foundation to decide for a hard fork, distinguishing ETC and ETH ever since. In this context, some observers pointed out that as the hackers had exploited an error in the code, they had not actually "stolen" anything, but just let the smart contract "work in their favour", and if the smart contract would have been a legal contract the hackers could have sued to re-obtain the stolen funds. While this might have been a wild guess, the debate on the issue has still been one of the most controversial in the blockchain community (for a review, see (De Filippi and Wright, 2018[111]) and (Werbach, 2017[112])).

guidelines. Recently, the Ministry of Innovation got involved and the technical guidelines should be published in the first half of 2020, making Italy one of the first countries to apply this legislative innovation (Bellezza, 2019[89]).

The MiSE and Cassa Depositi e Prestiti (CDP) launched in 2019 the "CDP Venture Capital Sgr – Fondo Nazionale Innovazione" to stimulate the VC market in Italy and unleash innovation, including with blockchain. The fund has been launched with a starting capacity of EUR 1 billion and it will be managed by CDP in cooperation with various stakeholders including MiSE. The fund will provide venture capital financing (direct or indirect minority equity participations) to innovative SMEs in Italy, with the objective of supporting the development of the Italian VC market through the injection of public funds. In the relatively small Italian VC market, a new public actor with considerable resources has been welcomed by interviewed entrepreneurs in the blockchain ecosystem. In addition, the Sustainable Growth Fund ("Fondo per la Crescita Sostenibile") managed by MiSE is offering support to businesses investing in R&D in ICT and the development of innovative DLT-based solutions could be included among its strategic areas of investment.

Another interesting pilot project was launched by the Ministry of Agricultural, Food and Forestry Policies (MiPAAF) in 2017 for the traceability of the wine supply chain. The project, called "Wine Supply Chain 4.0", included also Agea (Agricultural Dispensing Agency), SIAN (National Agriculture Information System) and Almaviva as a private partner. The system, based on Ethereum, was aimed at protecting the origin of Italian product in the wine supply chain, guaranteeing quality and safety in the production process. Smart contracts were set up so that participants to the supply chain could upload their data to certify them in a secure, transparent and unmodifiable way. A NFC code on the bottles allowed any third party to check the public information registered on the blockchain to verify the authenticity of the product, combating counterfeiting.

The Ministry of Education, University and Research (MIUR)[24] prepared in 2018 a white paper for "Diplo*me*", a system for recognition of educational qualification based on DLTs. The project has been carried out by CIMEA (Information Centre on Academic Mobility and Equivalence) and based on its CIS (Credential evaluation service of Italian and foreign certifications). The objective is to create a global, unified, transparent and secure recognition system for qualification and certification based on a distributed, decentralised and tamper proof infrastructure (Lantero and Marchionni, 2019[90]). It is interesting to note that while the idea is for the system to target higher education institutions and certification bodies, it is also stated clearly that it could be used in the future by private companies and in particular by SMEs. An example would be an SME in the construction sector, wishing to store securely and transparently the Safety and Security Certificate of one of its employees.

The MiSE has joined the European Blockchain Partnership (EBP) in 2018, as its 27th member. The EBP was created in April 2018 and it joins at a political level all EU member states and members of the European Economic Area (Norway and Lichtenstein; (EU Commission, 2018[91]). In July 2019, Italy has taken the role of President together with Sweden and the Czech Republic up to July 2020, coherently with its strategic view of supporting the diffusion of DLT systems and infrastructures at national and European level. In May 2020, EBP European Blockchain Partnership chose the use case "Blockchain solution for European Social Security Number" proposed by INPS (National Institute for Social Security) and endorsed by Italy, as one of the three new use cases for 2020/21 to be implemented on the European Blockchain Service Infrastructure (EBSI) infrastructure.

The development of the EBSI, supported by the Italian government, can help the diffusion of DLT-based solutions at European level. Some of the main problems linked to the diffusion of blockchain services in the economy is connected to the flourishing of a large number of conflicting infrastructures,

24 Since 2019, the government has established two separate Ministries, the Ministry of Education and the Ministry of University and Research.

which makes interoperability, lack of standards and connections problems a major barrier to the development. This European initiative is directly focused on overcoming this issue, and one of the key "infrastructure" project is focusing on creating a shared system for the management of self-sovereign identity (SSI), a theme that can spill-over in a vast range of innovative applications (EU Commission, 2020[92]). On these grounds, in January 2020 Italy has decided to actively participate to the EBSI infrastructure with three nodes to be set up within summer 2020. These three, first, nodes will be hosted by Infratel Italia, INPS, and Politecnico di Milano. Furthermore, from the second half of 2020, the MiSE and Infratel Italia will take active part in the promotion of implementation of additional EBSI nodes in Italy, supporting the deployment of selected use cases, and supporting capacity building and training activities targeting a broader uptake of the EBSI by public services.

Box 9. Policies to support the diffusion of DLT-based applications in the economy, Denmark

Main sectors interested and companies by size

A recent study on Danish industry shows that the country's financial services industry has the most blockchain applications already in use with 77% of companies reporting to have experience with the technology, which is in line with the global blockchain adoption trends. Within Denmark, the three main sectors that currently have the most number of entities working on blockchain are Fintech, maritime shipping and transportation, and general ICT services.

The maritime shipping and transportation industry is predicted to be a sector that in the future will benefit greatly from DLT. Currently the industry has shown great interest in how blockchain could improve registration and certificate process, with use cases being developed by Danish projects as such as TradeLens and Blockshipping.

The 2018 Strategy for Denmark's Digital Growth, developed by the Ministry of Industry, Business and Financial Affairs, further emphasises the importance of Blockchain for the maritime shipping industry. The Danish government has plans in place for Denmark to be the first country to use Blockchain technology for ship registration. The Danish Maritime Authority aims to digitise the Danish Register of Shipping to ease the burden of companies in this area and allow companies to access data on registration type, quantity and application. This Blockchain solution can be integrated and used by shipping companies and other actors in the supply chain, encouraging SMEs to explore DLT solutions (Danish Ministry of Industry, 2018[93]).

In Denmark, both large and micro-sized enterprises possess similar levels of blockchain knowledge, which could be a result of the plentiful resources available to large companies and "digitally born" start-ups having a greater interest in DLTs from their inception. On the other hand, medium-sized businesses are lacking expertise and the appetite for blockchain innovation.

Challenges for adoption

Danish companies face several challenges when adopting DLTs to their business. A recent study conducted by the European Blockchain Centre with the Danish Industry Foundation and the IT University of Copenhagen shows that the lack of standardized open interfaces and a lack of skilled experts are indicated to be the most significant impediment for the implementation of blockchain solutions.

Firms also reported that training and further educational programs are needed for the widespread assimilation of blockchain technologies, especially at the managerial level, as the level of expertise held by senior leadership is found to have the greatest effect on blockchain adoption.

Regulatory and legislative issues pose challenges in implementing DLT systems, especially for many smaller firms. Many Danish blockchain companies are found to be registered outside of Denmark, paying taxes elsewhere.

Current government policies

In March 2018 the Danish Ministry of Higher Education and Science released the Government's Objectives for Danish Research and Innovation. This white paper lists technological research as a priority with a significant increase in funding allocated to technological R&D, which is expected to have positive effects for innovation in the area of Blockchain for businesses. Moreover, the government will establish a national centre across all Danish research institutions to support the development of digital technologies including Blockchain.

The Strategy of Denmark's Digital Growth cites SME digitalisation as a central objective, A new program, 'SME:Digital', focuses on improving the digital skills of executives and those at the managerial level, creating more favourable conditions for Blockchain adoption. Similarly, 'The Technology Pact' and the innovation centre Digital Hub Denmark aim at strengthening technical and digital skills in cooperation with the private sector. The Digital Growth Strategy aims also to improve regulation to facilitate new business models and experimentation.

Relevance for Italy

The Danish data on awareness about blockchain technology in the business population is a very relevant tool for policy making, as it gives a profound understanding of the SMEs and entrepreneurs that would become the users of DLT-based services.

Support the increased applications of DLT-based solutions by the government for the delivery of public services and for the compliance of bureaucratic procedures, especially in sectors relevant to the Italian economy (e.g. blockchain register for ships for trade in Denmark).

Focus on improving SMEs' digital skills, especially of executives at managerial level, in order to facilitate the uptake of advanced digital solutions as the applications based on DLTs.

Source: (Beck et al., 2019[94]; Danish Ministry of Industry, 2018[93]; Ministry of Higher Education and Science, 2018[95]).

Conclusions and recommendations

Blockchain technology is evolving rapidly at the global level and Italy should leverage its competitive advantages to become an important player internationally. There is already a strong entrepreneurial base in Italy and many companies are elaborating innovative blockchain solutions that could attain considerable market presence, especially to provide services in the sectors of excellence identified with the Made in Italy signature (e.g. machinery, textile, food). To this aim, it is essential to foster a conducive environment for entrepreneurs and SMEs operating in this sector, such as by improving access to finance, talent, resources and, mentorship, and by simplifying bureaucratic procedures.

The high share of micro businesses and the concentration of employment and job creation in low productivity sectors are relevant challenges for the Italian economy, but an increased diffusion of digital technologies can offer viable solutions. The share of micro-businesses in the population is larger in Italy than the OECD average, and their share of employment is more than double that in Germany or the UK. This structure reflects the overall productivity of the economy, as micro businesses are concentrated in low productivity sectors and are responsible for a large share of job creation. However, Italian SMEs are more productive than the OECD average, and the use of digital technologies can further help them address scale and innovation barriers. Digital tools can improve resource efficiency in SMEs, reducing costs and spurring the diffusion of complementary technologies. Facilitating the digital transition of SMEs should be a policy priority both in terms of ensuring the essential access to digital infrastructure (e.g. broadband connection) across urban and rural areas as well as to support these companies in developing the right skill sets and finding the right talents, as the digital gap between large and small firms is widening.

Italian firms are above the OECD average in integrating business-related ICT tools in their processes, and the share of ICT investments directed to software and databases is relatively high, which is interesting considering that Italian blockchain businesses are mostly targeting SMEs. The use of ERP and CRM is relatively widespread, and cloud technologies can offer SMEs the opportunities to overcome cost barriers and scale up their digital capabilities. However, adoption of cloud solutions is still low in Italy (about 20%, below the OECD average of 30%). This is linked to the low diffusion of advanced data analytics practices, of which Italian SMEs are among the lowest users in the OECD (around 10% of SMEs have experience in this field). A low level of in-company training exacerbates this further. The fact that blockchain businesses are mostly developing products targeting SMEs presents opportunities for a greater digital capacity and enhanced productivity by SMEs.

The large and diversified Italian manufacturing sector offers interesting opportunities to developers of blockchain-based solutions, for the protection of Made in Italy, product quality and sustainability, IP and copyright protection. There are multiple projects and use cases developed by Italian start-ups and innovative SMEs to address the needs of the machinery, agri-food, textile, and art sectors, as the features of transparency, immutability, decentralisation, security and efficiency are all very

attractive for their operations. Most of the interviewed companies are launching pilots (e.g. alpha or beta version of their software) or serving a limited number of clients, but the potential is evident and the growth in coming years could be disruptive. SME, business and sector associations can play an important role in this transition by experimenting systemic solutions that would benefit the whole industry. The Spunta project, proposed by ABI in the banking sector, offers a very good example.

More than a third of Blockchain companies in Italy[25] exhibit a preference for public permissionless blockchain rather than permissioned system. This is not trivial, as in many countries (as for example Israel), the use of private permissioned networks has been more central due to its higher flexibility to business purposes, even considering the cost of losing the decentralised nature, and thus the consensus mechanism, which constitute the most striking innovations of DLT systems. However, at present many companies in Italy are proposing not only applications, but also their own underlying DLT infrastructure. This may cause serious problems for scaling up, as the "ecosystem" in the country becomes more and more fragmented[26]. To be overcome, it requires interoperability features to be integrated in the protocol and applications' development.

Businesses highlighted the complex bureaucratic procedures needed to operate in Italy and the difficulty in obtaining financing. These observations from industry operators should be considered a priority by the government, as in a very competitive environment as the one for DLT enterprises, companies often move to countries with the most reliable, transparent and simple regulatory and administrative process they can access. In addition, most interviewed companies highlighted that their main source of financing were personal funds, which, coupled with the indication of finding financing as a major barrier, depicts a scenario in which innovative SMEs are struggling to find the risk capital and resources needed to bring about innovation. The large number of ICOs with Italian CEOs and teams that were based in Chiasso, a small town close to Milan, right across the Swiss border, is a case in point about the implications of these barriers.

The Italian ecosystem is characterised by close cooperation of blockchain businesses with Italian universities. It is very important to acknowledge the pivotal role of the network of Italian universities to sustain the development of this industry, as a source of advanced research with possible industrial applications and providers of qualified skills, this may also help explain why finding talents is not considered a major issue by blockchain entrepreneurs in Italy. However, the current demand of such talents by SMEs is very limited so it is not possible to infer precisely if the needs of the industry will be met once it will reach scale.

Since 2018, the MiSE has been active in promoting and supporting the development of the technology and now more coordination could help to face the challenges ahead. Up to this moment it seems that the different public institutions dealing with the diffusion of DLTs have been moving mostly autonomously. We can see a substantial separation between the actions of regulatory authorities in financial markets (CONSOB, Banca d'Italia) and the fiscal authority (MEF including Agenzia delle Entrate) dealing mostly with the area of virtual assets (e.g. to ensure AML/KYC principles) and CBDCs, and the MiSE pushing for a strategic vision for the uptake of DLTs in the real economy. A more collegial approach, as in the example of the "Fintech Committee" (see section 3.1), could bring substantial benefits. For example in the case of Israel, the institution of an Inter-Ministerial working group helped policy makers to take into account the cross-disciplinary nature of this peculiar technology.

25 Here we refer to start-ups and innovative SMEs responding to the OECD survey. Many projects launched by large tech companies in Italy rely instead on private permissioned networks, where the company providing access is the de facto sole central administrator and decision-maker in the network.

26 This important point has been argued in the annual report of the Osservatorio Blockchain of Milan's Polytechnic University (Politecnico di Milano, 2020[25]) and discussed during the OECD Working Group in Rome in December 2019.

Box 10. Policy recommendations

Education and awareness

- Support the development of specific digital skills by SMEs' executives and managers, such as by providing "Innovation Managers" with trainings related to the potential and possible industrial applications of blockchain technology. "Training the trainers" could create a virtuous cycle to enhance SMEs awareness.
- Leverage the network of Competence Centres around the country to provide specific trainings and courses on DLTs capabilities targeting in particular SMEs. This could also take the form of an incentive covering the total or part of the costs of online courses offered on the topic by local and international universities[27].
- Expand the "Innovation manager vouchers" to projects focusing on distributed ledger technologies, as currently the list of 14 technologies does not explicitly include them. This would also create incentives for blockchain experts to become registered "innovation managers" and contribute to the growth of the ecosystem in the country.

Data for informed policy-making

- Leverage the country's data on the general business population to survey the cases of firm-level awareness and uptake of DLTs in their business process. Such approach will provide the policy makers a more granular understanding of SMEs' blockchain adoption and their geographical distribution, including possible identification of emerging blockchain ecosystems at the regional level. The Danish example could serve as an inspiration for this kind of survey.
- Partner with research institutions to provide detailed information on the development of the technology in the country and on the evaluation of government's incentive schemes for entrepreneurs and start-ups. Specialised research centres (e.g. the Osservatorio Blockchain & Distributed Ledger of Politecnico di Milano) could play an important role in informing policy with their in-depth understanding of the ecosystem.

Delivery of public services to SMEs through DLT infrastructure

- Increase instances of DLT-based application used by the government for the delivery of public services and compliance of bureaucratic procedures. For example, in Denmark, the Danish Maritime Authority aim to use blockchain to register ships, as shipping and maritime trade is central to the Danish economy; in Italy such experiment could be carried out in sectors relevant for the Made in Italy (e.g. machinery, textile, food). In Estonia the government used public procurement to obtain advanced technological solutions for digital signatures and IDs and a similar "problem-based" approach could be used to stimulate the development of DLT-based solutions.
- Consider organising a Hackathon among Italian blockchain companies, challenging them in a competitive procedure to propose a blockchain-based solution to a specific policy issue (for example, to simplify the process to obtain financial support from the MiSE's programs, making

27 E.g. online courses: 3 weeks "Cloud Computing and Blockchain from the Politecnico of Milan, 6 weeks "Blockchain Strategy" from Oxford Said Business School; 2 weeks "Certified Blockchain expert" from Frankfurt School of Finance and Management"; (Politecnico di Milano School of Management, 2020[113]; Oxford Saïd Business School, 2019[114]; Frankfurt School of Finance & Management, 2020[115])

it more transparent and effective[28]). A successful example of Blockchain Hackathon was launched by the Ministry of Economy of Latvia in 2019 (Bianchini and Kwon, 2020[96]).

Financing of innovative SMEs and start-ups

- Coordinate with incentives programmes delivered by local authorities and local business institutions/associations (e.g. Chambers of Commerce) to provide clear information for start-ups and SMEs about all the possible financing channel they have at their disposal. InvItalia Start&Smart project at national level, Innodriver from Lombardy Region and the digital voucher of the Chamber of Commerce, Industry, Agriculture and Crafts (CCIAA) of Milan are all relevant examples of this fragmentation that SMEs have to navigate without specific support;
- Consider including the diffusion of blockchain technology in Italy as an objective of the "CDP Venture Capital SGR – Fondo Nazionale Innovazione" and of the Sustainable Growth Fund managed by the MiSE. While taking in general a "technology neutral" approach to innovation projects, the fund could provide blockchain entrepreneurs useful resources and mentorship to develop their projects.

Local, national and international cooperation

- Establish an inter-Ministerial group that could be managed by the MiSE, to ensure that government actions and resources invested in this technological area are coordinated around a common vision. The case of Israel shows that open discussion at technical level across Ministries and public agencies can support more coherent and effective policy actions.
- Propose coordination (including within Program Agreements) with interested local authorities (i.e. regions, municipalities) actively pursuing innovation strategies that include the delivery of services to SMEs and citizens through systems based on DLTs. New initiatives of the Ministry could be piloted at local level, while successful projects at regional level could be evaluated and as appropriate, scaled up at the national level (e.g. the "Nidi Gratis" project of Lombardy Region, Box 6).
- Leverage the Italian Presidency of and participation in the European Blockchain Partnership to promote the diffusion of the technology. For example, by sustaining the implementation and rapid operational uptake in Italy of the self-sovereign identify system developed within the European Blockchain Service Infrastructure.

28 There is also previous experience in Italy, with the blockchain hackathon for public procurement solutions organised by E&Y and Microsoft in cooperation with MEF, AGID, Corte dei Conti, Consip and Sogei in 2017 (CORCOM, 2017[117]).

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