

The Effects of the Covid-19 Pandemic on the Italian Economic System: the Factors Underlying the Resilience of the Lombard Manufacturing Sector

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Italy was the first country in the western world to be officially hit by the pandemic in February 2020. Government interventions aimed at regulating the necessary lockdowns and restrictions of social behavior initially blocked all productive activities, except for activities relating to essential goods and services, with a particularly significant impact in sectors related to people's free time and social life. As is well known, this has had evident negative repercussions on the gross domestic product (GDP), above all on companies and sectors already in difficulty before the pandemic; on the disposable income of people employed in companies blocked by the measures; and, therefore, on the general levels of consumption. In this context, the Lombard manufacturing sector, the engine of the Italian economy, has shown a great capacity for resilience. The paper focuses on the factors underlying the effective response to the crisis, as they most likely represent the same elements that can allow or accelerate the post-Covid regrowth.

1 Introduction

Due to the Covid-19 pandemic that marked the whole of 2020 and which is still affecting the entire planet, there have been falls in Western economies' GDP that had not been recorded since the end of the Second World War, see Figure 1. Despite the drama of the situation at a social, economic and health level, the objective of the paper is to demonstrate how the pandemic and the related crisis have contributed to initiating important changes and transformation processes, both in terms of demand and production supply, that could indicate some possible ways of development for the future, as soon as the vaccination campaign will make it possible to secure the population in each country. Despite the drama of the situation at a social, economic and health level, the objective of the paper is to demonstrate how the pandemic and the related crisis have contributed to initiating interesting changes and transformation processes, both in terms of supply and demand - relevant for the

	Year over Year						Q4 over Q4 21			
	Estimate		Projections		Difference from October 2020		Estimate		Projections	
	2019	2020	2021	2022	2021	2022	2020	2021	2022	2022
World Output	2.8	-3.5	5.5	4.2	0.3	0.0	-1.4	4.2	3.7	3.7
Advanced Economies	1.6	-4.9	4.3	3.1	0.4	0.2	-3.9	4.6	1.9	1.9
United States	2.2	-3.4	5.1	2.5	2.0	-0.4	-2.1	4.0	2.0	2.0
Euro Area	1.3	-7.2	4.2	3.6	-1.0	0.5	-6.8	5.8	2.0	2.0
Germany	0.8	-5.4	3.5	3.1	-0.7	0.0	-5.3	5.2	1.7	1.7
France	1.5	-9.0	5.5	4.1	-0.5	1.2	-8.2	7.4	2.0	2.0
Italy	0.3	-9.2	3.0	3.6	-2.2	1.0	-8.3	4.2	2.3	2.3
Spain	2.0	-11.1	5.9	4.7	-1.3	0.2	-9.8	7.1	2.0	2.0
Japan	0.3	-5.1	5.1	2.4	0.8	0.2	-2.3	2.7	1.8	1.8
United Kingdom	1.4	-10.0	4.5	5.0	-1.4	1.8	-8.3	6.0	1.9	1.9
Canada	1.9	-5.5	3.6	4.1	-1.6	0.7	-4.0	3.7	2.7	2.7
Other Advanced Economies 3/	1.8	-2.5	3.6	3.1	0.0	0.0	-2.2	4.5	1.9	1.9
Emerging Market and Developing Economies	3.6	-2.4	6.3	5.0	0.3	-0.1	0.9	3.7	5.4	5.4
Emerging and Developing Asia	5.4	-1.1	8.3	5.9	0.3	-0.4	3.2	3.8	6.4	6.4
China	6.0	2.3	8.1	5.6	-0.1	-0.2	6.2	4.2	6.0	6.0
India 4/	4.2	-8.0	11.5	8.8	2.7	-1.2	0.6	1.7	7.8	7.8
ASEAN 5 5/	4.9	-3.7	5.2	6.0	-1.0	0.3	-3.2	5.2	6.1	6.1
Emerging and Developing Europe	2.2	-2.8	4.0	3.9	0.1	0.5	-2.7	4.8	3.0	3.0
Russia	1.3	-3.6	3.0	3.9	0.2	1.6	-4.6	5.3	2.8	2.8
Latin America and the Caribbean	0.2	-7.4	4.1	2.9	0.5	0.2	-4.8	2.3	2.8	2.8
Brazil	1.4	-4.5	3.6	2.6	0.8	0.3	-1.9	1.6	2.6	2.6
Mexico	-0.1	-8.5	4.3	2.5	0.8	0.2	-8.4	2.2	2.4	2.4
Middle East and Central Asia	1.4	-3.2	3.0	4.2	0.0	0.2	...	...	...	...
Saudi Arabia	0.3	-3.9	2.6	4.0	-0.5	0.6	-3.1	3.5	4.0	4.0
Sub-Saharan Africa	3.2	-2.8	3.2	3.9	0.1	-0.1	...	...	...	...
Nigeria	2.2	-3.2	1.5	2.5	-0.2	0.0	...	...	...	...
South Africa	0.2	-7.5	2.8	1.4	-0.2	-0.1	-6.2	2.8	0.6	0.6
Moratorium	...	...	...	...	...	...	...	...	...	...
Low-income Developing Countries	5.3	-0.8	5.1	5.5	0.2	0.0	...	...	...	...
World Growth Based on Market Exchange Rates	2.4	-3.8	5.1	3.8	0.3	0.0	-2.0	4.3	3.1	3.1
World Trade Volume (goods and services) 6/	1.9	-8.6	8.1	6.3	-0.2	0.9	...	...	...	...
Advanced Economies	1.4	-10.1	7.5	6.1	0.4	1.0	...	...	...	...
Emerging Market and Developing Economies	0.3	-8.9	9.2	6.7	-1.0	0.8	...	...	...	...
Commodity Prices (US dollars)	...	...	...	...	...	...	...	...	...	...
Oil 7/	-10.2	-32.7	21.2	-2.4	9.2	-5.4	-27.6	13.5	-2.2	-2.2
Nonfuel (average based on world commodity import weights)	0.8	6.7	12.8	-1.5	7.7	-2.0	15.4	2.0	-0.1	-0.1
Consumer Prices	...	...	...	...	...	...	...	...	...	...
Advanced Economies 8/	1.4	0.7	1.3	1.5	-0.3	-0.1	0.5	1.5	1.6	1.6
Emerging Market and Developing Economies 9/	5.1	5.0	4.2	4.2	-0.5	-0.1	3.2	3.8	3.7	3.7
London Interbank Offered Rate (percent)	...	...	...	...	...	...	...	...	...	...
On US Dollar Deposits (six month)	2.3	0.7	0.3	0.4	-0.1	-0.1	...	...	...	...
On Euro Deposits (three month)	-0.4	-0.4	-0.5	-0.6	0.0	-0.1	...	...	...	...
On Japanese Yen Deposits (six month)	0.0	0.0	-0.1	-0.1	-0.1	-0.1	...	...	...	...

Figure 1: World Economic Outlook Growth Projections: Real GDP, annual percent change. Source: IMF¹⁾.

economic development in the future, as soon as the vaccination campaign will make it possible to secure the world population.

The paper is structured in three main moments. The first concerns a brief examination of the health and economic context that characterized 2020 and which still seems to continue in 2021, with particular regard to the effects on GDP, on the economic and industrial sectors, on the income (and saving) capacity of families, as well as on the overall level of consumption according to official sources and the research carried out in the last year by the main national institutions.

The increase in poverty, the closure of schools with the relative learning gap of an entire generation, social disintegration and the increase in psychological pathologies are leading many to denounce, in addition to the health and economic crisis, a new social emergency. In particular, we attend to a reconfiguration of the purchase baskets and sales channels in favor of electronic commerce, for example, and a tendential transformation, in a value sense, of the same meaning of the act of consumption.

The second part of this paper focuses on the reactions to these crises by businesses, based on the results of the qualitative and quantitative research of the main private and public research institutes, aimed in particular at investigating the factors underlying a rapid economic recovery.

In details, the production sector has had to face not only higher costs to increase the safety and production capacity of basic necessities, but the most innovative companies have decided to pursue production diversification choices so as not to interrupt its business. In this regard, a privileged observatory was the

monitoring during 2020 of the activity of Lombard manufacturing companies - both industrial and craft businesses - whose results were periodically published in the InFocus Imprese Reports on the related quarterly field surveys by Unioncamere Lombardia in collaboration with the Department of Economics, Management and Quantitative Methods, University of Milan.² The reality of Lombard manufacturing companies is of particular interest for more than one reason. Firstly, Lombard manufacturing production shows the highest production indices at national level and is absolutely competitive compared to the European average. Secondly, no less important, the Lombard production structure has an employment level and a variety of product sectors - from fashion to precision mechanics, from pharmaceuticals to food - which configure it as an extremely explanatory reality for understanding the trend of entire national production.

The third moment is finally dedicated to reflections on the learning processes by companies, following the various lockdowns and the momentary recovery in the summer of 2020, both from the point of view of the ability to react in the short term, and from the strategic point of view. In fact, the pandemic lasted so long that it produced structural effects on a competitive level. In general, what emerges is a tendency towards the reconfiguration of international supply chains and a consequent internal reorganization in favor of new markets and targets; greater attention to access to credit and third-party financing, as well as investments in capital goods and digitalization to improve the quality of production processes and support more effective internationalisation. The quarterly economic surveys of Unioncamere Lombardia have however revealed in particular a great capacity for resilience and entrepreneurial tenacity that will represent the real discriminant for the future, especially in the sectors of activity most in crisis due to the effects of the lockdown and, above all, in those characterised by a structural productivity crisis already in 2019.

2 Health Context and Social Economic Background

The pandemic has hit Italy, officially, starting from February 2020, see Figure 2.³ Since the beginning of the epidemic, in April 2021, there have been 3,667,576 cases of COVID-19 and 110,559 deaths. The epidemic curve shows that the impact of the second wave, in terms of the total number of daily cases, was actually much higher of the first one, thanks to the increased diagnostic capacity.

From the point of view of government measures, the first and most severe lockdown was promulgated on the following 8 March with the total forbidding occasions for social interaction and blocking of all economic activities, not considered essential, until 4 May 2021.

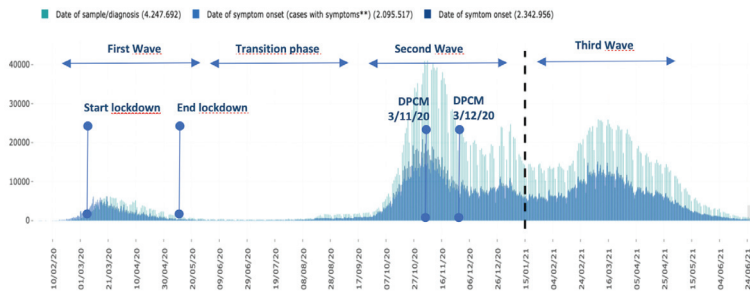


Figure 2: Cases of confirmed SARS-CoV-2 infection reported in Italy, by date of sample/diagnosis (green) and by date of symptom onset (blue) (February 2020 - June 2021). Source: Ministry of Health, Italy, Directorate-General for Communication and European and International Relations - <http://www.salute.gov.it>.

From mid-November, the curve showed a slow but steady decrease until 21 December, and then rose again in the following 2 weeks - despite the latest Prime Ministerial Decree of December 3, which established the return of the entire national territory to an intermittent “red zone” for the Christmas holidays. The different and subsequent waves, however, have unfortunately continued to affect social interactions and all sectors of activity, directly and indirectly connected. In January the curve stabilized with small daily variations, but from February there was a new increase in cases, which led to a third wave, albeit to a lesser extent than the second.

The first effect was therefore an important and immediate drop in consumption. According to data published by the Confcommercio Research Office,⁴ the Confcommercio Consumption Indicator (ICC) for 2020 reports an overall decline of 14.7%, with a reduction of 30.3% for services and 7.9% for goods; the only exceptions are the expenses for domestic power (+ 2.1%) and for communications (+ 8.7%). Beyond the trend of the individual quarters, 2020 signaled a real collapse in demand for many sectors, with reductions well above 50%, in sectors such as tourism in the broad sense, recreational services, clothing, footwear, furniture and furnishings. Focusing on the analysis of the consumption of goods, the trend can be further investigated by resorting to periodic Istat surveys, on overall retail sales by macro-sectors, by product categories and by sales channels.

On a trend basis, in December, retail sales decreased by 3.1% in value and 3.2% in volume. More precisely, there was a strong growth for food goods (+ 6.6% in value and + 5.7% in volume) and a fall for non-food goods (-9.4% in value and -9.5 % by volume).

As regards the individual types of non-food products, there are negative trend variations for almost all product groups, with the exception of equipment for

information technology, telecommunications, telephony (+15.3%), household tools and hardware (+2.3%), and furniture, textiles and furnishings (+0.5%). The trend seems to be consistent with the typical recovery of gifts during the Christmas period and the greater attention paid to one's living environment¹. The most marked downturns concern clothing and fur (-23.4%) and footwear, leather and travel items (-14.6%). Although the data are in line with the previous Confcommercio surveys, the indications on the individual sectors show more marked indications².

A second phenomenon determined by the pandemic was that of a redistribution of consumption by sales channels. Compared to 2019, the value of retail sales decreased both for large-scale distribution (-2.8%) and for companies operating on small surfaces (-10.1%). Sales outside the shops (i.e. street vendors) fell by 13.9% while e-commerce confirmed a strong increase (+ 34.6%)³, as expected also in the same 2021 (+ 37%)⁴. The forms of distribution with a predominantly non-food vocation were the most penalized, as they often do not deal with "essential" product categories. On the other hand, it is equally interesting to note that in the food distribution sector, the sales of supermarkets (5.6%) and especially discount stores (+ 8.2%) have grown, confirming the search for greater convenience and a reduction in purchasing power.

The qualitative analysis of the trend and composition of consumption during 2020 made it possible to highlight the emergence of new needs and purchasing habits, which have had the opportunity to assert and structure themselves, so much so that it is likely to distinguish the post-covid recovery. For example, with reference to food products, the purchase of basic ingredients, for cooking at home, is back in favor of a healthier diet⁵. With regard to non-food sales, the growth of parapharmaceutical and hygiene and cleaning products; consumer electronics and goods and services - that have supported social interactions via the web, entertainment and care for one's psycho-physical well-being - stands out. This has in fact favored a real literacy in favor of any form of digitization (from e-commerce, to new electronic payment methods). The greater propensity towards digitalization has favored significant changes in purchasing behavior and shopping habits. As known, online sales have exploded both of necessary products (ie drugs, health aids, etc.), and non-essential ones (ie furniture, clothing, electronics, fitness, etc.), however also favoring the development of foreign supply chains and actors. In this context, an element of great novelty in 2020 compared to the previous year is given precisely by the explosion of the so-called

¹Assessments also confirmed by what emerged in.⁵

²<https://www.istat.it/it/archivio/253286>.

³<https://www.istat.it/it/archivio/2532868>.

⁴AJ-Com.Net, November 2020.

⁵Information Resources Inc (IRI), February 2021.

e-grocery, i.e. the online market for the consumption of fresh or packaged food, products for home and personal hygiene, and in general consumer goods that can be found in supermarkets. Online sales of large-scale distribution closed 2020 with a turnover of 1.33 billion euros with a jump of 120% compared to 2019, anticipating the achievement of the objectives set for 2021 (IRI; 2021) ⁶.

The forced renunciation of goods and services, as well as the inability to carry out daily activities considered normal or taken for granted before the pandemic, has also affected the value system and preferences of individuals. The repercussions were found first of all, as already mentioned, in the composition of the shopping basket, in favor of brands and products considered sustainable (i.e. "at km 0", of local origin and in any case Italian, of lasting quality over time and not simply "fashionable"), avoiding unnecessary purchases or superfluous with respect to new sensitivities, and modifying one's behavior, for example in mobility, limiting waste of money or environmental resources.⁶ Another effect was the already mentioned recovery of the family dimension and the attention towards one's home, with a relapse in terms of purchases of goods and services to rebalance private and working lives at home (i.e. smartworking) or in terms of interventions for the redevelopment or renovation of living spaces.

It should also not be forgotten that the pandemic has forced many companies to resort to layoffs for their employees, with a generalized effect of depression of the level of available income of families. Thus, the reduction in per capita income and the growing uncertainty about the future have contributed to the further reduction in consumption and, at the same time, to a significant increase in the household saving rate (including non-interest bearing). In this regard, the indications of the Bank of Italy on the trend of consumer households' propensity to save and the current account balance for the three-year period 2021-2023 may be of help. They show how the household saving rate, which rose to 15 percent in 2020, should slowly decline, remaining above pre-Covid values for the entire three-year period, when it was still around 8 percent, see Figure 3. For the three-year period 2021-23, the macroeconomic scenario seems to foreshadow a significant recovery in consumption, but less marked than that of GDP, with only a gradual reabsorption of the sharp increase in the propensity to save, also attributable to precautionary reasons. In more detail, according to the forecasts of the Bank of Italy, consumption should increase by just over 3 percent on average this year and next, to slow down in 2023.

It is therefore evident that each of these aspects has therefore had an impact on the sales of sectors and companies, benefiting some (i.e. e-Commerce Companies) and disadvantaging others, those entrepreneurial realities most in difficulty in deciphering the change of context.

⁶ *Il canale Web della Gdo archivia un 2020 da record*, [The GDO web channel archives a record 2020], La Repubblica 24.01.2021.

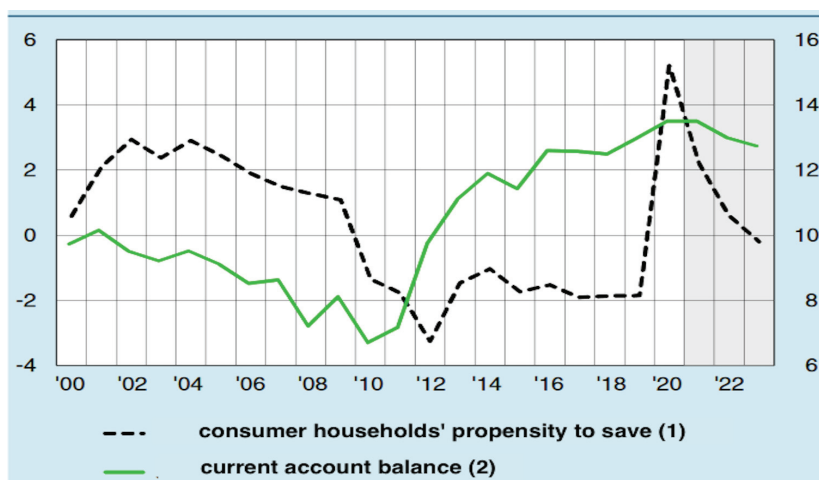


Figure 3: Consumer households' propensity to save and current account balance (percentage points) - January 2021. Source: Unioncamere (http://www.unioncamerelombardia.it/images/file/OE%20Analisi%20Congiuntura%202020/Report_4Q_2020_DEF.pdf); 1) right-hand side reference scale: consumer households' propensity to save - 2) left-hand side reference scale: current account balance - relative to GDP.

3 The Impact of the Pandemic on the Italian Production System: the Case of Lombard Manufacturing Companies

The impact of the pandemic was deleterious not only for all non-essential activities that had to comply with government regulations, but also for all those that had to cope with a blocked internal demand, both for the reduction of the level of income and due to the degree of uncertainty about the future, which has favored savings where possible.

In terms of demand, furthermore, as already mentioned in the previous paragraph, there have been important changes, in purchasing and consumption behavior, including in terms of values and brand preferences. With respect to the offer, some companies have shown a resilience capacity above expectations, especially in the manufacturing context. In other words, in this context, the survival of businesses was in fact only minimally allowed by government aid, but above all by their ability to react.

3.1 The Effect of the Crisis on the Business Structure

To analyze this aspect and the factors underlying this capacity, reference is made here to the results produced in a qualitative-quantitative conjunctural study, conducted in 2020 by the DEMM-Department of Economics, Management & Quantitative Methods of University of Milan in collaboration with the

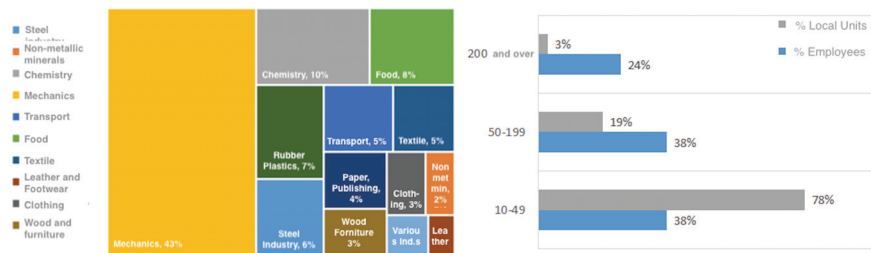


Figure 4: Representativeness of the Lombard manufacturing industry: distribution of employees by sector and distribution of employees and local units by size. Source: data processed by Unioncamere Lombardia on ISTAT - ASIA 2017 local unit data (size: 13,596 local units), latest available data.

Research Office of Unioncamere Lombardia, published on a quarterly basis.² More specifically, the contents of the study represent the integration between several sources on the recent evolution of demand and the Italian industrial sector, with the results of a quarterly empirical survey, conducted on a significant sample of industrial companies and craft enterprises in the Lombard manufacturing sector (about 3000 in total, each quarter), both in terms of product composition and in terms of revenues and number of employees. The importance of these data is given by the fact that - due to the density of businesses, concentration of employees, as well as the variety of sectors of activity represented - the Lombard manufacturing sector is extremely significant for interpreting the trend of the whole Italian industry, see Figure 4, and therefore the state of health of the national economy itself. In this perspective, it is therefore important to point out, first of all, how the Lombard production structure - which includes industry and craftsmanship - at the end of 2020, reached and exceeded national and European levels of competitiveness (see Figure 5 and Figure 6), thus being able to suggest some guidelines for the future, with respect to the strategic choices of investment, diversification and reconfiguration of supply chains. In fact, in each quarter, not only the trend of the main performance indicators (turnover, orders, exports, industrial production by province, sectors and technological content, labor market and forecasts) was monitored, but also how the pandemic had impacted, respectively, corporate strategies, digitization, access to credit and investment trends. By postponing the in-depth analysis of the many data and reflections published in the various economic reports to another time, it is considered useful here to highlight the prospective value of the study, at a general level and at the level of a single sector of activity.

In fact, in a situation in which the macroeconomic indices (euro-dollar exchange rate, oil price and interest rates) were neutral, if not even favorable, Lombard companies were able to recover almost all of their pre-Covid19 production, registering a more pronounced rebound compared to both the Italian

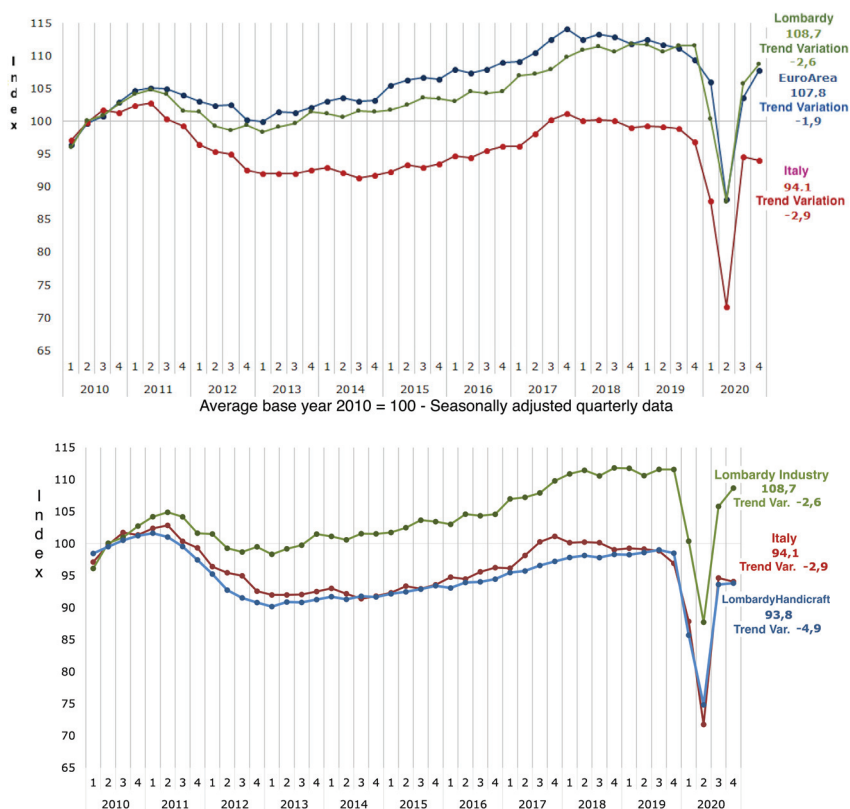


Figure 5: Top: Manufacturing Sector Production Index - Lombardy, Italy and Eurozone. Bottom: Production indices of the manufacturing sector - Handicraft and Industry, compared (2010 average basis = 100- seasonally adjusted quarterly data). Source: Unioncamere Lombardia - Eurostat.

and the European average. As can always be observed in Figures 5, in manufacturing there has been a 'V' recovery: so steep was the fall, so fast was the recovery - unlike the Great Crisis, characterized by a very slow restart of activity productive in 2009 and in the following five years. It should also be noted that in the fourth quarter Lombard production continued to grow more than Europe, despite the second wave of the pandemic and despite Italy as a whole recorded a small decline.

This confirms Lombardy as one of the driving forces of the Italian and European economy and bodes well for the future, even if this trend has not been the same in the different areas of activity. The first distinction concerns the size of the companies. In Figure 6 it is possible to see how for industries with 200 and more employees, the industrial production index quickly returned to the same seasonally adjusted level as in 2019. More modest result for companies

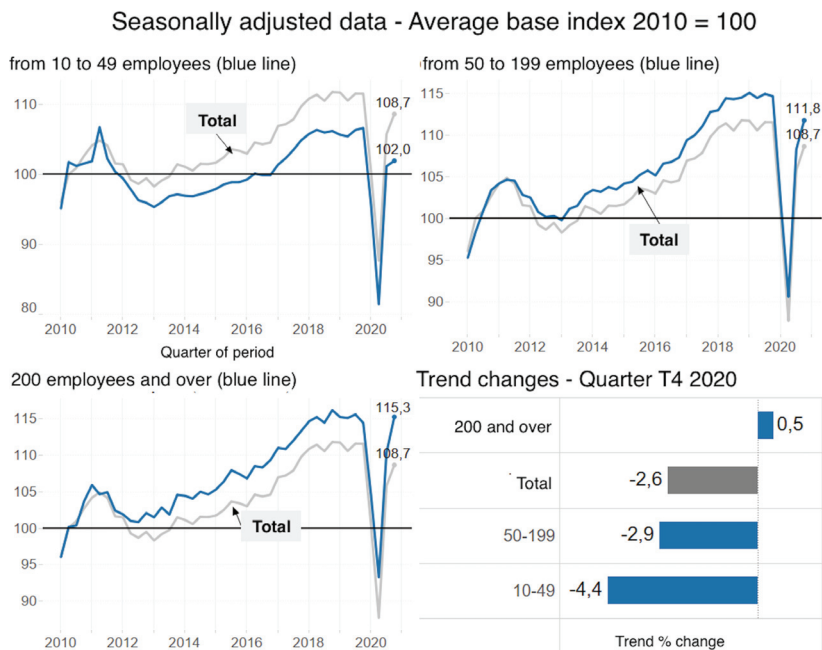


Figure 6: Index of industrial production by number of employees. Seasonally adjusted data - 2010 average base index = 100. Source: Unioncamere Lombardia.

with employees between 0 and 199 and decidedly little sustained for companies with fewer than 50 employees, which also recorded a quarterly trend variation of -4.4%, against -2.9% for companies with 50-199 employees and + 0.5% for companies with more than 200 employees. Surely the greater availability of resources, of the larger companies, have favored a faster recovery, while the smaller ones have not been able to fully use their flexibility to be able to get back on top.

The second distinction can be seen in Figure 7 and is related to the industrial production index by type of destination. In particular, the production of “investment goods” and “intermediate goods” already reached almost the same levels as in 2019 at the end of 2020 - rising in terms of trend changes in the last two quarters, respectively from -5.4 / -5 , 5% down to -1.5%, giving hope for growth prospects in the medium to long term. The “final goods”, despite the recovery during the last quarter, recorded a further decline (-6.4% in Q4 vs -4% in Q3), affected by the closure of non-essential activities and the opportunities for sociability, positively associated to final consumption.

In both cases - whether we consider the number of employees or the type of destination - there is an increase in the values of the indices, which exceed the threshold 2010 = 100, except in the case of final consumer goods (which even

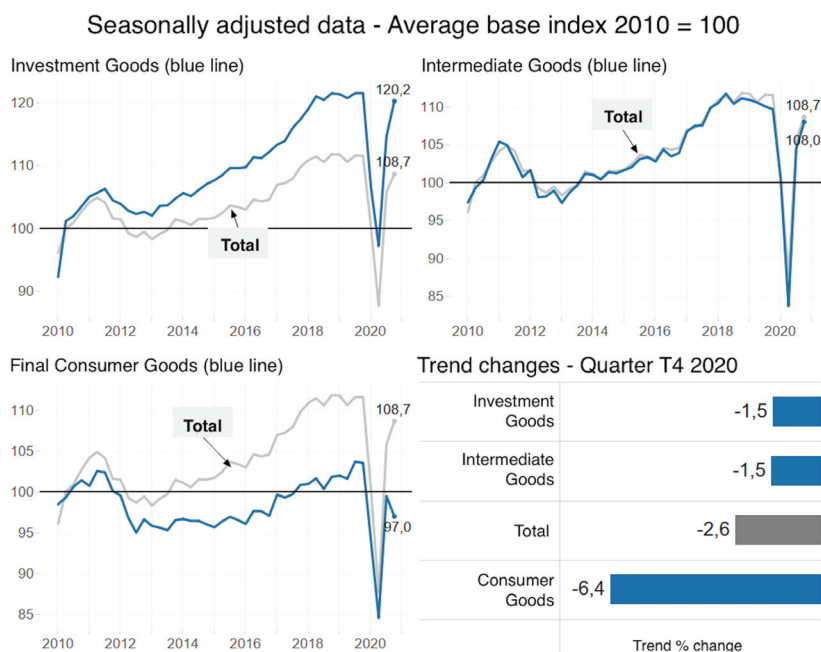


Figure 7: Industrial production index by type of destination. Seasonally adjusted data - 2010 average base index = 100. Source: Unioncamere Lombardia.

reach the value 97), showing a net decrease in value - due to the loss of disposable income and the slowdown in domestic demand, already present in 2019.

A further study is offered by the trend of industrial production according to the classification of the PAVITT sectors, based on the technological content, compared to the total (Figure 8). Against an average trend value of -2.6%, it is clear that the sectors with a high technological content (and therefore high R&D) achieve the best results (from + 2% in Q3 to + 5.3% at the end year), demonstrating a competitive capacity far superior to traditional sectors. The latter, in fact, show a trend variation equal to -7.1% (-8.6% in the previous quarter). In the last two quarters of 2020, the situation of sectors with high economies of scale (-0.1% currently, -4% previously) and specialized ones (-2.6%, -4.6% previously) has also improved, because they are able to incorporate more technological innovation, especially of process.

A last relevant aspect is the sectoral analysis (Figure 9). Although the pandemic has affected all sectors, those who have shown the greatest difficulties throughout 2020 were undoubtedly clothing (with a trend of -18.3%; Figure 9a), textiles (-17.7%) and leather-footwear (-10.9%), even if in part an improvement compared to the previous quarter, where they stood at -12.5%, -21.2% and -14.4% respectively. However, these are all sectors with evident bad debts already at the

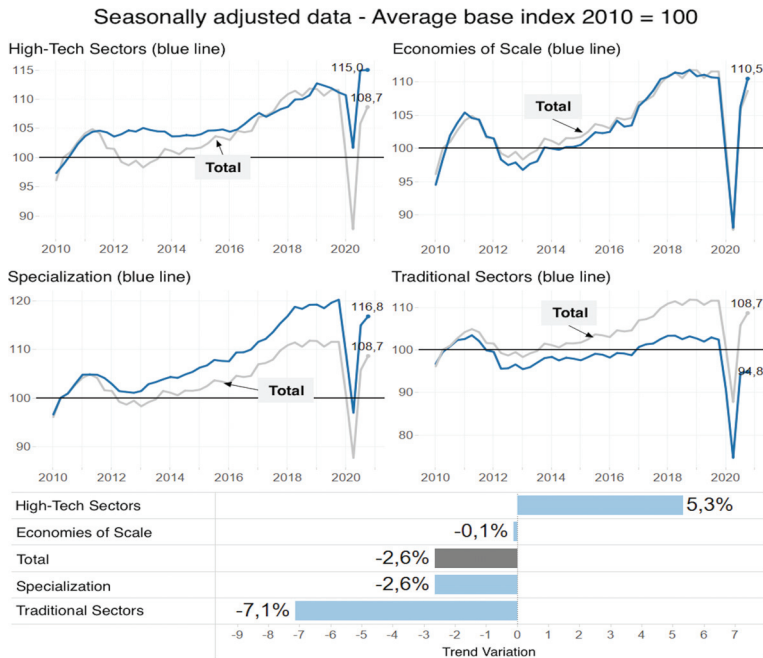


Figure 8: Pavitt industrial production index by sector. Seasonally adjusted data - 2010 average base index = 100. Source: Unioncamere Lombardia.

end of 2019 and which failed to seize all the opportunities offered by the new digital sales channels.

The only sector in marked recovery is that of means of transport (+ 6.3%), facilitated in part by incentives for the purchase of hybrid and/or electric cars, but above all driven by the demand for intermediate goods and components coming from abroad, and in particular from Germany, where the automotive sector is in sharp recovery. In addition to means of transport, only plastic rubber (+ 0.6%) and non-metallic minerals (+ 0.4%) recorded positive changes, while all the others showed a negative sign. Among the less penalized sectors with slightly negative variations, especially if compared with previous quarters, there are industrial sectors that have nevertheless shown resilience, such as chemicals (-0.7%), steel (-1.2%), and mechanics (-1.3%). The sectors that recorded particularly negative data in the last quarter are also those that recorded a significant share of annual turnover during the Christmas period (typically food -4.7%) and the fashion and accessories sector (from -10.9% to -18.3%). On the other hand, if we consider the average annual variations by sector of activity (Figure 9b), it is clear what the damages were for the “non-essential” sectors of activity (typically the clothing/textile/footwear recorded reductions in 2020 of between -18.2% in clothing and -23.6% in leather-footwear), compared to companies belonging

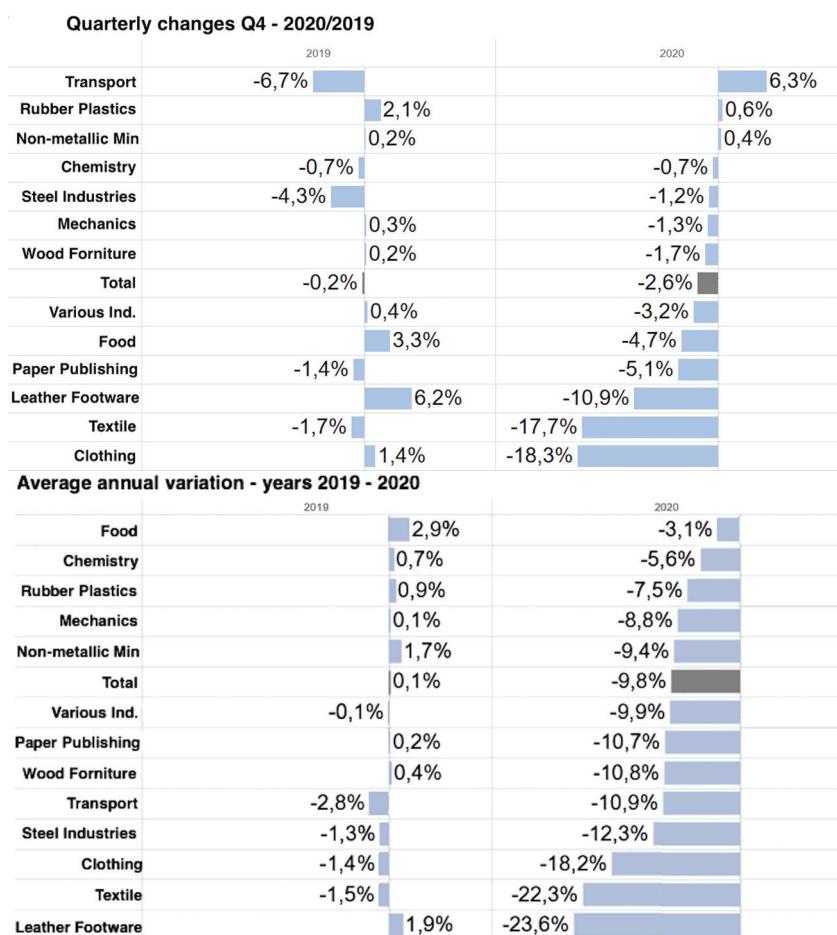


Figure 9: Industrial production by industrial sector, trend variations (left) and average annual variation (right). Source: Unioncamere Lombardia.

to the supply chains of primary necessities (i.e. Food, only -3,1%). Those who have contained the most damage are therefore the sectors relating to necessary productions (such as the case of chemicals with -5.6%), or driven by typically foreign production chains in recovery (i.e. electrical automotive) which have had a positive effect on the rubber-plastic sectors (-7.5%), mechanics (-8.8%) and non-metallic minerals (-9.4%), in the case of the resumption of building renovations. In Figure 10, the trend of the industrial production index of each sector over time is highlighted, revealing how critical the situation of certain sectors was already, based on the distance between one's situation and the average of the total industry, as in the case clothing. Within these sectors, however, all those companies that in 2020 managed to pursue courageous production

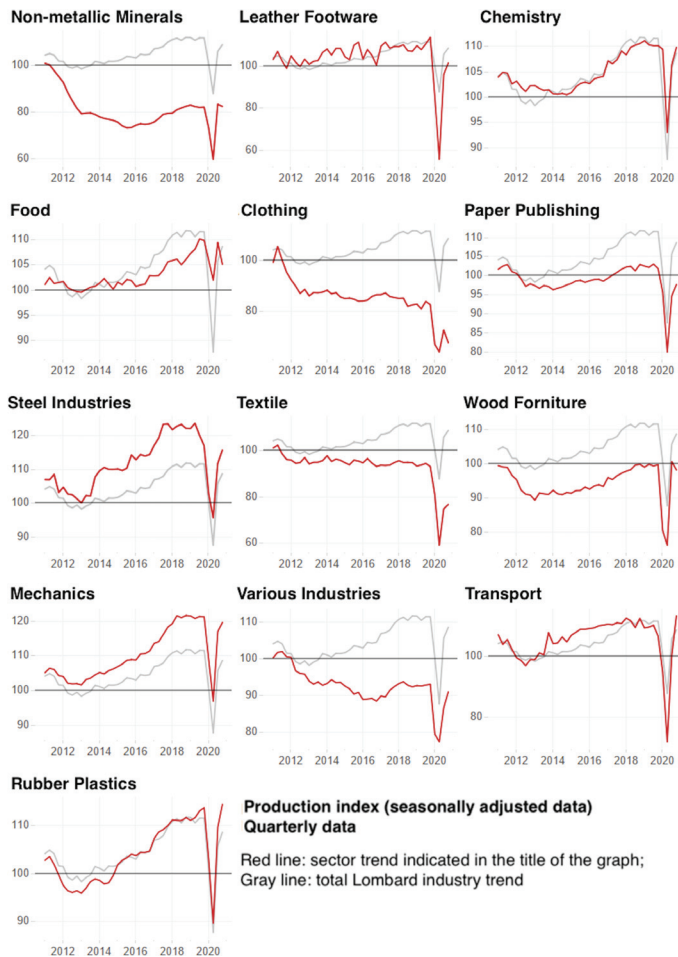


Figure 10: Industrial production: trend indices by sector and total industry. Source: Unioncamere Lombardia.

diversifications, reconversion of activities - for example in favor of the production of personal protective equipment (from masks, to gowns for health workers) or disinfectants, essential to deal with the health emergency. Similarly, even in the more traditional sectors (such as the furniture sector with a decline of 10.8% on an annual basis) there are companies that have been able to conquer new markets - national and/or foreign - using e-commerce website or focusing on new emerging needs (depending on the use of smart working).

The analysis of the turnover index of Lombard manufacturing companies (Figure 11) shows how the ability to recover the levels of the last quarter of 2019 and the resilience during the different waves of the pandemic have been supported by orders and foreign turnover, which represents just under 40% of the total.

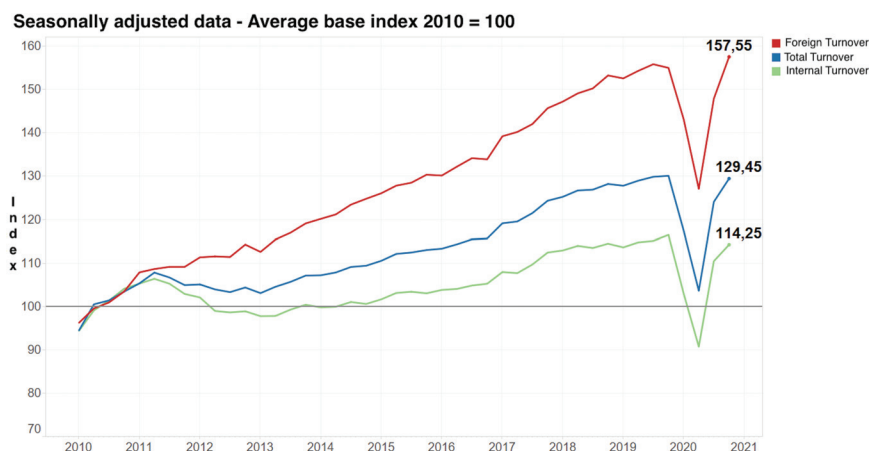


Figure 11: Index of total turnover, domestic and foreign - Industry. (Seasonally adjusted data - 2010 average base index = 100). Source: Unioncamere Lombardia. Note: Red Line: Foreign turnover; Blue Line Total Turnover; Green Line: Domestic Turnover.

After three quarters with a negative sign, in fact, the trend change in turnover returns to be positive for abroad (+ 1.6%) and greatly reduces the negative trend internally (-1.9%). The result is a total turnover index substantially identical to the value of the fourth quarter of 2019.

In this context, the labor market has been conditioned by the blocking of lay-offs established at the government level and, therefore, it seems more significant than anything else to consider the use of the redundancy fund “CIG-Cassa Integrazione Guadagni” (used for temporary unemployment benefits in Italy), by sector of activity. First of all, it should still be noted that the seasonally adjusted entry-exit balance for industrial employment in the Lombardy production system at the end of 2020 was negative (-0.3%), although in a lower value than last quarter. After a year of sharp slowdown, the seasonally adjusted index also starts to rise again. As regards the share of hours in CIG on the total number of hours per sector (Figure 12), the clothing sector (18.5% of hours on the total number of hours per sector) and the textile sector (10.8%) are those showing the greatest difficulties, despite the recovery.

All the other sectors have an incidence of less than 10% and a certain number below the average (3.3%, down compared to the previous quarter where it was 4.4%), with a generalized improvement compared to the previous quarter, except for the clothing.

Despite the difficult situation, the confidence index of Italian manufacturing companies in 2020 progressively improved, passing in the last two months, according to ISTAT data, from 90.9 to 95.9; to be evaluated with respect to that of services (which increased from 74.8 to 78.2), construction (from 136.8 to 136.0)

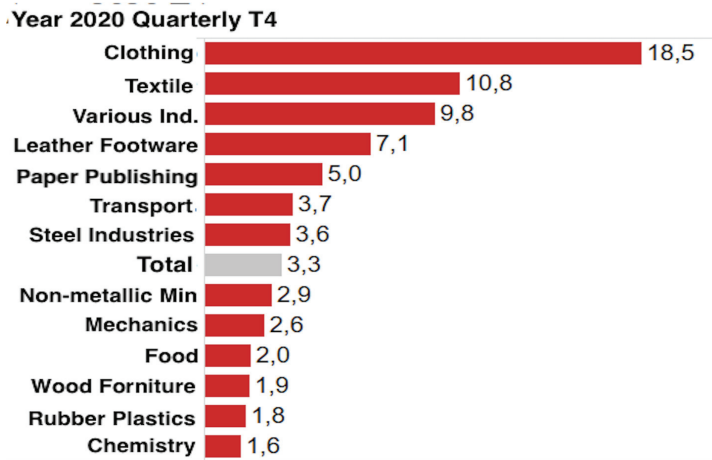


Figure 12: CIG: redundancy fund - share of the hours per sector (Year 2020 - Q4). Source: Unioncamere Lombardia.

and, above all, the value referred to retail trade (94.9 to 88, 5).⁷ With reference to the components of the confidence index, in the manufacturing industry the improving items are above all those relating to production expectations (from -9.2 to +0.4) which signal a clear change in trend, especially for goods instrumental (from -10 to +4.2) and intermediate (from -5.3 to +2.6).

Concerns remain regarding orders (from -28.6 to -25.7), especially for those operating in the consumer goods sectors (from -29.6 to -31.6). In this context, the assessments of the confidence of Lombard manufacturing companies appear substantially even more encouraging and positive. Figure 13 in fact shows the comparison between the national, supra-regional and regional confidence indices, which show the desire for redemption and recovery, despite the second pandemic wave that hit Lombardy at the end of 2020. Confidence levels are rising, with respect to the recovery in demand - primarily foreign and later domestic - although in the last quarter the distribution of frequencies seems to tend mainly towards a certain stability, as well as towards production and employment levels (Figure 14).

3.2 The Ability of Businesses to React to the Pandemic

The impact of the pandemic on the Lombard manufacturing sector, from the point of view of entrepreneurs, was consequently an element of particular study in 2020. In fact, it was not just a question of recording the changes in the performance indicators, but of analyzing how the strategic orientations of companies have changed over time. From this point of view, it is therefore particularly interesting to highlight how in general the pandemic represented a health, social and economic tragedy, but also an accelerator of change and

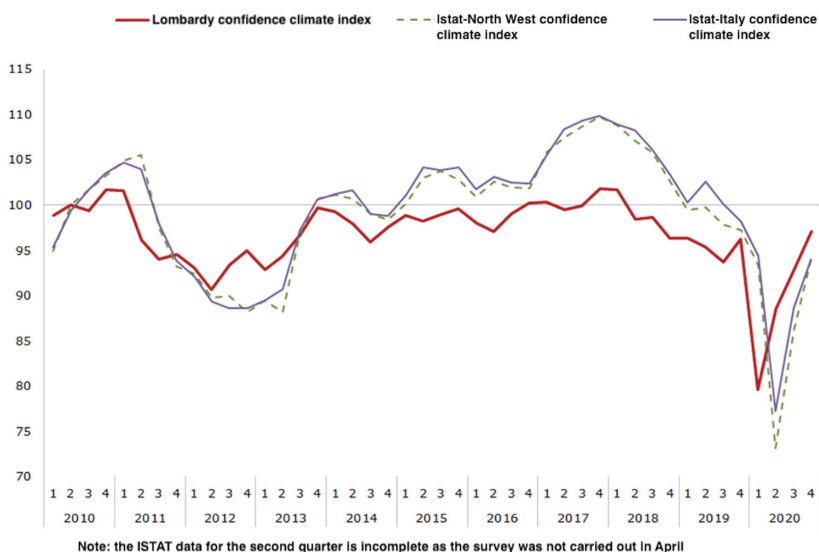


Figure 13: Business confidence index Numbers Index Base average 2010 = 100 (seasonally adjusted data). Source: Unioncamere Lombardia. Note: Red line: Lombardy confidence index; Black line: Istat, Italy; Dotted Line: Istat, North West confidence climate.

innovation, demonstrating that everything that seemed established could be questioned.

The damage of the pandemic from the point of view of the economic (in terms of turnover, liquidity, order cancellation, liquidity problems, production interruption, delays in the supply chain, etc.) and the organizational impact (change in the organizational structure and personnel, review of internal processes, restructuring, etc.) was significant and widespread in every type of company and sector of activity. However, the sectors most affected economically in industry were non-metallic minerals (100% of the Unioncamere sample), means of transport (100%), the steel industry (98.7%), clothing (96.4%), and furniture wood (95.7%). The least compromised sectors at an economic level were: paper and printing (84%), chemicals (78.6%) and the food industry (73.9%). From an organizational point of view, it is worth noting the supply problems (interruptions or changes in supplies) which affected 8.5% of the companies that remained active, in particular, in the chemical and mechanical sectors, especially due to the dependence of raw materials from third countries.

Looking into the impact of the first lockdown on the production and organization of companies, it is interesting to note how companies reacted differently from the start. Firstly, compared to an average trend decline in production of 10.1% (up to peaks of -19% for clothing and -23% for leather and footwear), the first effect was to change the organizational and

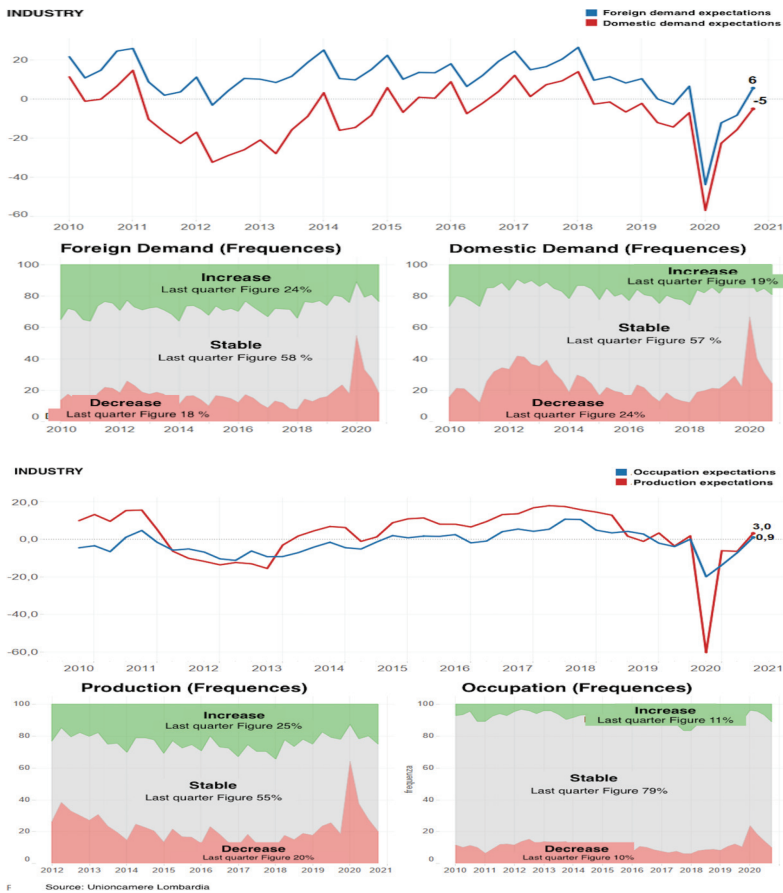


Figure 14: Expectations on: (top) foreign and domestic demand and (bottom) Production and Employment - Industry - Balanced assessments of increase and decrease. Source: Unioncamere Lombardia.

personnel structure (65.9% industry and 47.2% crafts, making extensive use of smartworking and redundancy payments), manage procurement-production-distribution difficulties (44.2% and 37.7%), while over 10% had no impact (11.1% and 16.7%). In this regard - in the logic of organizational transformation, as well as of the business models themselves - the ability to oversee new technologies represents an increasingly urgent diktat. The digital transformation underway, already begun with Industry 4.0, has only been accelerated by the pandemic which, in a completely exogenous and unpredictable way, has forced and continues to require a rethinking not only of the industrial scenario, but also of the relationship with the market.

Production trend, however - in terms of reduction, increase or reconversion - was affected not only by the type of business sector, but also if not above all by the creativity, speed of response and courage of entrepreneurs, the so-called *dynamic capabilities*. Dynamic capability is “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments”.⁸ They can be distinguished from operational capabilities, which pertain to the current operations of an organization. Dynamic capabilities, by contrast, refer to “the capacity of an organization to purposefully create, extend, or modify its resource base”⁹ in the search for new paths of development and forms of innovation of their business. Overall, the cases of reconversion and increase in activity account for 7.8% of the companies in the sample in industry and 5% in crafts. However, the decline in production affected all sectors, none excluded, with particularly critical situations in 68.9% of companies.

The industrial sectors that have benefited most from the current situation are obviously the food and chemical-pharmaceutical sectors (respectively 16.5% and 15.6%); the most penalized (all over 70%) were the rubber and plastic sectors (77.3%), leather and footwear (76.2%), mechanics (74.9%), wood and furniture (71.9%), non-metallic minerals (70.5%), means of transport (70.4%). Positive surprises come from companies in highly critical sectors that have been able to significantly reconvert their business by sensing the new demands of the market (such as personal protection devices and food disinfectants), as recorded in the clothing sectors (which stands out with 26, 5% of cases) and, more widely, in textiles (7.3%), chemistry (5.4%) and food (4.3%).

An interesting contribution to the study of the impact of digitization on the various traditional and non-traditional sectors, both at the organizational back-end level and at the front-end level towards the market, is given in.¹⁰ In particular, the organizational learning processes triggered as a result of the pandemic are highlighted, in a national and international comparison between companies operating respectively in the following sectors: food, fashion, sportswear, furniture and manufacturing-industrial equipment - examples that have had the merit to trigger further innovation processes. In the food sector, in the face of the modification of purchasing and consumption processes in favor of raw materials for self-production at home, instead of finished products - some companies have innovated the brand experience by offering consumers “shoppable contents”, to enrich the product offer with “branded” digital editorial content, which made it possible to intercept and accompany consumers throughout the

quarantine, in different ways than in the past. The fashion sector, heavily affected by the effects of Covid-19, has revolutionized the presentation activities to buyers of its products, with completely new ways of dialogue between suppliers and customers, through the use of the most innovative digital and immersive technologies (from platforms in remote, to virtual reality). In the sector of sports products and equipment (sportware), conditioned by seasonal activities and by the restrictions of social distancing, there was a boom in the online sale of products and clothing for fitness at home, destined to stabilize also in the future, so such as the relative collapse in sales of outdoor sports equipment. Here the competitive advantage was the speed of reaction from the companies that were able to innovate their product portfolio and the brands themselves, and communicate them effectively on the web, where users-customers were easier to intercept. The ability to review its supply chain and the ability to distribute content and products has made the difference and has allowed us to conquer new market segments. In the furniture sector, strongly conditioned by a traditional production and distribution chain, mediated by sales channels and with a low rate of digitization, the innovation that has materialized by the most advanced brands and dealers is that of offering completely online furnishing and design consultancy services, up to the sale itself, transforming the relationship between producers and distributors into an even more collaborative perspective. A final indication concerns precisely the management of the procurement processes of the manufacturing industry, in the face of the disappearance of the sales force of the supplier companies, gradually replaced by b2b e-commerce sites / marketplaces, able to disintermediate traditional distribution with solutions agile and more efficient.

In this perspective, it is therefore interesting to investigate the four prevailing forms of innovation pursued. The introduction of *new products and services* was a strategy that mainly involved chemicals, textiles and clothing in industry and food in crafts. The ability to conquer new markets, on the other hand, was the prevailing response in the more traditional sectors (mechanics, textile-clothing, furniture, steel and rubber-plastic, paper and printing), in a rather homogeneous way both in terms of industry and craftsmanship. Another interesting strategy was the *redefinition of sources and supply chains*, often excessively dependent on the Far East. In fact, the pandemic seems to favor a new globalization more centered on Europe, guaranteeing the continuity and quality of production, especially for all those supply chains considered strategic at the country level, with

evident positive effects for the already active and well-known Italian supplier companies. The sectors most interested in this case are mechanics, means of transport / automotive, chemicals, wood, furniture and various (which includes a large part of electro-medical and other specialized productions) which incorporate different raw materials, technologies, components. In the sectors with productions characterized by a greater impact and complexity of the technology based on plant engineering (means of transport, chemistry, mechanics, steel, rubber-plastic), the *reorganization and rethinking of the way of working* is also important, without excluding *smartworking* in structural way for the future where possible.

However, the capacity for innovation of companies in any sector has often been accompanied by the ability to obtain access to credit and the propensity to invest, with particular regard to digitization projects and the renewal of equipment.

As regards the first aspect, the financial situation of companies was severely tested by the drop in turnover due to the blocking of activities, as well as for having anticipated the redundancy fund for employees. The Unioncamere Lombardia research, therefore, made it possible to investigate the degree of indebtedness, the use of the various sources of financing and the assessments on access to credit by the Lombard industry and crafts, where the capacity and response times of the system credit are as critical as the effects of the economic crisis.

The companies that have not had financial difficulties (and/or that have continued to invest) are mostly, but not exclusively, those that have continued to operate on the market, because they belong to the authorized supply chains (chemical, mechanical and food in industry and plastic rubber in crafts).

In any case, the situation was worse for small and medium-sized enterprises (both industrial and artisan) with a weaker financial structure or which had to close without being able to reconvert production. The companies that said they were most in distress, mostly belong to the automotive and traditional "non-essential" sectors - as leather, footwear, textile-clothing, wood, furniture in industry and clothing; as well as in crafts, in which the largest share of possible business terminations is found, unable to overcome the effects of the total closure of retail distribution.

The pandemic has also represented an excellent opportunity for growth from a credit and financial point of view and, for some, an opportunity for real financial literacy, as it has pushed companies to inform themselves, even if only to be able to take advantage of aid and government credit

facilities with respect to innovative instruments or instruments different from own funds and bank credit, which have always prevailed above all in smaller companies.

In fact, it is no longer just a matter of choosing the most agile and least expensive tool for the company, but from time to time the combination of the most appropriate tools with respect to the specific business strategy.

In general, the picture appears quite positive with regard to the solidity of companies, even if there has been a slight increase in indebtedness to third parties, if we look at the index between third parties and own means, historically, even at a national level, less than 1, both in industry and in crafts.¹¹ This report indicates the ability of companies to repay their debt capital to third parties through their own resources and, in the last five years, the use of internal resources compared to external ones for financing the business has grown very significantly. In the five-year period 2014-2019, the percentage of those declaring a ratio of third parties / own means greater than 5 fell from 6% to approximately 2% and those declaring a ratio between 2 and 5 fell from 14% to 12% industry, and from 14% to 10% for crafts, while the percentage of those with an index lower than 1 has risen. In industry, on the other hand, 4% of companies have slightly increased financing through third parties, while maintaining an index below 2.² In 2020, this trend has slowed down slightly, especially in the craft sector, which sees an increase in the percentage of companies with a third-party / equity ratio greater than 2 compared to a reduction of 7 points in the percentage of those with an index lower than 1. In other words, the economic literature considers companies that have a debt / EBITDA index lower than 2 (ie similar to that highlighted in the Unioncamere Lombardia survey) as particularly secure on a financial level and, therefore, it is possible to affirm that Lombard companies maintain in 2020 there is still a high potential for investment financing. In general, in fact, the accumulation of own capital compared to third-party capital in 2019 served to not reach unsustainable levels of debt during the Covid-19 crisis. More precisely, if companies with a third-party / equity ratio lower than 1 slightly increase their debt, they could finance key investments, to effectively overcome the structural shock caused by the Covid-19 pandemic, without compromising financial stability. This financial security is less pronounced in artisan businesses which, in 2020, all see an upward shift in the index.

As regards the forms of financing used - in addition to self-financing as the main source for industrial enterprises (57.6%) and the second source

for artisan enterprises with 44.6% - it is highlighted as the second most important source in industry (and first in crafts) is bank credit (52.1% for industry and 48% for crafts). The third prevailing source of financing in industry is leasing (15.1%) while in the case of crafts, similar importance is given to public financing and incentives (12.3%). Compared to 2019, in 2020 there is also a progressive and generalized reduction of traditional sources, against an increase in: trade receivables, public financing, subsidized finance and factoring. This trend would appear to increase in the future, also favoring other instruments, such as venture capital and / or private equity and online financing operations. These data are perfectly in line with what was observed in.¹²

As for the tools most used to support liquidity, it emerges that the industry uses a broader and more diversified portfolio. During the pandemic, craftsmanship benefited more extensively from non-repayable public grants made available by the central and local administration, compared to industry (34.5% compared to 14.9%). The most widely used instruments in both categories were: moratoriums (30.4% for industry and 23.6% for crafts) and guaranteed bank credit (28.1% for industry and 32 , 3% for crafts); add to this the cancellation of IRAP (26.5% and 19.8%) and the tax credit (23.3% and 13.5%). Finally, just over 24% of businesses, both in crafts and in industry, did not use any of the liquidity support tools listed - a factor that may deserve further investigation. The reasons behind the use of credit at the end of 2019 were productive investments in industry and the need to finance liquidity and cash in crafts. In the midst of the 2020 pandemic, however, the priority reason is to finance liquidity and cash (65.8% of craft enterprises and 62.5% of industrial enterprises), particularly urgent for smaller companies. Industrial companies (in particular the larger ones) are those that, however, take advantage of the increase in funding to also support productive investments, which the craft industry sees reduced. Finally, in both categories, the resources allocated to debt consolidation and restructuring increased.

The judgments on access to credit tend in general to be positive: a good percentage of Lombard manufacturing companies declared that they did not encounter any critical issues in accessing credit during the first half of 2020 (for industry, 42% of companies did not detect any criticality, while the percentage drops to 31% for crafts), however showing a sharp decrease compared to 2019, both in crafts and in industry. The craft has more difficulties than industry also because they are usually less structured internally, to follow complex procedures; they mainly concern:

“the increase in ancillary costs”, “the increase in guarantees required” and “the reduction in the amount of credit required”. The more the size of the company increases, the more the companies are structured and can manage these problems, relieving the organization and the entrepreneur.

Anyhow, it should be emphasized that despite the measures ordered by the Government to mitigate the corporate liquidity crisis, both in crafts and in industry, all the companies have nevertheless encountered difficulties in finding liquidity in a short time, probably due to an inadequate response from the sector. to the “Liquidity” decree and the “Cura Italia” decree and for the ancillary costs linked to the practices handled by the individual bank branches.

The second aspect, relating to the ability to make investments, is equally important for understanding the level of resilience of the Lombard manufacturing sector. More in detail, thanks to past Unioncamere Lombardia surveys, it was found that in the Lombardy Region of Italy, total investments show a slowdown over time, after a continuous recovery in the five-year period 2015-2019, falling to values lower than those of the 2010, both for industry (52% of companies compared to 65% in 2019), and for crafts (23% compared to 34% in 2019).

The 2020 in fact - marked by uncertainty about the actual economic and financial resources due to the various waves of the pandemic - showed a collapse in investments in the Lombard manufacturing sector, particularly significant for craftsmanship compared to the industrial sector, due to the known structural and dimensional limits - as well as being more dependent on the trend of domestic demand, already depressed in the pre-pandemic phase. Nonetheless, if we consider that the investment growth gap compared to 2019 is completely similar to that of 2012 (at the end of the 2008 financial crisis, 51% of industry and 24% of craft enterprises invested), 2020 can be considered less negative than expected.

However, among those who invested, the share of industrial companies that decided to increase investments compared to the previous year also decreased (50% compared to 67% in 2019), while crafts show a decline in the propensity to invest compared to the previous year less worrying (72% vs 81%), balanced in all probability by the increase in digitization projects. On the other hand, the share of those who reduce the share of investments doubles, both in industry (43% vs 23% in 2019) and in crafts (17% vs 9% in 2019). In both sectors the propensity to invest prevails the more the company size increases (84% of enterprises with over 200 employees and 33% of artisan enterprises with or more than 10 employees), risking

to widen the distance, compared to companies weaker from a structural point of view.

The analysis of investments by sector of activity shows how the decline was generalized. As regards industry, the four sectors in which the most investments are made are Chemicals (66.7% vs 76.9% in 2019), Steel (63.3% vs 73.3%), Food (62.0% vs 73.8%) and Plastic Rubber (60.3% vs 70.9%). If Chemicals and Food are the sectors least affected by the pandemic at an industrial level, the most significant drop is in Textiles (-23%, from 65.1% to 49.1%). Leather and Footwear (35.7 vs 47.1%) and Clothing (35.5% vs 44.2%), on the other hand, are the sectors that stand out for maintaining the lowest level of investments, often due to inertial behavior in the the structural and competitive weakness of these sectors is determined. As for crafts, the sectors that show the highest percentages of investment are food (28.3% vs 40% in 2019), plastic rubber (26.4% vs 36.4%), non-metallic minerals and mechanics (25% vs 29.1%), however down compared to 2019.

Given the critical issues encountered by companies, it was therefore interesting to understand what the main forms of investment - tangible and/or intangible - were and with what strategic objective. As regards material investments, investments in instrumental machinery prevail (with a share of 64% of companies in industry and 68.9% in crafts, both essentially stable over the years). On the other hand, investments in information technology have grown in the last year, both in Industry (12.3% vs 10.2% in 2019) and in Crafts (11.7% vs 8.8%), even if only following the strengthening of smart working, for all various types of businesses. Another item is that of buildings, which is also fairly stable over time (8.1% vs 9.3% in 2019, for Industry; 6.5% vs 6.2% for Crafts). A last item "other" includes various goods, often "refuge" (eg investments in art), which do not seem to have great fluctuations (15.5% vs 15.4% in 2019 for industrial companies; 12.9% vs 14.9% in Crafts).

Further interesting observations derive from the analysis of intangible investments, among which the item consultancy and R&D emerges, with a percentage decrease for industrial enterprises (from 46% to 35% of the total) and increasing in artisan enterprises (from 43% to 49%), probably following the stimulus offered by calls for support for the search for new markets and sales channels, as well as the spread of digitization projects. In both types of companies, investments in ICT closely related to the precedents and to the spread of remote smartworking are growing (from 32% to 38% in industry and from 33% to 36% in crafts). Another

relevant item, but unfortunately much more limited, is that relating to patents and licenses (from 13% to 15% in industry; from 14% to 12% in crafts), as an indicator of the innovation capacity of businesses.

The propensity to invest could be favored by subsidized instruments, but they are not always easy to access, so much so that 34.6% of industrial enterprises and as many as 59% of artisan ones declare that they have never used any instrument. Among those who find the most success, in order, for both types of enterprises, the Super-depreciation measures (39% for industry and 19.5% for crafts), Hyper-depreciation (34.6% and 16%), Nuova Sabatini (Innovation credit; 14.0% and 12.9%), Research and Development Tax Credit (22.2% and 10.6%) and innovative start-ups (0.6 % only for industry) - also by the ease of using certain solutions compared to others, by the size of the investments themselves and in relation to procedures and consultancy assistance, often necessary. It follows that these instruments tend to be used more by more structured companies capable of efficiently managing the necessary activities: the example of industry alone applies, where super depreciation and hyper depreciation - regulated in the tax credit instrument in favor of investments in capital goods (tangible, intangible and functional to the technological transformation "Transition 4.0") - they are widespread in companies with over 200 employees (60.3% and 50% respectively), while the same are halved in the size class between 10 and 49 employees (24.5% and 24.8%).

A proof is given by the fact that as the size of the company decreases, the share of industrial companies that did not use any tool increases (25.3% in companies with over 200 employees, 30.2% between 50-199 employees and 43 , 3% in the class between 10-49 employees). The same phenomenon is found in crafts, with even more significant shares: 48.8% of companies with over 10 employees, 60% of those with 6 to 9 employees and 74.7% of companies with 3 to 5 employees employees do not use any tools. Also in the artisan sector, Super depreciation, Hyper depreciation, Nuova Sabatini and tax credit in R&D are the most used. In particular, the largest companies (with at least 10 employees) use the measures of hyper-depreciation (24.8%) and super-depreciation (22.3%), more than the new Sabatini (17.4%) and the Tax credit (14.0%).

It was also important to deepen the analysis of Lombard entrepreneurs' perceptions of how the pandemic has actually affected their investment decisions (Figure 15). In this sense, what emerges in both types of companies is a certain polarization: on the one hand, companies that have absolutely not changed their plans - 41.0% in industry and 39.5% in

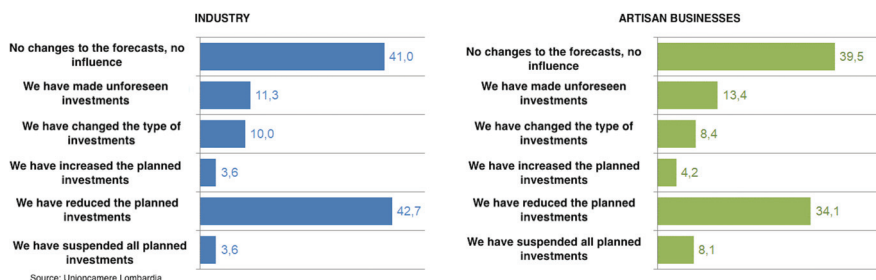


Figure 15: How was the decision to invest in 2020 affected by the pandemic? Industry and crafts, in comparison. (*Multiple question - multiple answers possible*). Source: Unioncamere Lombardia.

crafts - and on the other hand, the companies that necessarily had to reduce the planned investments (42.7% and 34.1%, respectively). It is probable that the first item could therefore include the strongest companies in sectors not particularly damaged by the pandemic, as well as those unwilling to invest. The ability to react and adapt the production system is also undoubtedly interesting, detectable by the ability to cope with “unexpected investments” (11.3% in industry and 13.4% in crafts) or to have changed the investment (10.0% and 8.4% respectively). Not to be overlooked are those who, on the other hand, had to completely suspend these decisions while waiting for better times, with a much higher incidence in crafts (3.6% vs 8.1%).

Particular attention within the Unioncamere Lombardia research was also reserved for investments abroad, an extremely interesting topic for assessing the degree of internationalization of companies and the direction of development of the same. The share in 2020 is generally very low and similar for both crafts and industry (3% of tangible investments and 1% for intangible ones), but increasing compared to 2019. In particular, while the industry has seen an increase in tangible investments abroad by 15% and intangible ones by 11%, craftsmanship - despite having favored investments in Italy - recorded a significant increase above all in material ones (11%) compared to intangible ones (2%).

It is therefore interesting to analyze the product sectors where it is possible to find the greatest propensity for investment abroad (Figure 16), by type. In industry, 18.6% of the clothing sector emerges, which reflects the choices of production relocation, in search of new market opportunities and / or cost containment; much more spaced non-metallic minerals (5.2%) and paper and printing (4.0%). The sectors that have seen a higher percentage of intangible investments abroad are: chemicals (4.6%,

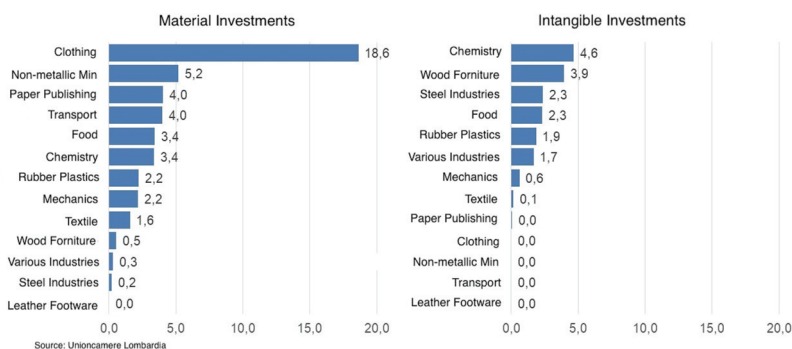


Figure 16: Manufacturing industry - Tangible and intangible investments abroad by type and sector (2020). Source: Unioncamere Lombardia.

basically in patents and licenses), one of the sectors in which Italy is more competitive; followed by wood and furniture (3.9%), a sector that in the crisis held its own for the reorganization of public, private and entrepreneurial spaces to adapt to the intensive use of smart working and which may be affected by positioning choices for its business in other markets; finally, the steel sector extremely exposed to international competition (2.3%), which in Italy will have to undertake the path towards the ecological transition for a clean steel.

The situation at the level of craftsmanship is less complex. Material investments abroad are found only in the paper-print (7.7%), mechanical (4.8%) and plastic rubber (2.1%) sectors, with clothing in last position and with minimum values (1.2%). Intangible investments are limited to the wood and furniture sector with 9.5% (which could be motivated by the digitalization projects of the sales channels) and to mechanics (0.3%).

In any case, the choice of investments abroad seems to be mainly motivated - both at the level of industry and crafts - by the need to renovate obsolete production plants (45% and 46.7%), as well as to increase the same capacity. productive (31.3% and 25.7% respectively). This is followed by the objective of diversifying the production activity (5.7% and 10.7%), the launch of new businesses (3.5% and 3.8%) and, less importantly, the internationalization of the company (1.8% and 0.8%). In general, there is therefore a good response from the productive sector in the search for higher levels of productivity or growth (diversification, new business, internationalization), rather than in a purely defensive logic.

By comparing the findings obtained on the reasons behind the investments - renovation of obsolete production plants; increase in production

capacity; diversification of production activities; activation of a new business; internationalization of companies - with the individual sectors of activity, some interesting indications emerge on the criticalities not only of the manufacturing sector, but also of the country itself. Only in six sectors - such as chemicals, mechanics, steel, food, paper and printing and wood-furniture - are companies able to pursue all the strategies. Internationalization, on the other hand, is currently completely absent in sectors such as textiles, clothing, non-metallic minerals, various productions (including electromedicals), means of transport and leather-footwear - a phenomenon often directly related to the reduced company size, typical of the Italian production system, in a mutual cause-effect relationship. Furthermore, all sectors, except Wood and Furniture, have made investments for the renovation of obsolete production plants, a widespread defensive strategy essential for the recovery of competitiveness.

Nonetheless, the forecasts of Lombard entrepreneurs regarding investments in the future tend to be positive, both for crafts (24% of companies) and for industry (58%), although still far from the levels reached in 2018 (28% and 63% respectively). The analysis of investment forecasts by sector (Figure 17) shows that the greatest investments are expected in the industrial sectors that emerged more painlessly from the crisis - such as steel (71.9%), affected by the ecological transition foreseen in the Recovery Plan; chemical (70.3%) and food (68.7%). To these, the means of transport (68.2%) has to be added, a sector that must completely rebuild itself after the pandemic, thanks to investments that allow it to return to growth, to face the huge losses of the lockdown. The sectors that, on the other hand, foresee lower investments in 2021, are still those that emerged with great difficulty from the pandemic, in particular: Textiles (44.3%), Leather and footwear (28.6%) and Clothing (19.4%). As for crafts, the sector that plans to make the most investments in 2021 is that of non-metallic minerals (36.5%), followed by paper-printing (30.8%), miscellaneous (29.9%) and rubber-plastic (28.6%), mechanical (25.9%). Sectors in which lower investments are expected to be made are, once again, clothing (19.4%), leather and footwear (12.0%) and textiles (11.6%) - the sectors most affected by the crisis.

However, the risk is that a vicious circle could be created: the sectors that most need investments to redevelop products and processes - also by virtue of the ecological and technological transition - do not actually have the resources and skills to do so, because too much marked by the effects of the crisis. The uncertainty of market prospects (the most important factor

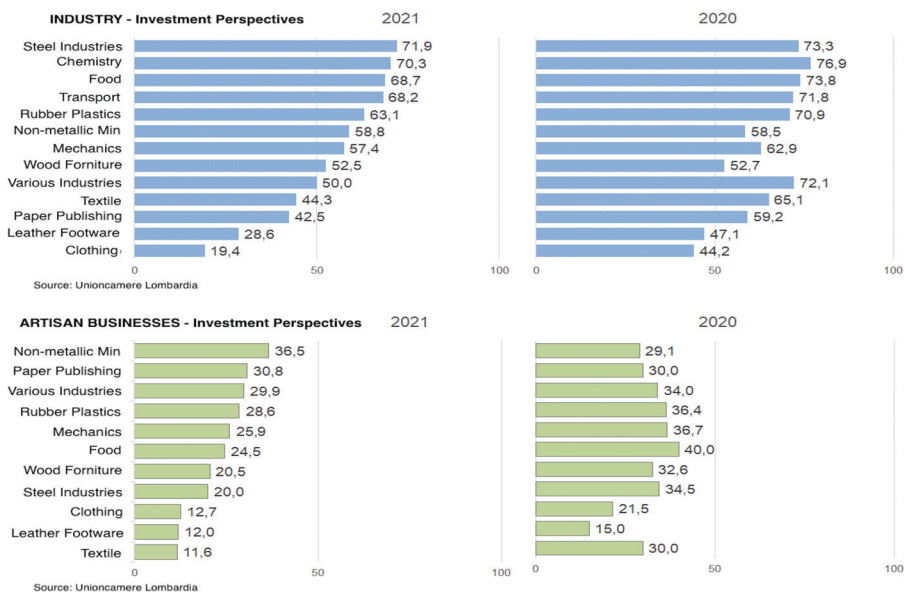


Figure 17: Manufacturing firms - industry and crafts - planning to make investments in 2021, by sector. Source: Unioncamere Lombardia.

holding back investments in 2021, for 44.6% of industry and 43.6% of crafts) also contributes to further delaying decisions. It is therefore believed that most companies will keep the situation unchanged in 2020 (42.3% in industry and 46.6% in crafts), but an equally significant share of companies intends to increase them (33.4% industry and 16.4% of crafts), from which it can be deduced a greater difficulty of artisan enterprises, since the remaining 37% will have to reduce them (against only 24.3% of industrial enterprises).

Among the most important investments, those relating to digitization should be mentioned, as the so-called *digital transformation 4.0* has become not only an essential choice, but the way of “doing business” is changing. If in recent years it could have been a simple option, first, and then a real source of competitive advantage, today it could represent a real *condicio sine qua non*, to achieve the minimum conditions of effectiveness and efficiency to compete in the most diverse sectors. , both nationally and internationally. However, this is a real cultural evolution, because it is not a question of making simple investments in hardware and software, but more and more often in the acquisition of specific data science skills to extract value from the information flows generated, increasingly strategically relevant.

It is therefore more and more appropriate that any financial facilitation tools to support investments in this sense (especially for artisan businesses, facilitating, for example, access to e-commerce or the web where relevant) also consider interventions in training/consultancy (indiscriminately for industrial and artisan companies) aimed at accompanying the change in organizational processes and the activities that they determine and require.

Within the Unioncamere Lombardia firm, therefore, it was in particular possible to investigate the role currently attributed to investments in digitization in the context of the business decisions of Lombard manufacturing companies. Faced with the extreme speed of diffusion of digital technologies in final demand, recorded since the pandemic, entrepreneurs seem to be much slower to take action and make a decision in this regard. Only 35% of industrial enterprises and 18% of artisan ones, in fact, were informed about the potential of digital and business 4.0 technologies; just over half of the former will invest in the future (56%) and only 35% of the latter will move in the same direction. The data is surprising if we consider what, during the pandemic, was one of the first urgencies for companies, namely the organization for its employees of a smart working system with the related technological equipment (hardware, software and VPN), that allowed to continue the activity.

However, the impact of digital technologies is transversal within and outside organizations, investing on the one hand every company function (think of the automation of production, testing and assistance processes) and the relationships between the same company functions; on the other hand, they concern the processes along the supply chain as well as towards the market. In fact, there are many variations of digital technologies, such as the family of 4.0 solutions that integrate IoT, AI and ICT in order to make an entire production plant more "intelligent" and autonomous in decisions, but despite the maturity of certain solutions, not the whole sector manufacturing seems aware of the real potential. At the industry level, in 18% of cases (24% in 2019) the knowledge of these technologies is completely lacking (since it increases to 37% for crafts); a general, if not even superficial, curiosity prevails, which consists mostly of reading articles on the internet (40% at the industry level and 45% in crafts).

On the other hand, 44% of industrial companies declare that they have done "something about it" or "plan to do it" (compared to only 18% in crafts); a quite alarming situation considering the competitors and the current international competition, based on visibility and an ability to relate to the market without interruption.

The level of knowledge and implementation of digitization projects is positively correlated with the growth of the company size: the greatest incidence is in fact found in industrial companies with over 200 employees (46.4%) and in artisan companies with at least 10 employees (22,0%). Also in this case, in fact, the companies with the greatest economic and financial resources are facilitated, which nevertheless represent a minority of companies; hence the great interest in the different subsidized finance instruments.

The extent of the investments made is also a variable to estimate their relevance and, therefore, their transformative scope within organizations: for example, a simple e-commerce site built in economy, in fact, not integrated with a CRM evolved, nor accompanied by a process of reconfiguration of internal processes could remain a spot intervention, without bringing any organizational learning or any structural innovation to the company. Within the sample, it was found in particular that - despite a digital literacy problem in a large part of the national businesses - those who actually carry out business 4.0 and or digitization projects tend to make strategic choices. 80.9% of industrial enterprises (and as many as 66.1% of craft enterprises) that made an investment in technologies have in fact spent a total of over 100,000 euros. Nor the share of companies that made investments from 60 to 100 thousand euros is irrelevant (7.9% of businesses and 10.5% of artisan businesses). The simplest activities - with an investment of less than 20 thousand euros - are among the respondents in the sample a minority component (4.1% of industry and 9.7% of artisan enterprises), but prudence suggests, in this case, not to generalize with respect to the universe of small and medium-sized enterprises in the area.

Within these investment choices, first of all, the new technologies supporting infrastructural choices, such as mostly solutions for advanced manufacturing (in 50.8% of cases at industry level and 45,2% in crafts), which include interconnected and rapidly programmable collaborative robots to make production activities more efficient. Other new technologies follow in importance, respectively attributable to vertical/horizontal integration along the value chain (29,4% and 27,7%), Industrial Internet and IoT solutions (18.1% and 16.1%), which allow multidirectional communication between production processes and products; additive manufacturing, with the use of 3D printers connected to digital development software (11.6% in industry and 14.8% in crafts); simulation between interconnected machines to optimize processes (19.8% and 27.7%); access to the

cloud (18.1% and 11.6%); CyberSecurity and business continuity (16.6% and 7.1%).

Investments in frontier technologies, such as the management of big data and analytics (in third last place in both sectors, with values of 15.9% and 7.7% respectively) or virtual and augmented reality applied both in contexts of production, training and marketing, in the last place (respectively 8.5% and 5.8%) do not yet receive sufficient attention.

In addition to infrastructure solutions, other technological applications are often considered complementary or synergistic with respect to the previous ones (e.g. artificial intelligence, digital technological solutions for supply chain management; e-commerce systems, also via app), which generate and process the 'set of information flows, which help to extract knowledge and create value for companies.

This is the case of software, platforms and digital applications (Figure 18) for the management and coordination of business processes (ERP, MES, PLM, SCM, CRM; RFID, barcode, etc.), now indispensable in the most diverse production contexts. (78.2% in industry and 59.0% in crafts). Other examples are given by System integration solutions applied to process automation (respectively equal to 29.9% and 25.2%) and for those digital technological solutions for the optimization of supply chain management (Drop Shipping, of "inventory zeroing "and" just in time") (17.3% and 11.5%).

On the other hand, the feedback from artisan businesses towards the activation of mobile and / or internet payment systems, electronic invoicing and fintech (22.3%) and e-commerce systems (15.8%), with values higher than industry (which reaches, respectively, 16.7% and 12.9%). The most advanced technologies, such as artificial intelligence, blockchain and technologies for the in-store customer experience, are too underdeveloped.

In general, there is a different sensitivity towards these applications: the industry seems to favor efficiency optimizing vertical / horizontal integration along the value chain and safety, in terms of business continuity; craftsmanship is more sensitive to solutions that can increase production flexibility, compatibly with a smaller company size and investment capacity.

An extremely relevant issue, with regard to investments and the implementation of digital transformation projects, is the awareness of companies about the strategic importance of the skills necessary to enable and enhance these solutions within organizations and the identification of the type of necessary supports in this regard. With regard to the latter, there is

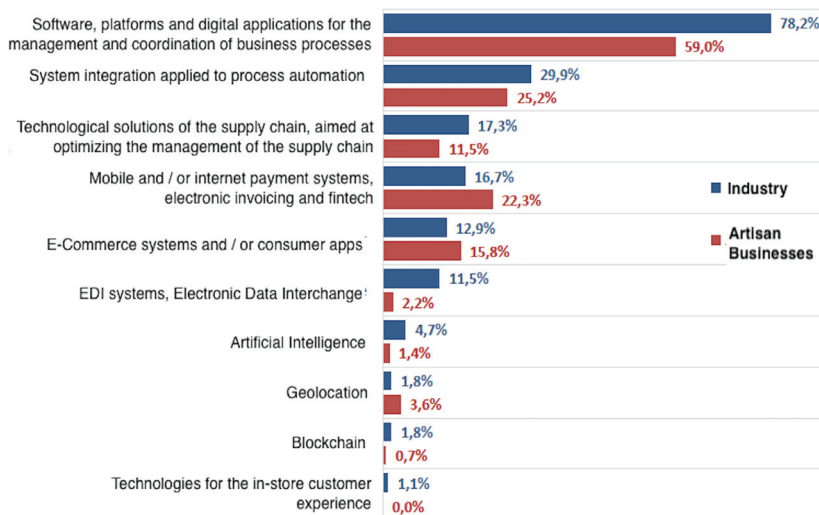


Figure 18: Compared to the following list of technological solutions, in which of these has already invested or intends to invest in the short term (multiple choice)? Source: Unioncamere Lombardia.

a certain widespread sensitivity, although support services are considered different priorities based on the type of enterprise - industry and crafts - and size class. More specifically, in industrial enterprises, in general, financial support (58.2%) and staff training (54.2%) are favored, but the latter is a priority for companies from 50 employees upwards. (reaching values of 61.4% and 66.2%, respectively, in companies with more than 200 employees), as a guarantee to obtain significant effects and create value for the company. Companies with fewer than 50 employees, on the other hand, show greater relative attention to financial support (61.9%) and, subsequently, to training (46.7%) and specialist consultancy (32.7%). It is easy to see how crafts, similarly, privilege financial support (68.6%), in a substantially homogeneous way in all size classes and particularly distant from the other items. Training reaches 36.7%, but only in larger companies (with 10 employees or more), which are more sensitive to qualitative aspects.

With regard instead to the presence or absence of specialist skills within the organizations, an indirect evaluation was opted for, verifying how the data generated by the use of the implemented technologies are processed, distributed and used.

The resulting picture is quite dramatic, since 53% of industrial enterprises and 47% of craft enterprises distribute "hand-prepared" data. This

means that not only a certain degree of backwardness prevails with respect to the enormous potential of current technologies, but also a waste of resources and / or the presence of important organizational inertia, especially if this happens in companies where significant investments have been made. If we also add to these percentages those relating to the total absence of the use of some tools for preparing and disseminating data (16% in industry and 45% in crafts), it is clear that the problem of staff training and adaptation of some organizational mechanisms within organizations is an absolutely critical and crucial aspect, for the majority of the companies in the sample (69% of the industry and 92% of the craft enterprises). Only 48% of industrial enterprises and 42.1% of craft enterprises use structured reports generated by business intelligence analytics tools, while big data solutions that also integrate external data sources, as well as artificial intelligence algorithms are essentially exceptions. (4% and 1% in industry and 3.8% and 1.1,% in crafts, respectively).

Cultural growth at the level of digitization is also based on the awareness of the effects of the latter in organizations and, therefore, of the return on investment, from a qualitative and quantitative point of view. In general, companies perceive positive results in terms of greater effectiveness and internal efficiency (57.8% of cases in industry and 23.1% in crafts), which however clashes with the possibility of measuring them. Added to this is the finding of a higher overall quality of production (25.5% and 12.8% respectively), which translates into an increase in efficiency) and the reduction of scraps and waste (22.1% and 13, 1%), with further effects on internal efficiency. Finally, the issue of profit (4.6% in industry and 3.0% in crafts), as a further indicator of the return on investment in a systemic business logic.

4 Conclusions: Managerial and Political Implications

The results of the analysis of the Lombard manufacturing sector during the different quarters of 2020 are very interesting because:

1. they are *signs of the health of the manufacturing sector* as a whole and, therefore, of the entire Italian economy;
2. *highlighted the different criticalities between sectors and between companies* in the same sectors of activity, with respect to different dimensions (i.e. revenues, markets, cost structure, resources and skills);

3. revealed the *critical success factors, often transversal between sectors and companies*, which are decisive not only in the face of the crisis, but above all for growth, that can exceed pre-Covid levels.

With reference to the first point, the sector has shown a clear reaction, confirmed by the trend of the industrial production and turnover indices, by virtue of the ability respectively to reconfigure production chains and individual supply chains in favor of European suppliers instead of those from the Far East, in search of a higher quality of product and service; to diversify production and to conquer new foreign markets, in the face of the collapse of domestic demand, thanks to new investments in digitization and more.

The second point is, however, equally relevant: the sectors with the most critical issues are in fact the traditional "made in Italy" ones which, even before the pandemic (end of 2019), showed levels of low productivity, inefficiencies and low propensity for production and processes innovation. However, it does not seem to be a question of resources, but rather of skills and competences portfolio. Although the apparel sector suffered from the closure of physical stores, consumers continued to buy but different products and turning to digital channels. At the same time, companies that have invested in digitalization by combining e-commerce with their traditional business have had to change - in a few months - their internal organization, information processes, marketing perspective and communication methods, customer service and logistics.

At the same time, the analysis of the economic trend of the manufacturing sector makes it possible to highlight the characteristics of the sectors and companies best able to face the crisis situation due to the pandemic, net of the fact that they belong to the sectors defined as essential, who were able to continue their business despite government restrictions. In particular, it is possible to refer, on the one hand, to the monitoring of real critical success factors; on the other, to the specificities that seem to characterize companies that are able not only to survive the crisis, but to lead the economic recovery. Among the main critical success factors, "technological & market innovation" and "research and development" undoubtedly stand out, both in terms of process innovation within traditional sectors (which is revolutionizing both production and sales both production and sales channels and management relationships with the customer), and typically in high-tech sectors, where there are strong investments in R&D and as many significant economies of scale at the production level. Moreover,

these are the same sectors that stand out for the high share of exports and competitiveness at an international level, with companies included in supranational chains characterized by high global growth trends (for example, the automotive sector in Germany, which is having positive effects on the mechanical, components and advanced electronics industry). In some cases, the ability to blend technological innovation and specific sectorial know-how (as in highly specialized sectors) also allows small and medium-sized companies to operate successfully on national and international markets. Ultimately, it could be argued that the basis of the resilience demonstrated by the manufacturing sector is the visionary capacity of companies that have been able to make counter-cyclical investments (tangible and intangible, in Italy and abroad) and activate more or less structured partnership agreements to "create a system", in cases where it was necessary cope with market or procurement difficulties.

The sectors most in difficulty are therefore those where the majority of companies before the pandemic had already given up investing in innovation - of every order and degree - exploiting with inertia the income advantage that the market position seemed to guarantee, even if it had already been verified significant changes in demand and sales channels. It is therefore possible that many small and medium-sized enterprises (from 15 employees upwards), both manufacturers and /or suppliers and at the retail level - with the disappearance of the restrictions, they will not be able to recover the previous levels of revenue and profit, because not more able to intercept what was their original market, nor to be able to cover the costs of previous inefficiency with government support, in addition to the higher costs due to the necessary health safety conditions in the workplace.

Moreover, during the pandemic the various public tenders intended to mainly support digitization projects for the conquest of new markets, in favor of micro and small-medium enterprises, have certainly had the advantage of accelerating a phenomenon of basic literacy by most of crafts and small manufacturing (in furniture, jewelry, clothing and accessories), but often these investments were alongside traditional management (e.g. opening of an e-commerce by external consultants), without new knowledge and skills have been effectively metabolized and internalized within the organizations. It is therefore desirable that the effectiveness of these transfers could be assessed not only in terms of the amount of expenditure, but also in terms of qualitative impact on local businesses, facilitating, for example, the acquisition of new resources and skills, to implement

structural changes in the approach to the market. In other words, if in the short term it is essential that the public actor be able to insert liquidity into the system, in the medium term it is strategically important to address the structural criticalities of the production structure, so that the harmful effects of the end of the layoffs can be avoided.

From the perspective of industrial policy at the national level, it is therefore possible that it is necessary to consider new dimensions of sectoral analysis and competitive transformation.

The first consideration concerns the transformation of supply chains, aimed at bringing suppliers closer to end markets, reducing risk factors. In this regard, resistance to globalization is emerging, as understood up to now, limiting it to the continental macro-region, especially for the strategic supply chains for the Italian economy.

A second consideration concerns the resilience and efficiency of the system - in terms of its ability to absorb a shock and to come out of it even better than its competitors - and not only of individual companies. If we compare the current situation with the financial crisis of 2008, the recovery of companies (and sectors) has been much faster, not only for the availability of resources and liquidity in the economic system, but for having quickly reduced costs in non-strategic activities and directed energies on rethinking the entire business model. This in order to neutralize avoidable risk factors (e.g. basing supply on global just-in-time) and digitizing processes, both at the back end and front end level, for the management of relations with the market, maximizing the value of the return of information (ROI). Thanks to Covid19, digitization itself has undergone a strong acceleration, leading to the birth of new business models (the so-called contactless economy), especially at the level of e-commerce, automation and digital health, in the face of an increasingly receptive demand in this sense.

It is also possible to observe how the pandemic has led to accepting, if not even requiring, a much more incisive role of the government in the economy. During times of great crisis or emergency, citizens are in fact willing to accept and support greater government control over the economy, in order to preserve jobs, support companies in difficulty and help the population in difficulty. It is already noted that the Italian government is already intervening by nationalizing companies, acquiring shares, providing loans or regulating more carefully the import of goods or activities that could be penalized due to competition (eg. job security). It is also desirable that the government can support the same

digital transformation underway, already begun with Industry 4.0, not only through funding to support digitization, but also by defining tools to feed research and development activities in small and medium-sized enterprises (through the external outsourcing of research or the creation of multi-company research centers), often extremely specialized.

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