DECREASING CONSUMPTION BECAUSE OF COVID-19?
A MULTISECTORAL ASSESSMENT

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1. Introduction

The outbreak of Covid 19 pandemics has caused two digit decreases of GDP of all the major economies, and a wide range of interventions has been put in place by the different governments to face this unprecedented shock. In the second quarter of 2020 household expenditures decrease, on average, by more than 10% with respect to the second quarter of 2019. In addition, households are subjected to several further shocks affecting them under different viewpoints, such as job arrangements, personal health conditions and region of residence. In response to pandemics, consumer expenditure, one of the main drivers of the economic activities, collapsed in the early 2020, because of the first wave of pandemics.

Covid 19 has affected different regions and individuals in several specific ways. Consumers were forced to change behaviour in response to different region-specific economic and social frameworks. The worldwide trade of goods, after a fall of 15% in volume, between February and May 2020, starting from summer months, has rapidly recovered, reaching, at the end of the year, higher levels than the pre-crisis period. In the first quarter of 2021, the economic cycle reinforces in China and the United States, while in the euro area the activity undergoes a new moderate decrease because of the introduction of further measures against the health emergency. In Italy, household expenditure drops significantly in 2020, by about 10%; this decrease is accompanied by a weaker reduction of 3% in households' real disposable income, supported by the government package to face the spread of pandemics.

This paper aims at the detection of the size of direct and indirect effects on total output linked to the changes in households' consumption levels and composition in the years of Covid pandemics with respect to the pre Covid period. For these reasons the analysis adopts the multisectoral viewpoint that allows for the evaluation of the direct and indirect impacts of a decrease in the households' consumption expenditures on total output which represents the level of economic activities. Year 2018 has been considered as the base year of the considered time horizon 2018-2020. We apply the Leontief inverse of 2018 to the consumptions of years 2018 to 2020. In this way, a quantification of the changes in the level of activities as expressed by sectoral total

outputs caused by the changes in the households' consumption expenditures can be obtained. The analysis, then, highlights the different intensity in the decrease of productions and the difference in consumption composition. Starting from 2020, the outbreak of Covid-19 pandemics causes a sharp decrease in households' private consumption and a relevant rise in the saving rate, both in US and in Euro area. Among the European countries, Italy and Spain suffered the most relevant decrease in consumption expenditures and higher increases in the saving rate. The anti-Covid healthcare measures, to prevent the spread of pandemics, added instability to the economic process, in terms of output and job losses, both in the directly involved industries and in the whole economy, as interacting process, create relevant problems of economic instability to millions of people at a global level.

These measures seriously affected the economic activities in most of sectors, following the relative output share of each single sector. Following FRED and Eurostat observations, in Italy the household private consumption expenditure has severely decreased in 2020, of about 10%. This never happening fall has been complemented with a milder contraction of about 3% in household's disposable real income, supported by the package of administrative incentives implemented starting from the burst of pandemics. The saving rate, after the historical levels reached in spring (over the 20%) remains above the pre pandemic level by the end of 2020.

There are many reasons connected to this consumption and saving trends.

First, the decrease in disposable income and the job loss led to a reduction in households' expenditures. Secondly, households increase their savings driven by precaution reasons, because of the uncertainty on the evolution of their economic situation or because the perceived higher healthcare risk. Third, lockdown policies inhibit some typologies of expenditure (restaurants and travels), producing forced savings. Fourth, the risk of contagion hinders households from the consumption of certain kinds of goods and services involving social contacts. At present, all these factors play a role, at a different magnitude, for each expenditure class and for the different categories of households. For example, precaution reasons are more likely connected to unemployed low-income people. Independently from their income, all the individuals are treated by the healthcare risk and contagion, this particularly involves expenditure categories whose jobs are mainly connected to risk of contagion. (Guglielminetti and Rondinelli, 2021).

After this introductory chapter the paper develops along four further chapters: chapter two provides a brief literature review on the main methodological topics dealing with the observed consumption behaviours in presence of the contagious disease in various European countries; chapter three gives a suggestion for dealing with consumption expenditure in presence of pandemics through the application of the multisectoral approach. Results are illustrated in the fourth chapter, while conclusions are drawn in the last chapter.

2. Literature Review

Starting from the initial phases of Covid 19 pandemics, attention of researchers has been drawn by the households' private consumption tendencies. Analyzing microeconomic data on high frequency bank operations and credit cards, evidence has been found of the negative consequences of the spread of the virus leading to relevant reductions in households' expenditures. These decreases are not equally performed within all the consumption categories. The most affected nonessential goods sectors, e.g., travels accommodation and restaurants while essential goods sectors, e.g., food consumption and ICT related sectors, attest relevant increases. These reductions have been more significant than job those observed in jobs and income detected in the same period. Consumption declines emerge across all households' expenditures and income classes.

The work of Bachas *et al*., (2020) and Chetty *et al*., (2020) showed that rich US individuals widely decrease their expenditures and stimulating them at a slower pace with respect to low-income individuals. Within this context, the behaviour of consumers during Covid 19 pandemics have been affected both by economic and precaution reasons but also by restrictive policies and infection troubles. Nevertheless, it is difficult to differentiate within the last factors, since they are both nearly simultaneously driven by the diffusion of contagion.

Therefore, the size at which the expenditure in nonessential goods has been affected by lockdowns is controversial. Data on the transaction level of a non-profit company (Baker *et al*., 2020) showed that the global decrease in expenditure with the burst of Covid 19 have been approximately two times higher in countries promoting stricter lockdown. Alexander and Karger (2020) try to estimate the causal consequences of policy recommendations. The simulation has been carried out using data on consumers expenditures and mobile registrations and exploit the change in stay-at-home orders within countries. The analysis highlighted that the stay-at-home order caused a broader decrease of expenditure in related sectors against mobility, but only partially explains the behavioural response to Covid 19. By means of high frequency data on transactions, (Chetty *et al*., 2020) found that the open order of countries has a moderate impact on expenditure, suggesting that consumption has been motivated by healthcare purposes. Andersen *et. al*., (2020) compares the behaviour of consumers in Denmark and Sweden drawing the same conclusions only based on the fact that the two countries were equally exposed to pandemics but only Denmark imposed significant restrictions to the economic activity. Exploiting data from the Bank of Italy's Special Survey of Italian Households (SSIH) Guglielminetti and Rondinelli (2021) combine a micro and macro approach explain the fall without precedents of private consumption due to the outbreak of Covid 19 pandemics. The macro estimation shows that there are many factors that explain consumption dynamics in 2020, among which the worsening of economic conditions, the fear of

infection, governmental restriction and uncertainty linked to the healthcare perspectives and economy. Consistently with the macro evidence, the microeconomic analysis, based on SSIH data, confirms the relevance of these factors in relation to pandemics. The work offers some evidence on the evolution of expenditure and saving in nearby future. In Italy, expenditures in different services, as travels, cultural events, restaurants, are still widely discouraged in the first part of 2021. These limitations translate in most relevant earnings, even if there has been a shift towards other categories of consumption goods, e.g., durables. These savings have been collected in 2020 and have been employed when the pandemics is under control and with a reduced fear of contagion. The uncertainty of this situation could have long term effects and hit more fragile sectors and households.

3. Database and Methodology

The analysis is carried out using the multisectoral approach. The starting point has been the Italian Input Output database of year 2018 retrieved in Istat website. In addition, we use the data on the Italian households consumption expenditure by family budget (database I.Stat) for years 2018-2019-2020. For this aim we need to refer to the consumption bridge matrix. At the beginning of the 'eighties', multisectoral Input Output simulations models were progressively integrated with systems of demand equations econometrically estimated. This generated the "modern Input Output models" that preserve the idea of technical coefficients but, for final demand, rely on the econometric estimation of final demand systems of behavioural equations for each demand component (Ciaschini, 1982). The Inforum project of University of Maryland (Almon, 2016) provided a forum for national research groups that joined the project of realising a net of similar models for simulating the outcomes of a consistent set of world economy models. The interest in the topics has progressively grown leading to the construction of datasets, bridging matrices between two different data classification systems. In particular consumption by purpose (COICOP) and products by activity (CPA). While the former classification is used in household budget and expenditure surveys allowing for the estimation of a system of consumption demands, the latter represents the industry sector dimension adopted in national accounts and input–output tables, allowing for the determination of the impact of consumption demands on total outputs. The consumption bridge-table transforms the flows of consumption expenditures according to the family budgets classification into the flows of consumption demands to the producing industries. This procedure allows for the determination of the activity level in each industry in terms of total output (Cazcarro *et al.*, 2022), (Cai and Vandyck, 2020), and for the evaluation of the loss of output growth caused by consumption deficits.

As shown in Table 2, we have attributed the 24 consumption expenditure items from the family budgets classification (COICOP) described in Table 1, (UN, 2018) to

the 63 industries classification (ATECO/ISIC) shown in Table 2 (ISTAT,2022). Lines with all zeros have been omitted.

Table 1 – *Family Budget Items (COICOP) for households Consumption Expenditures*

1 Cereals and cereal products	13 Clothing and footwear
2 Live animals, meat and other parts of slaughtered land animals	14 Housing, water, electricity, gas and other fuels
3 Fish and other seafood	15 Maintenance, repair and security of the dwelling
4 Milk, other dairy products and eggs	16 Imputed rentals for housing
5 Oils and fats	17 Furniture, Household textiles, Household appliances
6 Fruits and nuts	18 Health
7 Vegetables, tubers, plantains, cooking bananas and pulses	19 Transport
8 Sugar, confectionery and desserts	20 Information and communication
9 Ready-made food and other food products n.e.c.	21 Recreation, sport and culture
10 Coffee and coffee substitutes	22 Education services
11 Water, Fruit and vegetable juices	23 Restaurants and accommodation services
12 Alcoholic beverages, tobacco and narcotics	24 Other goods and services

Table 2 – *The consumption bridge table.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
5	76.45	98.29	41.22	59.12	15.93	42.18	63.45	19.17	10.99	14.08	22.66	46.1												
6													114.65				3.8							
8																					20.64			
12																		53.42						
17																		11.75						
18																	15.28							
20																			79.21					
21																			3.98					
22																	90.89							12.75
24														117.52										
25																								
26														34.62										
27														11.48	26.51									
30																								
31																			13.17					
32																			2.99					
33																			8.09					
34																			180.96					
35																				1.05				
36																							129.98	
39																				58.26	7.25			
41																								0.51
42																								69.18
44														45.35										
45																								12.25
50														82.68		577.89								
52																					20.2			
54																						15.83		
55																		53.16						
56																								6.39
57																					78.92			
61																								89.6
TOTALS	76.45	98.29	41.22	59.12	15.93	42.18	63.45	19.17	10.99	14.08	22.66	46.10	114.65	291.65	26.51	577.89	109.97	118.33	288.40	59.31	127.01	15.83	129.98	190.68

To the purpose of our application the 63 IO sectors have been then, aggregated in 29. Given a vector of consumption expenditures IO, made consistent with the features of the IO disaggregation, it is easy to determine the corresponding vector **x** of direct and indirect output requirements, through the Leontief inverse. (Leontief, 1956). In our application, vector **c** considers only the private households' consumption expenditure component of the final demand vector, which represents the consumption demand forwarded to the producing industries, no other demand component is considered. The

consumption bridge matrix, **B**, is obtained in two steps: i) by aggregation of the 63 IO sector in table 2 into the 29 considered in this application (see table 3) and calculating the coefficients by dividing each column of the resulting matrix by its total. Given a vector of final demands expressed by the behaviour of the households ($\mathbf{c}^{FB}$) the vector of final consumptions requirements to the I-O sectors, ($\mathbf{c}^{IO}$), can be determined using the bridge matrix **B** so that $\mathbf{c}^{IO} = \mathbf{B}\,\mathbf{c}^{FB}$. We will then be able to transform the consumption expenditure by family budgets, ($\mathbf{c}^{FB}$) i.e., the most recent data available on consumption expenditure, into a vector ($\mathbf{c}^{IO}$) of consumption demands to the IO industries (ATECO).

Table 3 – *Input Output sectors (ATECO classification).*

1 - Crop and animal production, hunting and related service activities	11 - Manufacture of transport equipment	21 - Real estate activities
2 - Fishing and acquaculture	12 - Manufacture of furniture, other manufacturing Repair and installation of machinery and equipment	22 - Professional, scientific, and technical activities
3 - Mining and quarring	13 - Electricity, gas, steam, and air conditioning supply	23 - Administrative and support service activities
4 - Manufacture of food products, beverages, and tobacco products	14 - Water collection, treatment, and supply	24 - Public Administration and defence; compulsory social security
5 - Manufacture of textiles and wearing apparel	15 – Construction	25 – Education
6 - Manufacture of wood and of products of wood, paper and paper products and printing	16 - Wholesale and retail trade and repair of motor vehicles and motorcycles	26 -Human health and social work activities
7 - Manufacture of coke and refined petroleum products	17 - Trasportation and storage	27 - Arts, entertainment and recreation
8 - Manufacture of rubber, plastic products, and other non-metallic mineral products	18 - Accommodation and food service activities	28 - Other services activities
9 - Manufacture of fabricated metal products, except machinery and equipment	19 - Information and communication	29 - Activities of households as employers; undifferentiated good and services producing activities of households for own use
10 - Manufacture of computer, electronic and optical products, electrical equipment machinery and equipment n.e.c.	20 - Financial and insurance activities	

4. Results

Industry total output quantifies the level of activation of each sector of the economy on which establishing the effect of the demand fall due to COVID-19 given that a (29x29) intermediate demand Matrix **A** in the base year (2018), the households demand sectors by 29 I-O sectors $\mathbf{c}^{IO}{}_t = \mathbf{B}_t \mathbf{c}^{FB}{}_t$ for years 2018, 2019 and 2020. The 29 sectors output vector **x** is then easily determined as: $\mathbf{x}_t = (\mathbf{I-A})^{-1} \mathbf{B}_t \mathbf{c}^{FB}{}_t$, where $t = 2018, 2019, 2020$.

Figure 4 shows the values of consumption for the three years analysed. Industries *(16) Wholesale trade* and *(21) Real estate activities*, show the highest values of consumption demand to IO sectors. Sectors *(1) Agriculture*, *(4) Food*, *(13) Electricity, gas, steam, and air conditioning supply* and *(29) Activities of households as employers,* after a downturn in the previous years, seem to recover in the last year. The remaining industries consumption demands show a decrease.

Figure 4 – *Households consumption expenditures for the three years 2018-2020.*
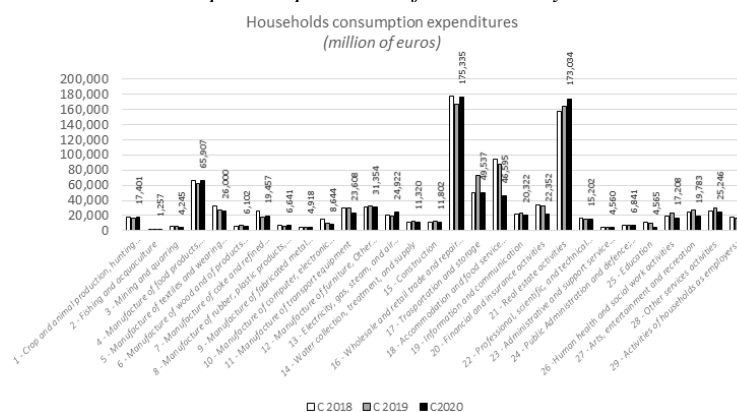
The aggregate result for the private consumption expenditure in the three-year period shows a decline that worsens through time. From -0,44% in the transition from 2018 to 2019, it markedly worsens to -9,05% in the transition from 2019 to 2020.

Figure 5 shows the sectoral results obtained for total output. Sectors *(13) Electricity, gas, steam, and air conditioning supply*, *(29) Households as employers, (21) Real Estate* and *(16) Wholesale and retail trade and repair of motor vehicles and motorcycles* for a negligible amount perform a positive growth rate. All the remaining industries suffer, at different magnitudes, the decrease in the activity levels. In evaluating the variations in the level of activities in the economy, we can refer to the industry output percentage changes between years 2018-2019 and 2019-2020 that emerge from Figures 6 and 7.

Figure 5 − *Forecasted total output for the three-years 2018, 2019, 2021.*
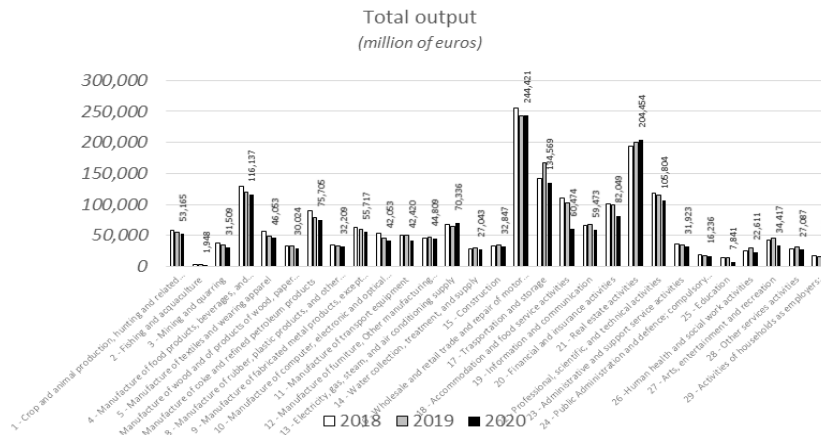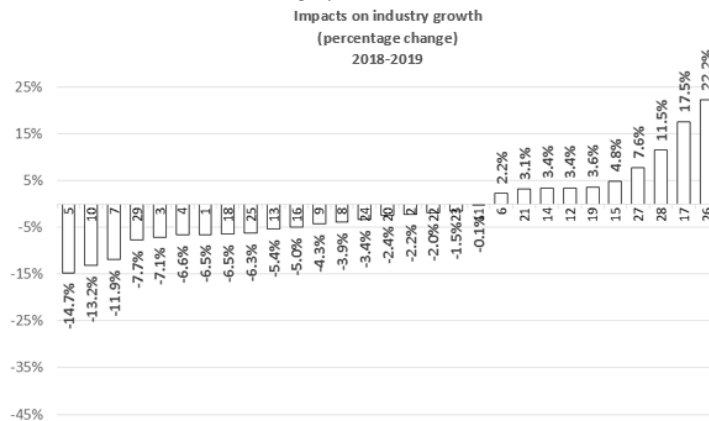
Total output
(million of euros)

Figure 6 − *Sectoral decline in activity levels in the pre-pandemic period.*
(% change years 2018-2019).

Impacts on industry growth
(percentage change)
2018-2019

In this way, COVID-19 impacts on industry outputs can be evaluated in comparison of the percentage change in total output of the economy as a whole. Each industry reveals, in the negative case, the weakness of its performance, and its strength in the opposite case, and can be analysed with reference to the aggregate growth of the economy. The industry total output change, providing a quantification of the change in the activity level of each sector in the three years period 2018-2020, shows a decline in the industry activity levels that tends to worsen over time. The overall decline expected for years 2018-2019 amounts to 4.4%. As we show in Figure 6, a set of fourteen industries show a percent change rate of their activity level around or above

the value of aggregate rate, as absolute value, with 8 industries in decline and six industries in growth.A second set of nine industries exhibit a rate of change lower than 8% but higher than aggregate rate considered in absolute values, where eight rates are negative and only one shows a positive value. A third set, that involves higher rates of decline/growth, is given by six industries where industries *(5) Manufacture of textiles and wearing apparel, (10) Manufacture of computer, electronic and optical products, electrical equipment machinery and equipment n.e.c.* and *(7) Manufacture of coke and refined petroleum products* decline respectively at a rate of 14.7%, 13.2% and 11.9%. Industries *(28) Other services activities*, *(17) Transportation and storage* and *(26) Human health and social work activities* show relevant impacts of 11.5%, 17.5% and 22.2% respectively. Figure 7 shows how the expected percentage decline in the industry activities, due to COVID-19 pandemic in the years, 2019 and 2020, impacts on each single industry in terms of the forecasted percent change of its own total output. Here the situation appears more difficult since the overall aggregate rate of decrease moves from 4.4% to 9.05%, presumably able to threaten the resilience of the industrial structure. The majority of industries, eighteen, show a rate of change in absolute value, lower, or much lower, than the aggregate rate of change. Nevertheless, only four industries exhibit the positive sign. The vast majority of the results, 25 sectors on 29, show negative signs, which means a significant decline. Two industries emerge as

specially threatened by a substantial decline, located around 40%, (*(25) Education*, -43.9%, *(18) Accommodation and food service activities*, -42.2%).

Figure 7 − *Decline in the industry activity levels due to COVID-19 pandemic. (% change, years 2019-2020).*
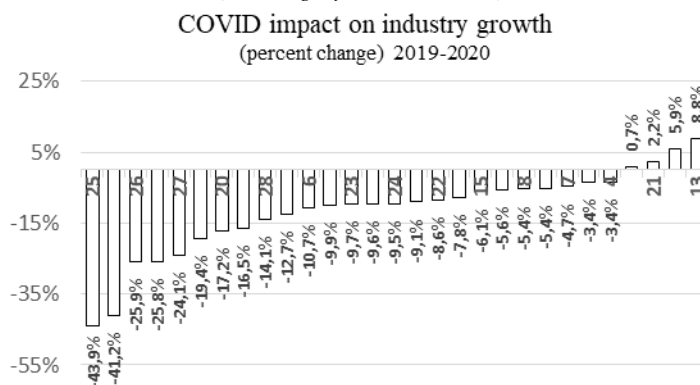
Three industries decline by one fourth (*(26) Human health and social work activities*, -25.9%, *(2) Fishing and aquaculture*, -25.8% and *(27) Arts, entertainment and recreation*, -24.1% and one by one fifth (*(17) Transportation and storage*,

19.4%.). As observed, the sectoral impacts of COVID-19 on economic growth reveals to be rather multifaceted. Its typical features are very different from those of usual recessions. On the one hand, "Contact Intensive" services, usually insensible to the economic cycle, have been the more intensively affected ones. On the other hand, sectors with a pro-cyclical evolution, e.g., experienced a milder decline but to a milder extent (*(12) Manufacture of furniture, other manufacturing Repair and installation of machinery and equipment* and *(15) Constructions*). Services sectors employing high skilled workers and strictly tied to remote works, such as *(19) Information and communication (20) Financial and insurance activities, (21) Real Estate activities* had positive impacts or suffered low negative impacts.

5. Conclusions

Covid 19 pandemics causes a loss in consumption expenditures that doesn't remain confined to the demand side but propagates on the growth of the general level of the economic activities as represented by total output. The type of measures of containment of the pandemics explains widely the different impacts on the various categories of consumption demands. Impact is more mitigated in the sectors where is less difficult avoiding personal contacts as using the telework as alternative to the face-to-face work and clients' interactions. The activities linked to close physical interactions both in the production and in the delivery of commodities and services have been forced to hut or limit/change the nature of their operations.

The perspective of a fast and strong recovery differs according to the sectors.

Sectors producing essential or digital commodities as food computers and electronics, have kept the demand during the crisis and experienced a relatively modest decrease in sales. Services of greater contact, as tourism, have suffered in a sharper way, while those which facilitated activities without contact, as ICT support and provision of services, have remained only partially unaffected. Policy support at both national and EU level has prevented an upsurge in unemployment so far. This is reflected by the fact that reductions in hours worked mirrored drops in economic activities across sectors while employment losses have so far been more contained. Still, by the third quarter of 2020, around 3% of employment or almost 6 million jobs had been lost in the EU since the onset of the pandemic. The hardest hit sectors were accommodation, food services and transport. The baseline scenario assumes that restrictions remain in place until April 2021, after which they are gradually phased out to reach pre-crisis levels by the end of the year. In the case of more adverse developments, the negative impact would be more pronounced in sectors as accommodation and food, and wholesale and retail trade (-5.3%). These sectors also tend to rely more on young and/or low-skilled workers than sectors that were impacted in a lower measure. Also, under the methodological viewpoint, the results presented underscore the crucial role of a neglected multisectoral tool which are the bridge

matrices of final demand components. More than a mathematical tool in multisectoral simulations, they reveal as economic tools for data analysis. The motives of the households in relation to the set of consumption commodities utilized, can be related to the technological instances of the production process activated or dis-activated. This contribution can be even more interesting in relation to investment bridge matrix which shows the relation between investment demands by branch to which it belongs and the reaction of the producing system in terms of investment according the industry that produces it in the study of technological change. The work presented depends directly on the availability of a multisectoral bridge, from the multisectoral consumption to the multisectoral output. This type of information is incorporated into the methodological economic concept of consumption bridge-matrix. It shows the relevance of the concept bridging multisectoral variables that in economic multisectoral analysis have the very same relevance, in terms of economic information contained, of the Leontief matrix also in the perspective of further developments of a somehow neglected, but relevant, procedure of economic analysis.

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SUMMARY

This paper aims at the detection of the magnitude of direct and indirect effects on total output connected to the changes in households' consumption levels and composition in the years of Covid 19 pandemics with respect to the pre Covid period. The study applies the multisectoral viewpoint that allows for the evaluation of the direct and indirect impacts of a decrease in the households' consumption expenditures on total output which represents the level of economic activities. Year 2018 represents the benchmark year of the analysed time span ered (2018-2020). We apply the Leontief inverse of 2018 to the consumptions of years 2018 to 2020. In this way, a quantification of the changes in the level of activities as expressed by sectoral total outputs caused by the changes in the households' consumption expenditures can be obtained.

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