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Potential impacts of COVID-19 pandemic on Turkish economy and its carbon dioxide emissions: an extended input-output analysis

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Abstract: COVID-19 pandemic has lead to societal transformation in terms of economic, social, and environmental behaviours. Like other countries, Turkey has suffered from the pandemic. The aim of this study was to investigate the impacts of COVID-19 on the following major indicators: total hours worked by employees, number of employees, labour compensation, capital compensation, gross value added and nominal capital stock at current basic prices, and carbon dioxide (CO_2) emissions. Throughout the study, an extended input-output (EIO) analysis was employed. The scope of the study was based on the decline in economic activities in the restricted sectors such as accommodation and food services, travel agencies, tour operators and other reservation and related services, air transport, land tourism, water transport, and leisure activities. Three main scenarios, i.e., fast recovery scenario, continuing slowdown scenario, and economic recession scenario, were set to analyse the effects of COVID-19 on the Turkish economy and CO_2 emissions.

Keywords: COVID-19; extended input-output analysis; Turkish economy; carbon dioxide emission.

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1 Introduction

COVID-19 has unprecedentedly affected almost all countries. Since the first reported case in December 2019, there have been 33,034,598 confirmed infections, 996,342 confirmed deaths (Forster et al., 2020; WHO, 2020a, 2020b). It is widely accepted that globalisation enhances the rate of spread of COVID-19. In the modern world history, seven pandemics have been observed and reported since 1889 (Maital and Barzani, 2020): yellow fever, Spanish influenza, MERS, Zika, SARS, Ebola, and swine flu (Buheji and Ahmed, 2020; WHO, 2020b). COVID-19 has extraordinarily affected most of the countries, including their social and economic activities. This pandemic has also changed the recovery periods in various sectors and fields (Baldwin and Mauro, 2020). Due to the non-existence of appropriate treatment or vaccines for COVID-19, or inadequate scientific evidence to control the pandemic, it is still not possible to assess its exact economic and social effects (Baldwin and Mauro, 2020). The pandemic has also caused a decline in the economic output (McKibbin and Fernando, 2020a). It is estimated that the impacts of COVID-19 on the global economy in the form of gross domestic product (GDP) losses will range between 283 and 9,170 billion USD (McKibbin and Fernando, 2020b). The estimated economic impact of each of the earlier pandemics was a GDP loss over 1% (Buheji and Ahmed, 2020). The estimations for the current pandemic vary between 1 and 6% of GDP, depending on the economic resilience of countries (Wren-Lewis, 2020).

Some prominent sectors, including manufacturing, transportation, automotive, tourism, trade, information, and communication technology, are widely observed to be affected by the pandemic in different countries (Baldwin and Tomiura, 2020). The resilience of each country depends on the sectoral sizes of trade, consumption, and production, as well as the interlinkages among various sectors (Mann, 2020). For example, right after the World Health Organization's (WHO) broadcast of the pandemics

news, countries like Turkey started to restrict traveling and transportation in order to reduce the rate of spreading. A number of economic, social and other necessary universal activities were either suspended or readjusted to reduce their frequencies. For instance, distance learning for primary and secondary schools and universities have been widely adopted by students, academicians, and other related stakeholders. At the global level, oil prices have been shocked by the falling oil demand and the disagreement among oil producers to determine the supply level (Arezki and Nguyen, 2020).

COVID-19 shows that the technological progress is not adequate to manage its health sectors (Buheji and Ahmed, 2020). Therefore countries need to revisit their economics and social business models to increase their resilience (Buheji and Ahmed, 2020). In current models, external shocks follow a 'V', 'L' or 'U' shape recovery (Mann, 2020). The shape of the recovery is correlated with the degree of elasticity in an economy. For example, the fast recovery follows a 'V' shape while a continuing recovery follows a 'U' shape and the remaining recession shows an 'L' (Mann, 2020). Economic activities in sectors such as tourism, transport, agriculture, industry and construction have been negatively affected by COVID-19, and tourism tends to follow an 'L' shape due to its lower resilience (Mann, 2020).

Many developing countries and emerging economies are not so capable of overcoming the results of this greatest calamity (Malley and Malley, 2020; UNDP, 2020; WB, 2020b). Turkey, as a developing country, epitomises a lag of economic and social recovery from the pandemic. This study aims to investigate the impacts of COVID-19 on the Turkish economic and social context which has a recovery problem in its economic activities. In this study, an extended input-output (EIO) model was used with the national data and a national input-output (I/O) matrix. Changing economic activities were divided into three categories: so-called 'expanded', 'restricted' and 'partially restricted'. 'Restricted' sectors include air transport, accommodation and food service activities, other service activities such as tourism and sporting services. 'Partially restricted' sectors are land transport and transport via pipelines, water transport and education. On the other hand, human healthcare services have experienced an increase in their activities and this is covered by 'expanded' sectors. Thus, this study provides an estimate for the impact of COVID-19 in terms of changing total hours worked by employees, number of employees, labour compensation, capital compensation, nominal capital stock and gross value added at current basic prices. In addition to the changes in these macroeconomic variables, sectoral activity changes might lead to reduced carbon dioxide (CO_2) emissions. This study also investigates the impact of COVID-19 on emissions. The article consists of the following sections: a literature review, a section presenting the method and data, a section presenting the results, and a last section to summarise the main findings and main policy results.

2 Literature review

In the literature, there are several studies finding evidence for the relationship between healthcare and income (Pritchett and Summers, 1993; Cuddington et al., 1994; Cuddington and Hancock, 1994; Bloom et al., 1998; Bhargava et al., 2001; WMO, 2001; Haacker, 2002a; Robalino et al., 2002; Bell et al., 2004). These studies provide some lessons learned about the impacts of communicable and non-communicable diseases and of the corresponding mortality and morbidity rates on the economy. Haacker (2002a)

finds supporting evidence for the effects of HIV/AIDS on the demand for labour, household and governmental expenditures, export-imports and final consumption. Rassy and Smith (2013) analyse the impacts of the H1N1 pandemic on the Mexican economy. They find that more than one million foreign tourists did not visit Mexico, and this caused a loss of 2.8 billion USD. Similarly, MERS-CoV caused the Korean economy to lose 2.1 million tourists and 2.6 billion USD (Joo et al., 2019).

No treatment for COVID-19 is currently known. Besides, there is no strong evidence for any discovery of a reliable medicine or vaccine. These conditions accelerate the impacts of COVID-19 on economic and social activities. Similar conditions were observed during SARS in 2010 (Lee and McKibbin, 2004). Lee and McKibbin (2004) investigate the macroeconomic effects of the SARS pandemic in terms of decreased utilisation of services and goods, raised cost of operation and evaluation of the country's new risky position. In country-based studies, similar findings were reported for Hong Kong (Siu and Wong, 2004), for China (Hai et al., 2004), and for Taiwan (Chou et al., 2004). At the regional level, a study (WB, 2016) estimates that the recent Ebola outbreak in Guinea, Liberia, and Sierra Leone has destroyed most of the previous years' economic gains in these countries, which were among the fastest-growing economies up to that point. Another World Bank (2020a) study explains that the epidemic caused a significant loss of growth in the private sector, threatening food security due to the decline in agricultural production and imposing a cost burden on cross-border trade with restrictions on movement, goods and services.

A number of studies in the literature analyse the economic effects caused by the recent global outbreaks of communicable diseases. An exemplary analysis for the economic impact of influenza was done by Schoenbaum (1987). Another critical research is the study of Meltzer et al. (1999), which examines the possible effects of global influenza and its vaccine interventions in the USA. The overall economic impact for the US economy has been estimated to be between 73 and 166 billion USD. In an analysis by the CBO (2006), which examines the pandemic influenza scenario for the USA, two scenarios are used: a mild scenario with an attack rate of 20% and a case death rate (the ratio of the number of people that died to the number of infected people) of 0.1% and a violent scenario with an attack rate of 30% and a case death rate of 2.5%. For the USA, a 1.5% GDP contraction in the mild scenario and a 5% GDP contraction in the severe scenario are calculated. McKibbin and Sidorenko (2006) analyse the influenza pandemic using the Computable General Equilibrium Model with four different scenarios: a 'mild' scenario in which the epidemic is similar to the 1968–1969 Hong Kong flu, a 'mild' scenario similar to the 1957 Asian flu, a 'severe' scenario based on the 1918–1919 Spanish flu, and upper-intermediate estimates similar to the 1918–1919 Spanish flu, except for the case fatality rate, which is an 'ultra' scenario. For the scenarios where costs to the world economy are taken into account, it varies between $300 million and $4.4 trillion. Seven different scenarios have been employed to determine how COVID-19 can develop using a modelling technique that has been expanded based on the studies done by McKibbin and Fernando (2020a), Lee and McKibbin (2004) and McKibbin and Sidorenko (2006) on the DSGE/CGE overall balance model, where they examine the macroeconomic effects of different scenarios.

McKibbin and Fernando (2020b) employ global data covering 20 countries to evaluate impacts of the COVID-19 pandemic. For Turkey, McKibbin and Fernando (2020b) estimate the GDP loss caused by the COVID-19 outbreak to be between 3 and 130 billion USD (or –0.1 to –5.5% GDP loss) based on the CGE model. Although a

number of studies focus on the economy plummets of previous pandemics (Over, 1992; Cuddington, 1993a, 1993b; Cuddington and Hancock, 1994; Cuddington et al., 1994; Haacker, 2002a, 2002b; Bell et al., 2004; Freire, 2004; Lee and McKibbin, 2004; Bloom et al., 2005; McKibbin and Sidorenko, 2006), a few of them use the EIO models (Arndt and Lewis, 2001; Bell et al., 2004; McKibbin and Fernando, 2020b). Only a few studies exist in the literature that present an estimation for the economic costs of the COVID-19 lockdowns. One of them was conducted by Mandel and Veetil (2020). They employ the I/O method for selected countries with the temporal sequences of the lockdowns implemented. They find that China, Italy, Mexico, and France suffer high costs and the USA, India, and Brazil face moderate costs. Similarly, Bodenstein et al. (2020) investigate the impacts of the COVID-19 pandemic on the US economy using the I/O tables of the USA. They focus on the level of restrictions and the extent to which social distancing measures were applied in economic sectors. They find that if social distancing measures were appropriately taken, the overall cost might be reduced.

For an estimation of variations in CO_2 emissions during the COVID-19 lockdown, there are a few studies in the literature. Le Quéré et al. (2020) investigate the changes in CO_2 emissions by countries' restriction policies. They compare the CO_2 emissions in April 2020 with the data from previous year, and they conclude that daily average emissions of CO_2 were reduced by 17%. They simulated the reduction in annual CO_2 emissions for 2020 vs. the level of restrictions. They find that CO_2 emissions would be cut by 4% to 7% depending on the duration of restrictions (Le Quéré et al., 2020). Similarly, Paital (2020) reports reduced CO_2 emissions in China, the EU and the USA due to the COVID-19 related restrictions. Paital (2020) finds that CO_2 emissions were reduced by 18% in China between February and March 2020.

Use of some assumptions and the nature of the pandemic is essential for estimating the possible economic impact of the Covid-19 outbreak on Turkey's economy. After reviewing previous studies, this paper contributes to building linkages between the level of restrictions and changes in macroeconomic indicators and emissions.

3 Method and data

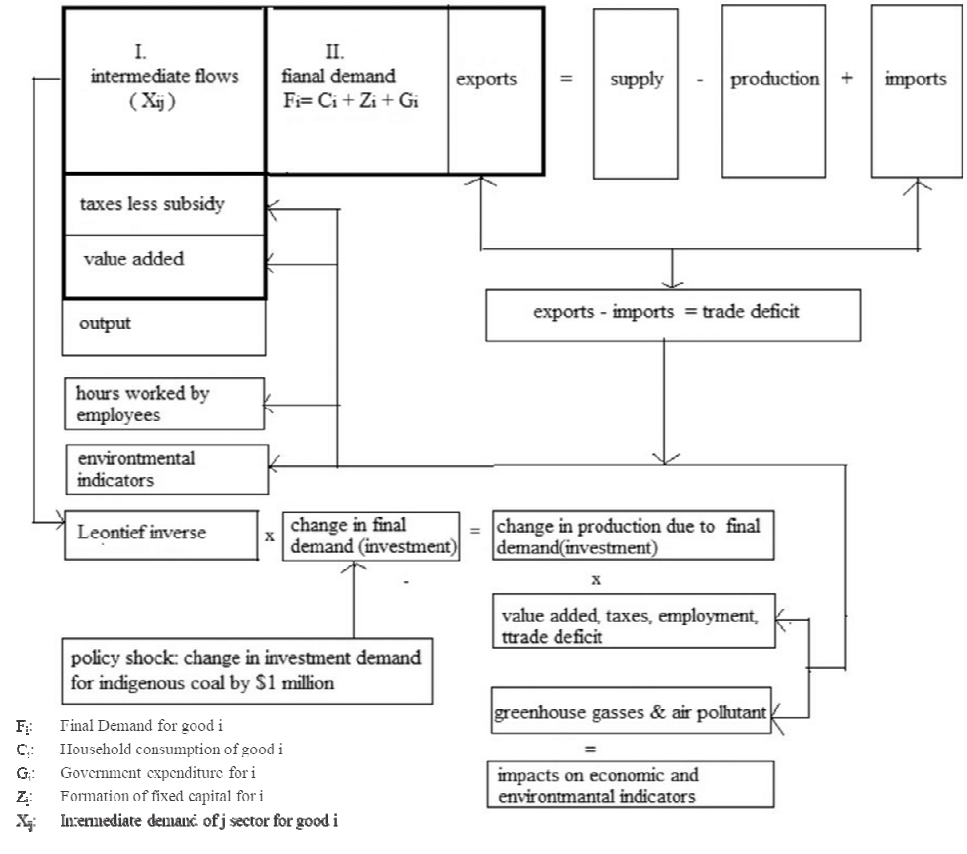
An I/O method is a quantitative economic model that embodies the interdependencies among various sectors or industries in an economy. This method aims to estimate the impacts of any shocks on sectors or industries and economies. This method was initially developed by Leontief (1941). Possible effects of COVID-19 on the Turkish economy will be evaluated by this method. The modelling approach of the economic input-output life-cycle assessment (EIO-LCA) is used to estimate and analyse environmental pollutants and material flows. EIO-LCA is based on an environmental I/O modelling approach, which was also proposed by Leontief (1941, 1966, 1970).

For this study, Turkey's economy is divided into various sectors to use the EIO-LCA method. In the form of a two-dimensional matrix, the economy is expressed in 56 sectors represented by rows and 56 goods and services represented by columns. The rows of the matrix show total sales from each sector to another, and the columns show purchases of one sector from other sectors. The EIO table, which includes the monetary flow of sectors among themselves and to final users, is shown in Figure 1.

The matrix contains three flow zones. There are intermediate flows (X_{ij}) in the first flow zone. Accordingly, there is a two-dimensional matrix in this flow that explains the

transactions and exchanges between economic sectors. There are several columns in the second flow zone that show industry deliveries for private consumption and public spending, investments, and exports. These constitute the final demand (F^i) of the economy. The third flow zone is the matrix with rows representing added value, including production subsidies, labour and capital incomes.

Figure 1 Flowchart of EIO analysis



Source: Aydın (2018)

I/O tables representing the supply and demand balance in any national or regional economy are named as equilibrium tables, so their total number of columns should be equal to their total number of rows. Equation (1) represents this balance.

$$X = (I - A)^{-1} F \tag{1}$$

In the equation above, the total output of the sectors is represented by X, unit matrix by I, technology coefficient matrix by A, and final demand by F. F denotes the demand for final users, including household consumption and government expenditure and fixed capital formation. It is represented by the Leontief inverse matrix $(I - A)^{-1}$, which shows the coefficients that measure successive effects on the economy because of the first increase in the production of an economic activity branch.

Equation (2) is obtained to make a comparative static analysis by taking the first difference of equation (1).

$$\Delta X = (I - A)^{-1} \Delta F \tag{2}$$

and also the first difference of X is defined as; $\Delta X = X_f - X_i$.

Here, X_f denotes the final value of output, X_i denotes the initial value of output. Accordingly, the first difference of final demand can be written as;

$$\Delta F = F^f - F^i,$$

where F^f denotes the final value of final demand and F^i denotes the initial value of final demand. As long as the technology remains constant, the Leontief inverse matrix will not change. When B_i, defined as the indicator vector for economic and environmental effects, is added to equation (2), equation (3) is obtained as;

$$B_i = R_i X = R_i (I - A)^{-1} F \tag{3}$$

In the above equation obtained, a matrix R_i with cross elements representing the economic and environmental effects per output is expressed for each process. Thus, equation (4) can show the first difference in equation (3) for a different period.

$$\Delta B_{it} = R_{it} \Delta X = R_{it} (I - A)^{-1} \Delta F \tag{4}$$

Table 1 Changes in restricted/expanded final demands for economic sectors due to COVID-19 (%)

Vulnerable sectors	*Restriction level*	*Simulations*		
		Fast recovery (FR)	*Continuing slowdown (ES)*	*Economic recession (ER)*
Land transport and transport via pipelines	Partial restricted	–10.7	–21.4	–32.1
Water transport	Partial restricted	–10.7	–21.4	–32.1
Air transport	Restricted	–25.0	–50.0	–75.0
Accommodation and food service activities	Restricted	–25.0	–50.0	–75.0
Education	Partial Restricted	–10.7	–21.4	–32.1
Human health services	Expanded	25.0	50.0	75.0
Other service activities[1]	Restricted	–25.0	–50.0	–75.0

Note: Travel agency, tour operator and other reservation and related services, creation, arts, entertainment, library, archives, museum, other cultural services; gambling and betting services, sports services and entertainment and leisure services.

Source: Authors' estimation

The effects of COVID-19 are estimated in various sectors with different restriction levels to estimate possible changes in the sectoral and overall economy. Table 1 presents the estimated changes in various sectors with three different scenarios. Air transport (aviation), activities of food services and accommodation and other services are fully restricted sectors due to COVID-19. These sectors experienced a 25% reduction in the

first quarter of the year. Transport via pipelines, land and water transports and education sectors are partially restricted. To determine the ratio of these partial restrictions, the number of days in a week, national holidays and extension of some weekend restrictions up to consecutive holidays were taken into consideration. Therefore, for these partially restricted sectors, it is assumed that 3 days were off in a week. For human healthcare services, activities have sufficiently increased and expanded. Thus, a 25% increase was assumed in healthcare service activities. These recovery and restriction rates are valid for the first scenario, namely fast recovery. For the continuing slowdown scenario (CSS) and economic recession scenario (ERS), these rates are doubled and tripled, respectively.

For the estimation, world input-output database (WIOD) relying on the study of Timmer et al. (2015) is used. WIOD and Corsatea et al. (2019) provide environmental accounts together with CO_2 emissions.

4 Results

For estimated impacts of COVID-19, restricted, partially restricted, and expanded sectors were simulated. Table 2 presents the results of three scenarios for significantly affected sectors. In line with the level of restrictions as highlighted in Table 1, activities of social work and human healthcare show an increase in the outputs while all kinds of transportation activities such as land, water, air, transport via pipelines, and education activities reduce their output with shocks. Other sectors, including air conditioning, gas and electricity distribution, retail, wholesale, maintenance of motor vehicles, activities of administrative and support service, animal and crop production, hunting and related service activities, scientific and technical activities, processing of food products, beverages and tobacco products, warehousing and support activities for transportation, and activities of financial services, except for insurance and pension funding, are negatively and significantly affected by the restrictions.

Table 3 presents changes in the macroeconomic variables and CO_2 emissions in the three scenarios; namely, fast recovery scenario (FRS), CSS and ERS.

According to the WHO-confirmed number of cases, Turkey is one of the most affected countries from COVID-19. In fact, Turkey is in the top 10 in terms of the total number of confirmed cases. Starting with the second week of March 2020, Turkey has taken essential measures in various sectors. These measures have economy-wide impacts. Table 4 shows the effects of the pandemic and associated measures in FRS, CSS and ERS. The total working hours have decreased by 4% to 12%. The reduction of total employees follows the same changes as in the total working hours. In line with the decrease in the total working hours and a falling number of total employees, labour compensation faces a decline rate of –4.3 to –13%. Another compensation issue occurs in the capital, which reduces by 4.8 to 14.3% in these three scenarios. Another macroeconomic variable is the nominal capital stock. This stock reduces by 3% to 9% depending on the level of restriction. The last macroeconomic variable is the gross value added (or GDP) for the whole economy. In the FRS, it reduces by 4.6%. This reduction is estimated as 9.2% in the CSS and it is as high as 13.8% in the ERS.

The final indicator is the carbon dioxide (CO_2) emissions. The activities in the I/O table and in the matrix use energy either as an input or an intermediate input. Any change in these activities also affects the consumption of overall energy. Although the share of renewable energy sources has been increasing in the recent years, fossil fuels are still the

dominant primary energy sources in the Turkish energy system. The main sources of CO_2 emissions as a greenhouse gas is combustion of fossil fuels. Therefore, the changes in the economic activities due to the COVID-19 pandemic reduce the CO_2 emissions by 2.8% to 8.4%. These reductions are observed across the whole spectrum covering supply, demand and carriers' sides. EIO-LCA provides this extensive and comprehensive analysis for tracing the changes of the CO_2 emissions in a country. Countries and other stakeholders have been cooperating and collaborating to mitigate the global climate change. The United Nations Framework Convention on Climate Change (UNFCCC) and its Paris Agreement require all countries to decrease their emissions in order to combat the climate change. In 2015, Turkey committed up to 21% reduction in its emissions from the business as usual scenario by 2030. Although the COVID-19 or any other unexpected outbreak was not foreseen at the time of Turkey's commitment for a reduction in emissions, the reduction in CO_2 emissions due to the COVID-19 allows fulfilling the obligations in relation thereto.

Table 2 Change in sectoral outputs (%)

Economic sectors	*Simulations*		
	FRS	*CSS*	*ERS*
Human healthcare and social work activities	25.5	50.9	76.4
Accommodation and food service activities	–27.5	–55.0	–82.4
Air transport	–26.7	–53.3	–80.0
Land transport and transport via pipelines	–16.9	–33.7	–50.6
Water transport	–12.0	–23.9	–35.9
Education	–10.5	–21.0	–31.5
Other service activities	–29.0	–58.1	–87.1
Financial service activities, except for insurance and pension funding	–6.2	–12.3	–18.5
Warehousing and support activities for transportation	–6.0	–12.0	–18.0
Manufacture of food products, beverages and tobacco products	–4.1	–8.2	–12.3
Other professionals, scientific and technical activities; veterinary activities	–3.9	–7.8	–11.7
Crop and animal production, hunting and related service activities	–3.2	–6.4	–9.6
Administrative and support service activities	–3.1	–6.2	–9.3
Wholesale and retail trade and repair of motor vehicles and motorcycles	–2.5	–5.0	–7.4
Electricity, gas, steam and air conditioning supply	–2.2	–4.4	–6.6
Manufacture of coke and refined petroleum products	–1.7	–3.4	–5.1
Real estate activities	–1.6	–3.1	–4.7
Wholesale trade, except for motor vehicles and motorcycles	–1.5	–3.0	–4.5
Retail trade, except for motor vehicles and motorcycles	–1.5	–3.0	–4.5
Telecommunications	–1.3	–2.6	–3.8
Manufacture of textiles, wearing apparel and leather products	–1.1	–2.1	–3.2
Other	–0.1	–0.2	–0.4

Source: Authors' estimation

Table 3 Changes in the macroeconomic variables and CO_2 emissions

Selected main macroeconomic variables	*Simulations*		
	FR	*CS*	*ER*
Total hours worked by employees (millions)	–1,519	–3,038	–4,557
Number of employees (thousands)	–808	–1,615	–2,423
Labor compensation (million TL)	–25,468	–50,936	–76,404
Capital compensation (million TL)	–45,998	–91,996	–137,993
Nominal capital stock (million TL)	–115,819	–231,637	–347,456
Gross value added at current basic prices (million TL)	–71,466	–142,932	–214,398
Carbon dioxide (CO_2) emissions (kton)	–7,581	–15,162	–22,742

Source: Authors' estimation

Table 4 Percentages of change in the macroeconomic variables and CO_2 emissions in the three scenarios

Main macroeconomic variables	*Simulations*		
	FR	*CS*	*ER*
Total hours worked by employees	–4.0%	–8.1%	–12%
Number of employees	–4.0%	–8.1%	–12%
Labour compensation	–4.3%	–8.6%	–13.0%
Capital compensation	–4.8%	–9.5%	–14.3%
Nominal capital stock	–3.0%	–6.0%	–9.0%
Gross value added	–4.6%	–9.2%	–13.8%
Carbon dioxide (CO_2) emissions	–2.8%	–5.6%	–8.4%

Source: Authors' estimation

5 Conclusions and policy recommendations

The COVID-19 pandemic has been affecting all countries and spreading rapidly. It destroys the real sector and the financial system. No treatment or vaccine has been found yet, but this pandemic will be overcome through strong collaborations. Many countries have taken necessary measures such as restricting tourism, travel and transportation, and social events or imposed partial restrictions, and distance learning and working. The ultimate objective is to minimise the damage of this outbreak, and the level of damage depends on the measures, responses and resilience of economies and sectors.

The economic output those restricted sectors, such as aviation and accommodation, has been lost during the lockdown. This study, therefore, aimed to analyse the effects of restrictions on the macroeconomic and CO_2 emissions in Turkey. Three scenarios, namely FRS, CSS and ERS, were set for the different levels of restriction. The simulations of these scenarios have yielded GDP as a prominent variable which decreases by 4.6% to 13.8%. Other macroeconomic variables such as total hours worked by employees, number of employees, labour compensation, capital compensation and nominal capital stock also fall significantly.

On the other hand, CO_2 emissions as a greenhouse gas mitigate by 2.8% to 8.4%. Such a reduction in emissions is a good effect of COVID-19. However, any strong impulse during the recovery period might add new and additional CO_2 emissions. The type of such impulse depends on the rate of transformation of sectors and behaviours. These transformations might include a continuing reduction in overconsumption, adaption to distance learning and working, a change of the aviation destinations and durations, and a transition towards a circular economy and sustainable production and consumption, rather than conventional systems.

Imposing restrictions on a great number of sectors is not feasible for an economy because when the sectoral activities are restricted, the economic system starts giving an alert. Thus, countries should immediately take essential measures and actions for the compensation of any losses in their sectors. In addition, changes in sectoral activities, behaviours and societies should be monitored very carefully. New sub-sectors might emerge or transform the conventional actions and patterns. Such a transformation might lead to a transition to more efficient sectors, with a reduction in consumption. Therefore, Turkey should check its fundamental macroeconomic and sectoral indicators more frequently. The quarterly or annually reporting by governmental institutions should be turned into a system of monthly or weekly reports. During the COVID-19 period, taking fast and appropriate measures and making tailored policies are very crucial.

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Appendix

Table A1 Economic sectors of Turkish economy

1	Crop and animal production, hunting and related service activities
2	Forestry and logging
3	Fishing and aquaculture
4	Mining and quarrying
5	Manufacture of food products, beverages and tobacco products
6	Manufacture of textiles, wearing apparel and leather products
7	Manufacture of wood and of products of wood and cork, except furniture
8	Manufacture of paper and paper products
9	Printing and reproduction of recorded media
10	Manufacture of coke and refined petroleum products
11	Manufacture of chemicals and chemical products
12	Manufacture of basic pharmaceutical products and pharmaceutical preparations
13	Manufacture of rubber and plastic products
14	Manufacture of other non-metallic mineral products
15	Manufacture of basic metals
16	Manufacture of fabricated metal products, except machinery and equipment
17	Manufacture of computer, electronic and optical products
18	Manufacture of electrical equipment
19	Manufacture of machinery and equipment n.e.c.
20	Manufacture of motor vehicles, trailers and semi-trailers
21	Manufacture of other transport equipment
22	Manufacture of furniture; other manufacturing
23	Repair and installation of machinery and equipment
24	Electricity, gas, steam and air conditioning supply
25	Water collection, treatment and supply
26	Sewerage; waste collection, treatment and disposal activities;
27	Construction
28	Wholesale and retail trade and repair of motor vehicles and motorcycles
29	Wholesale trade, except of motor vehicles and motorcycles
30	Retail trade, except of motor vehicles and motorcycles
31	Land transport and transport via pipelines
32	Water transport
33	Air transport
34	Warehousing and support activities for transportation
35	Postal and courier activities
36	Accommodation and food service activities
37	Publishing activities
38	Motion picture, video and television program production

Table A1 Economic sectors of Turkish economy (continued)

39	Telecommunications
40	Computer programming, consultancy and related activities; information service activities
41	Financial service activities, except insurance and pension funding
42	Insurance, reinsurance and pension funding, except compulsory social security
43	Activities auxiliary to financial services and insurance activities
44	Real estate activities
45	Legal and accounting activities; activities of head offices; management consultancy activities
46	Architectural and engineering activities; technical testing and analysis
47	Scientific research and development
48	Advertising and market research
49	Other professional, scientific and technical activities; veterinary activities
50	Administrative and support service activities
51	Public administration and defence; compulsory social security
52	Education
53	Human health and social work activities
54	Other service activities
55	Activities of households as employers;
56	Activities of extraterritorial organisations and bodies