The economic effects of epidemics: from SARS and MERS to COVID-19

Short Communication

To read the paper online, please scan this QR code

Rahmiye Figen Ceylan[1] **& Burhan Ozkan**[2]
Department of Agricultural Economics, Faculty of Agriculture, Akdeniz University, Antalya, Turkey.
Correspondence: ceylan.figen@gmail.com
https://orcid.org/0000-0003-0459-7521

Abstract

Around the end of 2019 through to 2020, the world had to encounter an outbreak of the novel COVID-19, a globally devastating virus, leading to mass losses and socio-economic panic. The impacts of previous SARS-COV and MERS-COV on macro-economic conditions, income level and labour market composition of 26 selected countries were evaluated within this paper in order to make economic inferences for COVID-19. The evaluation signed that the more fatal SARS-COV had depreciating effects on all economies in the sample, while MERS-COV had affected a more limited number of countries. Yet, the past epidemics mostly affected the labour market and services sector, as emphasized by the literature on economics of epidemics. It can be foreseen that, the services sector will be affected negatively with supply and labour demand aspects even after the end of the COVID-19 pandemic. On the other hand, changing consumption attitudes and the rising tendency for online shopping may lead a closer correlation between agriculture and services sectors in terms of delivery services. It might be possible to understand such impacts as more micro-data can be analysed in the future.

Keywords: *COVID-19, economics, epidemics, income, labour, MERS-COV, SARS-COV*

Public Interest Statement

Mitigating COVID-19 pandemic is currently on the world's agenda considering its fatality and public health effects. The disease also has led to devastation of the global economy within four months and its economic and social effects need to be monitored and evaluated seriously. The conditions of different sectors' that contribute to the global economy need to be managed properly to address the existing and potential effects in time and scope. With this view, it is considered that measuring the income effects of previously recorded epidemics can provide insights for policy makers and implementers in the face of COVID-19 pandemic.

1. Introduction

The world has witnessed many challenging situations throughout history. One of these challenges is contagious diseases. There were many epidemics as the plague of the Medieval and the Great Influenza of 1918-1920. The closest records were SARS-COV of 2002-2003, Avian Influenza (H5N1) of 2004-2006 and MERS-COV of 2012. The plague had changed the role of the working class, capital accumulation, welfare distribution and affected socio-politics significantly with the shift from feudalism to centralised governments (Bell and Lewis, 2004). Spanish Flu resulted in around 39 million deaths in 43 countries, contributed to losses of the WWI and led to a path to the WWII. Its effects were estimated for 42 countries between 1901 and 1929 and it was found that the Flu led to 6 % loss in GDP and 8 % in consumption (Barro, et al., 2020). SARS-COV was a services market destroyer that social fear and reduction in social contact resulted in reduced supplies and reduced labour demand specifically in the services sector between 20 and 70 % (Lionello, 2017). Recently, the world had to face with a virus called COVID-19 at the end of December 2019. After its pronouncement as a pandemic by the WHO on 11th of March 2020, COVID-19 spread throughout the world rapidly. By the mid of May 2020, the number of reported cases and deaths were more than 5 million and 340.000 respectively around the world (Anonymous, 2020). COVID-19 was announced as a pandemic by the WHO on 11th of March 2020. This paper sought to evaluate the potential impacts of COVID-19. Accordingly, the effects of two recent epidemics, SARS-COV and MERS-COV on income and market structures were analysed.

2. Material and Methodology

Per capita GDP of 26 countries were estimated for 2000 and 2015, with the data withdrawn from the WB. The countries that suffered from SARS-COV and/or MERS-COV and countries having affected from COVID-19 were included in the sample, even if they were not touched by the previous epidemics. The main methodological framework was the panel estimation of per capita GDP with E-views with the following formula.

$$GDP_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 ED_{it} + \beta_3 AL_{it} + \beta_4 SL_{it} + \beta_5 LE_{it} + \beta_6 SARS_{it} + \beta_5 MERS_{it} + \beta_5 CO8_{it} + e_{it}$$

GDP_{it}	per capita GDP ($)	LE_{it}	Life expectancy (year)
FDI_{it}	per capita Foreign Direct Investment ($)	$SARS_{it}$	Dummy for SARS-COV (1:2003-05; 0)
ED_{it}	per capita External Debt Stock ($)	$MERS_{it}$	Dummy for MERS-COV (1:2012-15; 0)
AL_{it}	Agricultural labour (.000)	$CO8_{it}$	Dummy for global crisis (1:2008-09; 0)
SL_{it}	Services sector labour (.000)	e_{it}	Error term
i	Country i (26 countries)	t	Year (2000-2015)

There are three main panel estimation methodologies. These are panel estimation, fixed effects model (FEM) enabling cross-country and inter-period variations to be demonstrated in the constant estimate and random effects model (REM), in which the variation information is hidden in the estimated error terms.

3. Findings

SARS-COV attack did not affect per capita GDP seriously. The most visible declination was observed in Hong Kong, with 2,79 % from 2002 to 2003, just after the initial SARS-COV attack. The major observation was reducing growth rates all over the world in the following years. The impact of MERS-COV was more visible. Real per capita GDP declined by 16 % in Saudi Arabia, 25 % in Qatar, 12 % in the UAE and 32 % in Kuwait. Following SARS-COV, most countries experienced declining agricultural contribution. However, there was a rapid reduction in China by 9 % from 2003 to 2005 and by 11 % in South Korea from 2004 to 2005. This led us to question the existence of a disease impact as well. Following diagnostic and correlative tests proposed for panel econometric analysis, per capita GDP was estimated with FEM methodology and findings were indicated in Table 1.

Table 1. FEM results for GDP per capita (26 countries*16 years)

Variable	Estimate	Significance – t(p)	Test	Score
EDpc	0,41	0,71 (0,48)	R^2	0,86
FDIpc	0,18	0,54 (0,59)	MDV	25.384,15
SL	-0,01	-0,21 (0,84)	F-statistic (p)	71.28 (0,00)
SARS	-3.487,17	-3,72 (0,00)	DW	0,34
MERS	6.371,46	6,82 (0,00)		
Constant	24.600,12	30,08 (0,00)		

The findings indicated that 86 % of the variation in per capita income could be explained with per capita external debt, net FDI, services labour incorporated and incidence of two epidemics. With differing individual and joint significances of parameter estimates and insignificant quantitative indicators, there appeared a suspicion of overestimation. Besides, much of the average per capita income (97 %) was explained by the constant estimate of 24.600,12. External debt and incoming FDI seemed to raise the income level on a limited extent. The rising number of people employed in the services sector seemed to lower per capita income. While the income had declined for all economies on average by $ 3.487,17 between 2003 and 2005 during SARS, MERS had a rising effect, as it took place in a limited number of countries. In all cases, the number of people employed in agriculture in the previous year had a positive effect on per capita income. When replaced with agricultural labour, services labour affected income negatively. The inference in this regards is related to declination in demand for leisure, tourism and transportation. However, the DW statistic (0,34) indicated the existence of positive autocorrelation between variables. Therefore, it was decided to make a complementary assessment.

The relationship between the appearance of epidemics and GDP per capita was analysed within a panel framework disregarding the other indicators.

Table 2.The relationship between per capita GDP and two epidemics – (26 countries*16 years)

GDPpc	Estimate	Correlation (p)	GDPpc	Estimate	Correlation (p)
Constant	26.298,41		Constant	23.836,49	
SARS	-5.264,83	-0,12 (0,02)	MERS	7.863,79	0,18 (0,00)

There is a correlation between income level and years that the diseases were effective. Yet, residual and parameter diagnostics were disregarded and just the direction of the impact was evaluated for two epidemics. The negative relationship with SARS incidence and positive relationship with MERS incidence can be seen. Besides, in a panel framework, it was understood that the average per capita income had reduced by more than $5.000 during and after SARS-COV, while it had risen by almost $8.000 during and after MERS-COV.

The cross-sectional effects retrieved from FEM results were positive for higher income countries while they were negative vice versa. Besides, even though the overall income of China and the Russian Federation was high, the negative effect was related to their population. Bulgaria, Greece, Poland and Portugal were the EU countries having a lower average income. However, when the continuous per capita income rose in all countries during the SARS (2005-2003) years was considered, the reducing effect seemed to be understandable. However, per capita income in exactly ten countries had declined from 2012 to 2014 during MERS. Among these, affected countries were Saudi Arabia, Qatar and Iran Islamic Republic. Therefore, the income inducing

MERS dummy seemed to compensate the declination in these countries and led a rising tendency in outbound countries.

4. Results and Conclusion

The economic impact is bi-directional for COVID-19. It has both supply and demand effects. With regards to consumption, we have been facing changing consumer attitudes and changing marketing channels. Web-based online shopping tools have long been used all over the world. However, with quarantine applications and lockdowns, the tendency to leave physical retail channels and rising focus on online shopping became visible. Some recent research signed the forthcoming change. Due to lockdown enforcements and voluntary social distancing, travel, tourism, catering and leisure got affected critically. Foregone tourism revenue of China was forecasted as 75% and this would mean almost $95 billion loss in 2020 (Hoque et.al, 2020). There was also an estimated a 32% reduction in offline consumption expenditures for China (Chen et al., 2020). McKibbin and Fernando (2020) inferred that the global income will reduce by 6,7 % in 2020 based on 2019 figures. Besides, some projections made by international organisations are overwhelming as well. ILO (International Labour Organisation) estimated a 10,5 % job deterioration for the second quarter of 2020 due to COVID-19; meaning a loss of 309 million full-time jobs (ILO, 2020). The expected global growth rate shrank to -6,3 %, which is a huge declination in a quite short period (IMF, 2020).

The bank transaction data analysis of Americans' indicated that, consumption spending for necessities rose at first by around 56 % from February, 26 to March, 11 due to stockpiling. Yet, most of these spending shifted to online shopping and records indicated a strict reduction in leisure spending (Baker et al., 2020). Transportation, tourism, catering and face to face retailing services have been effected seriously within this short period. The lack of operation in leisure, tourism, transportation and related services means unemployment of the masses. Consequently, unemployment would lead to reduced income, declining demand and a further reduction in all productive fields. Demand loss accompanied by excess supply will reduce the prices. The declining prices and reducing productive capacities are expected to induce downsizing in all industries. So, reducing prices are expected to lead stagnation and reduce the economic worth everywhere. Industrial production of both final and intermediary goods is a problem as well. Most of the manufacturing industries that purchase intermediaries are in loss apparently and the tendency to save in exchange for spending have been rising all over the world (Barro, et al., 2020). Cyclical impact of rising unemployment seems to reduce all interior and international trade opportunities.

The pandemic seemed to have a downsizing effect in all economies. In this process, what would not be surprising is the changing consumption and purchasing attitudes as discussed partly. If we are asked to be honest, the downsizing of the services sector, when health care was left aside,

seemed to continue as more and more people started to get experienced in online-shopping. Besides, outdoor services demand will not recover soon. It is accurate to note that detailed analysis on a micro level will be needed to understand the effects of COVID-19. Considering the previous diseases and the ongoing process, it is not hard to predict global economic effects will most likely persist for years. Nonetheless, there are many decisions ahead on the management of the labour market and sustainability of services and manufacturing industries.

Works Cited

Anonymous. "Worldmeter Statistics for Coronavirus". *Worldometer*, 26 April 2020. www.worldometers.info/coronavirus.

Baker, Scott R., et al. "How Does household Spending Respond to an Epidemic? Consumption During the 2020 COVID-19 Pandemic." *NBER working paper series* no: 26949. 2020. *National Bureau of Economic Research, Inc.*, 20 April 2020, swww.nber.org/papers/w26949.

Barro, Robert J., et al. "The Coronavirus and the Great Influenza Epidemic Lessons from the "Spanish Flu" for the Coronavirus's Potential Effects on Mortality and Economic Activity". *CESifo Working Papers* WP No: 8166. 2020. ISSN 2364-1428.

Bell, Clive, and Maureen Lewis. "The Economic implications of epidemics old and new". *World Economics*, vol 5, no 3, 2004, pp. 137-174.

Chen, Haiqiang, et al. "The Impact of The COVID-19 Pandemic on Consumption: Learning from High Frequency Transaction Data." *SSRN Working Paper*. 2020. *Social Science Research Network*, 28 April 2020, ssrn.com/abstract=3568574.

Hoque, Ashikul, et al. "The Effect of Coronavirus (COVID-19) in the Tourism Industry in China." *Asian Journal of Multidisciplinary Studies*, vol 3, no1, 2020, pp. 52-58.

ILO. "International Labour Organisation Monitor: COVID-19 and the World of Work". 3rd edition. International Labour Organisation 30 April 2020.www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_743146.pdf.

IMF.(2020). "World Economic Outlook, Chapter 1: The Great Lockdown". International Monetary Fund. 27 April 2020. www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020.

Lionello, Lorenzo. "Economics and Epidemics: An Historical Analysis on the Effects of Infectious Diseases on Economic Development of Four Major Outbreaks". 2017. LUISS Guido Carli, BSc thesis on Macroeconomics. pp. 67. 20 March 2020, https://tesi.luiss.it/id/eprint/19837.

McKibbin, Warwick, and Roshen Fernando. "The Economic Impact of COVID-19". *Economics in the Time of Covid-19*, edited by Richard Baldwin and Beatrice Weder di Mauro. Centre for Economic Policy Research e-book, 2020, pp. 45-51. ISBN: 978-1-912179-28-2,

Biographies

Rahmiye Figen Ceylan

Figen Ceylan, PhD is an agricultural economist specialised on agricultural policy and she has been working in the Department Agricultural Economics at Akdeniz University since 2013. She is specialised in international economics, and economic growth and development. She was authored or co-authored to around 100 articles. She has participated and managed many research projects. She also has expertise in the preparation and management of developmental projects funded by national and international organisations.

Burhan Ozkan

Burhan Ozkan, PhD has been working in agricultural economics for the last 30 years and has extensive management experience and expertise in farm management. He has been involved in many international projects, Dr. Ozkan has authored over 250 publications, including 150 refereed journal articles. He is founder of the Department Agricultural Economics at the Akdeniz University and chaired the Department for more than 15 years. He is currently chair of the Agribusiness Management Division at the Department.