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An analysis of the social distancing effects on global economy and international finance using causal loop diagrams

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ABSTRACT

This paper investigates the COVID-19 outbreak, explains the policies adopted by governments, and examines the side effects of social distancing on the global economy and international finance. Causal loop diagrams are used to explain the interlinkages amongst the important variables and show the outbreak follows the pattern of a reinforcing loop. Governments strive to balance this loop by adopting a set of policies, of which social distancing has left a tremendous negative impact on the global economy. The side effects of this policy are highlighted in three categories: short-term, midterm, and long-term by explaining the reinforcing loops that require time to get stimulated. The short-term loops result in demand and supply shocks in any economy, and if this policy stays effective for a longer period, the midterm loops get activated, leading to corporate and government debt crises. When the pandemic duration extends, the long-term side effects appear with a deflationary recession and a banking crisis. The quickness of moving from one category to another in an economy depends on the financial strength of firms and their government. Finally, this paper anticipates some changes in future business caused by the pandemic, which can bring insights for managers.

1. Introduction

The lethal onset of the pandemic caused by the novel coronavirus, called COVID-19, has created a health-economic catastrophe unseen in the world. The origin of COVID-19 was the city of Wuhan in China and the coronavirus-2019 disease was announced a pandemic by the World Health Organization (WHO) on 11 March 2020. As of 18 November 2021, more than 255 million confirmed cases and more than 5,142,000 deaths have been reported in 223 countries and territories across the world.

There is a narrow body of literature on the economic impacts of past epidemics or pandemics while the COVID-19 pandemic has triggered a widespread motivation to study pandemics mainly due to social-distancing impacts. Lewis [1] states profound epidemics impede economic growth and cause greater financial reliance of people on governments which may be out of the budgetary capacity of the government. Yach et al. [2] investigate the effects of global epidemics of obesity and diabetics on the economy and stress creating a clear roadmap for policies to tackle the epidemics. Hunter [3] studies the AIDS pandemic in South Africa and outlines that the pandemic causes high unemployment and social inequality. Lagoarde-Segot and Leoni [4] develop a theoretical model that shows the impact of pandemics such as AIDS and malaria on the banking industry of developing countries and they conclude a large pandemic leads to the collapse of banks there. By conducting a simple statistical method and based on available data, Zhang et al. [5] explore the effects of the COVID-19 pandemic on stock markets and assert the risk of global financial markets has been dramatically increased since the coronavirus outbreak. Al-Awadhi et al. [6] run a regression analysis to find the impact of COVID-19 on the Chinese stock market and indicate the stock return of all firms is significantly negatively affected by the virus. Janus [7] finds that the long-term interest rate in the emerging economies is vulnerable to the COVID-19 shock because of low GDP dynamics and the high sensitivity of bond yields to the market's expectations for volatility over the coming 30 days. Khan [8] states there is a high probability of experiencing liquidity and cash flow problems for financially constrained SMEs during the COVID-19 pandemic because of increased credit risk. As a result, their capacity to access traditional bank lending is limited and they search for funds provided by alternative methods such as equity financing, trade credit, government grants, delayed payments to suppliers/employees, and informal sources. Tu et al. [9] assert the production costs of renewable energy in China have increased during the COVID-19 pandemic and green policies should support low-cost finances for this segment to offset the effects of the pandemic. Jia et al. [10] investigate the effects of decreasing oil price during the COVID-19 pandemic on China and conclude its influence on GDP is less than that of the pandemic, but it leaves a significantly negative impact on the low-carbon economy. Dunz et al. [11] find the restricted lending decisions by banks in Mexico limit the firms' ability to finance their investments and an expansionary fiscal policy is crucial for the economic recovery. Hewa-Wellalage et al. [12] analyze a cross-country sample

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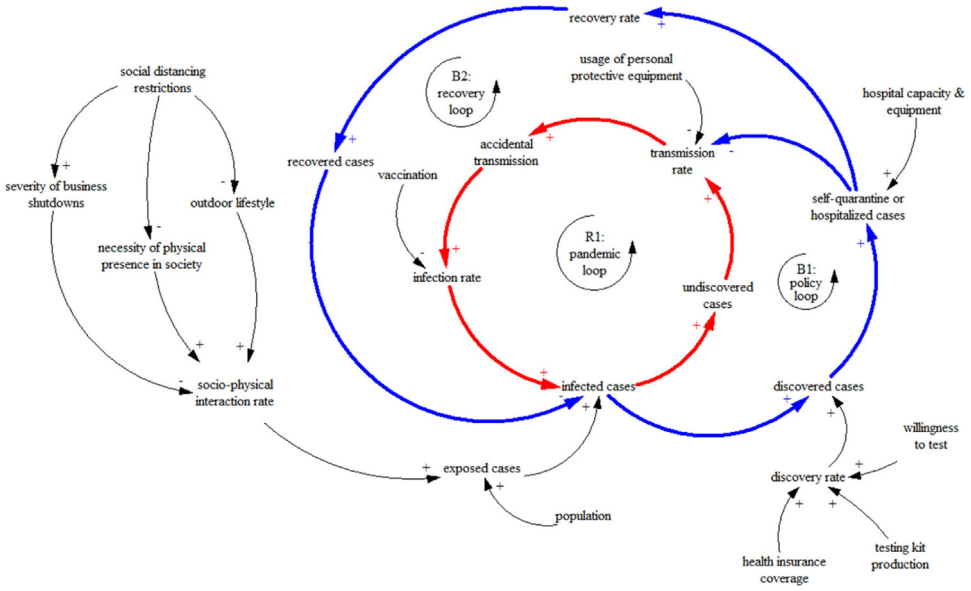

Fig. 1. Causal loop diagrams of the COVID-19 pandemic and the adopted policies.

of 8921 private firms and deduce creditors favor female entrepreneurs when dealing with cash flow challenges during the COVID pandemic.

The coronavirus-ridden countries impose different policies in the hope of observing a big decline in viral transmission. However, each policy causes some unintended consequences. The policies adopted by governments around the world can be categorized into five groups: testing as many as possible, offering insurance coverage, increasing hospital capacities, implementing social distancing restrictions, and promoting personal protective equipment (known as PPE). The final intention of all policies is to reduce the exposed cases and accidental transmission until the population is vaccinated (or the society reaches the herd immunity), but they create some side effects which both overwhelm healthcare services in short term and portray a tragic outcome for the economy in long term.

As the casualty rate of the pandemic rises over the world, many governments increase the severity of social distancing measures and decide to shut down their countries and businesses to flatten the infection curves. However, as time passes, the economic side effects of this policy loom and darken the economic outlook for every single country and the World. This paper contributes to the literature by examining an existing health crisis that may turn to be a gigantic economic crisis. It is shown that the economic consequences are a function of time and if the COVID-19 pandemic, or any pandemic which causes lockdowns, endures for a long time, it has the ability to create a series of financial crises one after another one.

2. Study approach

This pandemic is an unfamiliar event that does not have enough historical data to run an econometric model; as a result, applying quantitative research at this stage is not applicable to analyze the economic effects of the pandemic. This research employs causal loop diagrams (CLDs) of the system dynamics modeling for a couple of reasons. First, system dynamics modeling permits multiple variables from different disciplines into a single model [13]. Second, system dynamics modeling has been employed many times to investigate the highly dynamic nature of epidemics and health-sector problems and has proved its applications in understanding dynamically complex systems and in resolving systemic issues [13–19]. Third, CLDs are able to reveal the interactions among variables in the system to have one complete picture and allow policymakers to check the side effects; that is, CLDs help to qualitatively understand the problem(s) and pave the way for future quantitative research when sufficient data will be available.

As CLDs show a considerable amount of interactions amongst coupled variables, this paper tries to focus on the main ones to make the analysis more clear. After that, the policies adopted by governments are examined to show their effects on the pandemic. As of the time of writing this paper, the COVID-19 pandemic is ongoing and the vaccination has started in most countries. This paper anticipates the economic, financial side effects of severe social distancing rules in the short term, midterm, and long term. In the end, the paper predicts some of the COVID-19 impacts on international business and finance. Furthermore, in this paper, variables in the reinforcing and balancing loops are connected with red and blue arrows respectively and other relationships are shown with black arrows.

This research refrains any discussion on the side effects of social distancing on other domains such as politics, psychology, demography, culture, and anthropology for a couple of reasons. Although each of them can influence finance and international business, the main focus of the paper is on the business- and economy-embedded variables that are managed by customers, business leaders, central bankers, and fiscal-policy authorities. Second, concentrating on one domain in this paper gives the author the possibility to explore the problem in more detail and escape a jumble of interconnected variables that confuse readers. However, they can be avenues for future research.

It is worthy to note that by the time of reading this paper, the coronavirus pandemic may be close to its end and the business is back to normal, but these desired happenings do not weaken the importance of this research since it shows the aftermath of any pandemic which imposes social distancing and nationwide lockdown.

3. Coronavirus spread and adopted policies

To simulate a pandemic or an epidemic, several models such as Susceptible–Infected–Recovered (SIR) [20–24], Susceptible–Infected–Susceptible (SIS) [25], Susceptible–Unidentified infected–Confirmed (SUC) [26], Susceptible–Exposed–Infectious–Recovered (SEIR) [18,27], Susceptible–Exposed–Infected–Quarantine–Recovered (SEIQR) [28], Susceptible–Vaccinated–Infected–Recovered (SVIR) [29], and Susceptible–Exposed–Infected–Recovered–Deceased (SEIRD) [30] have been applied. As most of the COVID-19 researchers base their analysis on the SIR [31–33] and SEIR [16,17,19,34–37], this paper builds its pandemic model on these two models and demonstrates it in Fig. 1.

As illustrated in Fig. 1, infected cases can be classified into two categories: discovered cases and undiscovered cases. If the infected cases (1) are not aware of the disease at all, (2) have no symptoms, so they do not feel any needs to contact their physician, (3) have not tested for coronavirus because of lack of tests, and (4) have a false-negative test result, they are categorized as undiscovered cases. On the other hand, when infected cases test positive for the virus, they are sorted as discovered cases.

The reinforcing loop of R1 depicts the COVID-19 pandemic loop and it shows that undiscovered cases can cause accidental transmission to other people by influencing the transmission rate that is the probability that the virus transmits from one person to another. These variables have a positive relationship which means an increase in undiscovered cases leads to an increase in transmission rate and consequently in accidental transmission. A growth in accidental transmission generates an escalation in infection rate, as they are positively related. The infection rate is the probability that transmission becomes an infection. As a result, when the infection rate advances, the number of infected cases grows because infected cases can be calculated as the multiplication of infection rate by exposed cases. And R1 cycles again, resulting in a higher number of infected cases. The loop of R1 is the main loop of a pandemic when no policy is adopted and humans do not intervene in its nature.

At the beginning phases of the pandemic, governments, based on the recommendations of the WHO and their health advisors, have embraced a couple of policies that focus on (A) a reduction in the transmission rate as well as a jump in the recovery rate, and (B) a cutback in the socio-physical interaction rate. In most countries, these policies remain effective until when society becomes vaccinated or reaches herd immunity, and as a consequence, the infection rate drops.

3.1. Policies aiming at a reduction in the transmission rate and at a jump in the recovery rate

This set of policies creates two balancing loops of B1 and B2 that the former targets a shrinkage in the transmission rate and the latter intends to boost the recovery rate. As B1 depicts, when infected cases test positive for the novel coronavirus, they are assorted as discovered cases. When infected cases are high, the number of people with a positive test will increase, so there is a direct relationship here. Discovered cases should be hospitalized or perform self-quarantine and by doing so, they do not accidentally transmit the contagious disease to others and accordingly, infection rate and infected cases fall. And these policies are highly dependent on:

1. The testing capacity of a country: as the developed/emerging economies have a higher testing capacity, they report a higher number of infected cases.
2. The insurance coverage for coronavirus patients: by paying, partially or in full, costs related to COVID-19 disease, some governments encourage people to take the test, so infected cases can be discovered.
3. The hospital capacity and equipment: the level of hospitalization is limited to hospital capacity in terms of intensive-care equipment, health workers, and testing kits. So, equipping hospitals leads to treating more patients, having recovered cases, and avoiding accidental transmission.
4. The usage of personal protective equipment (PPE): the PPE policy has a tendency to curb accidental transmission by enforcing the use of personal protective equipment such as face masks and face shields along with asking people to wash or sanitize their hands frequently.
5. Willingness to test: promoting and encouraging people to test and self-test raise the discovery rate.

3.2. Policies aiming at a cutback in the socio-physical interaction rate

The social-distancing policy targets a reduction in exposed cases; that is, if the number of exposed cases decreases, infected cases will drop. On the left-hand side of Fig. 1, there are some elements governing the accumulation of exposed cases. Social distancing measures are set up to prevent people from having an outdoor lifestyle, going to social events and places, and being physically present at school or work. By imposing these tough restrictions to restrict movement in a battle to contain the novel coronavirus outbreak, governments intend to decrease the social–physical interaction rate in society and make it close to zero. As exposed cases are equal to the product of the social–physical interaction rate and population, the imposition of a full nationwide lockdown leads to narrow exposed cases which are a very small fraction of the population, or ideally zero. Thereupon, infected cases drop enormously.

4. Economic and financial impacts of social-distancing policy

In this segment, the side effects of social distancing, the main policy to tackle the virus, are discussed in detail. While this policy has a rational intention to curb the spread of COVID-19, its economic side effects differentiate it from other policies for restricting the pandemic because its enforcement results in a severe business shutdown. This paper concentrates on the consequences of social distancing on the global economy as well as international finance and avoids any discussion on political, psychological, demographic, cultural, and anthropological effects.

Social distancing, also called physical distancing, means avoiding or limiting face-to-face contact with others to slow down the outbreak of the COVID-19 virus and flatten the infection curve. The severity of its enforcement differs amongst countries whose adoptions are an assortment of these practices: staying 1.5 or 2 m far from other people, staying at home, no group or mass gatherings, no sports events, no religious gatherings, school/college/university suspensions (online education), business shutdowns, and country lockdowns. In this segment, the unintended outcomes of this policy are analyzed.

Needless to say, the inception of each side effect, depicted in CLDs, requires time because the activation of most elements in the system is subject to delay. As a result, the analysis is performed based on different time horizons: short-term, mid-term, and long-term. The effects of social distancing vary amid industries, for example, it boosts the business of supermarkets but ruins the aviation industry; thus, this paper focuses on the economy as a whole, not on a specific industry. Moreover, the intertwined loops are illustrated in separate figures to enable the author to clearly explain them, but the name of variables are not changed in case of being in common in multiple loops; hence, the reader can realize how different figures are linked together to create the big picture. Also, after the development of the loops, some real examples are collected to support the analysis and they are added as footnotes.

4.1. Short-term side effects of social distancing on the global economy and international finance

The short-term (or immediate) effects consist of two main shocks: supply and demand. As Fig. 2 characterizes, two reinforcing loops of R2 and R3 are shaped after the imposition of a business shutdown which is part of the social-distancing measures to contain the COVID-19 outbreak. The loop of R2 illustrates the supply shock and the loop of R3 portrays the demand shock.

In the supply shock loop, the requirement to obey the shutdowns of non-essential businesses is to prohibit the physical presence of the labor force at work and to impose a ban on international travel and transportation. For almost all unnecessary product-based businesses, these prohibitions badly reduce the production of their supplier and themselves. However, the outcome for non-essential service companies

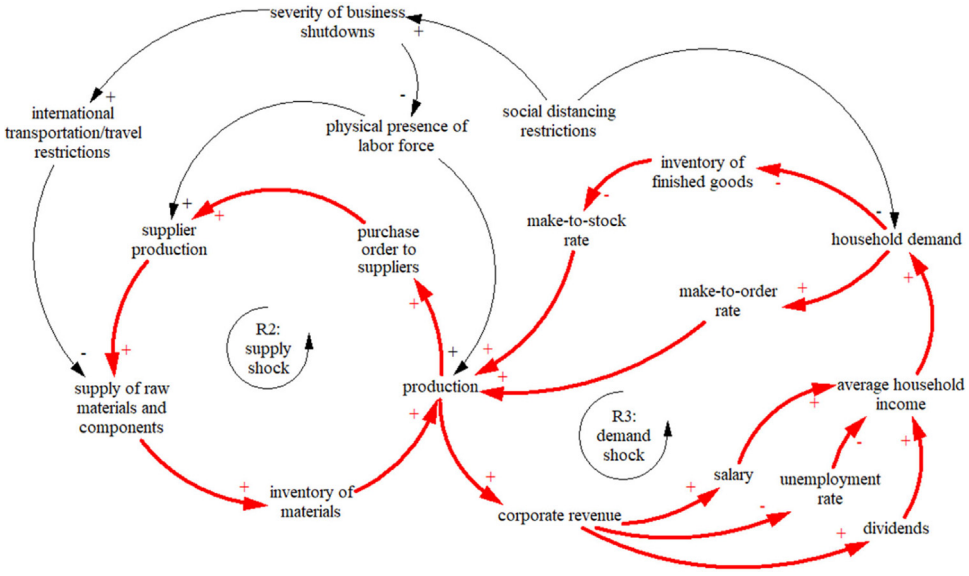

Fig. 2. Causal loop diagrams of the supply and demand shocks.

is threefold and dependent on whether the service can be delivered by working at home or not. First, the operation in some service-based sectors such as airlines, hospitality, and tourism goes to almost zero at once. Second, in some service companies such as big techs, the effects are unnoticeable as employees can perform their duties remotely. Third, the last group of service companies such as media-services providers, e.g. Netflix[1] and Spotify, enjoy a boost in revenue during the coronavirus-related lockdown because people need to amuse themselves while staying at home. When the supplier production decreases, the supply of raw materials and components will be disturbed and consequently, the inventory and production decline more, leading to low orders to the suppliers. And the reinforcing loop of R2 is created. This loop shows the supply shock, but it also sketches the corporate demand in the form of the purchase order to suppliers. The decreasing corporate demand causes a plunge in commodity prices such as oil and metal. The shocking part is that this loop is created overnight for most businesses and they do not have enough time to react accordingly.

As shown in the demand shock loop, the precipitous drop in production of firms and their suppliers results in the evaporation of revenue and as a consequence, the speed of lay-offs soars and a mass surge in the unemployment rate happens.[2] An increasing jobless rate in combination with salary cuts and dividend suspensions cause a decline in average household income. The household demand is affected by both a noticeable reduction in income and social distancing restrictions. And the reducing demand affects the product-based firms in two ways: (1) If the firm follows the make-to-order (MTO) production system, it diminishes the MTO rate that lowers production, and (2) If the company pursues the make-to-stock (MTS) production scheme, it leaves inventories full of finished products that lead to slashing the MTS rate and production consequently. As a result, the drop in consumption triggered by coronavirus contributes to a lower level of production and eventually, the reinforcing loop of R3 goes on and causes a demand shock to the economy.

The combination of demand and supply shocks generated by the COVID-19 uprising can create a recession because of quarterly negative economic growth during the implementation of social distancing. Furthermore, the effects of this combination on transportation and hospitality industries resemble the impact of the attacks against the U.S. on 11 September 2001 when travel rules rapidly changed.

4.2. Mid-term side effects of social distancing on the global economy and international finance

The mid-term effects encompass two major dilemmas: corporate and government debt crises. It is expected that the element of these shocks gets triggered after the intense enforcement of the social distancing policy, but the complete activation of the reinforcing loops requires time. How much time? It is totally dependent on the cash reserves and financial strength of firms and the government and on the size of the quantitative easing policy adopted by the central bank.

Fig. 3 illustrates five loops: R4, R5, R6, R7, and B3, of which R4 and R5 are related to corporate and government debt crises and R6, R7 as well as B3 present the quantitative easing (QE) policy of the central bank. To examine the situation, firstly the figure is explained without considering the QE policy. The left-hand side of Fig. 3 describes the financing shock to firms. The severity of business shutdowns is negatively related to corporate revenue, and a dramatic reduction in revenue causes a collapse of net income as firms are obliged to pay rents, salaries, utilities, payables, and interests and consequently, the share price topples.[3] If the central bank does not intervene by quantitative easing, low share prices leave limited possibilities to raise capital by equity financing; as a result, firms without sufficient cash reserves[4] are interested to borrow money from lenders to satisfy their cash needs, enjoy the tax deductibility of debt, and survive. This leads to an increase in the level of corporate debt.[5] Since the revenue of

[1] Netflix reported an eye-catching jump in its subscribers by 15.8 million in the first quarter of 2020, leading to a 28%-increase in its revenue and a 30%-boost in its share price since the enforcement of the global lockdown.

[2] A total of 40.8 million Americans and 10 million French applied for unemployment benefits in May 2020. In Spain, more than 800,000 people became jobless in March 2020, which is a historic record jump in unemployment for the country. According to Eurostat, in the 19-country eurozone, the jobless rate and the youth unemployment rate rose to 8.7% and 18.9%, respectively, in June 2020.

[3] The magnitude of share price collapse convinced authorities in some countries such as Austria, Belgium, France, Greece, and Spain to ban the short-selling of shares in order to stabilize the stock markets. Some countries such as Germany have imposed temporary restrictions on the predatory behavior of foreign countries to takeover firms.

[4] At the beginning of the pandemic, firms such as Boeing, Delta Airlines, Estee Lauder, Gap, Goodyear, Marriott, Ford, and Nordstrom have suspended or cut dividend payments to able to meet cash requirements.

[5] According to the Securities Industry and Financial Markets Association (SIFMA), U.S. firms hit a record of $10,563 billion in corporate debt in 2020.

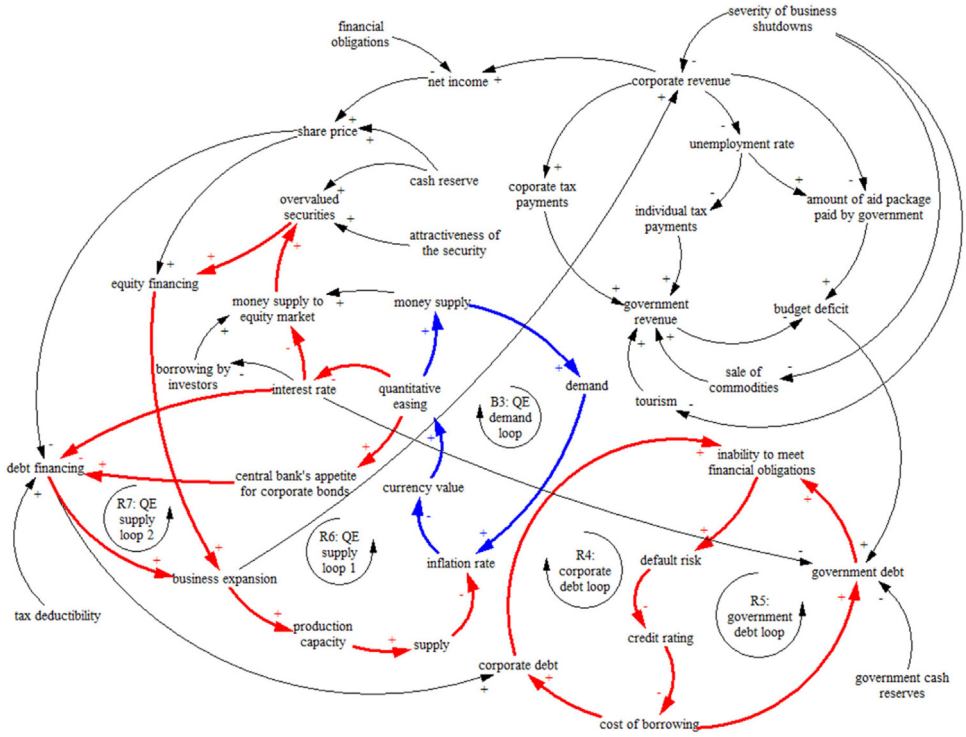

Fig. 3. Causal loop diagrams of the corporate and government debt crises as well as the supply and demand loops of quantitative easing.

firms has dropped enormously, they do not have sufficient earnings before interest and tax (EBIT) to meet their interest obligations on corporate loans. Consequently, their default risk escalates[6] and their credit rating erodes, provoking a higher cost of borrowing which leads to more corporate debt because firms need to replace the old borrowings (principle + interest/coupon payments) with new ones with higher rates. And the reinforcing loop of R4 continues and represents an increasing accumulation of debt in firms. The number of cycles that R4 spins around is a function of the pandemic duration which can provoke the bankruptcy of heavily indebted firms, especially zombie ones.[7]

As demonstrated on the right side of Fig. 3, the shrinkage of corporate revenue affects the government budget in two ways: a sharp contraction in tax collection and an unprecedented expansion of public spending. The reason is attributed to the fact that when corporate revenue drops, not only the value-added tax (VAT) and earnings before tax diminish, but also the unemployment rate grows due to high levels of lay-offs[8] and individuals are subject to fewer tax payments to the government. Additionally, if the government relies on exporting commodities or tourism, the contraction of government earnings experiences profoundly.[9] Besides, the government is obliged to pass multibillion-dollar rescue packages to help firms and citizens survive during the pandemic[10]; that is, a sudden hike in public spending. These two effects cause a huge budget deficit[11] and if the government does not have ample cash reserves or buffers, it calls for borrowing.

As the budget deficit enlarges, meeting interest payments becomes challenging for the government; thus, its default risk broadens and its credit rating deteriorates.[12] This leads to an escalation of borrowing costs and a higher accumulation of government debt because the government needs to replace the old bonds (principle + coupon payments) with new ones carrying higher coupon rates. And the reinforcing loop of R5 goes on and shapes the debt shock to the government. The nature of R5 is similar to the structure of the European sovereign debt crisis which is investigated by some researchers such as Moradi and Paulet [39] and the economic response of advanced economies is very much alike: quantitative easing at a large scale.

Now, it is time to look at the response of the central bank and observe how QE intends to help governments and firms. To help countries that intend to promote aid packages, QE reduces the interest rate to record lows, which helps the government sell its bond at a higher price[13] and borrow heavily from the lenders, and also QE purchases the government bonds through their corresponding central banks. That is,

[6] According to S&P Global Ratings, global corporate defaults rose by 91% (108 rated issuers) in 2020, reaching an 11-year high of 226 defaults. The U.S. and Europe led the world by having 146 and 42, respectively, defaults.

[7] Zombie firms pay interest only and have no money for growth, investment, employees, and principal repayments.

[8] According to the IMF, the unemployment rate in advanced economies jumped from 4.8% in 2019 to 7.3% in 2020.

[9] In Oceanic nations, the tourism industry is the main driver of the GDP (in 2019, 34% for Fiji and 34.7% for Vanuatu) and employment (in 2019, 26.3% in Fiji and 36% in Vanuatu) [38]. Based on the World Bank database, the GDP of Fiji dropped by 19.04% in 2020; as a result, the debt-to-GDP ratio jumped from 48% in 2019 to 65.2% in 2020.

[10] At the beginning of the pandemic, the U.S., France, Germany, and South Korea introduced stimulus packages of $2 trillion, €100 billion, €130 billion, and $190 billion, respectively, to deal with the fallout of the COVID-19 pandemic on their economies.

[11] Based on the projection of the Congressional Budget Office (CBO), the U.S. government runs a deficit of 17.9% of GDP in 2020. According to a report published in Financial Times on 18 October 2020, it is estimated that the eurozone countries have an aggregate fiscal deficit of almost €1 trillion, 8.9% of their GDPs in 2020, which is almost 10 times higher than deficit levels in 2019.

[12] In 2020, the sovereign debt of emerging market countries such as South Africa was downgraded by Moody's. And Zambia and Ecuador informed investors that they were struggling to repay their debts due to a drop in the prices of copper and oil, respectively. Tunisia and Bahrain negotiated with their lenders to restructure their foreign debt. Argentina was on the verge of an imminent default on its sovereign debt, but managed to restructure $65 billion of its debt in August. Lebanon defaulted on $30 billion of foreign-currency bonds in February.

[13] Bond price has an inverse relationship with the interest rate and yield.

the governments reduce the interest rate to almost zero to be able to borrow cheaply from the central banks in order to finance their battle with COVID-19 and to keep the businesses afloat. For example, governments in the U.S., the U.K., and the eurozone have embarked on a large borrowing and their central banks have launched an unprecedented level of bond-buying. This policy also leads to a remarkable jump in the balance-sheet size of central banks.

To help businesses to survive and expand, QE generates three loops: QE supply loops (R6 and R7) and QE demand loop (B3). R6 focuses on the equity-driven business expansion target of QE and R7 addresses the debt-driven business expansion objective of QE. In R6, low-interest rates offered by QE convince investors to look for investments with higher yields than the bond market, so the first market to favor is the equity market. Major investors especially funds benefit from low rates to be more involved in the equity market; therefore, the money supply in the equity market increases and leads to an overpriced market that makes equity financing attractive for firms.[14] The raised money can be used for business expansion to boost the production capacity and build up a higher level of supply. This also results in more jobs and higher corporate revenue. In R7, the low interest rates convince some managers to finance their business expansion with debt financing. Supply has an inverse relationship with the inflation rate while the demand created by money supply in B3 acts positively. That is, when demand increases in an economy, the prices go up unless the economy has the capacity to produce enough to match or surpass the demand. Increasing inflation rate causes the currency to depreciate and when it happens, the scale of QE decreases or stops. The QE policymaker aims at pulling strings not to create a high inflation rate; however, he may not achieve what he expects to have.

A side effect may accompany QE: R4 and R5 spin out of control; that is, the level of debt in corporations and governments become way beyond their capacity. Corporate borrowing costs have tumbled after central bank intervention in terms of lowering the interest rates and of showing the appetite for corporate bonds even with a rating below investment grade. To exemplify, the Federal Reserve (the Fed) and the European Central Bank (ECB)[15] move another step forward and show interest in buying risky bonds of firms striving to survive; that is, adding junk bonds to their balance sheets. Offering more debt to risky firms by the government means that the taxpayers are taking the same bankruptcy risk as shareholders because some firms will go bankrupt and their government loan (better to say, taxpayers' money) will not be repaid. As a result, companies with high rates enjoyed a rising share price as they could borrow with an extremely low-interest rate.[16] On the other hand, the lowest-rated companies were struggling to raise cash despite a resurgence market for selling bonds because the interest rate is unfavorable.[17]

Although unlimited quantitative easing assists the government to acquire the fund inexpensively, it does not address the accumulation of the public debt in developed countries[18] and is not applicable in emerging/developing/underdeveloped countries whose public debt is mainly denominated in strong foreign currencies such as the U.S. dollar and the euro. As a result, the rapid growth in government debt will be the source of other financial problems, especially sovereign default which leads to currency depreciation[19] and withdrawal of foreign investments, in the years to come and makes it extremely difficult for those countries to pay back their bonds entitled in foreign currencies. Additionally, for how long can governments use quantitative easing to pay unemployment benefits to people or stimulus packages to the firms? Some governments state they will keep doing it "whatever it takes", but it is hard to sustain over a long period of time. To illustrate, the Fed has promised to buy unlimited amounts of U.S. Treasury bonds. However, if the Fed keeps this policy for a long time, a series of investment outflows happens in the U.S. because the investors relocate their assets in a search for high yields and because the creative destruction is eliminated in the economy.

Conversely, due to a high likelihood of the creation of the R4 and R5, some pandemic-stricken countries decide to either impose mild social distancing measures or ignore the aid packages to firms and people. By doing so, they avoid a surge in the amount of government and corporate debt. As you can observe, the coronavirus financial crisis looks like a pandemic of financial crises, contagion from one to another. It only requires time to activate one financial crisis, then it moves towards the activation of the next type of financial crisis.

4.3. Long-term side effects of social distancing on the global economy and international finance

If the social distancing restrictions remain stable, they give the cycles of R2–R5 enough time to spin and active the long-term side effects that are made up two crucial crises of deflationary recession and banking crisis, which both contribute to the setback of global economic growth. Also, it is expected to observe a persistent drop in average household income and a remarkable jump in the number of the poor across the world.

Fig. 4 presents the long-term effects of social distancing on the GDP growth rate with the QE policy. First, assume the QE policy is not in play. As depicted in Fig. 4, all four main contributors to the GDP calculation are negatively affected by stringent social distancing regulations. In the loop of R8, harsh lockdown measures leave a negative outlook for the future that causes a reduction in investment and therefore a decline in GDP growth rate which results in more pessimism on the economic prospect. In the loops of R9 and R10, low household and corporate spending leads to a freefall in consumption and consequently, the GDP growth rate plummets and the earnings of corporates along with households will shrink more. In the reinforcing loop of R11, the budget deficit lowers the government spending and then, the GDP growth gets badly damaged and the deficit widens more. In most countries, the draconian shutdown measures result in no exports and imports. That is, not only does net export decrease, but also it gets close to zero. These loops evidently show that recession approaches when the COVID-19 pandemic stays for a long time.[20]

At the beginning of the pandemic, inflation falls because of (1) the declines in energy prices, commodity prices,[21] business activities, and

[14] According to SIFMA, equity issuance in the USA totaled $390 billion in 2020, a 71% increase over the previous year. Also, IPOs in the USA raised $85.3 billion in 2020, a 74.7% jump over 2019.

[15] The size of the ECB pandemic stimulus program is €1.85 trillion. And the ECB buys a portfolio of the debt of 19 eurozone countries.

[16] In mid-2020, Amazon, with a credit rating of A+ assessed by Fitch Ratings, benefited from extremely low rates in the bond market and raised $10 billion by issuing three-year, five-year, seven-year, and 10-year bonds carrying interest rates of 0.4%, 0.8% 1.2%, and 1.5%, respectively. The interest rate of 0.4% is the lowest borrowing cost in the history of the US corporate bond market.

[17] Carnival Corporation raised $4 billion on its bonds with an annual coupon of 11.5% to stay afloat for months.

[18] Based on Eurostat data, in the third quarter of 2020, the average debt-to-GDP ratio of the euro area was 97.3% and that of Belgium (113.2%), Spain (114.1%), France (116.5%), Cyprus (119.5%), Portugal (130.8%), Italy (154.2%), and Greece (199.9%) exceeded 100%. According to the Institute of International Finance (IIF), since the beginning of 2020, the global debt has surged by $15 trillion (5.84%) and in the third quarter of 2020, it hits a new record of $272 trillion.

[19] The Lebanese pound and Turkish lira have been depreciated dramatically. Some emerging economies such as Hungry raised interest rates after their currencies had depreciated sharply during the pandemic.

[20] In the June-2020 update of the World Economic Outlook, the International Monetary Fund (IMF) forecasts a 4.9% contraction in the world economy, and in the April-2020 version, the IMF expects that the GDP of advanced economies shrinks more than that of poor countries. According to the ECB, the single currency zone entered deflation territory in August.

[21] The commodity price index (CRB) consists of 19 major commodities and it dropped from 197.5 on January 01, 2020 to 110.7 on April 21, 2020.

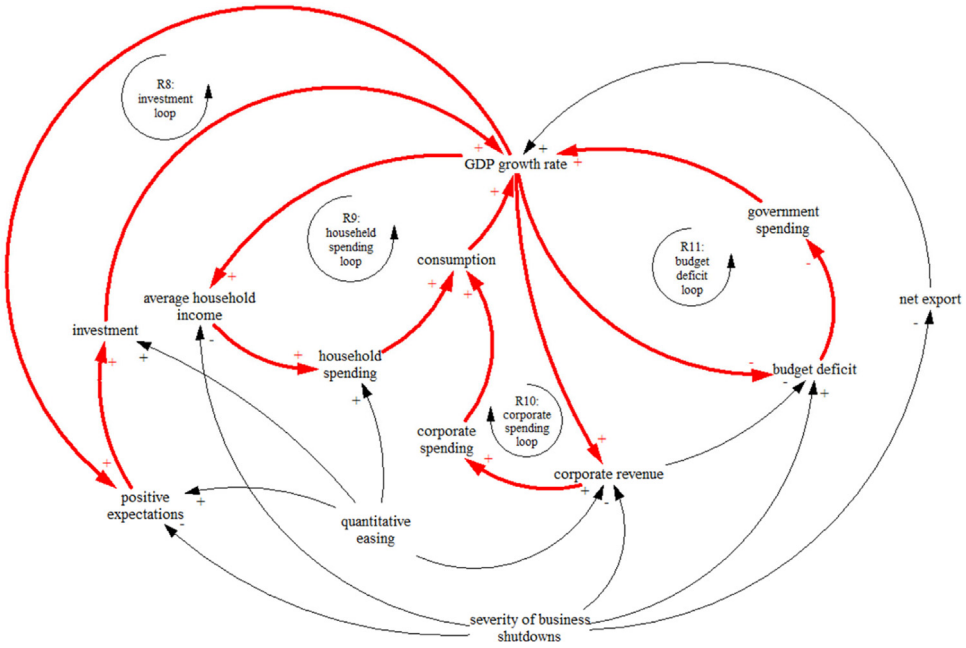

Fig. 4. Long-term effects of social distancing plus the impacts of QE on the GDP growth rate.

consumption, (2) the soar in savings,[22] and (3) the temporary reduction in VAT rates, so it is expected to face a deflationary recession.[23] Not only a prolonged period of deflation can discourage consumers from spending and firms from investing, but also it can make more debt for individuals, businesses, and governments because interest payments are fixed, but wages, prices, and tax payments fall.

Now it is time to consider the QE policy. As explained in R6, R7, and B3, the central banks embark on a colossal QE to boost demand and supply, improve employment, and recover the economy. Fig. 4 exhibits that QE should augment demand that results in a higher level of household spending and in higher corporate revenue. It also increases the investment and positive expectations in the financial markets as the central bank is employing its tools. Consequently, due to the enormous size of aid packages and the large scales of quantitative easing, recession turns into growth. As discussed before, QE introduces its own side effect in the economy: inflation. So, it is highly likely that countries who follow QE face inflationary growth.[24] To address inflation, it is expected that the central banks drop the QE policy and increase the interest rate (as Fig. 3 describes) which results in a higher cost of borrowing and more debt for firms and governments (see R4 and R5).

As Fig. 5 displays, a burgeoning banking crisis threatens the economies around the globe because of a massive increase in defaults[25] by individuals, firms, and governments. The colossal reduction in earnings of households, corporations, and governments leads to an inability to meet their financial obligations, to enormous defaults on loans, bonds, and mortgages, and to a surge in the risk of contagious default. The nonpayment of debts erodes the banks' capital and limits the lending capacity of banks.[26] Hence, the supply of money lessens and the cost of borrowing soars as the nominal interest rate increases to adjust the effects of inflation on the economy (look at R6 and R7). And the reinforcing loop of R12 continues and makes it seriously difficult for borrowers and lenders to go out of the loops of R4, R5, and R12. To postpone defaults in the hope of lifting social distancing restrictions, banks can take the initiative to allow delays in mortgage and loan payments. Plus, central banks can assist banks to raise their lending capacity.[27] However, these policies may transfer the risk from production to financial institutions. If R12 spins a couple of times, a crisis similar to the combination of the U.S. subprime mortgage crisis and the European sovereign debt crisis approaches to the world economy.

5. Managerial implications during and after the COVID-19 pandemic

The coronavirus is a global health crisis with no precedent causing inevitably major impacts on the world economy and international finance. In the following, some plausible consequences of the pandemic on countries and firms in the post-COVID-19 world are stated.

[22] According to the U.S. Bureau of Economic Analysis (BEA), the personal saving rate in the U.S. skyrocketed to 33.8% in April 2020 and remained more than 13% in 2020 (that was between 7% and 8% in 2019). In poor countries, households do not save during recessions because their salaries are cut or they get unemployed and the government is unable to offer aid packages.

[23] According to Eurostat, the 19-country eurozone has had five consecutive months of deflation since August 2020. And the GDP growth rate in them was −6.4% in 2020 with a range of 16.7% (min: −10.8% in Spain; max: +5.9% in Ireland).

[24] According to Eurostat, the annual inflation rate is 4.1% in October 2021 in the eurozone (max: 8.2% in Lithuania; min: 1.4% in Malta). OECD forecasts the inflation rate in 2022 goes over 2.3% on average in the OECD member countries and 1.1% in the eurozone.

[25] Based on a report in Financial Times on 15 January 2021, JPMorgan Chase, Citigroup, and Wells Fargo considered more than $31 billion in loan-loss provisions in the first three quarters of 2020 due to fears of mass default by borrowers. In the last quarter of 2020, some Eurozone banks scaled back lending activities, such as loans, mortgages, and credit, to businesses and households as fears of rising bad debt prevail.

[26] Based on a report in Financial Times on 4 May 2020, global banks embrace $50 billion of loan losses in the first quarter of 2020.

[27] At the beginning of the pandemic, the Bank of England puts pressure on UK-based banks such as HSBC to cancel their dividend payments. Also, the European Central Bank (ECB) asked the eurozone banks to suspend dividend payments to have more lending capacity. Based on an account in Financial Times on 6 April 2020, central banks and regulators freed up almost $492 billion of capital for banks to be able to absorb higher demand for loans. This capital relief reduces capital buffers of banks, which may lead to a crisis like the 2008–09 global financial crisis.

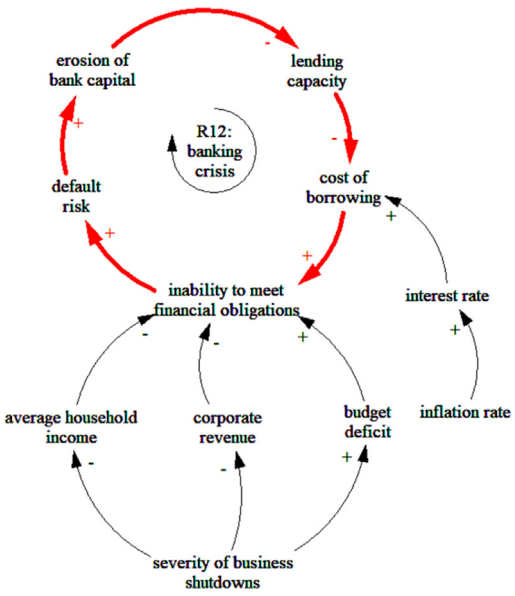

Fig. 5. Causal loop diagrams of banking crisis.

5.1. Change in attitude towards economic growth

Some developing and emerging countries have heavily borrowed from foreign creditors by issuing foreign-currency bonds or receiving loans denominated in major currencies. This huge debt has been mainly claimed to be used in the development of the economy by stimulating the GDP element of government spending. This behavior gets bold when borrowings are available at very low rates, but what happens when the interest rate goes up, the debt is due, and the treasury is empty? Look at R5.

Accumulating a colossal amount of debt is financially unsustainable because governments consume and spend more than what they can afford.[28] Especially when an economic crisis happens, the government is in shortage of foreign reserves to fulfill its financial obligations. The impacts of the COVID-19 pandemic force a number of governments to re-consider their economic growth strategies. Also, a topic for future research can be related to the maximum level of sustainable borrowing for a government.

5.2. Individual taxation

As remote working allows employees to work outside of a traditional office, lots of people and companies prefer to move to places with lower costs, especially lower taxes. Then, the question is to which country (or state or province) the individual tax should be paid; that is, the tax is based on the place of residence or the place of the firm. The former makes the countries with close-to-zero rates a hot spot and the housing prices there jump. The latter makes a tax dilemma for individuals when they want to submit their tax return forms because when they do not pay any income tax to the country of residence, they may not be entitled to any tax returns, and when they do not live in the country of the firm, they are not eligible to claim tax returns.

5.3. Massive restructuring in supply chain

A change in the way of managing the supply chain of firms, especially critical-goods producers, is expected to happen in two ways: increasing the safety stock and diversifying the supply base. The former can be seen as a deviation from the just-in-time philosophy in order to increase the stock resilience in case of experiencing a sudden shock to the supply chain system. Besides, firms need to diversify their supplier base to (1) bypass an excessive reliance on suppliers located in a particular country and (2) avoid disruptions to a specific producer, region, country, or trade policy. Some firms may interpret diversification as localization and repatriate the supply chain. These changes raise the normal costs of running a business but reduce the cost of facing an economic or health crisis and raise the resiliency of the supply chain. Companies need to see them as a hedging technique to mitigate their business risk in today's highly integrated global commerce without a worldwide, or even a nationwide, coordinated response to a pandemic.

Another lesson from this pandemic is that the liquidity of suppliers is vital because a supplier without sufficient cash may go bankrupt and disturb the supply chain of the firm. As a result, firms will refrain from engaging financially weak suppliers in their supply chain. In addition, it is highly likely that mass producers rely more on automation, and service providers count more on remote working in order to reduce cost and to scale down the reliance on the physical presence of their workforce. This change leads to a jump in investment and a large drop in the size of their human resources.

6. Conclusion

The COVID-19 pandemic has created chaotic havoc in public health and left countries with a huge influx of COVID-19 patients. To tackle this pandemic, governments employ some policies, of which social distancing has introduced some side effects on the global economy and international finance. And governments learn that keeping people healthy without devastating the economy is challenging. If the coronavirus health crisis does not get addressed properly, it can create the coronavirus financial crisis which has the potential to act as the trigger of financial crises because it is able to activate all sorts of financial crises one after the other.

This paper addresses the side effects of the social distancing policy on the global economy and international finance and concludes that the harshness of the impacts is a function of the pandemic duration. Accordingly, the economically unintended consequences are described in three categories: (1) the short-term side effects which include demand and supply shocks, (2) the mid-term impacts which contain corporate and government debt crises, and (3) the long-term effects which introduce deflationary recession and banking crisis. The economic blow of the pandemic depends on how long it lasts to be able to jump from one category of effects to the next one. Also, this research explains some managerial implications for the post-COVID-19 world. It is expected to observe three major changes in economic growth strategies, individual taxation, and the supply chain of firms.

As a future expansion of this research, when enough data are available to run an econometric model, this paper suggests modeling the R2–R12 mathematically and quantifying the side effects of the social distancing on the local and global economy. Another avenue for future research is to examine the effects of QE on macroeconomic factors such as inflation and interest rates in long run to realize the effectiveness of QE policy. Other topics can be related to the study of delays in the activation of loops in single countries when sufficient data will be provided.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

[28] Persian proverb: food is for free, but stomach is yours. That is, borrowing cheaply is doable, and spending the borrowed money is easy, but paying it back is challenging. So, do not go over your stomach capacity.

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