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The Economic Effects of Epidemics

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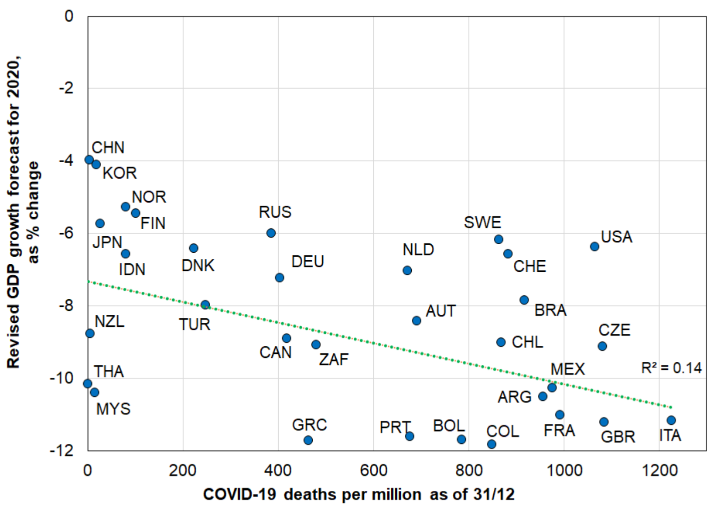
- The rapid spread of the COVID-19 epidemic throughout China in late 2019, its evolution into a global pandemic in early 2020, and the historical contraction of economic activity that followed are a reminder of the vulnerability of economies to epidemic outbreaks.
- In recent decades, the world has seen a number of epidemics emerge and quickly spread, some of which remain active and continue to proliferate. Each of these epidemics has had a clear economic impact, ranging from a few tenths of a percentage point to several percentage points of GDP depending on their severity.
- History suggests that there are various channels through which an epidemic can pass-through to the real economy, affecting the labour force and prompting behavioural changes as economic actors adjust to the progression of the outbreak. Epidemics can also have long-term effects on productivity and bring about structural changes. There is a general consensus in the mainstream academic literature that the more severe the epidemic, the higher the economic cost.
- Quantifying the economic impact of an epidemic is an uncertain endeavour. Firstly, some epidemiological parameters are based on assumptions, introducing uncertainty from the start both in terms of public health and economic effects. Secondly, some epidemics can have relatively long-term effects, which should be factored into their overall economic cost but their consideration can be hindered by a lack of data or by the difficulty of separating out individual effects.
- The economic impact of the COVID-19 pandemic appears predominantly related to the abrupt halt of global economic activity, stemming from government measures introduced in many countries as well as voluntary precautions taken by individuals. Although it is still too early to make any meaningful predictions, we can also expect to see longer-term effects, including sectoral reallocations in response to the heterogeneity of the economic shock across sectors.

Economic and epidemiological impacts of the COVID 19 pandemic in 2020



Source: IMF, Our World in Data, DG Trésor calculations.
Note: Change in IMF World Economic Outlook GDP growth forecast between fall 2019 and fall 2020.

1. Transmission channels: from epidemics to the economy

An epidemic can spread to the real economy in different ways. It can impact supply (via the labour force, hours worked and productivity) and demand (via changes in households' consumption behaviour and firms' investment decisions). Demand effects can be exacerbated by voluntary social distancing, or by the economically restrictive nature of containment measures. These effects can vary significantly across countries, depending on their specific characteristics, even if they experience comparably severe outbreaks (see Table 1)..

Table 1: Key economic transmission channels of epidemics

	Short-run impact		Long-run impact		
Economic transmission channels	**Direct loss of labour supply**	**Behavioural or policy-related shock to consumption, labour supply and investment**	**Reduction in human capital**	**Reduction in productivity of education**	**Structural changes: (i) Technical progress, sectoral reallocation (ii) International trading patterns[a] (iii) Development setbacks for children**
Epidemiological parameters	High infection rates among working-age individuals; high mortality/morbidity; low rates of recovery; long-term scarring	High infection rates (by direct contact); high uncertainty as to the spread of the disease	High prevalence, high adult mortality and/or diseases that involve serious scarring	High prevalence; high childhood mortality; high loss in educational productivity due to morbidity and/or high parental mortality	(i) New epidemics turning endemic (ii) Pandemics (iii) Diseases with strong comorbidities
Examples	Spanish influenza, HIV/AIDS, Tuberculosis, Malaria	SARS, MERS, Ebola, COVID-19	Spanish influenza, HIV/AIDS, Tuberculosis	Malaria, Hookworm, HIV/AIDS	(i) & (ii) COVID-19 (iii) HIV/AIDS, Malaria, Tuberculosis

a. Manifestations of these long-term effects may include de-globalisation or relocations of production systems.

Source: Bloom et al. (2020). Modern infectious diseases: macroeconomic impacts and policy responses. NBER WP N° 27757.

1.1 Labour force and productivity

In the short term, in the absence of a vaccine or an effective treatment, an outbreak will cause the labour force to decline, temporarily or permanently, with an impact on aggregate productivity that is likely to increase as the epidemic spreads and lasts over time.

The long-term effects will depend on the nature of the epidemic. If it is particularly deadly among working-age adults, it will cause the labour force to permanently decline; this was the case with the Spanish flu, which resulted in 40 million deaths between 1918 and 1920 (with very high mortality among 20-40-year-olds).[1] It can also result in disabling scarring, putting pressure on both labour supply and productivity. Investments in human capital and health tend to be limited by endemic diseases, as was the case with AIDS before effective treatments were developed.[2] Diseases that disproportionally affect children (malaria, hookworm) also cause long-term effects, by reducing the productivity of their education and leading stalling their development. Endemic diseases, in the same way as recurring epidemics among adults or diseases affecting children, may therefore contribute to widening inequalities across the board.[3]

1.2 Public policy measures and behavioural changes

Labour supply effects may be exacerbated by behavioural changes in response to the outbreak, for example not going in to work as a prophylactic measure. Avoidance behaviours can also contribute to a drop in domestic demand. If aggregate consumption falls as a direct result of the epidemic[4] and the measures introduced to contain it, it will also be indirectly affected by the voluntary choices made by households to limit their risk of exposure. The epidemic

(1) Barro R., Ursua J. F. and J. Weng (2020), "The Coronavirus and the Great Influenza Pandemic: Lessons from the 'Spanish Flu' for the Coronavirus's Potential Effects on Mortality and Economic Activity", *NBER WP* no. 26866.
(2) Bloom *et al.* (2020), "Modern Infectious Diseases: Macroeconomic Impacts and Policy Responses", *NBER WP* no. 27757.
(3) Boucekkine *et al.* (2010), "On the Distributional Consequences of Epidemics", *Journal of Economic Dynamics and Control*.
(4) The magnitude of this direct shock will depend on the age of the population affected by the epidemic and the consumer age structure.

may also result in increased levels of personal savings,[5] partly as a precautionary measure in response to greater uncertainty, and partly as a consequence of public health measures (e.g. shops forced to close). Border closures may lead to a near total shutdown of air traffic and have an impact on foreign trade, in particular via tourism. Firms may also become aware of potential vulnerabilities and dependencies to the rest of the world, motivating them to secure their value chains and relocate production systems.[6]

Epidemic-related macroeconomic shifts can influence permanent changes in behaviour, with impacts that may outlast the end of the outbreak.[7] In the short run, a combination of lingering uncertainty, excess savings and demand shortage can lead to hysteresis in the labour market, with a persistent rise in unemployment, particularly among younger age groups,[8] leading to negative socioeconomic effects in the long run (the scarring effect as well as a loss of confidence in institutions).[9] The same uncertainty may cause firms to put off investment decisions or to temporarily accept higher financing costs for short-term borrowing, via increased risk premiums.[10] However, in the long run, epidemics appear to lead to a decline in interest rates, due in part to plentiful savings.[11] They can also cause a persistent change in the perceived probability of extreme events occurring in the future.[12]

1.3 Other effects

Epidemics have direct consequences for healthcare systems, increasing the workload for medical workers and causing healthcare costs to rise. These costs can grow considerably with the seriousness of the symptoms and the length of the treatment period.

Epidemics also tend to be a drain on public finances, either directly (increased hospital capacity and healthcare costs) or indirectly (lower tax income due to lower labour supply). For example, the Ebola epidemic caused fiscal deficits to soar in afflicted West African countries, due in particular to a decrease in government revenue from direct corporate taxes, VAT income and indirect taxes. This has had a noticeable impact that has outlasted the epidemic itself.[13]

Furthermore, epidemics can lead to price changes in goods and factor inputs. For example, an outbreak with high mortality among the working-age population could ultimately lead to wage increases as the result of labour scarcity.[14] Changes to prices of consumer goods are more difficult to determine, due to forces pulling in opposite directions: upward pressure on prices,[15] at least in the short run, due to value chain disruptions associated with strict social distancing measures and spiking demand for medical products, versus natural deflationary pressure due to a global drop in demand. As a result, whether an epidemic results in deflation or inflation depends on the relative strength of these pressures.[16]

1.4 Idiosyncrasies and differential effects of epidemics

The economic impacts of an epidemic will also differ based on the relative wealth of afflicted countries. In low-income countries, individuals have less access to healthcare and a higher likelihood of exposure to simultaneously active epidemics.[17] In addition to that, there is a pre-existing lower level of investment in

(5) Such an increase in savings may also be amplified by support measures introduced to limit income loss.
(6) See Bonneau C. and M. Nakaa (2020), "Vulnerability of French and European Imports", *Trésor-Economics* no. 274.
(7) Individual household experiences in relation to macroeconomic shifts could have long-term effects on their aversion to risk. See Malmendier U. and S. Nagel (2011), "Depression Babies: Do Macroeconomic Experiences Affect Risk-Taking?", *The Quarterly Journal of Economics*, 126(1).
(8) Oreopoulos et al. (2012), "The Short- and Long-Term Career Effects of Graduating in a Recession", *American Economic Journal: Applied Economics* 4(1); Grzegorczyk and Wolff (2020), "The Scarring Effect of COVID-19: Youth Unemployment in Europe", *Bruegel Blog*.
(9) Aksoy, Eichengreen and Saka (2020), "The Political Scar of Epidemics", *NBER WP* no. 27401.
(10) Kozlowski *et al.* (2020), "Scarring Body and Mind: The Long-Term Belief-Scarring Effects of COVID-19", *NBER WP* no. 27439.
(11) Jordà *et al.* (2020), "Longer-Run Economic Consequences of Pandemics", *Federal Reserve Bank of San Francisco WP* 2020-06.
(12) Kozlowski *et al.*, *op. cit.*
(13) For example, Liberia's fiscal deficit grew from a pre-Ebola rate of 1.6% of GDP in 2013 to 8.5% of GDP in 2015 at the height of the crisis, despite the extraordinary amount of official development assistance the country received (approximately 19% of GDP). See Zafar *et al.* (2016), "2014-2015 West Africa Ebola Crisis: Impact Update", *World Bank Reports*.
(14) Jordà *et al.* (2020), *op. cit.*
(15) Jaravel and O'Connell (2020), "Inflation Spike and Falling Product Variety During the Great Lockdown", *CEPR Discussion Paper* 14880.
(16) Baqaee and Farhi (2020), "Supply and Demand in Disaggregated Keynesian Economies: An Application to the Covid Crisis", *NBER WP* no. 27152.
(17) Bloom *et al.* (2020), *op. cit.*

human capital.[18] Overall, this combination could generate stronger and longer-lasting economic consequences from a single epidemic.[19] The same holds true for countries with large informal labour markets and limited social safety nets, where lower-income workers are unable to stop working to care for themselves or to protect themselves and their communities.

2. Methods for measuring the economic impact of an epidemic

In the academic literature, a variety of measurement tools are used to estimate the economic effects of infectious diseases as well as the effectiveness of mitigating public policy measures:

- The enumerative approach adds up all the direct costs (healthcare, vaccine R&D, etc.) and indirect costs (income lost by infected workers) of an epidemic over a given period of time. To measure the effect of public policy, the monetary value of these combined costs is compared, depending on the case, to: (i) the epidemiological effectiveness of the policy measure, which can be quantified, for example, by the number of avoided deaths; (ii) the utility value derived from the policy measure, which can be quantified, for example, by the number of years of good health gained; or (iii) the monetary value corresponding to the number of lives saved. Notwithstanding the ethical issues raised by these methods,[20] a significant limitation is that they do not effectively take into account the impact, severity or cost of containment measures, or the behavioural changes they may cause, and are therefore ill-suited to measure the economic costs of an epidemic beyond healthcare expenditure.
- The non-structural approach uses regressions to explain the economic growth rates of different countries by the prevalence of a given disease and a set of control variables, in order to establish a direct measure of the impact of the disease on economic growth. The drawback of this approach is that it requires exact econometric specifications and numerous control variables to avoid estimation biases. Additionally, it cannot be used to identify the transmission channels to the real economy or the impact of public policy measures.
- The structural approach links the epidemiological parameters of an epidemic to the macroeconomic effects of their trajectory. In contrast to the other two approaches, this one can be used to measure, via general equilibrium models, the indirect effects caused by behavioural changes in response to the epidemic or containment policies.[21] For some types of epidemics, it can also be used to identify transmission channels. In SIR-macro models,[22] households adapt their consumption and work decisions based on the severity of the outbreak and its mortality rate, and the social planner determines the optimal public health policy based on externalities[23] and healthcare capacity. These models, in conjunction with others (see Box 1), have been used to model the COVID-19 pandemic. A significant limitation to this approach is that it uses theoretical assumptions that are empirically difficult to verify, particularly when it comes to linking the trajectory of epidemiological parameters to economic behaviours.

(18) Chakraboty *et al.* (2010), "Diseases, Infection Dynamics and Development", *Journal of Monetary Economics* 57(7), p. 859-872.
(19) Conversely, other differences, in particular those related to the climate or the population pyramid, could limit the economic impact.
(20) Academic research in this area uses the concept of the value of statistical life (VSL), which draws criticism with regard to the ethics of assigning a monetary value to a human life, as well as the problematic properties of the variable, i.e. the fact that it decreases with age and increases with income. See Adler (2020), "What Should We Spend to Save Lives in a Pandemic? A Critique of the Value of a Statistical Life", *Covid Economics* 33.
(21) See for example Guerrieri *et al*. (2020), "Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages?", *NBER WP* no. 26918.
(22) An SIR model (an acronym for Susceptible, infected, Recovered/Removed) is a compartmental epidemiology model used to predict the trajectory of an epidemic based on rates of transition between the three categories. By extension, SIR-macro models were developed to endogenise households' behaviours through both economic and epidemiological channels, making it possible to determine the theoretically optimal policies for minimising fatalities and limiting the economic cost of an epidemic. For an application of this type of model to the COVID crisis, see Eichenbaum, Rebelo & Trabandt (2020), "The Macroeconomics of Epidemics", *NBER WP* no. 26882.
(23) As people do not fully internalise the effect of their consumption and work decisions on the overall spread of the virus, the planner establishes a public health response that will maximise social welfare.

Box 1: Other analysis tools

Other types of models than the ones described above can be mobilised to provide additional information. For example, models designed to evaluate the impact of shocks on value chains can be used to measure the effects of an epidemic on a country's foreign trade. Similarly, network models, which trace relationships between suppliers and customers in different sectors, can be used to estimate the impact of work-from-home policies, forced business shutdowns and school closures on individual sectors and, ultimately, on overall economic activity.[a]

A disaggregated general equilibrium approach can be applied to model changes in the composition of demand. On the supply side, this same type of model can be extended to include corporate bankruptcies in order to evaluate the impact of forced shutdowns on firms and unemployment.[b] Individual firm data can also be used to better identify weaknesses in the productive structure.[c] Furthermore, sector-specific models allow for a more detailed analysis of the total impact to help understand which parts of the economy are most affected and through which channels.

a. Barrot, Grassi and Sauvagnat (2020), "Sectoral Effects of Social Distancing", work in progress.
b. Baqaee and Farhi (2020), "Supply and Demand in Disaggregated Keynesian Economies with an Application to the Covid-19 Crisis", *NBER WP* no. 27152.
c. Gerschel, Martinez and Mejean (2020), "Propagation of Shocks in Global Value Chains: The Coronavirus Case", *Institut des Politiques Publiques*.

3. Economic impacts of past epidemics

Historically, the economic impact of localised outbreaks or epidemics with a low rate of transmission has been limited - just a few tenths of a percentage point of GDP per year (see Chart 1). In 2015, the dengue fever outbreak in Taiwan led to a 0.3% decline in average income per capita.[24] Initial estimates of the impact of the SARS epidemic in Southeast Asia indicate an annual loss of GDP ranging from 0.5% to 1% for the region, primarily associated with the efforts of individuals to avoid becoming infected.[25]

Although impact studies on the two most recent major flu epidemics (avian and swine flu) are relatively scarce, preliminary estimates of the economic cost of the H1N1 swine flu epidemic of 2009 range from 0.5% to 1.5% of GDP in affected countries.[26] These estimates should nevertheless be considered an upper bound; research on South Korea indicates a significantly lower impact, in the range of 0.1% of GDP.[27] The cost of the AIDS epidemic is estimated to be higher, with an average annual loss of GDP of 1.2%. On a country-by-country basis, however, the impact of the epidemic varies widely – between 0.4% and 2.1% – depending on prevalence rates, which have been particularly high in sub-Saharan countries.[28]

The most recent pandemic on a scale comparable to COVID-19 was the 1918-1921 influenza outbreak, also known as the Spanish flu. Although it was damaging for the economy on the whole, the economic impact on the relative cost of factor inputs is unclear. Some researchers estimate the epidemic led to growth in income per capita levels over the ensuing decade in the United States,[29] due to the scarcity of labour, although the same was not observed in Sweden.[30] There are not many empirical estimates available on the overall effect

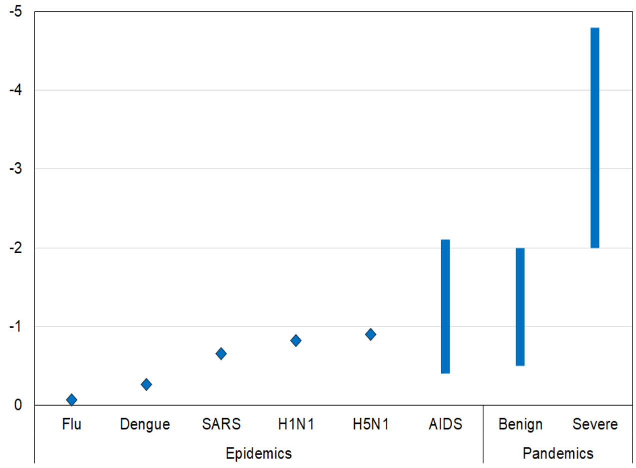
(24) Sher, Wong and Lin (2020), "The Impact of Dengue on Economic Growth: The Case of Southern Taiwan", *International Journal of Environmental Research and Public Health*, 17, p. 750.
(25) Brahmbhatt, M. and A. Dutta (2008), "On SARS Type Economic Effects during Infectious Disease Outbreaks", *World Bank Reports*.
(26) www.economist.com/news/2009/07/27/the-cost-of-swine-flu
(27) Kim *et al.* (2012), "The Economic Burden of the 2009 Pandemic H1N1 Influenza in Korea", *Scandinavian Journal of Infectious Diseases*, 45(5).
(28) United Nations, Department of Economic and Social Affairs (2004), "The Impact of AIDS, Chapter VIII: Impact on Economic Growth".
(29) The regions most impacted by the epidemic, i.e. those with the highest mortality rates, appear to have seen bigger increases in per capita income between 1921 and 1930. See Brainerd E. & Siegler M. (2003), "The Economic Effects of the 1918 Influenza Epidemic", *CEPR Discussion Papers* 3791.
(30) Karlsson M., Nilsson T. and Pichler S. (2012), "What Doesn't Kill You Makes You Stronger? The Impact of the 1918 Spanish Flu Epidemic on Economic Performance in Sweden", *Research Institute of Industrial Economics*, *WP Series* 911. The authors did not find that the labour supply shock led to an upward adjustment in wages, but there was a negative impact on capital returns. Poverty was found to increase after the epidemic.

on GDP, the main reason being the difficulty of separating out the effects of the pandemic from those of World War I, but in all likelihood the pandemic had an impact of several percentage points of GDP.[31]

As far as can be determined from the available data, the oldest documented case of an epidemic, the bubonic plague that ravaged Europe between 1347 and 1351, also appears to have led to a rise in real wages,[32] measured retrospectively.[33]

For some of these epidemics, the aggregate measurement may represent a lower bound of the effective aggregate impact, since long-term effects are difficult to quantify. This is true for AIDS and tuberculosis, where the effects associated with the loss of human capital and development setbacks are not readily measurable. The aggregate effects that have been measured may also conceal heterogeneous sector-specific impacts; economies with similar death tolls may experience differing degrees of economic impact based on their sectoral composition. For example, the spread of the H5N1 avian flu was largely contained within the poultry industry, which explains why the economic impact was so severe for Southeast Asian economies, particularly Thailand (1.5% of GDP) and Vietnam (0.3% to 1.8% of GDP), compared to other countries that were also affected by the epidemic but had a relatively smaller poultry industry.[34] In the case of Thailand, the economic cost was substantial despite a low death toll, with only 17 recorded fatalities.[35]

Chart 1: Impact économique d'épidémies récentes (en points de PIB par an, en écart au compte central)



Source: Authors' analysis.[36]
How to read this chart: As the methods used across the reviewed literature are not directly comparable, this chart is only intended to provide a general picture of the economic impact of different epidemics, in percentage points of GDP per year relative to a baseline scenario without an epidemic. For dengue fever, the variable used is the average income per capita. For epidemics, the chart shows the average estimated impact from the literature. For pandemics, whose economic impacts tend to be measured through simulations, the chart shows the range of estimated impacts from the literature, the extent of which depends on the epidemiological parameters used.

Box 2: Macro-econometric simulations

As epidemics are not frequent events and the availability of data is limited, one way to quantify their economic impacts is to conduct macro-econometric simulations based on epidemiological characteristics.

Depending on the severity of the epidemic and the mitigating measures in place, as well as the transmission channels concerned, macro-econometric simulations point to an economic impact ranging from a few tenths of a percentage point to multiple percentage points of GDP.

- For pandemics with low infection rates, the economic impact is estimated to be just a few tenths of a percentage point of GDP. For example, the economic cost of an epidemic with a low infection rate but with a high mortality – such as SARS – is estimated to be 0.4% of global GDP at the height of the outbreak, primarily as a result of the labour supply shock.[a] In contrast, a highly infectious but not especially lethal epidemic – like

a. Verikios *et al.* (2011), "The Global Economic Effects of Pandemic Influenza", *Centre of Policy Studies/IMPACT Centre WP*.

(31) Barro *et al.* (2020), op. cit. The authors estimate that the 1918 influenza reduced per capita GDP by 6.2% on average.
(32) Clark G. (2003), "Microbes and Markets: Was the Black Death an Economic Revolution?", University of California, Davis. Mimeo.
(33) Bloom and Mahal (1997a), "AIDS, Flu, and the Black Death: Impacts on Economic Growth and Well-Being", in David Bloom and Peter Godwin, eds, *The Economics of HIV and AIDS: The Case of South and South East Asia, New Delhi: Oxford University Press*, 1997, p. 22-52.
(34) Elçi C. (2006), "The Impact of HPAI of the H5N1 Strain on Economies of Affected Countries", *Human and Economic Resources Proceedings Book*, p. 101.
(35) World Health Organization (2020), Cumulative number of confirmed human cases of avian influenza A(H5N1).
(36) Main results of the articles referenced here.

the H1N1 flu – would lead to a 3.3% loss of global GDP at its peak, due to a restricted labour supply (due to contaminations, deaths and absences related to school closures) and a drop in tourism.[b]

- For more extreme scenarios, there are numerous simulations that have used epidemiological parameters (virulence and mortality) similar to or more severe than those of the 1918 Spanish flu. For example, a global pandemic requiring a 13-week school closure and 4 weeks of prophylactic absenteeism from work would have an estimated cumulative economic impact of 4% of GDP in the United Kingdom,[c] whereas a pandemic even more severe than the 1918 flu could lead to over 140 million deaths and a cumulative economic shock of 12.6% of global GDP,[d] without any social distancing measures.

b. The scenario for the high-infection, low-mortality epidemic includes the availability of an effective vaccine within months of the outbreak. See Verikios *et al.* (2011), *op. cit.*

c. Keogh-Brown M. R., Smith R. D., Edmunds J. W. and Beutels P. (2010), "The Macroeconomic Impact of Pandemic Influenza: Estimates from Models of the United Kingdom, France, Belgium and The Netherlands", *The European Journal of Health Economics*, 11(6), 543-554.

d. The authors estimate an "ultra" scenario, where the epidemiological parameters are similar to those of the 1918 flu, with the exception of mortality among older individuals, which in the exercise is considered to be equal to that among younger age groups. (The 1918 flu was significantly more fatal among younger individuals.) See McKibbin W. J. and Sidorenko A. (2006), "Global Macroeconomic Consequences of Pandemic Influenza" (p. 79). Sydney, Australia: Lowy Institute for International Policy.

4. The COVID-19 pandemic

Global activity has been strongly impacted by the deterioration of the epidemiological situation due to the spread of COVID 19 and the measures introduced to contain it (see chart on first page). The main causes of the economic shock are the severity of restrictions and the self-distancing behaviours people have voluntarily adopted, although it is difficult to accurately measure the extent of each effect.

From a public health perspective, preliminary estimates show that the earlier strict lockdown measures are introduced, the more effective they are at containing the spread of the epidemic.[37] This ultimately results in lower economic costs, owing in part to the fact that if restrictions are introduced earlier they do not need to remain in effect as long.

The relationship between lockdown severity and economic cost has been well-established in the literature,[38] but it is more or less narrow across countries. Some countries experienced a comparable economic shock to others that introduced much more restrictive measures (such as Sweden and its neighbours, see below). Conversely, countries experiencing similarly severe epidemics have experienced differing economic impacts (for example, the economic shock for 2020 is forecasted to be twice as severe in Greece than in Russia, even though their epidemiological situations are comparable; see chart on first page). These differences may be due to country-specific characteristics, such as differences in sector al composition,[39] employment flexibility (e.g. the ability to work from home), degree of urban concentration and households' behaviours (e.g. already prevalent social distancing behaviours or an existing culture of mask wearing in some Asian countries).[40]

The economic impact of households' voluntary changes in behaviour is corroborated by the findings of body of research available on the first COVID-19 wave. The example of Sweden illustrates the importance of this transmission channel: even without a nationwide lockdown, the drop in private household consumption and in individual mobility appeared to be commensurate with rates in neighbouring countries

(37) Based on European data: Demirgüç-Kunt A., Lokshin M. & I. Torre (2020), "The Sooner, the Better: The Early Economic Impact of Non-Pharmaceutical Interventions during the COVID-19 Pandemic", *World Bank Policy Research WP* 9257. Based on theoretical epidemiological and macroeconomic models and different propagation scenarios: Atkeson A. (2020), "What Will Be the Economic Impact of COVID-19 in the US? Rough Estimates of Disease Scenarios", *NBER WP* no. 26867.
Eichenbaum M. S., Rebelo S. & M. Trabandt (2020), "The Macroeconomics of Epidemics", *NBER WP* no. 26882.

(38) Autumn 2020 Economic Forecast, European Commission.

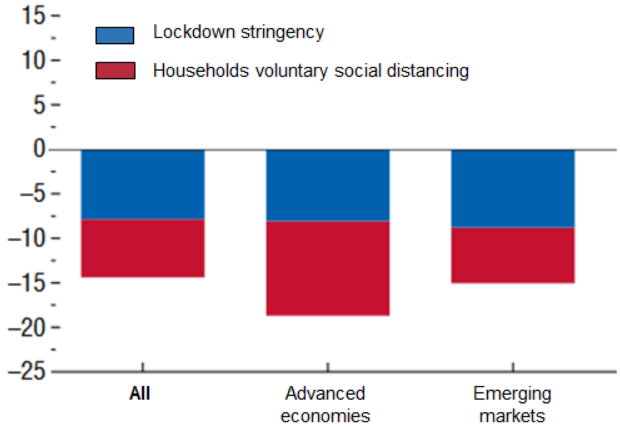
(39) In France, for example, the high share of value-added represented by the tourism industry and aerospace exports may explain the significant size of the shock.

(40) A history of previous epidemics in some countries resulted in effective control and prevention systems being created, helping to limit the public health and economic costs of future epidemics. For example, lessons learned from the SARS crisis, which hit Asia in 2003, combined with a highly proactive response meant Taiwan and South Korea were able to avoid lockdowns.

where national lockdowns were imposed.[41] More generally, the IMF estimates that country-specific lockdowns are responsible for at most 50% of the drop in mobility in advanced economies (see Chart 2). That being said, the exact share of the economic impact that is to be attributed to changes in households' behaviour has not yet been clearly established.

The duration of the pandemic will depend on how quickly an effective vaccine can be administered to a sufficiently large proportion of the population to achieve herd immunity. Until then, uncertainty will continue to influence the decision-making of households and firms. Long-term effects on productivity will depend on the extent and efficiency of reallocations between sectors and firms, on whether there are persistent morbidities among patients who contracted a severe form of the disease, and on lasting structural changes with the potential to transform the organisation of production or households' preferences.

Chart 2: Impact on mobility during the first 90 days of each country's epidemic (%)



Source: Chapter 2 - World Economic Outlook, October 2020, IMF.

(41) Sheridan *et al.* (2020). "Social Distancing Laws Cause Only Small Losses of Economic Activity during the COVID-19 Pandemic in Scandinavia", PNAS Research article 117(34) 20468-20473; https://doi.org/10.1073/pnas.2010068117.

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