Saving Lives and Livelihoods Amidst a Once-in-a-Century Crisis

01
CHAPTER

आपदि प्राणरक्षा हि धर्मस्य प्रथमाङ्कुरः ।

Saving a life that is in jeopardy is the origin of dharma
– Mahabharata (Shanti parva), Chapter 13, Shloka 598

The COVID-19 pandemic engendered a once-in-a-century global crisis in 2020 – a unique recession where 90 per cent of countries are expected to experience a contraction in GDP per capita. Faced with unprecedented uncertainty at the onset of the pandemic, India focused on saving lives and livelihoods by its willingness to take short-term pain for long-term gain. India's response stemmed from the humane principle advocated eloquently in the Mahabharata that "Saving a life that is in jeopardy is the origin of dharma." Therefore, India recognised that while GDP growth will recover from the temporary shock caused by the pandemic, human lives that are lost cannot be brought back. The response drew on epidemiological and economic research, especially those pertaining to the Spanish Flu, which highlighted that an early, intense lockdown provided a win-win strategy to save lives, and preserve livelihoods via economic recovery in the medium to long-term. The strategy was also motivated by the Nobel-Prize winning research in Hansen & Sargent (2001) that recommends a policy focused on minimising losses in a worst case scenario when uncertainty is very high. Faced with an unprecedented pandemic and the resultant uncertainty, loss of scores of human lives captured thus the worst-case scenario.

This strategy was also tailored to India's unique vulnerabilities to the pandemic. First, as the pace of spread of a pandemic depends upon network effects, a huge population inherently enables a higher pace of spread. Second, as the pandemic spreads via human contact, high population density, especially at the bottom of the pyramid, innately aids the spread of the pandemic at its onset. Third, although the average age is low, India's vulnerable elderly population, in absolute numbers, exceeds significantly that of other countries. Finally, an overburdened health infrastructure exposed the country to a humongous supply-demand mismatch that could have severely exacerbated fatalities. In fact, assessments of crores of cases and several thousands of deaths by several international institutes in March and April possibly reflected the concerns stemming from such vulnerabilities.

To implement its strategy, India imposed the most stringent lockdown at the very onset of the pandemic. This enabled flattening of the pandemic curve and, thereby, provided the necessary time to ramp up the health and testing infrastructure. Faced with enormous

uncertainty, India adopted a strategy of Bayesian updating to continually calibrate its response while gradually unlocking and easing economic activity.

Using a plethora of evidence, the Survey demonstrates the benefits of this strategy in this chapter. India has transformed the short-term trade-off between lives and livelihoods into a win-win in the medium to long-term that saves both lives and livelihoods. By estimating the natural number of cases and deaths expected across countries based on their population, population density, demographics, tests conducted, and the health infrastructure, we compare these estimates with actual numbers to show that India restricted the COVID-19 spread by 37 lakh cases and saved more than 1 lakh lives. Uttar Pradesh, Gujarat and Bihar have restricted the case spread the best; Kerala, Telangana and Andhra Pradesh have saved the most lives; Maharashtra has under-performed the most in restricting the spread of cases and in saving lives. The analysis clearly shows that early and more stringent lockdowns have been effective in controlling the spread of the pandemic – both across countries and across States in India.

By constructing a stringency index at the State level Survey show that the under-or-over performance in cases and deaths (compared to the expected) correlates strongly with the stringency of the lockdown. Similarly, the V- shaped economic recovery also strongly correlates with the stringency of the lockdown. This alleviates concerns that the inference about the impact of the lockdown is due to any cofounding factors peculiar to India such as higher level of immunity, BCG vaccination, etc. As such India-specific factors are common to all states, they cannot be accounting for this correlation. Thus, Survey infer that the lockdown had a ***causal*** *impact on saving lives and the economic recovery. India thus benefited from successfully pushing the peak of the pandemic curve to September, 2020 through the lockdown. After this peak, India has been unique in experiencing declining daily cases despite increasing mobility.*

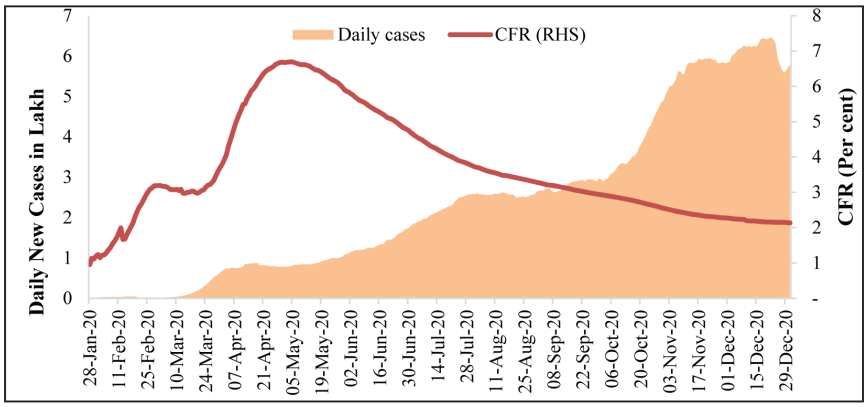
While there was a 23.9 per cent contraction in GDP in Q1, the recovery has been a V-shaped one as seen in the 7.5 per cent decline in Q2 and the recovery across all key economic indicators. In line with learning from economic research, economic activity in States with higher intial stringency has rebounded faster during the year. On the economic policy front, India recognized that, unlike previous crises, the Covid pandemic affects both demand and supply. Furthermore, given disruptions in the labour markets that can affect disposable income and firms suffering financial distress, the loss of productive capacity due to hysteresis could not be ruled out. Therefore, a slew of structural reforms were announced; together, these would help to expand supply significantly in the medium to long term. On the demand side, at the onset of the pandemic, India's policies focused purely on necessities. This was optimal given the uncertainty and the resultant precautionary motives to save as well as the economic restrictions during the lockdown. After all, pushing down on the accelerator while the brakes are clamped only wastes fuel. During the unlock phase, demand-side measures have been announced in a calibrated manner. A public investment programme centred around the National Infrastructure Pipeline is likely to accelerate this demand push and further the recovery. The upturn in the economy while avoiding a second wave of infections makes India a sui generis case in strategic policymaking amidst a once-in-a-century pandemic.

COVID-19: ONCE IN A CENTURY 'CRISIS'

1.1 The world has endured a year of the unexpected onslaught by the novel COVID-19 virus - SARS-CoV-2 - first identified in Wuhan city of China in December 2019. The virus has posed an unprecedented challenge for policy making, globally and nationally. It has tested the mettle of policymakers to deal with uncertain, fluid, complex and dynamic situations having far-reaching socio-economic implications. It has also tested the frontiers of medical science, which rose to the challenge by developing an effective vaccine within a year.

1.2 The pattern and trends in spread of the virus across major countries showed that confirmed cases spread exponentially once community transmission began. Understanding the disease dynamics posed challenges as a large fraction of affected people were asymptomatic but were potentially contributing to the spread of the pandemic. By the end of February 2020, the infection had spread to over 54 countries, infected more than 85,403 individuals across the world and resulted in around 3,000 deaths. The exponential rise in the number of cases being witnessed daily compelled the World Health Organization (WHO) to title this outbreak a pandemic on March 11, 2020 – within a period of three months of its emergence. Within a year, it has infected around 9.6 crore people growing at an average rate of 3.3 per cent per day. The number of daily cases is still rising with more than 6 lakh cases per day. The pandemic has accounted for 20.5 lakh death across 220 countries with a global case fatality rate of 2.2 per cent as of 15th January 2020. However, in the initial stages of the pandemic, the world average case fatality rate (CFR) was much higher at 5-6 per cent (Figure 1). These features have made the virus lethal.

Figure 1: Global Trend in COVID-19 Spread and Case Fatality Rates



Source: Data accessed from World Health Organisation (WHO)– as on 31st December, 2020

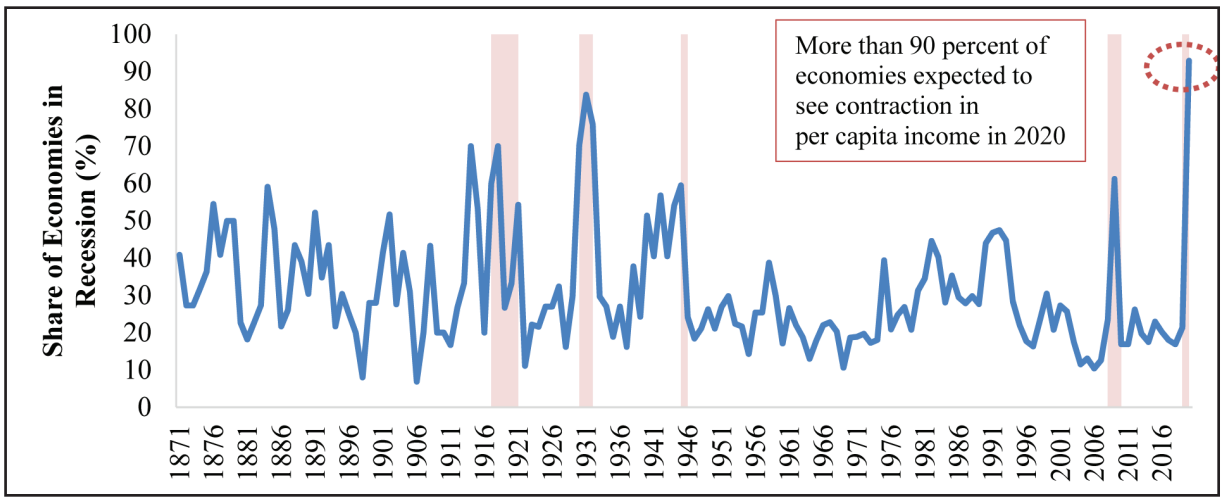
1.3 The only strategy that seemed viable for containment of the pandemic was active surveillance, early detection, isolation and case management, contact tracing and prevention of onward spread by practicing social distancing and safety precautions. Various non-pharmaceutical interventions (NPIs) – such as lockdowns, closure of schools and non-essential business, travel restrictions – were, therefore, adopted by countries across the globe. These were aimed to slow down the transmission of infection or 'flatten the epidemic curve' and buy the health care system some time to handle the surge in demand for its services and for development of an effective treatment and a vaccine (Box 1).

1.4 The global health crisis prompted by COVID-19, in addition to an enormous human toll, has engendered the largest economic shock the world economy has witnessed in the last century. The pandemic and associated lockdown measures led to a de facto shutdown of a significant

portion of the global economy, thereby triggering a global recession this year. The world economy is estimated to contract in 2020 by 4.3 per cent, as per World Bank, and 3.5 per cent, as per IMF. The crisis World is facing today is unique in a number of ways. Firstly, the health crisis-induced global recession is in contrast with previous global recessions which were driven by confluences of a wide range of factors, including financial crises (the Great Depression in 1930-32; 1982; 1991; 2009), sharp movements in oil prices (1975; 1982), and wars (1914; 1917-21; 1945-46).

1.5 Secondly, this recession is highly synchronized as the fraction of economies experiencing annual declines in national per capita is highest since 1870—more than 90 per cent, even higher than the proportion of about 85 per cent of countries in recession at the height of the Great Depression of 1930-32 (Figure 2). The pandemic is, therefore, once in a 150-year event with an unprecedented impact with all regions in the world projected to experience negative growth in 2020. It is aptly called the 'Great Lockdown'.

Figure 2: Once-in-a-Century 'Synchronized' Recession



Source: World Bank
Note: Recession is defined here as contraction in per capita income

1.6 Thirdly, the present crisis is unique as it originated in a pandemic that required social distancing and limiting of physical interactions. Thus, inherent to the crisis there was the trade-off – at least in the short run – between health and human lives, on the one hand, and the economy and livelihoods, on the other hand. Specifically, containment measures, necessary to manage the pandemic and save lives, limited human interactions and thereby restricted economic activities of various hues and exacerbated the impact on livelihoods. Thus, the COVID crisis presented a trade-off between lives and livelihoods, in the short run.

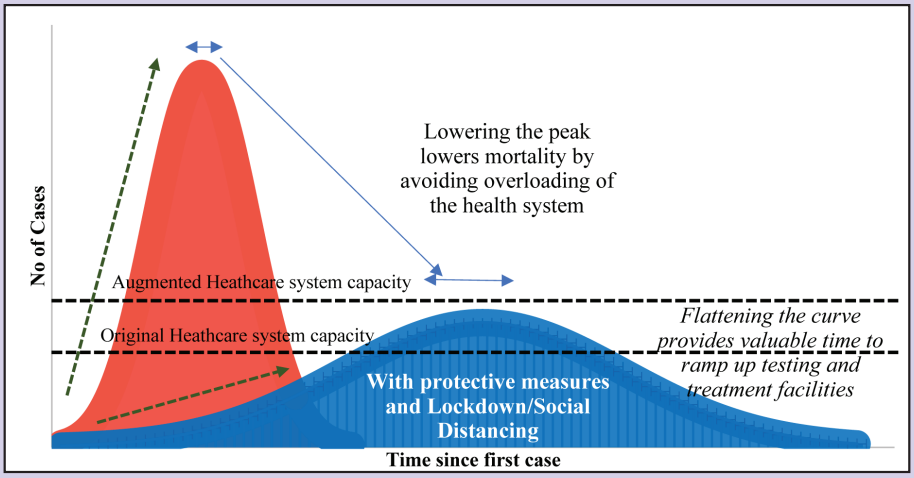
1.7 The short-run trade-off presented countries with policy options that revealed policymakers' preferences for the "value" placed on human life versus the "price" of temporary economic restrictions. Unlike Oscar Wilde's cynic, "who knows the price of everything and the value of nothing," India's policy response to the pandemic stemmed fundamentally from the humane principle advocated eloquently in the Mahabharata that "Saving a life that is in jeopardy is the origin of dharma." Therefore, the "price" paid for temporary economic restrictions in the form of temporary GDP decline is dwarfed by the "value" placed on human life. As the Survey demonstrates clearly, using a plethora

of evidence, India's policy response valuing human life, even while paying the price of temporary GDP decline, has initiated the process of transformation where the short-term trade-off between lives and livelihoods is converted into a win-win in the medium to long-term that saves both lives and livelihoods.

Box 1: Flattening the Curve

Epidemiological research highlights that a key strategy to combat the spread of an epidemic is termed as "flattening the curve." The curve refers to the projected number of people who will contract the disease in a given population. The shape of the curve varies according to the rapidity with which the infection spreads in the community. There is a "peak" of the disease, where the number of infected individuals reaches a maximum, followed by a decline. Policymakers care particularly about the time taken to reach this peak because this determines the time available to respond to early signs of a pandemic. The peak number of infected individuals is also important as it determines the scale of medical facilities required. Overloaded healthcare systems that are forced to operate beyond their capacity lead to higher case fatality rates. In the short run, the capacity of any country's health system is finite (number of hospital beds, number of skilled health professionals, ventilators/Integrated Care Units among others). This puts an upper bound on the number of patients that can be properly treated, at any given point of time. If the spread of the pandemic exceeds the existing capacity of the health system, it may lead to higher mortality rates. The 'flattening of the curve' spreads the pandemic over time, enabling more people to receive proper health treatment – ultimately lowering the fatality rate.

Flattening the Curve



The transmission potential is often summarized by the expected number of new infections caused by a typical infected individual during the early phase of the outbreak, and is usually denoted by the basic reproduction number, R_0. It is simply the expected number of new cases of the disease caused by a single individual. Three possibilities exist for the potential transmission or decline of a disease, depending on its R_0 value: (i) If $R_0 < 1$, each existing infection causes less than one new infection and the disease eventually peters out; (ii) If $R_0 = 1$, each existing infection causes one new infection and will not lead to an outbreak or an epidemic and (iii) If $R_0 > 1$, each existing infection causes more than one new infection and there may be an outbreak or epidemic. Occasionally, one person may transmit to tens or even hundreds of other cases - this phenomenon is called super-spreading.

If individuals and communities take appropriate steps to reduce R_0 and slow the spread of the virus, the cases would be stretched out across a longer period of time, thereby flattening the curve and avoiding overburden of the existing healthcare systems. It also buys time to potentially develop newer drugs and vaccines targeted at the virus.

RESEARCH-DRIVEN POLICY RESPONSE AMIDST UNPRECEDENTED UNCERTAINTY

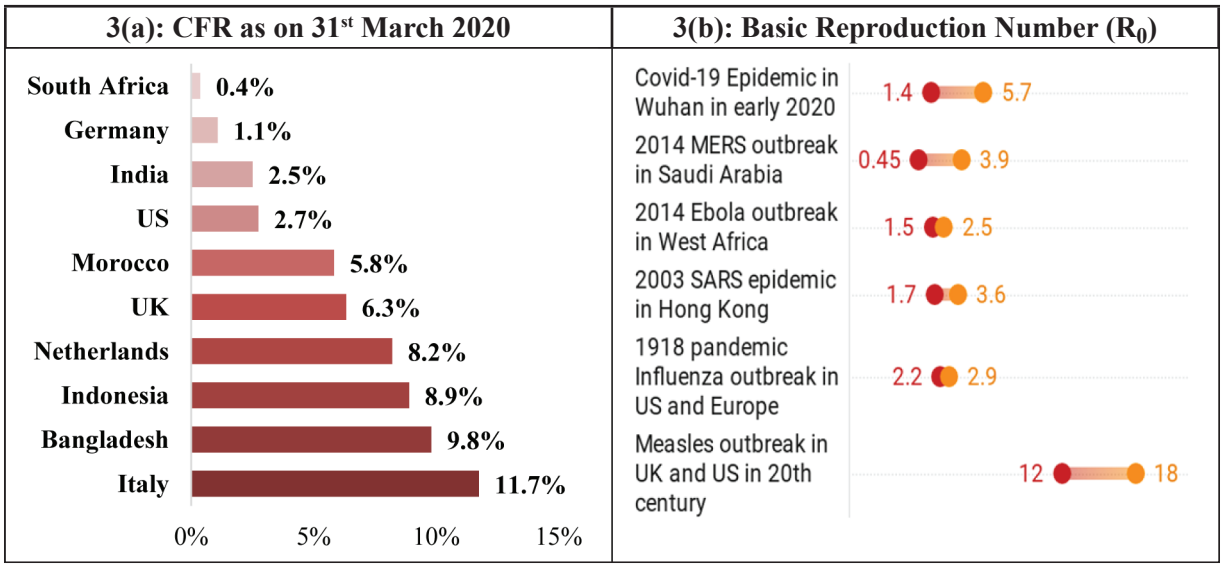
1.8 Two fundamental strategies to combat an epidemic are possible: (a) mitigation, which focuses on slowing the epidemic spread by reducing R_0, and (b) suppression, which aims to reverse epidemic growth by reducing R_0 below 1. Each policy has major challenges. Ferguson et al, 2020 show that optimal mitigation policies (combining home isolation of suspect cases, home quarantine of those living in the same household as suspect cases, social distancing of the elderly and others at most risk of severe disease and use of masks, sanitization & handwashing) might reduce peak healthcare demand by two-thirds and deaths by half. In this scenario, population immunity builds up through the epidemic, leading to an eventual rapid decline in case numbers and transmission dropping to low levels. However, the resulting mitigated epidemic would still likely result in hundreds of thousands of deaths and health systems (most notably intensive care units) being overwhelmed many times over – given that CFR for COVID-19 was high. The death toll of COVID-19 is dreadful, both for those who lose their lives and for their family, friends, colleagues and all whom their lives touched. It would have an adverse impact on economic activity too in terms of loss of productive lives.

1.9 Suppression in the form of national lockdowns carries with it enormous social and economic costs, which may themselves have significant impact on health and well-being in the short and longer-term. Evidence shows that population-wide social distancing would have the largest impact; and in combination with other interventions – notably home isolation of cases and school and university closure – has the potential to suppress transmission below the threshold of R_0=1 required to rapidly reduce case incidence.

Uncertain COVID-19 Parameters in March 2020

1.10 In Epidemiology, two factors are particularly important for evaluating the severity of a contagious disease: first, CFR or the fraction of individuals infected who lose their life due to the disease; second, the basic reproduction number R_0 - the expected number of new cases of the disease caused by a single individual. However, both the indicators were uncertain at the onset of the pandemic and showed wide variation. The CFR was as high as 12 per cent in Italy while the world average was 6 per cent in March, 2020 (Figure 3a). Various studies showed that COVID-19 had a higher range of R_0, than many recent viruses, which aggravated the risk of its contagion (Figure 3b). Another key factor regarding uncertainty in both the CFR and R_0 was the fact that many cases were initially asymptomatic. This made it very difficult to ascertain the true number of individuals infected with COVID-19, and hence determine the CFR and R_0.

Figure 3: Wide Variation in Critical Parameters of COVID-19



Source: Compiled from various sources

1.11 When faced with enormous uncertainty, policies must be designed with the objective of minimizing large losses by selecting the policy that would be optimal under the worst-case scenario (Hansen and Sargent, 2001). This assumed significance given the significant uncertainty around the critical parameters that a priori made it difficult for policy makers to weigh the health benefits of various strategies against their economic damages (Barnett et al, 2020). COVID-19, therefore, presented before the world in March 2020 the predicament of which strategy to choose and whether to save 'lives' or 'livelihoods'.

Higher Speed of Transmission Potential in Dense Areas

1.12 The virus would be transmitted faster when people live in close vicinity or work in close physical proximity in factories, or in service sectors with face-to-face interactions with the public (Box 2). Two important factors that, then, become significant are the absolute population and population density. This is because higher the proxmity between people, higher is the likelihood that an infected person carrying the virus will make contact with a susceptible person. Transmission events occur through contacts made between susceptible and infectious individuals in either the household, workplace, school or randomly in the community, with the latter depending on spatial distance between contacts. This is evident in the spread of COVID-19 wherein countries with higher population have shown higher caseloads and higher fatalities while countries with higher population density have shown higher caseloads though fatalities do not vary much with population density (Figure 4).

Figure 4: Correlation between COVID-19 and Population Parameters

Figure 4a: Total Confirmed Cases and Population

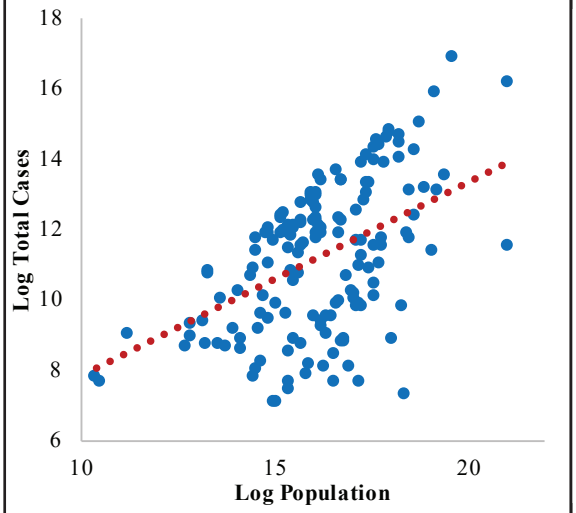


Figure 4b: Total Confirmed Cases and Population Density (per sq.km)

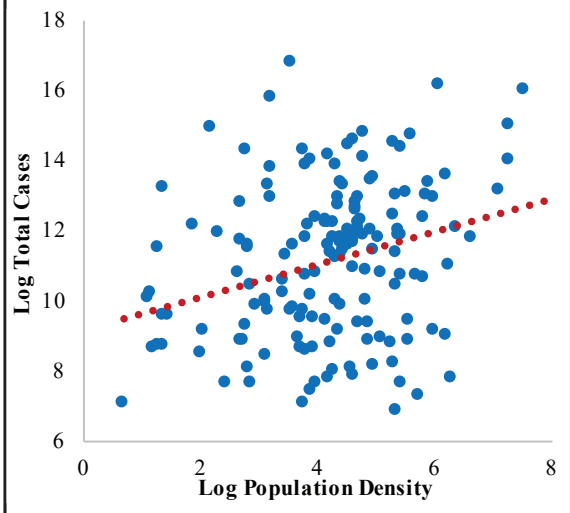


Figure 4c: Total Deaths and Population

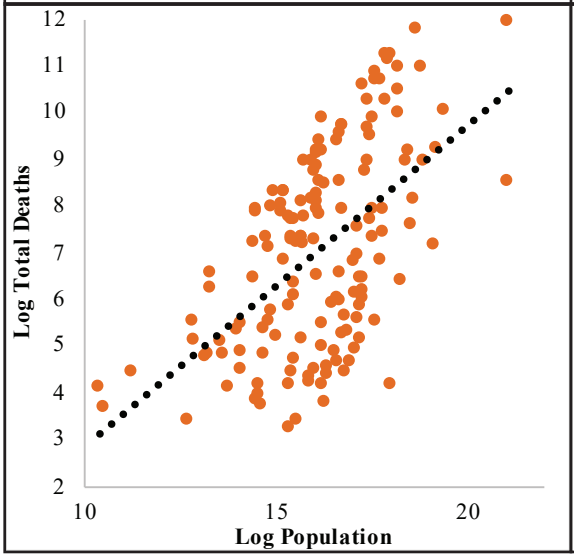
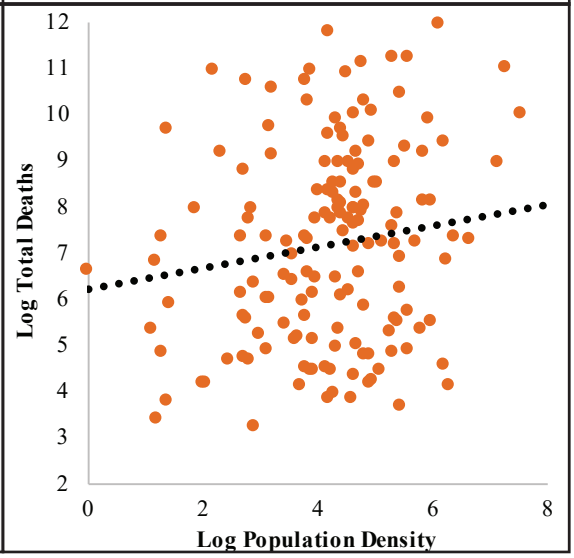


Figure 4d: Total Deaths and Population Density (per sq.km)



Source: Data accessed from World Health Organization as on 31st December, 2020
Note: Top 160 countries in terms of cases and deaths have been taken for the analysis.

Box 2: Network Effects of a Pandemic

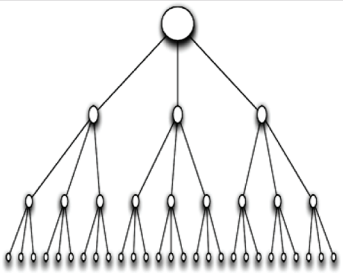
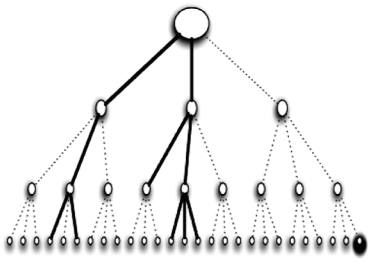
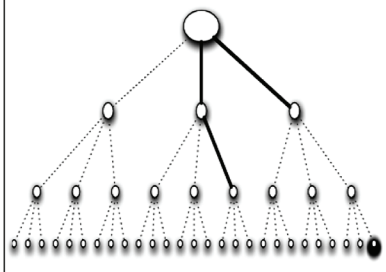
The transmission potential of an epidemic is measured by the basic reproduction number, R_0 - the expected number of new cases of the disease caused by a single individual. R_0 is an interplay between the number of people an infected person meets (k) and the probability with which he spreads the infection to the person he comes into contact with (p). Small changes in (k) and (p) can have a large effect when R_0 is near 1. Suppose R_0 is very slightly below 1, and any one of the factors increases by a little bit; the result could push R_0 above 1, suddenly resulting in a positive probability of an enormous outbreak. The same effect can happen in the reverse direction as well, where slightly reducing the contagiousness of a

disease to push R_0 below 1 can eliminate the risk of a large epidemic. This indicates that around the critical value $R_0 = 1$, it can be worth investing large amounts of effort even to produce small shifts in the basic reproductive number by controlling each of the two factors.

Both (p) and (k) would be impacted by the network structures in a population. Infectious diseases spread through the human social network, and network effects are significant in influencing the spread of disease (David Easley & Jon Kleinberg, 2010). The patterns of spread of epidemics are determined not just by the properties of the pathogen carrying it — including its contagiousness, the length of its infectious period, and its severity — but also by network structures within the population it is affecting. The social network within a population, i.e., the modes of interaction determines a lot about how the disease is likely to spread from one person to another.

The opportunities for a disease to spread are given by a contact network: there is a node for each individual/organization, an edge if two people come into contact with each other in a way that makes it possible for the disease to spread from one to the other and a path linking nodes to edges. A network is said to be connected if any individual (or node) can be reached from any other by following network links; epidemiologically, this is equivalent to infection being able to reach the entire population from any starting point. In this way, each infected individual is linked to one other from whom they caught the infection, and additionally, to a variable number of others to whom they transmitted the disease, thus providing a 'transmission network' consisting of all the links through which infection spread in a single outbreak. For a highly contagious disease, involving airborne transmission based on coughs and sneezes, the contact network will include a huge number of links, including any pair of people who sat together on a bus or an airplane. Thus, network structures in a society become very significant in modelling the spread of a contagious disease and probability of its turning into an epidemic/pandemic.

Mode of Contagion of an Epidemic

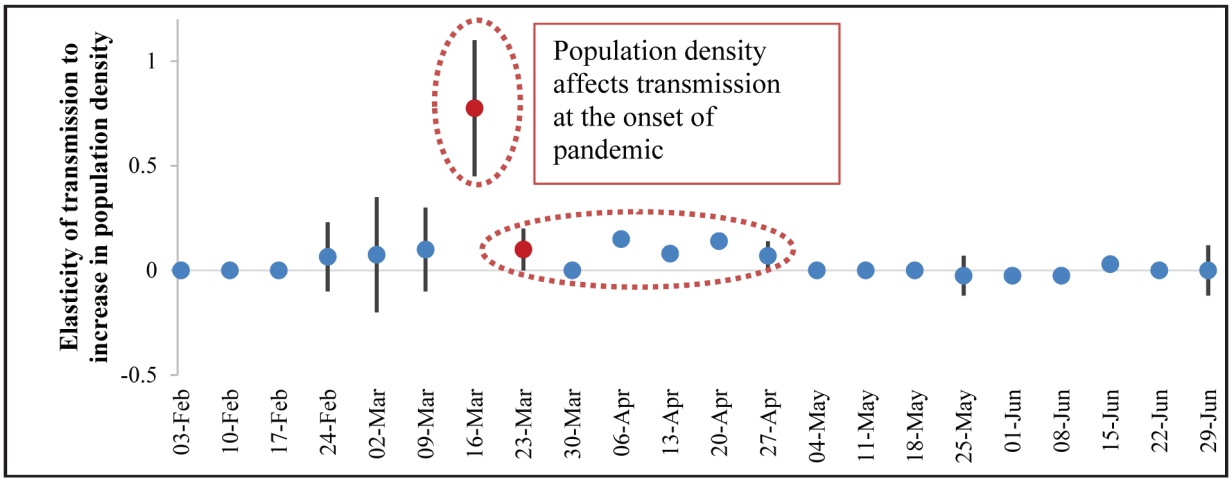
A Contact Network	High Contagion Probability - the Infection Spreads Widely	Low Contagion Probability, the Infection is Likely to Die Out Quickly
		

Adapted from David Easley & Jon Kleinberg, 2010
Note: Bold lines implies spread of infection in the contact network

These epidemic models on networks help to determine the features affecting spread, how interaction within networks can be restricted, and in particular, how it is possible to reduce spreading by means of public health measures such as vaccination, (quicker) diagnosis and treatment, isolation, travel restrictions and so on. A key priority is, therefore, the early and rapid assessment of the transmission potential of any emerging infection.

1.13 For COVID-19 in particular, studies show that density and city size aggravate its spread (Stier et al., 2020; Ribeiro et al., 2020). In dense areas, commuters make more extensive use of public transport. The physical proximity and grouping of people in public transport may also be a source of contagion (Harris, 2020). A study on pattern of spread in the U.S. shows that higher population density is associated with higher transmission rates of the virus (Gerritse, 2020) - population density that is twice as high yields about 0.7 points higher transmission rates (Figure 5). It also shows that the role of population density in transmission peaks during early phase of the pandemic: population density is more strongly linked to high transmission rates in March than it is in April or May. This signifies that denser areas are more vulnerable to faster spread of the virus and this effect is stronger at the onset of the epidemic. This had important policy implications in terms of early measures to prevent spread for a densely populated country like India with more than 130 crore people and a population density of 382 persons per square km versus the global average of 58 persons per square km.

Figure 5: Population Density Affects Transmission in Early Phase of Pandemic



Source: Adapted from Gerritse (2020) (Based on study on pattern of spread in the U.S.)

Efficacy of Lockdowns in a Pandemic: Learnings from Spanish Flu

1.14 Given the uncertainty and potency of the COVID-19 virus, it was prudent to learn from any earlier experience. The Spanish flu pandemic of 1918-19, was one of the deadliest in world history with peak of worldwide mortality in modern times, as it infected around 500 million persons, or about one-third of the world's population, and killed anywhere from 50 to 100 million people (Barro et al, 2020). Like COVID-19, the Spanish flu was highly contagious; it was also unusually lethal for young, "prime-age" adults, especially men. It came in three waves beginning in the spring of 1918. The second wave, in the fall of 1918, was the largest by far in terms of total infections and deaths. A third wave occurred in the spring of 1919. The pandemic began during World War I, and the virus is thought to have been introduced and spread throughout the United States by soldiers returning from Europe. Lockdowns implemented in 1918 resemble many of the policies used to reduce the spread of COVID-19, including school, theater, and church closures, public gathering and funeral bans, quarantine of suspected cases, and restricted business hours. Other public health interventions used were emphasis on hand-washing, sanitization practices and social/ physical distancing.

Box 3: How Handwashing began as a Medical Experiment

Due to COVID-19, handwashing received attention once more after nearly 170 years. It may be unbelievable today, but nearly 200 years ago, doctors did not wear gloves for surgeries and the concept of germs was not known. The germ theory was proposed by Louis Pasteur in 1885.

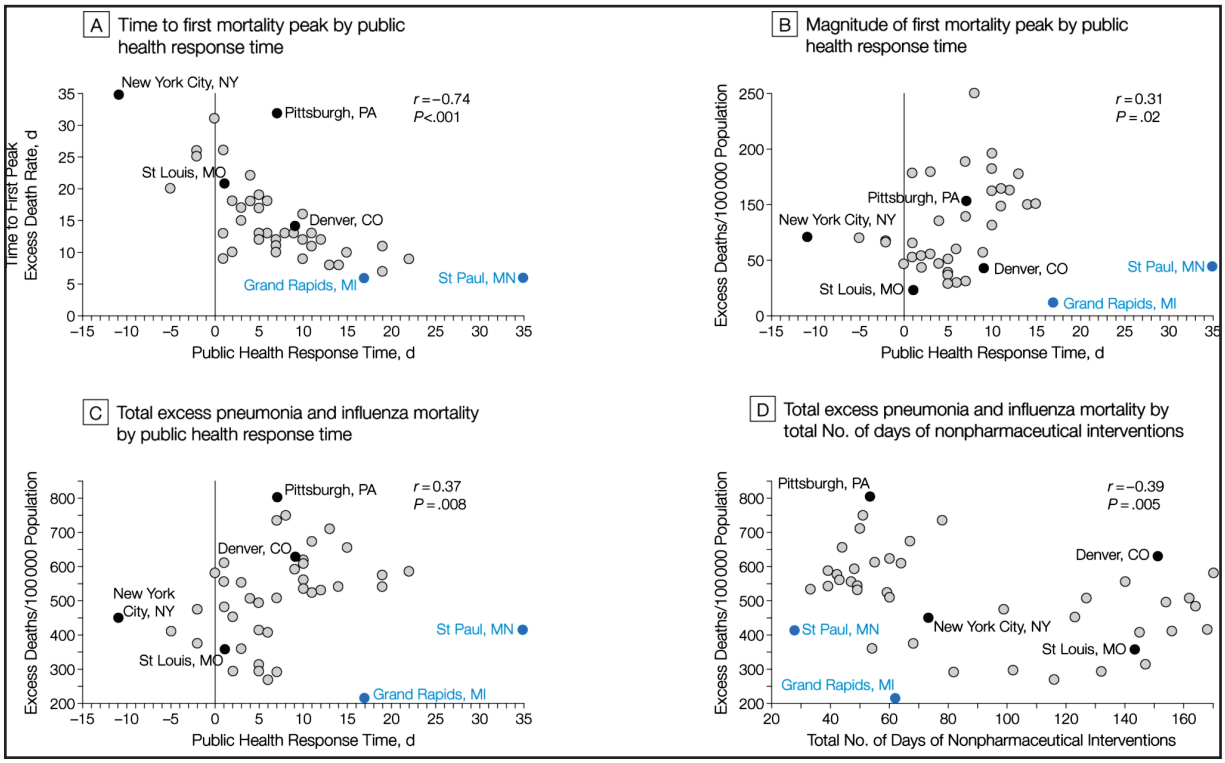
It all started when a young Hungarian physician Ignaz Semmelweis in the obstetrics department of Vienna Hospital is 1846 found, to his surprise, that the mortality rate of his division was sevenfold higher than that of another obstetrics division staffed exclusively by midwives. Upon further investigation, he found that the physicians would start their day by conducting autopsies and then proceeding to labour rooms for conducting deliveries, without cleaning their hands. The nurses and midwives, on the other hand, started their days with deliveries. He then introduced a handwashing policy for all physicians and medical students before they entered the labour room, and within a year, the mortality was brought down to one-sixth of the former number. This was the first scientific proof that handwashing helped in preventing infection, though this did not immediately become popular among doctors. Today, Ignaz Semmelweis is considered the father of hand hygiene and infection control in hospitals.

During the SARS outbreak in 2002-04, the authorities in Hong Kong had advised the public to wash their hands to prevent the spread of the disease. During the COVID-19 pandemic, handwashing has come to the rescue once again. Handwashing is considered a proven and among the most cost-effective public health interventions along with vaccination. This was recognised under the Swachh Bharat Mission in India with a focus to develop the habit of handwashing early at schools under Swachh Bharat: Swachh Vidyalaya.

1.15 The evidence comparing the containment policies of 21 cities during the 1918 H1N1 influenza pandemic shows that social distancing policies reduce transmission (Markel et al., 2007). The scatterplots in Figure 6 display the impact of (i) public health response time, which is shown as the number of days compared to the overall average; negative and lower values thus imply early lockdown while higher values imply a slow response, and (ii) the intensity of the lockdown as measured by the number of days the lockdown was employed. The figure shows that cities that implemented lockdowns earlier delayed the time to peak mortality, reduced the magnitude of the peak mortality as well as the total mortality burden. Similarly, cities that had a more intense lockdown also reduced their total mortality.

1.16 Hatchett et al., 2007 showed that cities in which multiple interventions were implemented at an early phase of the epidemic had peak death rates ~50 per cent lower than those that did not and had less-steep epidemic curves. For COVID-19 too, evidence showed that a combination of three interventions (face masks, physical distancing and handwashing) works better than a single intervention (D.Chu et al, 2020). The chances of infection were around 13 per cent when people maintained a distance of one metre – that reduced to a fifth, that is 2.6 per cent, when a distance of more than one metre was maintained.

Figure 6: Early, Intense Lockdowns Controlled Mortality Due to the Spanish Flu



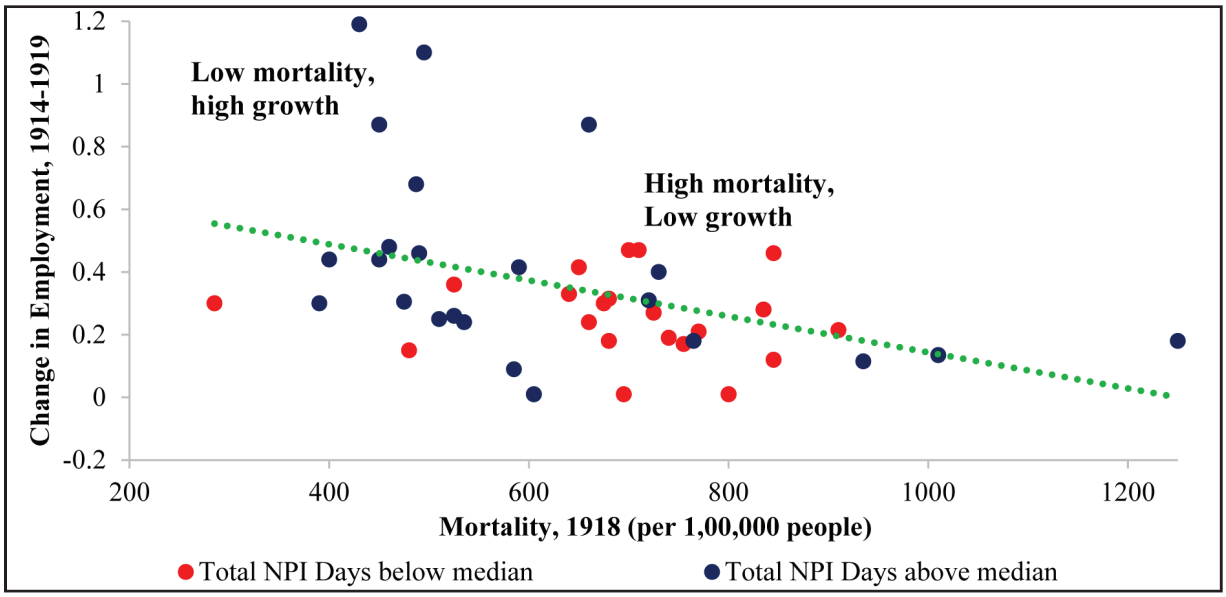
Source: Adapted from Markel et al (2007)

Note: New York and St. Louis used lockdowns promptly and were successful in increasing time to peak (A), decreasing the peak mortality rates (B) and total mortality burden due to Spanish Flu (C and D). The 2 cities represented by blue circles are outliers chosen to demonstrate that the associations shown are not perfect.

1.17 The economic effects of lockdowns could be both positive and negative. All else equal, lockdowns constrain social interactions and thus dampen any economic activity that relies on such interactions. While lockdowns lower economic activity, they have a salubrious effect by delaying the temporal effect of a pandemic, reducing the overall and peak attack rate, reducing the number of cumulative deaths, providing valuable time for production and distribution of pandemic-strain vaccine and antiviral medication and decreasing the burden on health care services and critical infrastructure. US cities' strategy during Spanish flu demonstrated how early and forceful lockdowns do not worsen the economic downturn. On the contrary, it was established that cities who intervened earlier and more aggressively experience stronger recovery in economic front in the long run.

1.18 Correia et al. (2020) use a dynamic difference-in-difference regression approach to examine the impact of lockdowns on control of the Spanish flu and consequent effect on economic activity across cities. The study found that cities that implemented lockdowns for longer tend to be clustered in the upper-left region (low mortality, high growth), while cities with shorter lockdowns periods are clustered in the lower-right region (high mortality, low growth). This suggests that lockdowns play a critical role in attenuating mortality, but without reducing economic activity and contribute to faster growth in the medium term (Figure 7).

Figure 7: Lockdowns are Effective in Reducing both Mortality and Unemployment



Source: Adapted from Correia et al. (2020)

1.19 It also shows that implementing lockdowns earlier in the pandemic and using them more intensely produced significantly higher rates of growth in manufacturing output and employment from 1919 to 1923 than did slower activation or less intense use of lockdowns. Estimates from the study indicates that a one standard deviation increase in the speed of adopting lockdowns (8 days) is associated with 4 per cent higher growth of employment and 5 per cent higher output after the pandemic, while a one standard deviation increase in lockdown intensity leads to 6 per cent higher employment growth and 7 per cent higher output. The findings suggest that pandemics can have substantial economic costs, and lockdowns can lead to both better economic outcomes and lower mortality rates (Figure 8).

Figure 8: Effectiveness of Lockdowns in Enabling Faster Economic Recovery

Figure 8a: Duration of NPIs and Log Manufacturing Employment

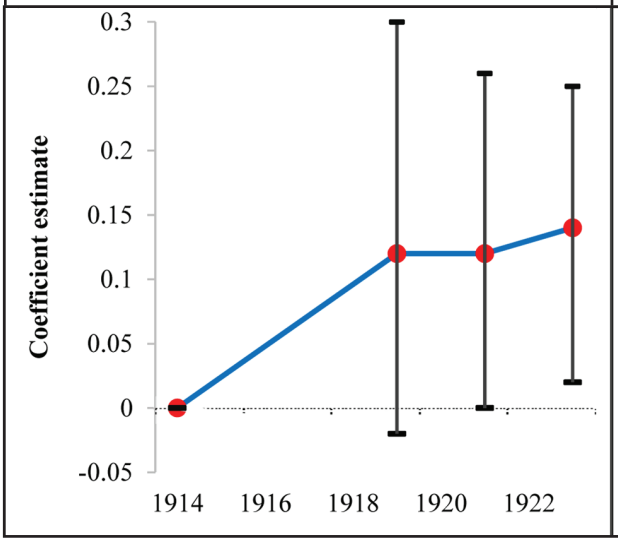


Figure 8b: Speed of NPI and Log Manufacturing Employement

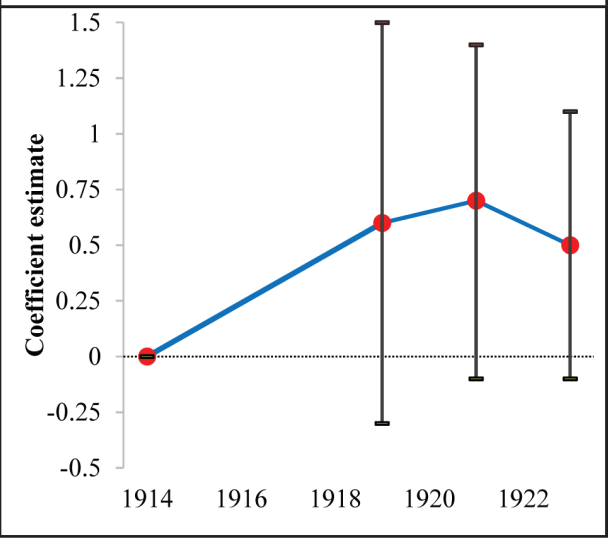


Figure 8c: Duration of NPIs and Log Manufacturing Output

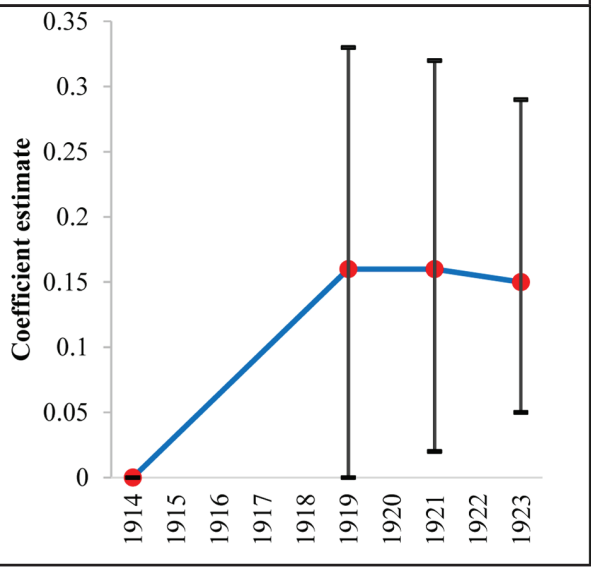
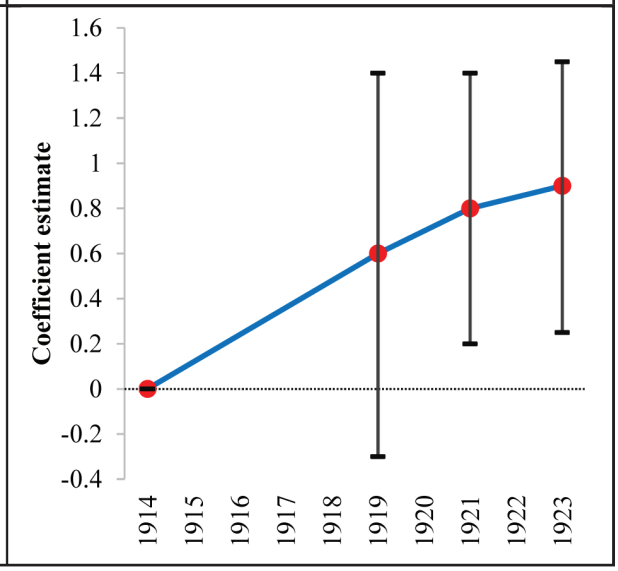


Figure 8d: Speed of NPI and Log Manufacturing Output



Source: Adapted from Correia et al. (2020)

1.20 Learning from the experiences of the Spanish Flu, two basic kinds of public-health measures to control spread of COVID-19 were adopted: quarantining people to reduce the quantity of people interacting and encouraging behavioral measures such as better sanitary practices to reduce the spread of germs. Several countries, therefore, resorted to use of lockdowns in the initial phase of the pandemic lockdowns of varying degrees to ensure that people stayed at home, minimizing the spread of the infections.

1.21 The above learnings from research in epidemiology and economics, especially the research focused on the Spanish Flu, guided India's policy response. In sum, the learnings were as follows:

a. The pandemic curve needs to be 'flattened' to spread the pandemic over time and enable more people to receive proper health treatment, thereby lowering the fatality rate ultimately.

b. Given the network structures that affect the transmission of the pandemic, higher population can lead to faster spread of the pandemic.

c. Denser areas are more vulnerable to faster spread of the virus and this effect is especially strong at the onset of the pandemic.

d. Early lockdowns delay the time taken to reach the peak, reduces the magnitude of the peak, and thereby decreases the total mortality burden by providing valuable time to ramp up the health and testing infrastructure.

e. Implementing lockdowns earlier in the pandemic and using them more intensely – while costly in the short-run – led to a much sharper economic recovery and reduced mortality as well.

f. When faced with enormous uncertainty, policies must be designed with the objective of minimizing large losses by selecting the policy that would be optimal under the worst-case scenario.

INDIA'S HUMANE POLICY RESPONSE: SHORT-TERM PAIN, LONG-TERM GAIN

1.22 In the absence of a potent cure, preventive vaccine; interplay of network structures in densely populated areas, and a high CFR, India weighed the costs and opportunities strategically. The limits of scientific understanding of the disease, lack of good data on the mode of spread and potency of the virus made it difficult to model the likely impact of different policy options in a reliable and timely way. To aggravate the uncertainty, it was estimated that India would have 30 crore cases and several thousand deaths by the end of May, 2020 (Klein et al., 2020).

1.23 Given that India is the second largest populated country in the world with a high density, the transmission potential of COVID-19 was high. The pace of spread of the virus through contact, probable transmission from asymptomatic cases, the disproportionately higher mortality seen among individuals of the age more than 60 years and the escalation of the pressure on the health infrastructure of many developed countries were alarming and increased the potential threat to 'lives'. In the absence of both a vaccine and a treatment, failing to impose restrictions on the free movement of individuals during the pandemic would have exposed the population to a contagious threat, thereby leading to deaths in enormous numbers. However, the economic impact of the lockdowns and closure of economic activity would have adversely impacted the 'livelihoods' of people. COVID-19, therefore, posited complex and multi-faceted health and socio-economic trade-offs for policymakers – whether to save 'lives' or 'livelihoods'.

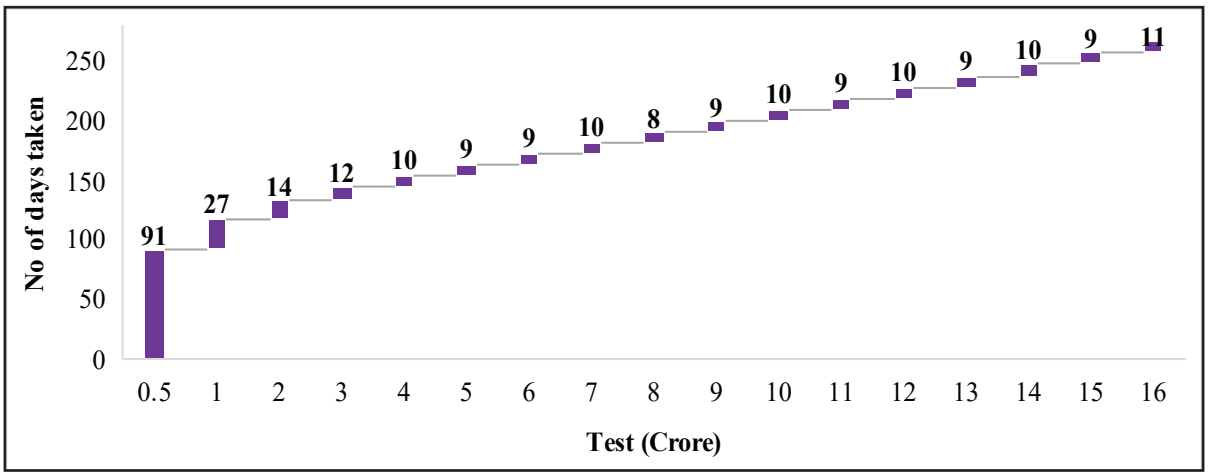
1.24 Evidence showed that the timing of intervention was crucial as population density plays a crucial role in aggravating spread at the onset of a pandemic and that speed and duration of lockdowns help in keeping mortality in control. Learning from the Spanish Flu experience also showed that timing matters - early and extensive lockdowns led to greater delays in reaching peak mortality, lower peak mortality rates and overall lower mortality burden. Swift lockdowns also had no adverse effect on local economic outcomes. On the contrary, cities that intervened earlier and more aggressively experience a relative increase in real economic activity after the pandemic.

1.25 Given the 'black swan event' marked by sheer uncertainty and once in a century crisis, Indian policymakers followed an approach similar to the Barbell strategy in finance – hedging for the worst outcome initially, and updating its response step-by-step via feedback. The clear objective of 'Jaan Hai to Jahan hai' and to 'break the chain of spread' before it reaches 'community transmission' helped the government face the dilemma of 'lives vs livelihood', pace the sequence of policy interventions and adapt its response as per the evolving situation. India was amongst the first of the countries that imposed a national lockdown when there were only 500 confirmed cases. The stringent lockdown in India from 25th March to 31st May was necessitated by the need to break the chain of the spread of the pandemic. This was based on the humane principle that while GDP growth will come back, human lives once lost cannot be brought back.

1.26 The 40-day lockdown period was used to scale up the necessary medical and para-medical infrastructure for active surveillance, expanded testing, contact tracing, isolation and management of cases, and educating citizens about social distancing and masks, etc. The lockdown provided the necessary time to put in place the fundamentals of the '5 T' strategy - Test, Track, Trace,

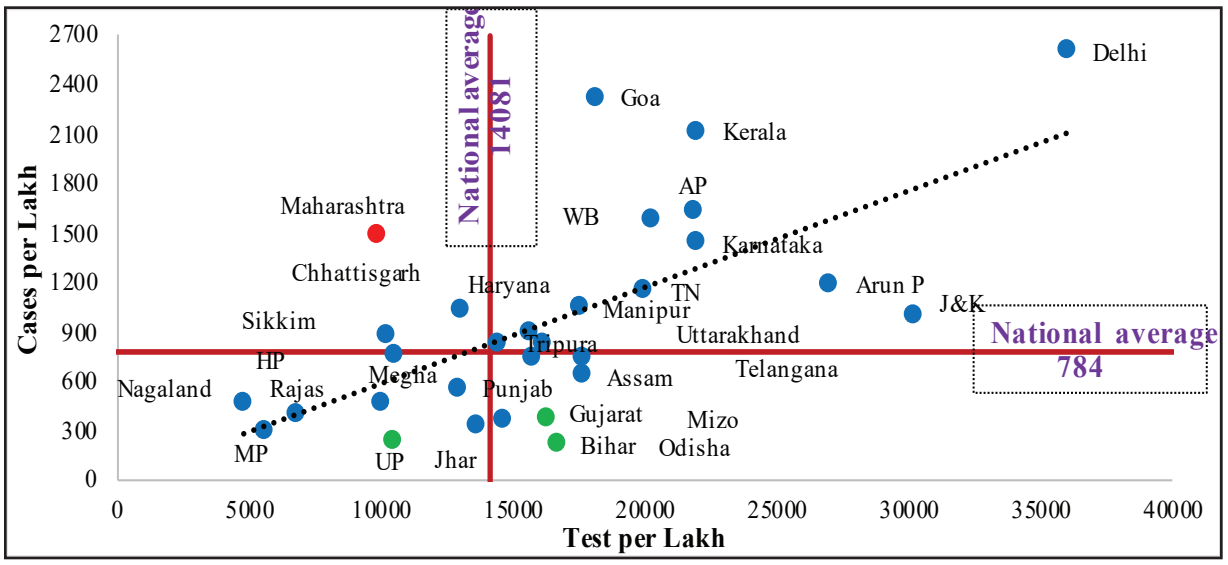
Treat, Technology. As the first step towards timely identification, prompt isolation & effective treatment, higher testing was recognized as the effective strategy to limit the spread of infection. At the onset of the pandemic in January, 2020, India did less than 100 COVID-19 tests per day at only one lab. However, within a year, 10 lakh tests were being conducted per day at 2305 laboratories. The country reached a cumulative testing of more than 17 crore in January, 2021. The sharp decline in the number of days to add the next cumulative 1 crore tests show the dedicated efforts to expand the testing infrastructure (Figure 9). The requisite resources of PPEs, masks and sanitizers were also expanded at a fast pace. The emphasis placed on testing is corroborated in Figure 10, which shows that States that ramped up the testing facilities were able to control the spread of COVID-19.

Figure 9: Ramping up Testing Facilities in India



Source: Data accessed from https://www.Covid19india.org/, Ministry of Health and Family Welfare (MoHFW)

Figure 10: Ramped up Testing Effective in Control of COVID-19



Source: Data accessed from Covid19india.org, MoHFW – data as on 31st December, 2020

1.27 The districts across India, based on number of cases and other parameters were classified into red, yellow and green zones. Across the country, 'hotspots' and 'containment zones' were

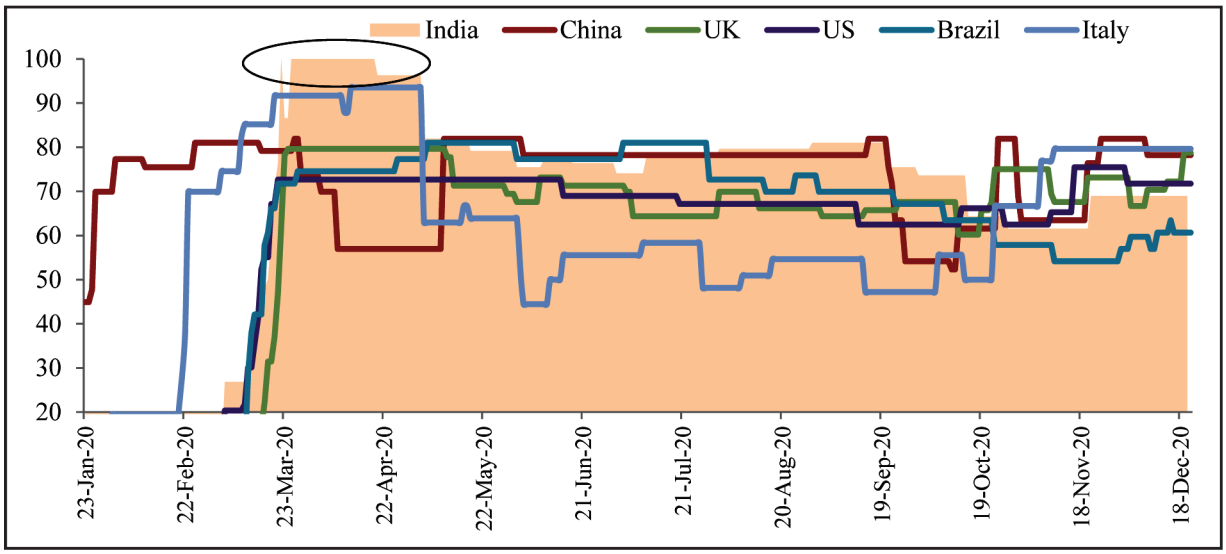
identified – places with higher confirmed cases increasing the prospect of contagion. This strategy was increasingly adopted for intensive interventions at the local level as the national lockdown was eased. This enabled a smooth transition to 'Jaan bhi aur Jahan bhi'.

1.28 The analysis in the chapter makes it evident that India was successful in flattening the pandemic curve, pushing the peak to September. India managed to save millions of 'lives' and outperform pessimistic expectations in terms of cases and deaths. It is the only country other than Argentina that has not experienced a second wave. It has among the lowest fatality rates despite having the second largest number of confirmed cases. The recovery rate has been almost 96 per cent. India, therefore, seems to have managed the health aspect of COVID-19 well.

EFFICACY OF INITIAL LOCKDOWN IN CONTROLLING THE PANDEMIC

1.29 COVID-19 prompted a wide range of responses from governments around the world. The Oxford COVID-19 Government Response Tracker (OxCGRT), provides a systematic way to track government responses to COVID-19 across countries. Common lockdowns used included school closings, travel restrictions, bans on public gatherings, emergency investments in healthcare facilities, new forms of social welfare provision, contact tracing, wide scale testing and other interventions to contain the spread of the virus, augment health systems, and manage the economic consequences of these actions. However, government policy responses have varied substantially—both across countries, and often within countries—in the measures that they have adopted and how quickly they have adopted them. As is evident from Figure 11, the policy response in top major five affected countries varied over time. India imposed the most stringent lockdown (equal to 100 as per the index) for around a period of forty days from late March to early May – this was when it had total cases of only around 500-600 cases. As a comparison, stringency in US was around 72 only during that period when it already had 1 lakh cases. As on date, India has a declining trend in daily new cases which has dropped below 20,000 and lowest CFR despite having second largest number of total cases. US is still seeing around 2 lakh daily new cases.

Figure 11: Variations in Stringency of Lockdowns in Top 5 Countries

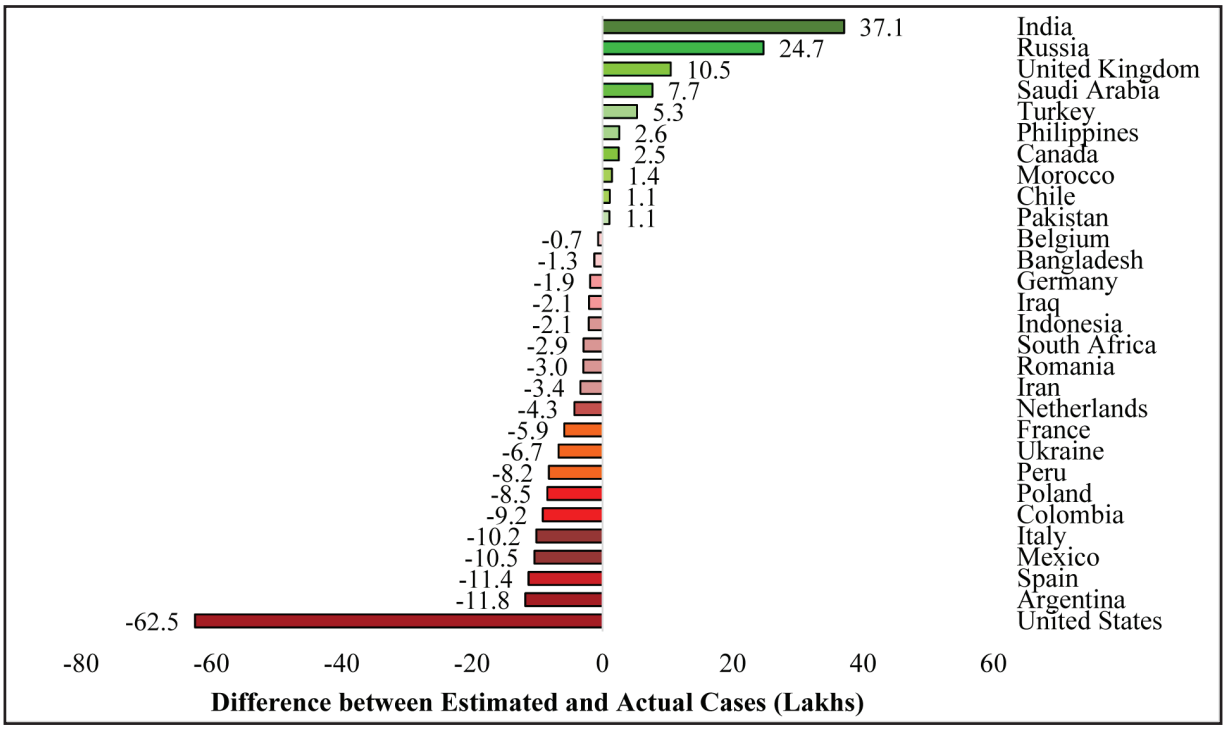


Source: Oxford COVID-19 Government Response Tracker – data as on 31st December, 2020

Cross-Country Analysis

1.30 Survey has analyzed if the policy response across countries was effective in controlling the spread of the pandemic and associated fatalities across countries. To assess this, the counter-factual is estimated, i.e., what would have been the natural caseload and associated fatalities purely based on the population, population density and the demographics of the population. Given the network effects that affect the spread of the pandemic, the size of the population, population density as well as the demographics, especially the proportion of the elderly population, affect the caseload across countries. Moreover, the number of tests conducted also impact the caseload. Therefore, using a panel regression model, natural expected per capita cases has been estimated using mentioned explanatory variables (Box 4). A second regression model is used to estimate the effect on per capita fatalities of the number of cases per capita, the proportion of elderly who are more likely to suffer fatal consequences than other sections of the population as well as the health infrastructure as captured by the number of hospital beds per capita. The sample includes the top 30 countries in terms of total confirmed cases, which represent 86 per cent of the world caseload, from March to December 2020 (details of the model are in Box 4). After estimating the natural caseload and fatalities, the actual cases and deaths are compared with these estimates. The analysis shows that India has been able to effectively manage both the spread of COVID-19 and the fatalities. India has 37.1 lakh less cases than what was estimated by the model while the actual cases in US are more than the estimated cases by 62.5 lakh cases (Figure 12).

Figure 12: Management of COVID-19 across Countries (Measured as Actual Cases *vis-à-vis* Naturally Expected)



Source: Survey calculations; Positive (negative) number implies actual cases less (more) than naturally expected

Box 4: Assessing the Management of COVID-19 across Countries and within States in India

To assess the effectiveness of the policy response to COVID-19, we have to estimate the counter-factual, i.e., what would have been the natural caseload and associated fatalities purely based on the population, population density, the demographics of the population and the number of tests conducted. Using a regression model, we estimate the effect on per capita cases of each of these explanatory variables. Our sample includes the top 30 countries in terms of total confirmed cases, which represent 86 per cent of the world caseload, from March to December 2020.

We estimate the following panel regression model:

$$Log\ (No\ of\ total\ cases\ per\ lakh_{ct}) = \alpha_1 + \beta_1 * Log\ (population_c) + \beta_2 * Log(population\ density_c) + \beta_3 * log(Total\ tests\ per\ lakh_{ct}) + \beta_4 * Log\ (\%\ of\ population\ above\ 60\ years_c) + \beta_5 * Log\ (\%\ of\ population\ between\ 0\text{-}14\ years_c) + \beta_6 * Log\ (\%\ of\ population\ between\ 15\text{-}59\ years_c) + \varepsilon_{ct}\ ,$$

where c denotes country and t denotes month. Note that the inclusion of the log of proportion of the population above 60 years, 0-14 years and that between 15-59 years does not generate a problem of multi-collinearity as the log transformation ensures that these variables are not linearly dependent. In other words, log x_1, log x_2 and log $(1\text{-}x_1\text{-}x_2)$ are not linearly dependent.

The following panel regression model has been estimated to estimate deaths using the same group of countries:

$$Log(new\ deaths\ per\ lakh_{ct}) = \alpha_t + \beta_1 * Log\ (No\ of\ total\ cases\ per\ lakh_{ct}) + \beta_2 * Log\ (\%\ of\ population\ above\ 60_c) + \beta_3 * Log(No\ of\ beds\ per\ 1000\ pop_c) + \varepsilon_{ct}$$

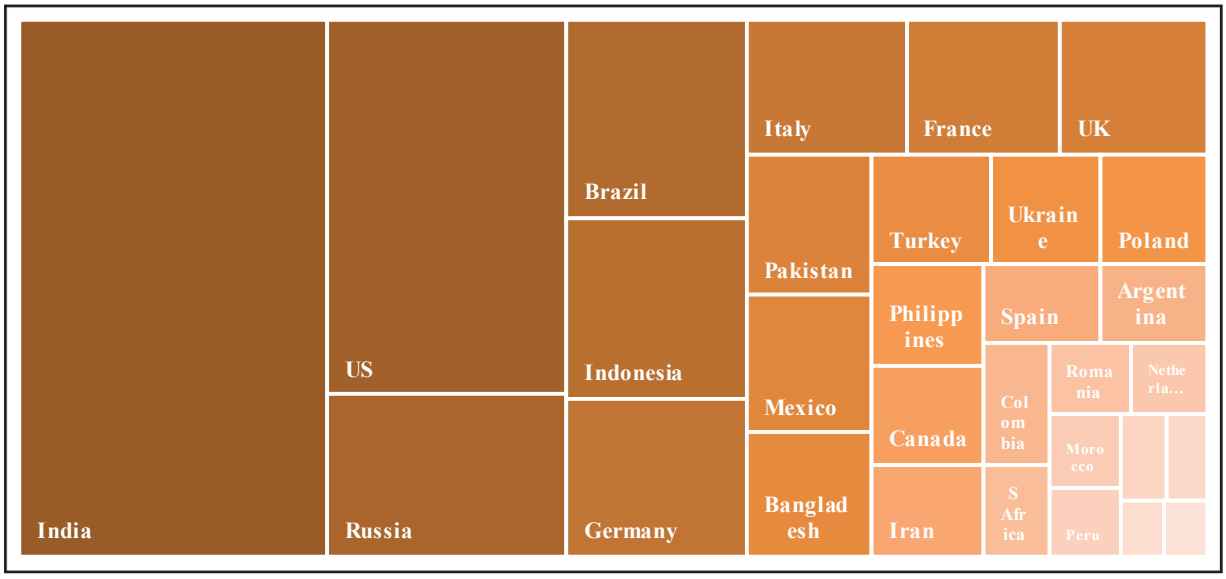
where c denotes country and t denotes time period.

As COVID-19 has been more lethal on aged population, taking into account per cent of population above 60 years helps us to control for demographic heterogeneity across countries. The number of beds per thousand has been taken as a proxy for health facilities that affects the number of deaths.

Similar models were estimated across 30 Indian States and Union Territories as well. In this model, c denotes States instead of countries.

1.31 Although all age groups are at risk of contracting COVID-19, older people face significant risk of developing severe illness if they contract the disease due to physiological changes that come with ageing and potential underlying health conditions. Though India has a young population with only around 10 per cent share of people above 60 years of age, the population of people above 60 years of age is significantly higher in India than in any of the 30 countries that account for 86 per cent of the cases (Figure 13). If we take the total cases in India as estimated by the analysis above and apply the CFRs of countries with comparable proportion of old age people and CFRs of some worse affected countries, it is evident that India has been able to save a large number of lives (Figure 14).

Figure 13: Elderly Population (above 60 Years of Age) is Much Higher in India than Other Countries



Source: Data accessed from World Population Prospects 2019, United Nations

Figure 14: Estimated Lives Saved in India Using Case Fatality Rates (CFR) of Other Countries

Figure 14a: Using CFR of Countries with Similar Demographics

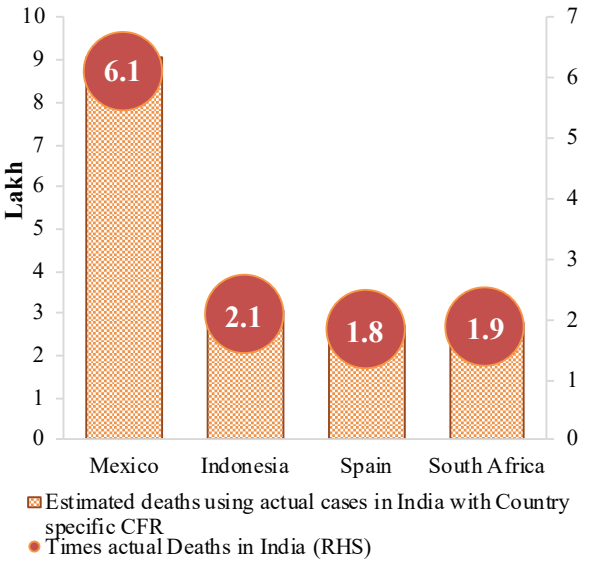
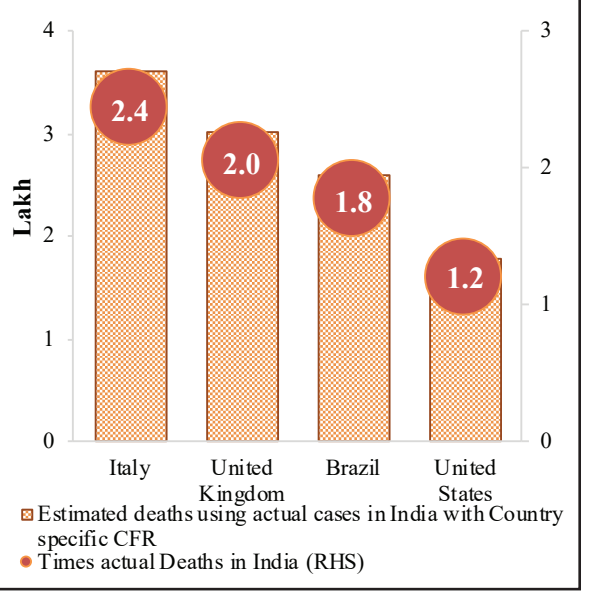


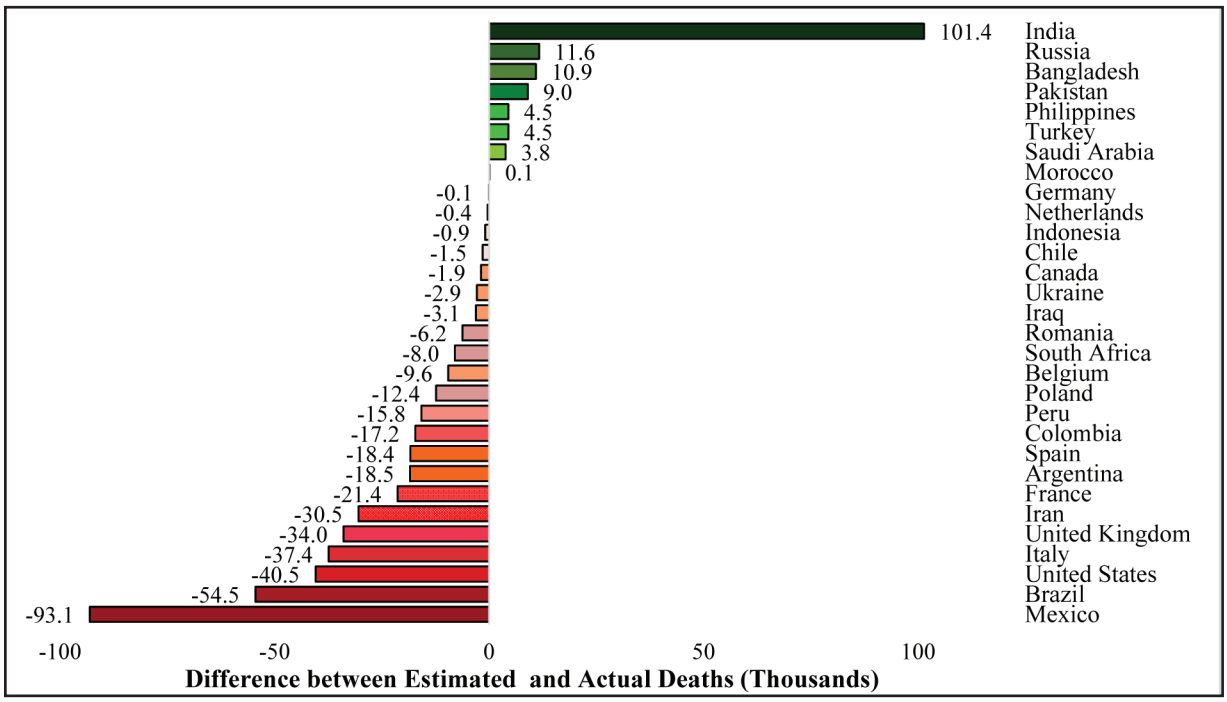
Figure 14b: Using CFR of Worst-Affected Countries (as Measured by Total Number of Deaths)



Source: Survey calculations

1.32 The model used for estimating the number of deaths across countries also shows that India has been successful in controlling deaths and saving lives (Figure 15).

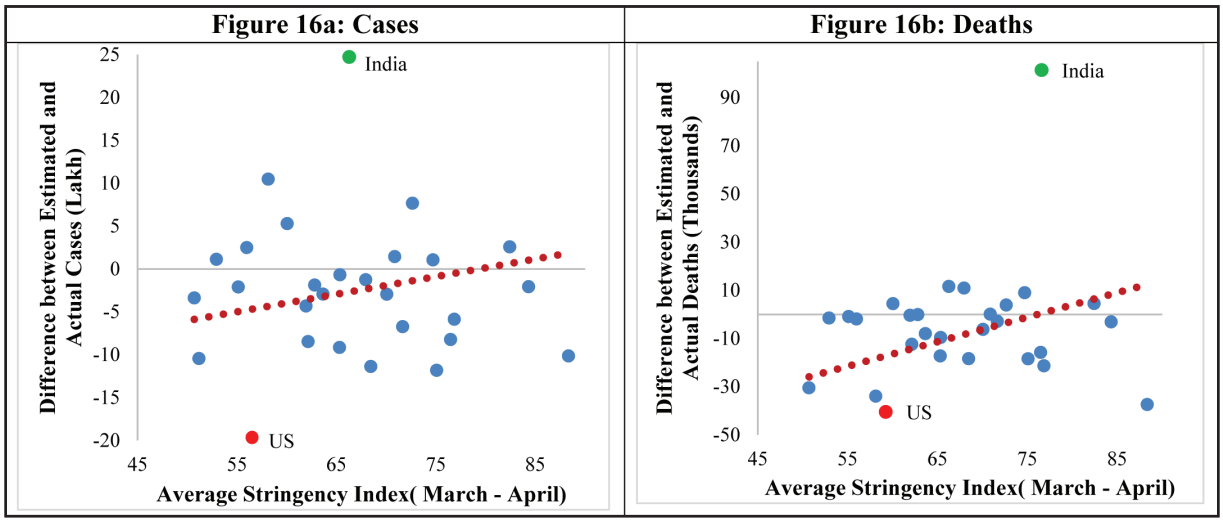
Figure 15: Management of COVID-19 across Countries (Measured as Actual Deaths *vis-à-vis* Naturally Expected)



Source: Survey calculations; Positive (negative) number implies actual deaths less (more) than naturally expected

1.33 Collating the results of the analysis with the stringency of lockdowns across countries show that higher initial stringency in countries in March-April, 2020 had a significant impact on controlling the number of confirmed cases and deaths (at 10 per cent level of significance). India has been a clear outlier both in cases and deaths (Figure 16).

Figure 16: Effectiveness of Initial Stringent Lockdown in Control of COVID-19 Cases and Deaths across Countries



Source: Survey calculations

1.34 The cross-country analysis above demonstrates clearly that the intense lockdown helped India to effectively manage the pandemic. Given the diversity within India, an inter-state analysis

is also informative to assess States that were able to manage the spread of COVID-19 well. The network impact of COVID-19 is evident in India with States with higher population and population density having witnessed higher spread of cases and weak in case of deaths (Figure 17).

Figure 17: Correlation between COVID-19 and Population Parameters

Figure 17a: Total Confirmed Cases and Population

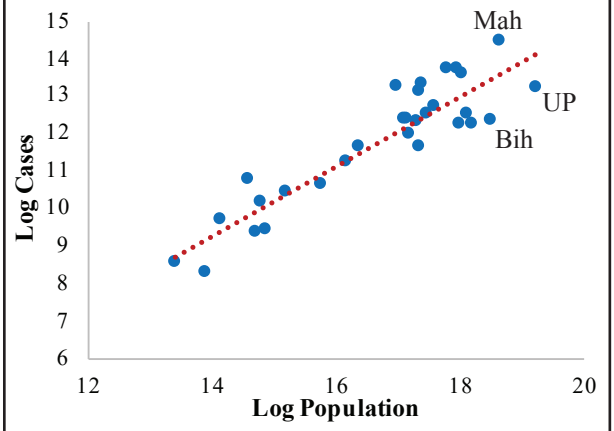


Figure 17b: Total Confirmed Cases and Population Density (per sq.km)

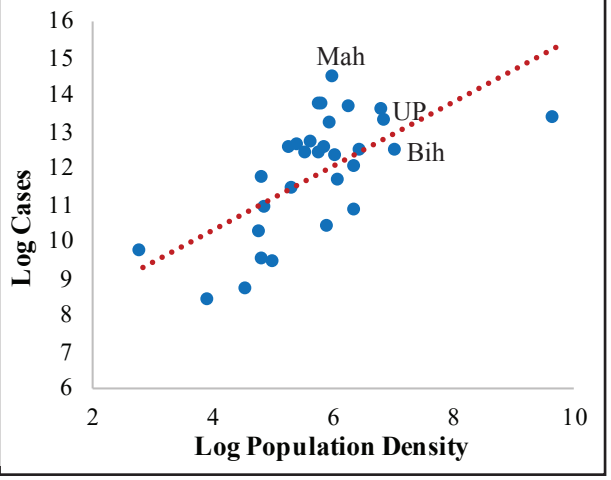


Figure 17c: Total Confirmed Cases and Population

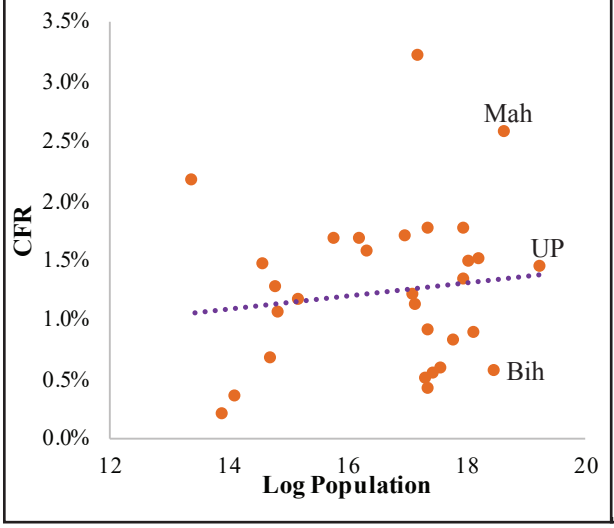
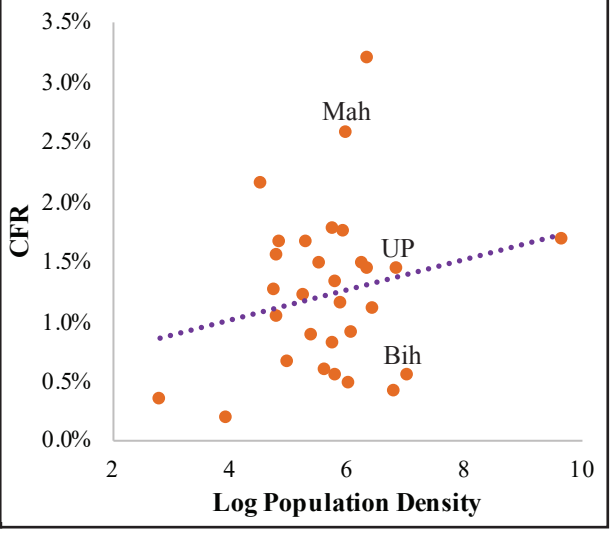


Figure 17d: Total Confirmed Cases and Population Density (per sq.km)

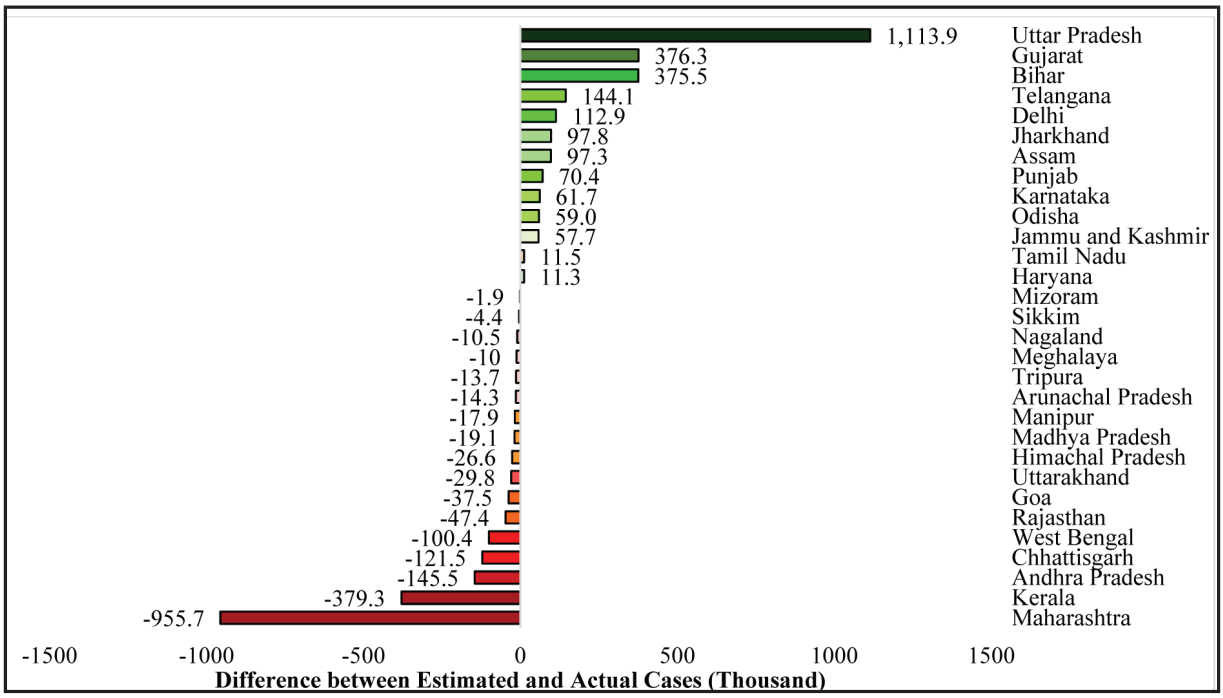


Source: Data accessed from https://www.Covid19india.org/ and MOHFW - Data as on 31st December, 2020

1.35 The model shows that Maharashtra has performed the worst in number of cases and deaths. In terms of estimated cases, Survey compares Maharashtra with Uttar Pradesh and Bihar; as seen in the top-left panel of figure 17, these three States have the most population with Bihar and Maharashtra having almost identical population. But Maharashtra has a lower population density than both Bihar and Uttar Pradesh. Yet, Uttar Pradesh and Bihar have much lower cases than what is naturally expected while Maharashtra had much higher cases. In fact, highly populous, densely populated

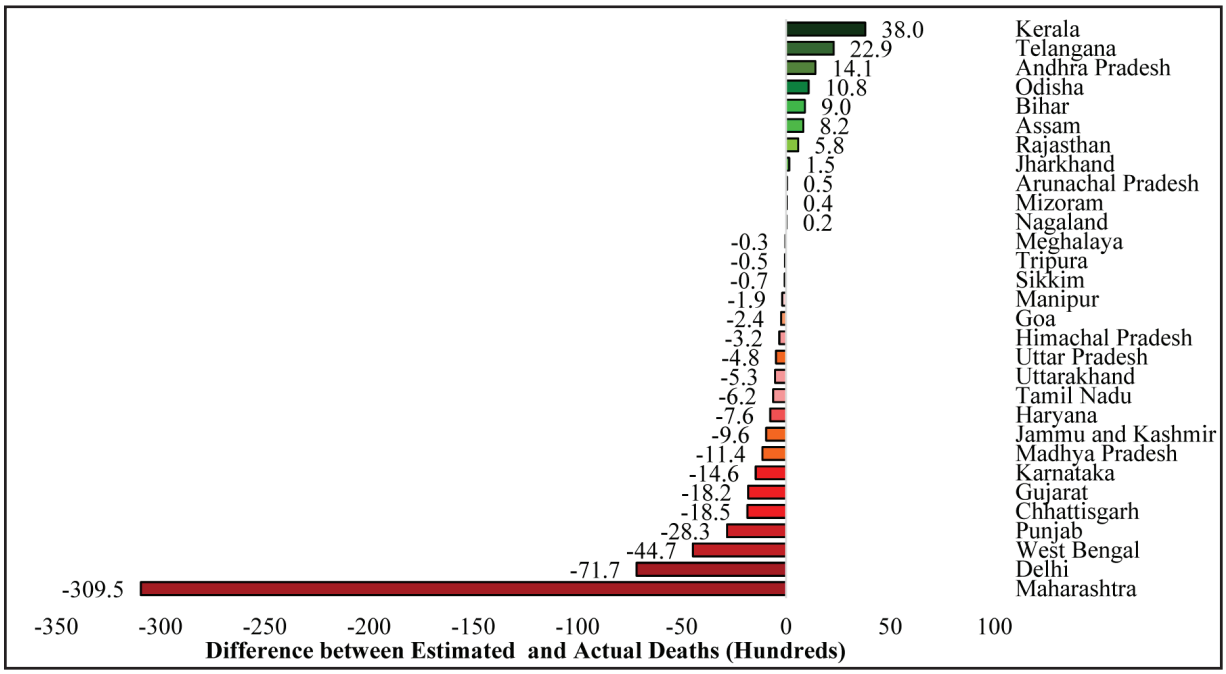
States like Uttar Pradesh (with a density of 690 persons per square km) and Bihar (with a density of 881 persons per square km) – as against the national average of population density of 382 persons per square km – have managed the pandemic well (Figure 18). This ultimately held India in good stead. In terms of deaths, Kerala, Telangana and Andhra Pradesh have managed it effectively (Figure 19).

Figure 18: Management of COVID-19 by States in India (Measured as Actual Cases vis-à-vis Naturally Expected)



Source: Survey Calculations; Positive (negative) number implies actual cases less (more) than naturally expected

Figure 19: Management of COVID-19 by States in India (Measured as Actual Deaths vis-à-vis Naturally Expected)



Source: Survey calculations; Positive (negative) number implies actual deaths less (more) than naturally expected

1.36 A measure of the COVID-19 induced restrictions imposed by governments (Centre and State) have been developed as a State-wise Stringency index (Box 5). After the nation-wide lockdown was gradually eased, States were advised to impose restrictions as per the spread of the pandemic in the State; thus the stringency of lockdown varied across States over time. Figure 20 shows that higher initial stringency in States during the period June to August has a significant impact in controlling the spread in cases and deaths (at 10 per cent level of significance).

Box 5: Stringency Index for States in India

Objective of the stringency index is to capture the strictness of 'lockdown style' policies of respective States that primarily restrict people's behaviour. Index measures government responses by tracking 12 indicators. The information has been collated from State and Centre government specific lockdown orders, press releases, newspaper articles etc (Table B1).

Table B1: Description of Indicators

No	Containment/Closure Indicators	Include/ description
C1	Inter state movement	Public and private transport
C2	Intra state movement	Public and private transport
C3	Night Curfews	Restriction on movement/opening
C4	Shops & other business establishment	Shops and industrial units
C5	Services	Restaurants, Hotel & hospitality
C6	Places of Worship	Temple, Masjid, Church and others
C7	Entertainment	Theatres, Cinema hall, Entertainment parks
C8	Personal Services	Spa, Parlor and salon
C9	Work Places	Government and private offices
C10	School/Colleges	School, college and educational institutions
C11	Large public Gathering	Social/political/religious/academic/cultural/sports
C12	Marriage & funeral gathering	People allowed in particular events

Table B2: Description of Indicators

Indicator Values	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
0	No restriction	No restriction	No restriction	No restriction	No restriction	No restriction	No restriction	No restriction	No restriction	No restriction	No restriction	No restriction
1	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP	Open with SOP
2	E pass/ Capacity restriction	E pass/ Capacity restriction	8 hours	Capacity/ Time Restri-ctions	Capacity restriction	Capacity restriction	Capacity restriction	Capacity/ Time Restri-ctions	Capacity restriction	Voluntary Basis for higher classes	Capacity-100	marriage 50 funeral-20
3	Closed	Closed	More than 8 hours	Closed	Take away	Closed	Closed	Not allowed	Closed	Training Institutes/ Higher Education	less than 100	less than 50
4	-	-	-	-	Closed	-	-	-	-	Closed	Restricted	Restricted

Note: SOP – Standard Operating Procedure.

Sub-indices value (Ij) from C1to C12 is derived using formula as:

$$I_j = \frac{C_j}{N_j} \times 100 \Rightarrow (1)$$

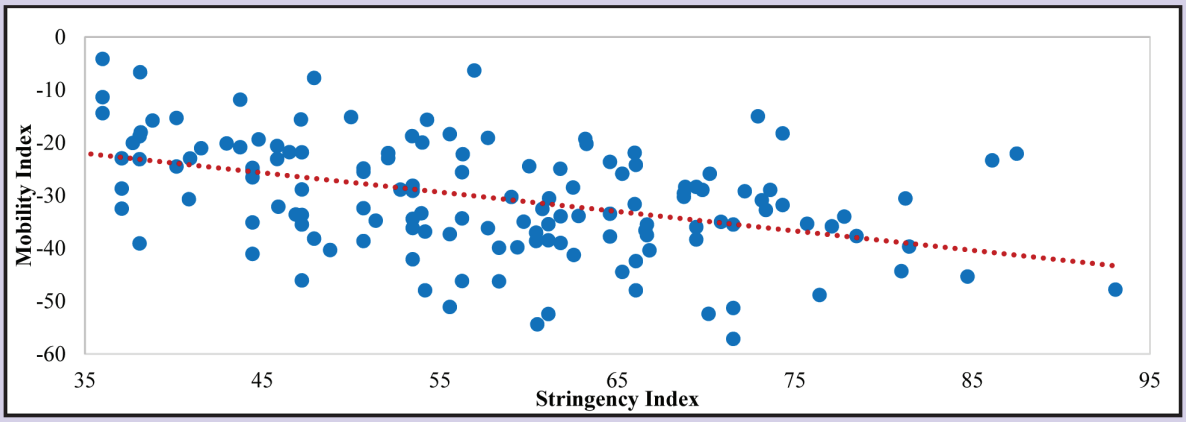
Where C stands for containment measures defined in Table 1. C_j is the ordinal value and N_j is the maximum ordinal value of indicator C_j.

The value of the index is the average of 12 sub-indices pertaining to the individual policy indicators, each taking a value between 0 and 100.

$$Stringency\ \ Index\ \frac{1}{12}\sum_{j=1}^{12} I_j 0\ \Rightarrow (2)$$

The Stringency Index is validated with the trends in google mobility index - higher the restrictions lower is the human mobility.

Stringency Index and Mobility Index



Source: Google Mobility Report and Stringency Index of DEA.
Data is state-wise for June-October. Larger the value of Stringency index stricter are the restrictions.
Note: Google Mobility index is average of the monthly averages of daily values of five variables excluding Residence.

Figure 20: Higher Initial Stringency was Effective in Controlling Actual COVID-19 Spread and Deaths in States

Figure 20a: Cases

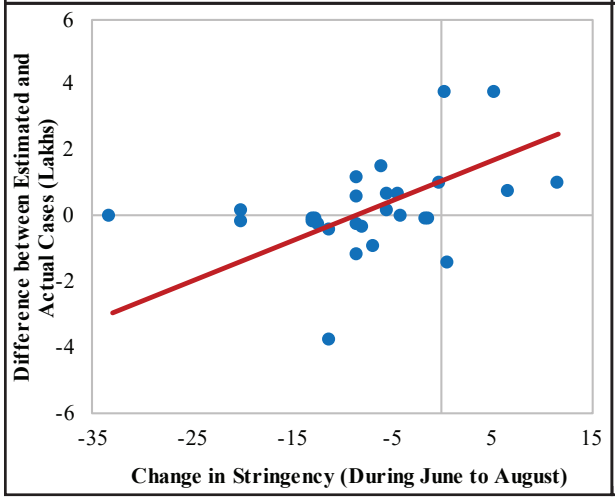
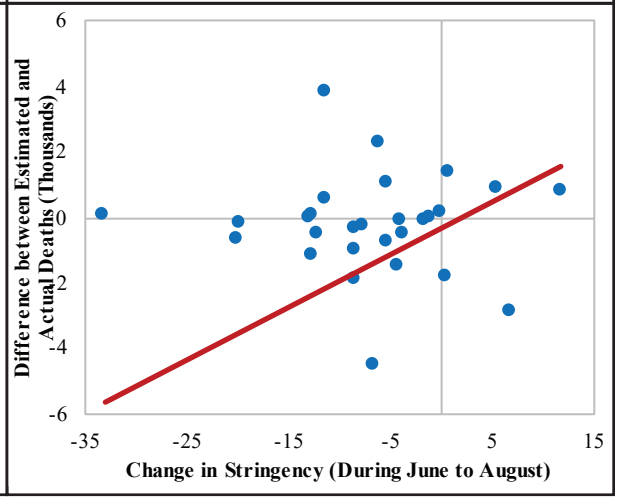


Figure 20b: Deaths



Source: Survey calculations

Box 6: From correlation to causality

The significant correlation of the difference between expected and actual cases and deaths, and the economic variables with the state level stringency index implies that the stringency of the lockdown had a causal impact on these outcomes.

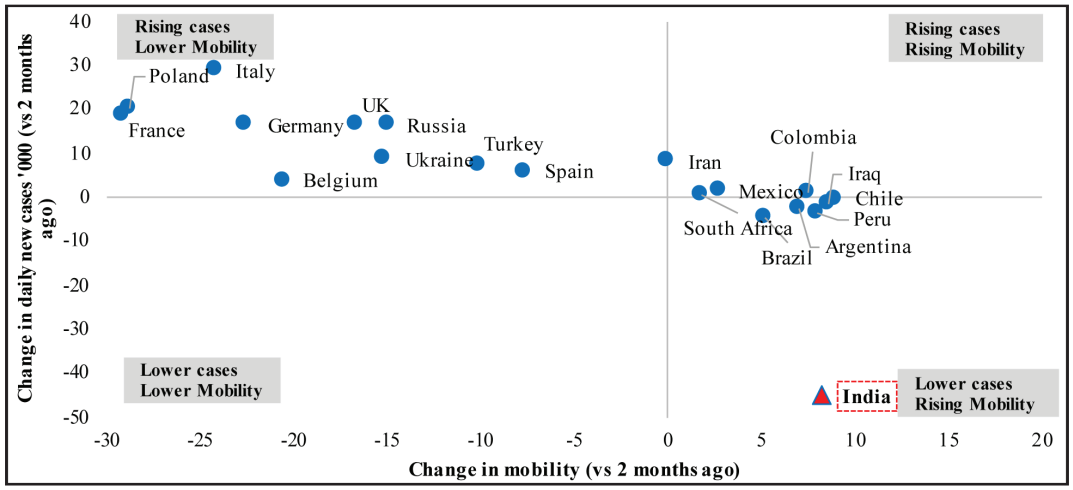
First, any unobserved factor that is peculiar to India - such as higher immunity levels, universal BCG vaccination, or any other socio-economic factor cannot be accounting for the correlations between the deaths and economic variables at the state level with the stringency of the lockdown measured at the state level. This is because these correlations exploit differences across States in the deaths and economic variables, on the one hand, and the differences in the stringency of the lockdown across States. By construction, these differences across states remove the influence of any peculiarity that is specific to India. Therefore, these correlations cannot be due to the influence of some observed or unobserved characteristic that is peculiar to India.

Before interpreting a correlation as a causal relationship, a second concern that econometricians worry about stems from the possible reverse causality, i.e., that the future deaths or economic variables cause the initial lockdown. Of course, this is not possible. A more nuanced concern in this context is that the stringency of the lockdowns at the state level were precisely because of the anticipated difference between actual and estimated cases or deaths. Given the enormous uncertainty that policy makers faced when making the lockdown decisions, such precise expectations during the lockdown is indeed extremely far-fetched. Therefore, the evidence that has been documented indeed shows convincingly that the stringent lockdown saved lives and supported a V-shaped recovery across all the economic indicators.

INDIA: RIDING AGAINST THE WAVE

1.37 India, in fact, has been an outlier in its experience with COVID-19. It reached its first peak in mid-September, after which rising mobility has been accompanied with lower daily new cases (Figure 21). Globally, many European countries and US have been facing deadly second and third waves around this time with easing of lockdowns and increasing mobility. Most countries had to re-impose intermittent lockdowns while India has been increasingly unlocking. These trends reinforce that India has been effective in combating the COVID-19 pandemic.

Figure 21a: Rising Mobility and Falling Cases in India



Source: Data accessed from https://www.Covid19india.org/ and MOHFW - Data as on 31st December, 2020

Figure 21b: Daily COVID Cases and Mobility

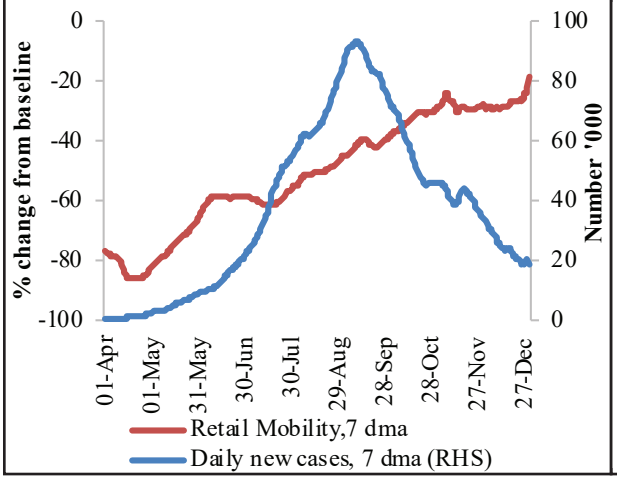
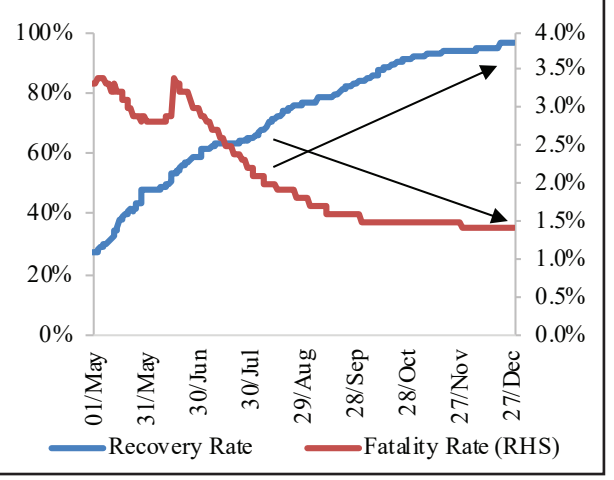


Figure 21c: Recovery Rate vs Fatality Rate



Source: Data accessed from https://www.Covid19india.org/ and MOHFW - Data as on 31st December, 2020

1.38 As of January 15, 2020, the spread of the pandemic has been effectively controlled. The number of days to add an additional 10 lakh confirmed cases has been increasing since September, 2020 (Figure 22a). India took 168 days to reach the first 10 lakh cases – largely due to the stringent lockdown in the initial days. The lockdown, in effect, pushed the epidemic curve ahead and gave time to policymakers to build up the testing and health infrastructure to cope up with the increasing caseload once lockdowns were eased – in effect shifting the peak of the pandemic to September. The institutional capacity built during the initial period helped to cope with the peak caseload and sustain the controlled spread after the peak. Among the worst affected countries, India took around 175 days to reach the peak from its first 100 cases while most countries reached their first peak in less than 50 days (Figure 22b). This may have led to overwhelming of their health capacity.

Figure 22: Shifting of the Peak of the COVID-19 Curve in India

Figure 22a: Days to Reach Next 10 lakh Confirmed Cases in India

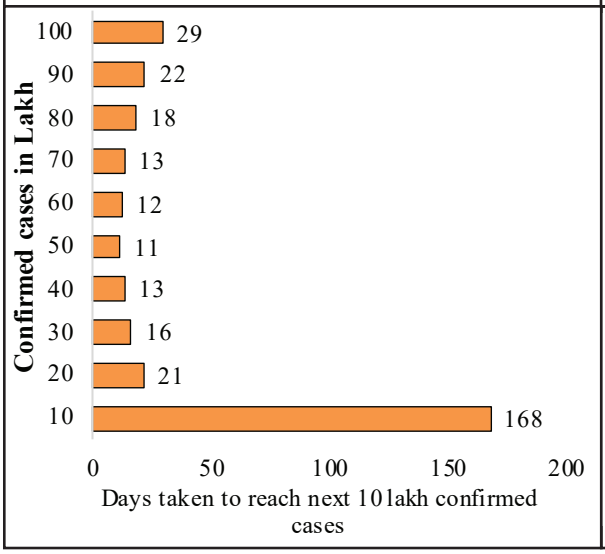
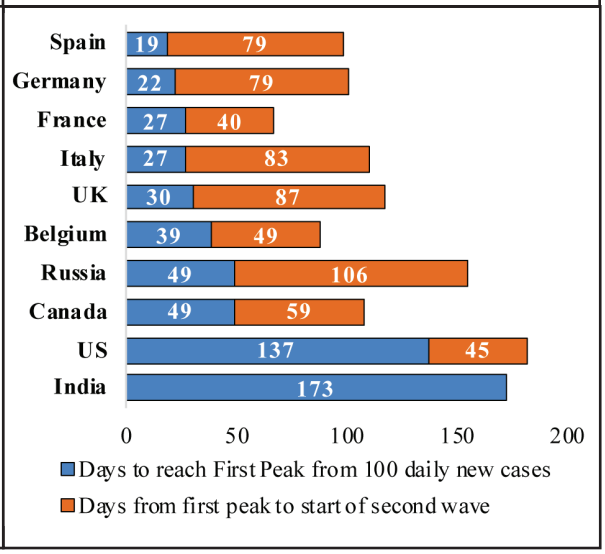


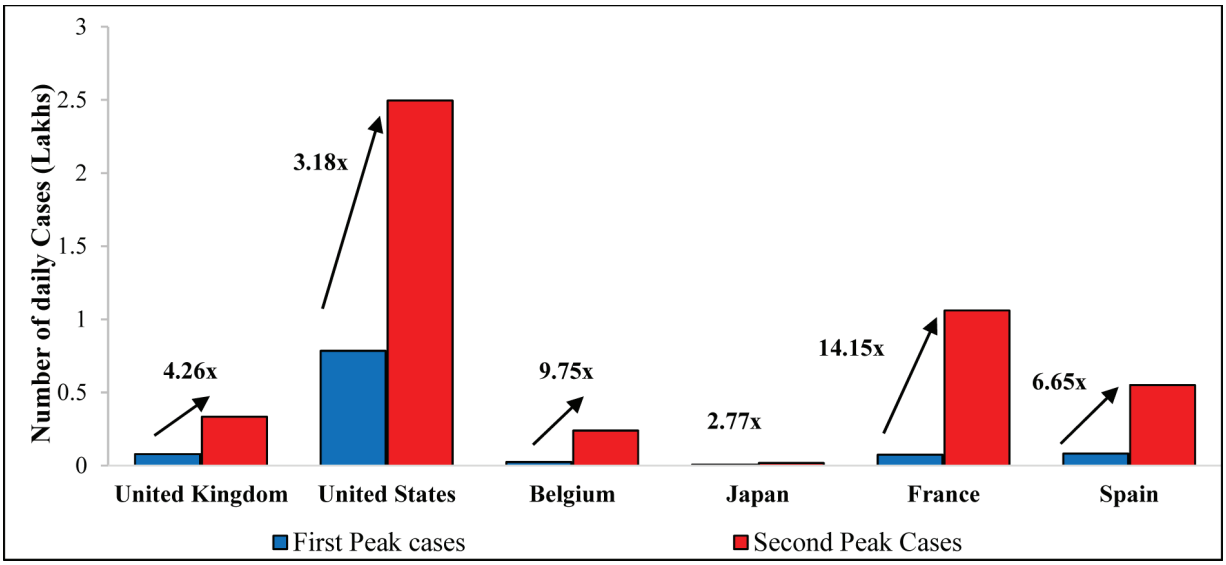
Figure22b: Peaking Time of COVID-19 in Top Countries



Source: Data accessed from https://www.Covid19india.org/ and MOHFW - Data as on 31st December, 2020

1.39 Also, most countries experienced their subsequent waves within a period of 2-3 months of crossing their first peak. These second waves have been more lethal in terms of number of cases. (Figure 23). The fatalities in US were 2.9 times higher during second wave. The prospect of India facing a strong second wave is receding with the start of the vaccination this year.

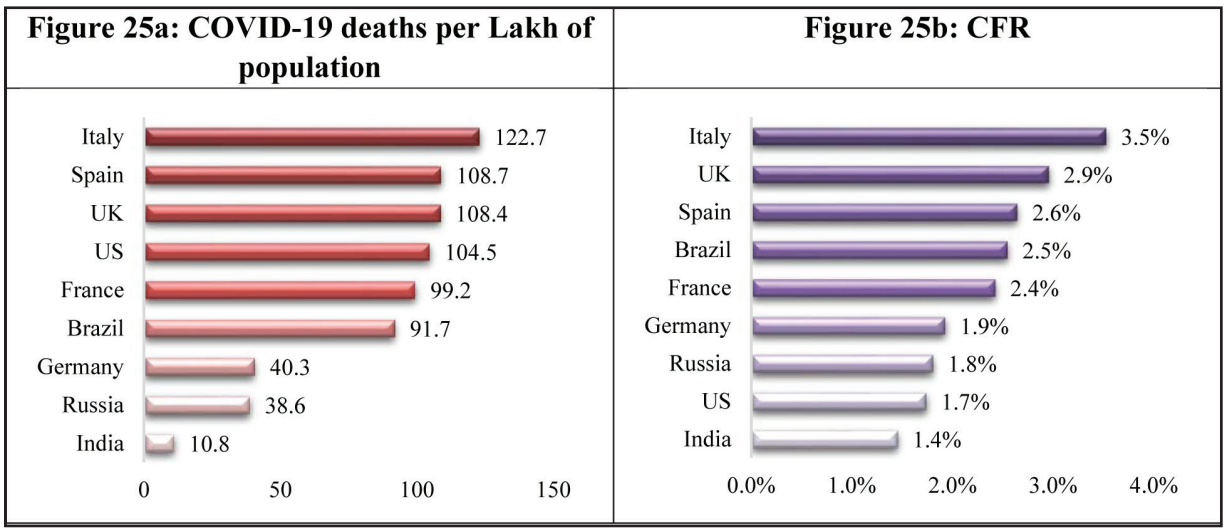
Figure 23: Second Wave in Countries Has Been More Lethal



Source: Survey Calculation

1.40 From the peak of 97,900 new cases in a day on September 16, 2020, the COVID-19 curve has flattened with a decline in the number of active cases and new daily cases (Figure 24).

Figure 25: Comparison of COVID-19 Deaths in Top 10 Worst Affected Countries



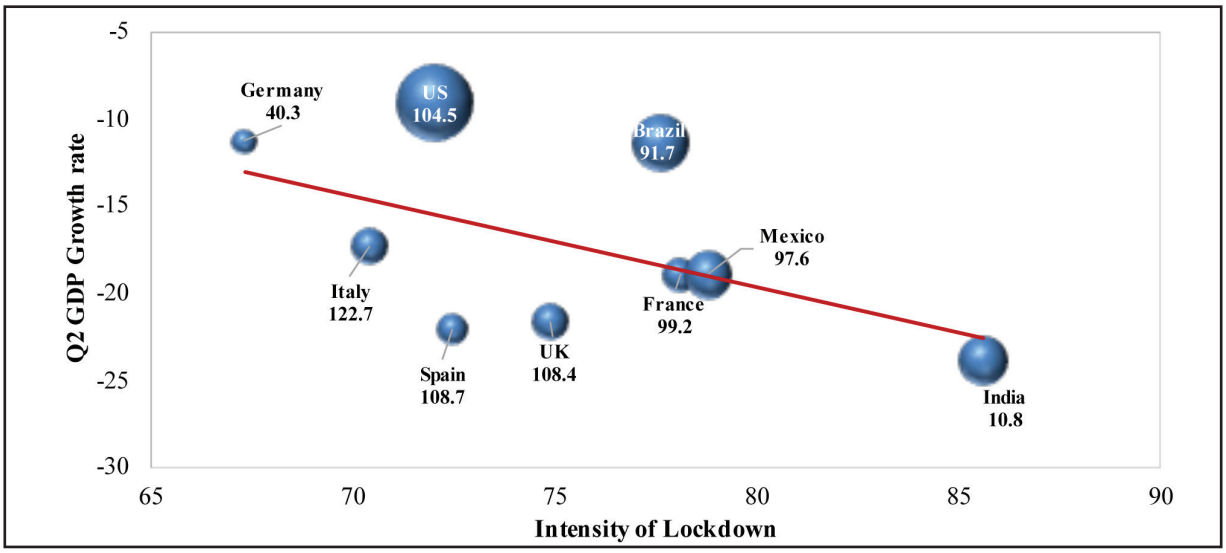
Source: Data accessed from Covid19india.org, MoHFW as on 31st December, 2020

1.41 India's strategy of imposition of a stringent lockdown in the initial stages to control the spread and focus on ramping up testing infrastructure and health facilities are validated by this analysis. The lockdown, therefore, was a critical instrument in "flattening the curve" and saving lives.

V-SHAPED ECONOMIC RECOVERY DUE TO TIMELY STRINGENT LOCKDOWN

1.42 Evidence from the experience of Spanish flu establishes that cities that intervened with lockdowns earlier and more aggressively experience stronger recovery in economic front in the long run. Learning from this experience, India implemented an early and stringent lockdown from late March to May to curb the pace of spread of COVID-19. With the economy brought to a standstill for two complete months, the inevitable effect was a 23.9 per cent contraction in GDP as compared to previous year's quarter. This contraction was consistent with the stringency of the lockdown (Figure 26).

Figure 26: Correlation between Stringency and GDP Contraction during Apr-June, 2020



Source: Compiled from various sources

Note: Bubble size corresponds to number of deaths as on 31st December, 2020; number of deaths per lakh indicated with the bubble

1.43 The economy was gradually unlocked since June, 2020 and has experienced a V-shaped recovery since then. An attempt has been made to capture the impact of the stringency of lockdown on high-frequency indicators of economic activity States across India. The contemporaneous as well as lagged impact of change in stringency of lockdown across States on month-on-month growth of varied economic indicators from time period since unlock begins i.e., from June to October has been studied (Box 7). The state-wide Stringency Index as detailed in Box 4 has been used for the analysis. It may be noted that April and May had similar stringency across States as mandated by Central Government.

Box 7: Using First-Differences to Avoid Spurious Correlations

Time series data on various economic indicators commonly exhibit a trend effect i.e., to grow over time

Example: $y_t = \alpha_0 + \alpha_1 * t + e_t$, $t = 1, 2, \ldots$ where e_t represents errors that are i.i.d., independent and identically distributed.

In this case, it can be seen that $\Delta y = y_t - y_{t-1} = \alpha_1$ Thus, the first difference of y_t does not have a time-trend incorporated into it.

Granger and Newbold (1974) argued that the "levels" of many economic time-series are integrated or nearly so. As a result, if such data are used in a regression model a high R2 value

is likely to be found even when the time-series for the two variables are independent of each other, thus leading to spurious estimates of the correlation between the two variables. They also illustrated that the regression residuals are likely to be autocorrelated, as evidenced by a very low value for the Durbin-Watson (DW) statistic.

Granger and Newbold (1974) present strong evidence that regressions involving random walks are spurious when performed on the levels, but not on the differences. Therefore, instead of levels, using first difference i.e., $\Delta y_t = y_t - y_{t-1}$ avoids the problem of spurious correlations.

1.44 Table 1 shows the negative relationship between the month-on-month change in economic indicators with the month-on-month change in stringency index, thereby corroborating that the lockdown negatively impacted economic activity contemporaneously.

Table 1: Contemporaneous Impact of Stringency Index on Economic Indicators

Dependent Variable (MoM Change)	Electronic toll (ETC) collection	Electronic toll (ETC) Count	Number of E-Way Bills	Value of E-way Bills
Stringency Index (MoM Change)	-0.528***	-0.703***	-0.239	-0.203*
	(0.135)	(0.156)	(0.158)	(0.121)
Constant	0.0760***	0.0875***	0.123***	0.104***
	(0.0258)	(0.0298)	(0.0306)	(0.0233)
R^2	0.123	0.158	0.015	0.019

Source: Survey Calculation
Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

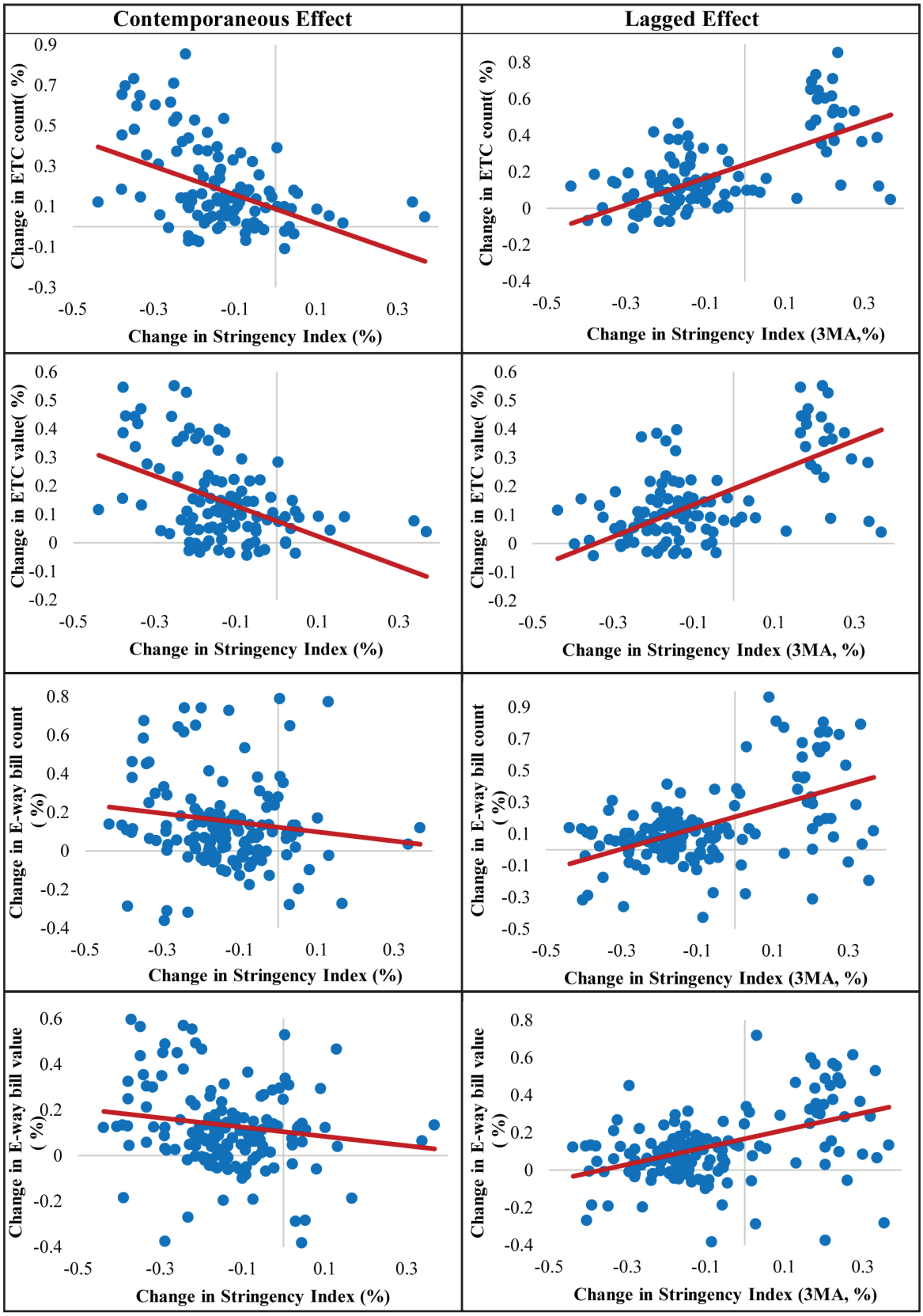
1.45 To capture the lagged impact of stringency on economic indicators, a three-month moving average of stringency index has been used. The Survey see that the month-on-month change in the three-month moving average of the stringency index has a positive relationship with the growth in each of the economic indicators (Table 2). Thus, the initial stringent lockdown has supported a V-shaped recovery across all the economic indicators (Figure 27 and 28).

Table 2: Impact of 3-Month Moving Average of Stringency Index on Economic Indicators

Dependent Variable (MoM Change)	ETC collection	ETC Count	Number of E-Way Bills	Value of E-way Bills
3_MA_Stringency Index (MoM Change)	0.560***	0.739***	0.678***	0.458***
	(0.0877)	(0.0981)	(0.0970)	(0.0766)
Constant	0.191***	0.240***	0.207***	0.167***
	(0.0179)	(0.0200)	(0.0206)	(0.0163)
R^2	0.274	0.345	0.248	0.194

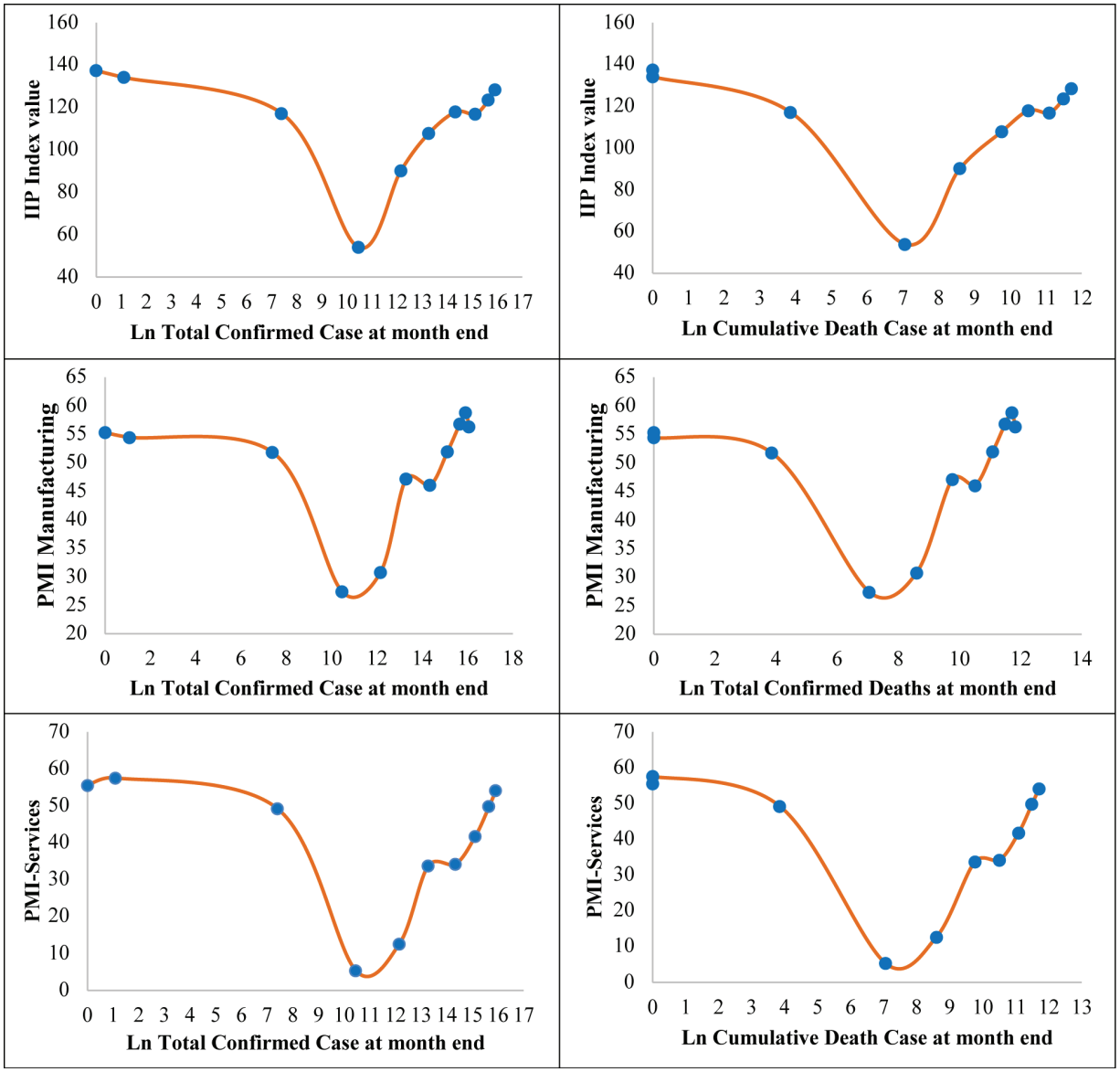
Source: Survey Calculation
Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 27: V-shaped Economic Recovery: Contemporaneously Negative and Lagged Positive Impact of Initial Stringency



Source: Survey Calculation

Figure 28: V-shaped Economic Recovery



Source: Data accessed from https://www.Covid19india.org/, MoHFW, MoSPI, BSE, IHS Markit

FAR-SIGHTED POLICY RESPONSE FOR ECONOMIC RECOVERY

1.46 The public health response needed to slow transmission of COVID-19, together with need for social distancing and minimizing contact, has meant that service sectors reliant on face-to-face interactions—particularly wholesale and retail trade, hospitality, and arts and entertainment—have seen larger contractions than manufacturing. These service sectors, in most economies, contribute a significant portion to both incomes and employment. The scale of disruption in these sectors has, therefore, had a severe impact on the livelihoods of sections engaged in these sectors.

1.47 The pandemic induced lockdowns led to local, regional, and global supply disruptions hitting economic activity – rendering a 'first order' supply shock. This, in turn, has led to

a demand shock both through disruptions in the labour market, which affect household income, and through the precautionary motive to save, which stemmed from the uncertainty amidst the health crisis. In a normal economic crisis, policy support is rendered to stimulate aggregate demand as quickly as possible. However, the containment measures required to limit the spread of the pandemic, which constrained economic activity, reduced the efficacy of demand-side measures during the lockdown.

1.48 The unprecedented nature of the COVID-19 shock, the associated uncertainty about the length and severity of the pandemic, and the widespread prevalence of lockdowns which restrict in-person shopping made it ex-ante unclear how individuals would use direct cash transfers. An analysis of stimulus payments in US documented that only 15 per cent of recipients of this transfer spent their transfer payment, while 33 per cent saved it and 52 per cent used it to pay down debt (Coibion et al., 2020). Most of the spending was on essential items like food and other non-durable consumer products. This was largely due to the restrictions placed by the pandemic-induced lockdown with curtailed options for discretionary spending. The uncertainty of the duration of the pandemic with associated job loss or reduced incomes induced precautionary savings in the anticipation that these funds will be needed to make it through a long period of low income or for health urgencies. Carroll, et.al, 2020 showed that in the face of a prolonged and severe crises, government may want to consider a broad range of policies targeting aggregate demand, with direct transfers being only a part of the fiscal policy response.

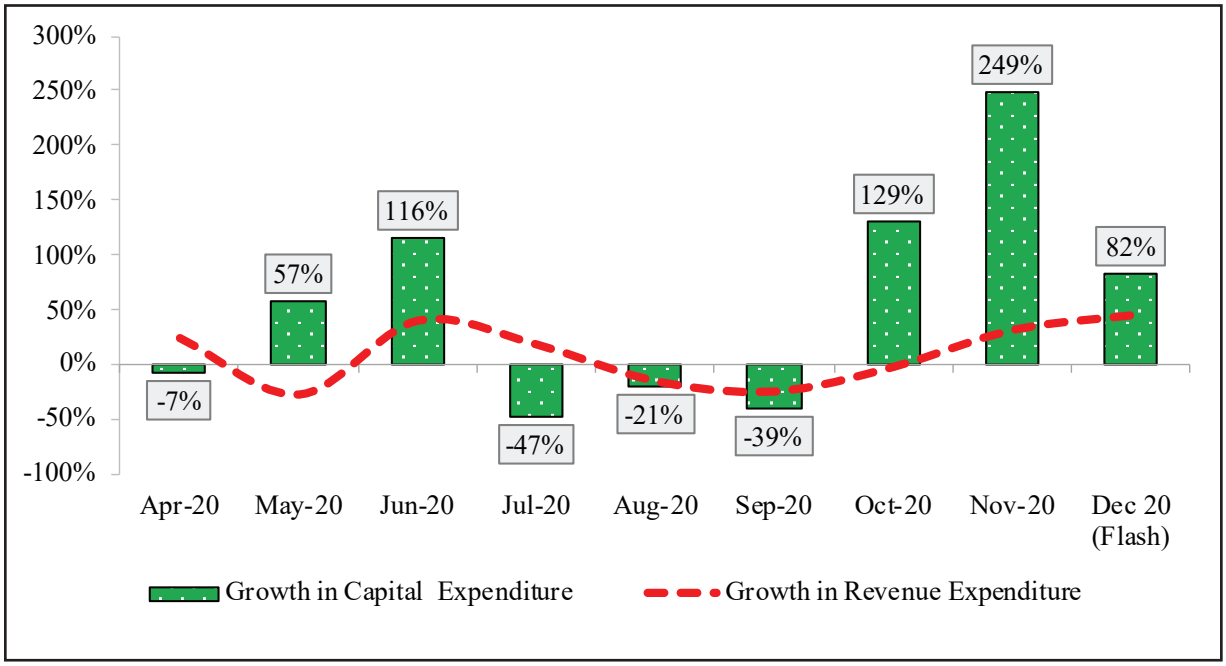
1.49 Indian policymakers, backed by evidence, recognized that the lockdown would adversely impact economic activity and disrupt livelihoods. The fiscal policy response of the Government of India to the pandemic was, accordingly, strategized with a step-by-step approach. During the first two quarters of FY:2020-21, the Government ensured that funds for essential activities were available despite a sharp contraction in revenue receipts. The initial approach was to provide a cushion for the poor and section of society and to the business sector (especially the MSMEs) to tide over the distress caused by disruption of economic activity. The Pradhan Mantri Garib Kalyan Yojana (PMGKY) for ensuring food security through public distribution system, direct benefit transfers to widows, pensioners and women, additional funds for MGNREGS, and debt moratoria and liquidity support for businesses (Table 3). With the easing of movement and health-related restrictions in the third quarter, the the government transited in a calibrated fashion to support investment and consumption demand through Atmanirbhar 2.0 and 3.0. The timing of stimulus was tuned to the absorptive capacity of the economy, which was affected by the lockdown. There was no point in pushing the accelerator while the foot was firmly on the brake as a demand stimulus at a time when supply was constrained would have not helped. The timing of the expenditure push, especially the capital expenditure, after the reduction in health-related curbs, manifests the strategy of stimulating 'growth' when it would be most effective (Figure 29). As we have seen above, the economic recovery gained momentum since the first quarter.

Table 3: Pradhan Mantri Garib Kalyan Package – Total Direct Benefit Transfers

Scheme	Number of Beneficiaries (Crore)	Amount (₹ Crore)
Support to PMJDY women account holders	1st Ins – 20.65 2nd Ins – 20.63 3rd Ins – 20.62	10,325 10,315 10,312
Support to NSAP (Aged widows, Divyang, Senior citizen)	2.81	2814
Front-loaded payments to farmers under PM-KISAN	8.94	17891
Support to Building & Other Construction workers	1.82	4987
24 per cent contribution to EPFO	.45	2570
Pradhan Mantri Ujjwala Yojana	1st Ins – 7.43 2nd Ins – 4.43 3rd Ins – 1.82	9700
TOTAL	**42.1**	**68914**

Source: PIB
Note: Progress as on 31st December 2020, Ins means Instalment.

Figure 29: Trend in Growth of Monthly Expenditure of Central Government during FY 2020-21 (YoY)

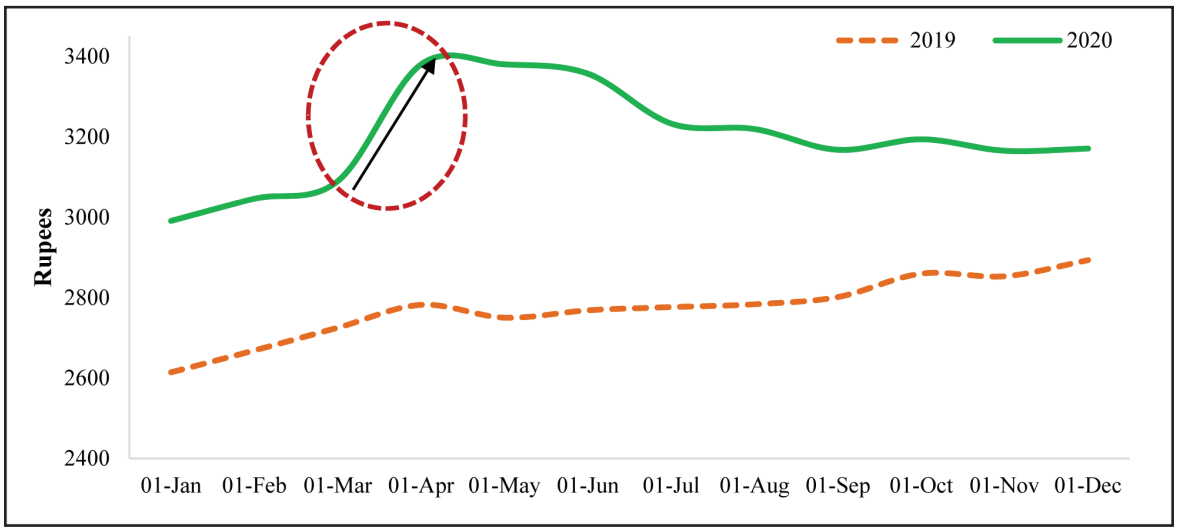


Source: Department of Expenditure

1.50 The calibrated stance of the Government is corroborated by the trend in average balances in Pradhan Mantri Jan-Dhan Yojana (PMJDY) accounts. Figure 30 shows that the average balance in these accounts increased during the April-June quarter – indicative of the precautionary savings by the accountholders. However, as the economy revived, the balances have shown a

fall pointing towards increasing expenditures on consumption.

Figure 30: Trends in Monthly Average Balances in PMJDY Accounts



Source: pmjdy.gov.in

Structural Reforms

1.51 The Indian policymakers also recognized that the 'supply' shock induced by the lockdown would disrupt the productive capacity of the economy. This capacity would need to be strengthened to meet the pent-up demand once it resumes – any mismatch would lead to macro-economic instabilities. This was, in effect, an 'underheating' of the economy with lack of demand, disruption of supply chains and anticipated large scale corporate distress. A simple reflating of the economy through increased government expenditure would, under these circumstances, have led to runaway inflation especially given the inherent supply-side constraints in India's food economy. Therefore, India initiated a slew of multi-sectoral supply-side structural reforms to lend flexibility and resilience to supply chains as a part of the Atmanirbhar Bharat Mission (ANB) (Table 4). India is the only country to have undertaken structural reforms on the supply-side at the initial stages of the pandemic. This far-sighted policy response will generate productivity gains in the medium to long term.

1.52 These reforms primarily focus on strengthening the potential of primary and secondary sectors of the economy to create jobs. The primary sector in India (agriculture and mining sectors) contributes around 16 per cent of Gross Value Added (GVA) while it employs around 43 per cent of the workforce (as per PLFS, 2018-19). This indicates the huge potential to provide gainful employment opportunities for people employed in these sectors. The secondary sector provides expanded opportunities for formal employment with enhanced incomes, income stability and social security provisions.

Table 4: Major Structural Reforms Undertaken as a Part of Atmanirbhar Bharat Package

Sector	Structural Reform Undertaken
	Deregulation and Liberalization of Sectors
Agriculture	• Farmers' Produce Trade and Commerce (Promotion and Facilitation) Act, 2020 • Farmers (Empowerment and Protection) Agreement of Price Assurance and Farm Services Act, 2020 • Essential Commodities (Amendment) Act, 2020

MSMEs	• New MSME definition covering almost 99 per cent of all firms enabling MSMEs to grow in size and create jobs • Removal of artificial separation between manufacturing and service MSMEs
Labour	• Enactment of four labour codes namely, Wage Code, Industrial Relations Code, 2020, Code on Occupational Safety, Health & Working Conditions Code, 2020 & Social Security Code, 2020 • 'One labour return, one licence and one registration'
Business Process Outsourcing (BPO)	• Simplification of the Other Service Provider (OSP) guidelines of the Department of Telecom. Several requirements, which prevented companies from adopting 'Work from Home' and 'Work from Anywhere' policies have been removed
Power	• Tariff Policy Reform: DISCOM inefficiencies not to burden consumers, Progressive reduction in cross subsidies, Time bound grant of open access, etc. • Privatization of Distribution in UTs
PSUs	• PSUs in only strategic sectors • Privatization of PSUs in non-strategic sectors
Mineral Sector	• Commercial Mining in Coal Sector • Removal of distinction between captive and merchant mines • Transparent auction of mining blocks • Amendment to Stamp Act, 1899 to bring uniformity in stamp duty across States • Introduction of a seamless composite exploration-cum-mining-cum-production regime
Strengthening Productive Capacity	
Industry	• Production Linked Incentive (PLI) Scheme for 10 identified sectors • National GIS-enabled Land Bank system launched
Space	• Level playing field provided to private companies in satellites, launches and space-based services • Liberal geo-spatial data policy for providing remote-sensing data to tech-entrepreneurs
Defence	• Corporatization of Ordnance Factory Board • FDI limit in the Defence manufacturing under automatic route to be raised from 49 per cent to 74 per cent. • Time-bound defence procurement process
Strengthening Productive Capacity	
Education	• PM-eVidya to enable multi-mode and equitable access to education • Manodarpan initiative for psychosocial support
Social Infrastructure	• Scheme for Financial Support to Public Private Partnerships (PPPs) in Infrastructure Viability Gap Funding (VGF) Scheme extended till 2024-25
Ease of Doing Business	
Financial Markets	• Direct listing of securities by Indian public companies in permissible foreign jurisdictions • Provisions to reduce time line for completion of rights issues by companies • Private companies which list NCDs on stock exchanges not to be regarded as listed companies

Corporates	• Including the provisions of Part IXA (Producer Companies) of Companies Act, 1956 in Companies Act, 2013 • Decriminalization of Companies Act defaults involving minor technical and procedural defaults • Power to create additional/ specialized benches for NCLAT • Lower penalties for all defaults for Small Companies, One-person Companies, Producer Companies & Start Ups • Simplified Proforma for Incorporating Company Electronically Plus (SPICe +) introduced
Administration	• National platform for recruitment: National Recruitment Agency to conduct a Common Eligibility Test • Revised guidelines on Compulsory retirement to remove ineffective or corrupt officials through Fundamental Rule 56(j)/(l) and Rule 48 of CCS (Pension) Rule • Faceless tax assessment and a 12-point taxpayers charter • Fast track Investment Clearance through Empowered Group of Secretaries

Source: Compiled from various sources. The list presents the major structural reforms.

1.53 Major structural reforms launched by the Government – in agriculture markets, labour laws and definition of MSMEs – provide unparalleled opportunity to grow and prosper now and thereby contribute to job creation in the primary and secondary sectors. The modified definition of MSMEs facilitates expansion and growth of these enterprises without them fearing the loss of government incentives, thereby avoiding the phenomenon of dwarfs among MSMEs. The resulting economies of scale can enhance productivity without the MSMEs losing out on several government incentives including interest subvention, collateral-free loans, market support, export promotion, preferential procurement in the public sector and enabling of IT ecosystems.

1.54 The historic labour reforms – discussed for three decades after the conditionality in the 1991 loan from IMF but never implemented thus far – will benefit MSMEs to increase employment, enhance labour productivity and thereby wages in MSMEs. The use of full-time equivalents provides flexibility to MSMEs to tailor their labour strength to market conditions and thereby enhance employment. The increase in the size thresholds from 10 to 20 employees to be called a factory, 20 to 50 for contract worker laws to apply, and 100 to 300 for standing orders enable economies of scale and unleash growth. The drastic reductions in compliance stem from (i) 41 central labour laws being reduced to four, (ii) the number of sections falling by 60 per cent from about 1200 to 480, (iii) the maze due to the number of minimum wages being reducing from about 2000 to 40, (iv) one registration instead of six, (v) one license instead of four, and (vi) de-criminalisation of several offences. These reforms balance the interest of both workers and employers. These codes provide social security, protection, safe and working environment and effective conciliation dispute mechanism to workers.

1.55 The reforms in the agricultural sector were more overdue than even the labour reforms as the existing laws kept the Indian farmer enslaved to the local Mandi and their rent-seeking intermediaries. While every other category of producer in India had the freedom to decide

where to sell his/her produce, the Indian farmer did not. The local monopolists created by this legal infrastructure enabled the intermediaries to prosper at the cost of the farmer, especially the poor ones without the wherewithal to store their produce. The agricultural reforms enable the farmer to sell where he gets the best deal and thereby enable competition that is sine qua non to create welfare for the small farmer. The reforms in agriculture markets will enable creation of 'One India one market' for agri-products, create innumerable opportunities for farmers to move up the value chain in food processing - from farm to fork, create jobs and increase incomes.

1.56 The proposed structural reforms in the mining sector aim to increase participation of the private sector in mineral exploration, redefine the norms of exploration for auction of mineral blocks to ensure a seamless exploration-cum-mining-cum-production regime. They will also redefine the standard of exploration required for auctioning of blocks for prospecting license-cum mining lease and open acreage licensing policy for allocation of mining rights which will give a major boost to the production of minerals in the country. These reforms aim to reduce dependence on imported coal, to create a strong, self-reliant domestic energy sector, attract private investments, generate jobs and stimulate the economic growth in the medium-term.

1.57 At the same time, production-linked incentive (PLI) schemes have been implemented in ten key specific sectors to make Indian manufacturers globally competitive, attract investment in the areas of core competency and cutting-edge technology; ensure efficiencies; create economies of scale; enhance exports and make India an integral part of the global supply chain. These Schemes provide incentive to enhance production and create wealth and jobs. The proposed privatization of Public Sector Enterprises in non-strategic sectors recognizes the need for efficient allocation and use of resources. All these reforms are intended to bolster the productive capacity of the economy, and create wealth and jobs especially at the bottom of the pyramid. This would, in turn, lead to inclusive growth and sustained demand generation in the economy. The policy package ensures that the regulatory environment is conducive to ease of doing business with simpler, transparent and time-bound procedures for doing business.

1.58 Most of these reforms have long been recommended for enhancing the efficiency and achieving economies of scale in various sectors. An illustrative timeline of the consultations for agricultural reforms may be seen at Table 4. Specifically, economic surveys of previous years have made the case for these reforms by highlighting carefully the economic benefits from the same. The time of the 'crisis' was utilized to take some 'bold' decisions to actually implement these reforms to propel the growth of the Indian economy.

Table 4: Illustrative Timeline of Consultations/Recommendations for Agricultural Reforms

S. No.	Committee/Report	Year	Chairperson/Author
1	Expert Committee on Strengthening and Developing of Agricultural Marketing	2001	Shankerlal Guru
2	Report on the Task Force on Employment Opportunities	2001	Montek Singh Ahluwalia

3	Inter-Ministerial Task Force	2001	R.C.A. Jain
4	Model APMC Act created	2003	
5	First Report of National Commission on Farmers	2004	M.S. Swaminathan
6	Second Report of National Commission on Farmers	2005	M.S. Swaminathan
7	Towards an Indian Common Market: Removal of Restrictions on Internal Trade in Agriculture Commodities, the Food and Agriculture Organisation of the United Nations	2005	
8	Third Report of National Commission on Farmers	2005	M.S. Swaminathan
9	Fourth Report of National Commission on Farmers	2006	M.S. Swaminathan
10	Fifth Report of National Commission on Farmers-Volume I & II	2006	M.S. Swaminathan
12	Draft State Agricultural Produce Marketing (Development and Regulation) Rules, 2007	2007	
13	Economic Survey 2011-12, Chapter 8: Agriculture and Food	2012	Chief Economic Adviser (CEA): Dr. Kaushik Basu
14	Final Report of Committee of State Ministers, In-charge of Agriculture Marketing to Promote Reforms	2013	Harshvardhan Patil
15	Economic Survey: 2012-13, Chapter 8: Agriculture and Food Management	2013	CEA: Dr. Raghuram G. Rajan
16	Economic Survey 2013-14, Chapter 8: Agriculture and Food Management	2014	Finance Secretary: Dr. Arvind Mayaram
17	Economic Survey 2014-15, Volume I, Chapter 8: A National Market for Agricultural Commodities – Some Issues and the Way Forward	2015	CEA: Dr. Arvind Subramanian
18	Economic Survey 2014-15, Volume II, Chapter 5: Prices, Agriculture and Food Management	2015	CEA: Dr. Arvind Subramanian
19	Budget 2017-2018- Market reforms to be undertaken and the States to be urged to denotify perishables from APMC	2017	Finance Minister: Arun Jaitley
20	Economic Survey 2016-17, Volume II, Chapter 7: Agriculture and Food Management	2017	CEA: Dr. Arvind Subramanian
21	Standing Committee On Agriculture (2018-2019), Ministry Of Agriculture And Farmers Welfare (Department Of Agricultural, Cooperation And Farmers Welfare): Agriculture Marketing And Role Of Weekly Gramin Haats	2019	Hukmdev Narayan Yadav
22	Economic Survey 2019-20, Volume I, Chapter 4: Undermining Markets	2020	CEA: Dr. K. V. Subramanian
22	Parliament enacts three laws that usher in agricultural reforms	2020	

Source: Compiled from various sources and is indicative.

LOOKING FORWARD

1.59 The V-shaped economic recovery while avoiding a second wave of infections make India a sui generis case in this unique, synchronized global recession. Despite the hard-hitting economic shock created by the global pandemic, India is witnessing a V-shaped recovery with a stable macroeconomic situation aided by a stable currency, comfortable current account, burgeoning forex reserves, and encouraging signs in the manufacturing sector output. India is reaping the "lockdown dividend" from the brave, preventive measures adopted at the onset of the pandemic, which were based on the humane principle advocated eloquently in the Mahabharata that "Saving a life that is in jeopardy is the origin of dharma." The policy maturity and the alacrity displayed to not "waste a crisis" has helped the country to save both 'lives' and 'livelihoods' in its own unique way and has shifted the focus away from the short-term pain created by the crisis to the potential for long-term gains engendered by the policy response.

CHAPTER AT A GLANCE

- The COVID-19 pandemic engendered a once-in-a-century global crisis in 2020. Faced with unprecedented uncertainty at the onset of the pandemic, India focused on saving lives and livelihoods by its willingness to take short-term pain for long-term gain.
- India's response stemmed from the humane principle that while GDP growth will recover from the temporary shock caused by an intense lockdown, human lives that are lost cannot be brought back.
- The response drew on epidemiological and economic research, especially those pertaining to the Spanish Flu, which highlighted that an early, intense lockdown provided a win-win strategy to save lives, and preserve livelihoods via economic recovery in the medium to long-term. This strategy was also tailored to India's unique vulnerabilities to the pandemic.
- The strategy was also motivated by the Nobel-Prize winning research in Hansen & Sargent (2001) that recommends a policy focused on minimizing losses in a worst case scenario when uncertainty is very high. Faced with an unprecedented pandemic and the resultant uncertainty, loss of scores of human lives captured thus the worst case scenario.
- India's strategy flattened the curve, pushed the peak to September, 2020, and helped transform the short-term trade-off between lives and livelihoods into a win-win in the medium to long-term that saves both lives and livelihoods. After the September peak, India has been unique in experiencing declining daily cases despite increasing mobility.
- While the lockdown resulted in a 23.9 per cent contraction in GDP in Q1, the recovery has been a V-shaped one as seen in the 7.5 per cent decline in Q2 and the recovery across all key economic indicators.
- Unlike previous crises, the COVID pandemic affects both demand and supply. India was the only country to announce a slew of structural reforms to expand supply in the medium to long term and avoid long-term damage to productive capacities.

- On the demand side, India's policies have been calibrated to ensure that the accelerator is slowly pushed down only when while the brakes are being removed on economic activities. A public investment programme centred around the National Infrastructure Pipeline is likely to accelerate the demand push and further the recovery.
- The upturn in the economy while avoiding a second wave of infections makes India a sui generis case in strategic policymaking amidst a once-in-a-century pandemic.

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