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BRITISH VIRGIN ISLANDS

COVID-19 HEAT REPORT
HUMAN AND ECONOMIC ASSESSMENT OF IMPACT

Based on research conducted by Dr. Simon Naitram

COVID-19 HEAT SERIES

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COVID-19 MACROECONOMIC AND HUMAN IMPACT ASSESSMENT FOR BRITISH VIRGIN ISLANDS

INDICATORS	VALUE
Demographic	
Age Dependency Ratio (Census, 2010)	39.6%
% of Labour Force Female (Census, 2010)	49.16%
Population 0-17 Population Male Female	30,030 7,367 3,767 3,600
Macroeconomic	
GDP percapita (UNSD, 2018)	US$48,511
GDP growth rate (Caribbean Development Bank)	2.1%
Inflation (Caribbean Development Bank)	1.7%
Fiscal	
Debt to GDP ratio (GBV Budget estimates)	16.7%
Primary Balance to GDP (GBV Budget Estimates)	2.4%
Interest to Revenue Ratio (GBV Budget Estimates)	1.5%
Social	
Unemployment (LFS, 2015)	2.9%
Unemployment (female)	4.1%
Unemployment (male)	1.5%
Poverty rate (Census, 2010)	9.9%
Poverty rate (female)	13.3%
Poverty rate (male)	6.5%
Poverty rate (children, 2003)	29.1%
Number of school-going children (2017)	4,259

Note: All data is for 2019, unless otherwise stated. Poverty is defined by incomes less than US$700

EXECUTIVE SUMMARY

Prior to the COVID-19 outbreak, the BVI economy was set to continue its recovery from the impacts of the 2017 hurricane season. The economy was forecast to grow at around 3%, building on the two previous years of growth after the 2.7% decline in 2017. Economic output in the BVI is driven mainly by financial services and tourism. The finance and insurance activities industry contributes around 24% of real GDP, while the accommodation and food services industry contributes around 7%. More broadly, tourism as a whole is estimated to contribute around 35% of GDP directly. Accommodation and food services accounted for 11.6% of employment in 2018. The workforce is comprised primarily of non-nationals, most of whom are employed in the management and professional services (25%), accommodation and food services (21%) and services and sales (21%) sectors.

Fiscal rules have helped to ensure modest public indebtedness, with debt outstanding at the end of 2019 equivalent to approximately 16.7% of GDP and interest costs accounting for just 2% of fiscal expenditure. Unemployment is among the lowest in the region at 2.8% in 2017, with data from two years prior suggesting rates of joblessness were almost three times higher for women than men. This gender inequity is mirrored among those who are employed as women's average monthly wage is roughly 10% lower than that of their male counterparts. Similarly, women are overrepresented in lower income earning groups.

Since confirming its first cases of COVID-19 in late March, the BVI Government implemented a 24-hour national lockdown that lasted nearly a month. This quick response, coupled with one of the highest per capita testing rates and aggressive contact tracing, contained the spread of the virus to just 7 cases. Nonetheless, the external demand shocks and effects of the domestic lockdown are expected to constrain economic growth in both the tourism and non-tourism sectors.

Our best estimate is for tourism to reopen in August or November 2020, which would result in GDP declines of between 11% and 13%, with concomitant four or five-fold increases in the rate of unemployment to between 12% and 17% in 2020, with a disproportionate impact expected on female workers and migrants. These outcomes would reverse the fiscal surplus and result in a deficit equivalent to nearly 2% of GDP.

Constraints on economic growth will be transmitted to those living in poverty. It will increase both the number of individuals living in poverty and those living with vulnerabilities. Figures from the Virgin Islands' Country Poverty Assessment in 2003 found that 21% of the population were considered poor, and 29% of children from 0-17 were considered poor.[5] Children accounted for 42% of the poor population who will bear the brunt of the financial distress in the households.

The report recommends examining the use of the framework created for the Financial Assistance Programme after Hurricanes Irma and Maria to provide temporary, expanded income support which would cost around US$12 million at the lower end; exploring the provision of liquidity for small firms to preserve livelihoods through deficit financing or government guarantees; an extension to the period for work permit holders to find new jobs and the implementation of rapid work permit transfers to mitigate outward migration. Longer term, the report proposes a rigorous assessment of the current level of poverty to inform the design and implementation of an expanded, gender-responsive Public Assistance Programme and the development of a permanent unemployment benefit fund.

CONTEXT

MACROECONOMIC

The Caribbean Development Bank estimates that real gross domestic product (GDP) in the British Virgin Islands grew 2.1%[1] in 2019. This reflects a second year of recovery after GDP growth slowed to 0.7% in 2017 due to damage inflicted by Hurricanes Irma and Maria.

The Virgin Islands economy is driven mainly by tourism and financial services. According to National Accounts data, accommodation and food services accounts for around 6% of national output and around 11.6% of employment.[2] The World Travel and Tourism Council (WTTC) estimates that when both the direct and indirect contributions of tourism are considered, the sector supports around two-thirds of employment and contributes nearly 60% of overall output.[3] National accounts data suggests that in 2017 finance and insurance activities contributed around 25% of economic activity.

The majority of the British Virgin Islands' labour force is non-national. In 2014, 68% of the workforce was estimated to be non-national. This non-national workforce was split evenly between men and women. The Government's 2019 Residency and Belonger Status Initiative has likely regularised a significant number of these non-nationals. In 2014, 9,751 work permits were issued while 13,041 migrants were estimated to be employed. This implied that around 75% of migrants were on work permits, or half of the total employed labour force of the Virgin Islands. Of the 9,571 work permits issued in 2014, only 559 were issued for the financial and insurance services sector. In contrast, 2,037 or 21% of all work permits were issued for workers in the accommodation and food services sector. Twenty-five percent of work permits were for management and professional workers, while 21% were for service and sales workers, 18% were for craft and related trades workers, and 13% were for elementary occupations.

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1 Caribbean Development Bank, https://www.caribank.org/publications-and-resources/resource-library/economic-reviews/country-economic-review-2019-virgin-islands
2 & 3 The WTTC suggests that the direct and indirect effects of the tourism industry contribute around 57% of GDP and 66% of employment.
4 https://bvi.gov.vg/media-centre/economic-response-plan-be-implemented-phased-approach

FISCAL

The Virgin Islands imposes a relatively low tax burden. Under normal circumstances, the Government's fiscal decisions are constrained under Section 20 of the Protocols for Effective Financial Management. Section 20 of the Protocols for Effective Financial Management calls for an affordable level of debt, consistent with Annex B, which in turn requires:

• Net debt remains within 80% of recurrent revenue,
• Debt service remains within 10% of recurrent revenue,
• Liquid assets remain above 25% of recurrent expenditure.

In 2018 the Government of the Virgin Islands' total expenditure was US$345 million. The largest component of spending was employee compensation, which accounted for 34% of total recurrent spending. Interest payments accounted for only 2% of recurrent expenditure, reflecting low debt levels. Capital expenditure made up 6% of total expenditure, well below the originally budgeted share of 18%, reflecting delays to infrastructure projects.

In 2018, the Government of the Virgin Islands collected US$372 million in revenue, equivalent to 36.2% of GDP. Taxes on goods and services account for 68% of total revenue, with 90% of that being income from the registration and renewal of international businesses. Payroll taxes account for 14% of tax revenue, and import duties accounts for 11%.

The Government of the Virgin Islands expects to record a balanced budget for 2019, and total public sector debt is estimated to have reached US$216 million, approximately 16.7% of GDP at the end of 2019. The Government is reported to be in negotiations with the UK Government for a Loan Guarantee for Recovery to Development projects associated with rebuilding the Territory following the destruction from Hurricanes Irma and Maria. This was initially reported to be up to £300 million and would open significant financing opportunities for the Virgin Islands.[5]

SOCIAL SECTOR

Social sector development challenges are broad, but the main challenges are unemployment, income inequality, poverty as well as universal access to quality education and healthcare services. The unemployment rate was estimated to be 2.8% in 2017. The 2015 Labour Force Survey found a higher unemployment rate for women of 4.1% compared to 1.5% for men. Lacking an unemployment scheme, the Labour Force Survey found that half of the unemployed were financially supported by friends and relatives while 30.6% depended on their spouses and partners. Further, there was a higher unemployment rate among Virgin Island nationals (4.5%) than the overall unemployment rate of 2.9%. The average monthly income was US$2,513 for nationals, and US$2,078 for non-nationals.

A quarter of working women are service workers and shop and market sales workers, and a fifth of them are skilled professionals. Because many women work in sectors that pay lower wages, 50% more women than men earn a salary between US$700 and US$1,400, and 100% more women than men earn less than US$700. Women's average monthly wage is roughly 10% lower than men's: US$2,332.77 vs US$2,573.05.

The Virgin Islands' most recently completed Country Poverty Assessment in 2003 found that 21% of the population were considered poor, and 29% of children from 0-17 were considered poor.[6] Children accounted for 42% of the poor population. Child poverty was 49% in households with 4+ children compared to 18% in households with 1 or 2 children. The 2010 Census found that 9.9% of the working-age population had incomes below US$700.[7] Of these 67% were women, making up 13.3% of the working female population. A further 19.2% of the population had incomes between US$700 and US$1400, considered low-income by the Government. Of these, 60% were women.

Social Protection programmes which include social assistance is a tool to respond to the needs of those living in poverty and those living with vulnerabilities, in addition to addressing income inequalities. The Virgin Islands' flagship social assistance programme, the Public Assistance Programme, provides cash grants up to a maximum of US$350 to support the most indigent and low-income groups. Financial assistance is offered on either a short-term (up to 3 months), medium-term (3 to 6 months) or long-term (6 to 12 months) basis. This is means tested, followed by a committee assessment of the degree of hardship. The number of beneficiaries stood at only 93 in 2019. At present, the target groups include "vulnerable" children, persons aged 65 years and over, unemployed and disabled people.

In the aftermath of Hurricane Irma, a three-month unconditional household grant was paid to vulnerable households. This Financial Assistance Programme was part of the first ever joint cash platform - Humanitarian Cash Transfer Programme in BVI to provide multi-purpose cash to the affected and vulnerable households. The humanitarian response initiative was the first in BVI, led by Government of the BVI in close partnership with the the BVI Red Cross, the British Red Cross, Caritas Antilles and funded by DFID - UK Department for International Development. It was originally anticipated that 24 households would benefit from the programme.[8] In the end, the programme reached 1076 households, accounting for 3274 individuals, including 280 infants — almost 12% of the population of the BVI.[9]

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[5]Real GDP has grown 14% in that time. If some of these benefits accrue to the low income groups, then the rate of poverty might be somewhat lower in 2020. However, it is important to note that the damage of Hurricanes Irma and Maria likely exacerbated the vulnerability of these groups.

[6]This implies an annual income of US$8,400 in 2010. In 2003, the poverty line was assessed as US$6,300 per year.

[7]These might be considered vulnerable individuals.

[8]https://bvinews.com/nearly-12-of-bvi-benefits-from-financial-assistance-programme/

9 https://cash-hub.org/resources/cash-in-emergencies?q=bvi&Category=&DateFrom=

The criteria used for prioritising families were: those with low or no income who also fit into one or more of the following categories:

- larger households
- households with people with disabilities or severe health issues,
- single-parent families,
- families with children under 5,
- families with members over the age of 65.

Grants were given in the range of US$800 to US$1,200 per month for three months. The total programme cost US$3.2 million. The application period was time-limited. A follow-up survey of 7% of the recipients found 97.5% to be satisfied with the programme, while 78.5% indicated that the amount allocated was sufficient in meeting their basic needs such as food, water, rent, transportation, communication and household items.

Approximately 78% of individuals living in the Virgin Islands were estimated to have access to the internet. The lowest monthly fee for fixed broadband is US$99 per month for 50Mbps.

Physical school closures have put a toll on students quality learning experience. In Virgin Islands' education is compulsory and free for children from ages 5-17 years old in the Virgin Islands but not for early childhood of 0-4 years old. The total number of children age 0-4 years in BVI is 2,134, where provision of universal access to early childhood education is a work in progress. The Virgin Islands has 32 non-compulsory early childhood education centres, 27 primary schools, and 7 secondary schools.

Two of the early childhood education centres are publicly-owned, as are 16 of the primary schools and 4 of the secondary schools. In 2018 there were 1,782 students enrolled in public primary schools and a further 705 enrolled in private primary schools. There were 1,447 students enrolled in public secondary schools, 325 enrolled in private secondary schools, and a further 70 enrolled in alternative secondary education.[10]

Connectivity is a fundamental necessity for ensuring quality online education.

Healthcare for legal residents of the Virgin Islands is mainly provided through the National Health Insurance System (NHIS). This is funded by a contribution of 3.75% of an employee's income, matched by a 3.75% contribution by the employer. The benefits of National Health Insurance are accessible by the unemployed, self-employed, and indigent. The Government provides subsidised healthcare for the indigent, elderly and youth. There is a single public hospital with a capacity of 120 beds.[11] There is also a private hospital with significant additional bed capacity, which the majority can afford due to the NHIS.

10 https://bvi.gov.vg/media-centre/new-peebles-hospital-officially-opens-december-17
11 https://bvi.gov.vg/pub/2020%20Budget%20Estimates%20Final.pdf

CHANNEL OF TRANSMISSION

EXTERNAL

The Virgin Islands' main tourism source market is the United States. The IMF expects US GDP to decline by almost 6% in 2020, rebounding by only 4.7 in 2021. This suggests there will be some permanent loss. This likely implies lower tourism activity in the post-pandemic period than immediately pre-pandemic.

Table 1: Tourism Arrivals by Source Market and Contribution to GDP			
	Share	GDP Growth in 2020	GDP Growth in 2021
United States	60%	-5.9	4.7
Caribbean	22%	-2.8	4
Europe	11%	-7.5	4.7

Source: Government of the British Virgin Islands. GDP growth predictions are from the IMF's World Economic Outlook April 2020

The direct impact of COVID-19 on tourism could potentially be long-lasting. The Government intends to reopen its borders on June 2, 2020. At this time, it appears that only BVI citizens and residents will be allowed to enter. It is seeking to use hotels as contracted quarantine facilities during this time. While the tourism industry remains closed, a large number of residents will become unemployed. This is particularly damaging to the Virgin Islands due to its large migrant workforce—many of whom remain on temporary work permits subject to continuing employment.

The COVID-19 virus has acted as a synchronised economic shock to an already-vulnerable global economy. The financial services sector is quite sensitive to changes in global economic activity. During the global financial crisis of 2007, incorporations of business companies in the Virgin Islands–the key measure of financial services activity–fell by 38% from 2007 to 2009.[12] In this time, global GDP shrank only 0.7% in 2009, having actually grown 2.8% in 2008 according to the IMF. In stark contrast, the IMF is predicting a decline in world GDP of 3% in its most recent World Economic Outlook.[13]

Agriculture output represents less than 1% of total GDP. Soils are shallow and are not conducive to high yields. Additionally, potable water originates from desalination and even though reports suggest that the water complies with WHO standards, its effects on crops vary greatly. There appears to be little domestic buffer against shocks to the global supply chain.
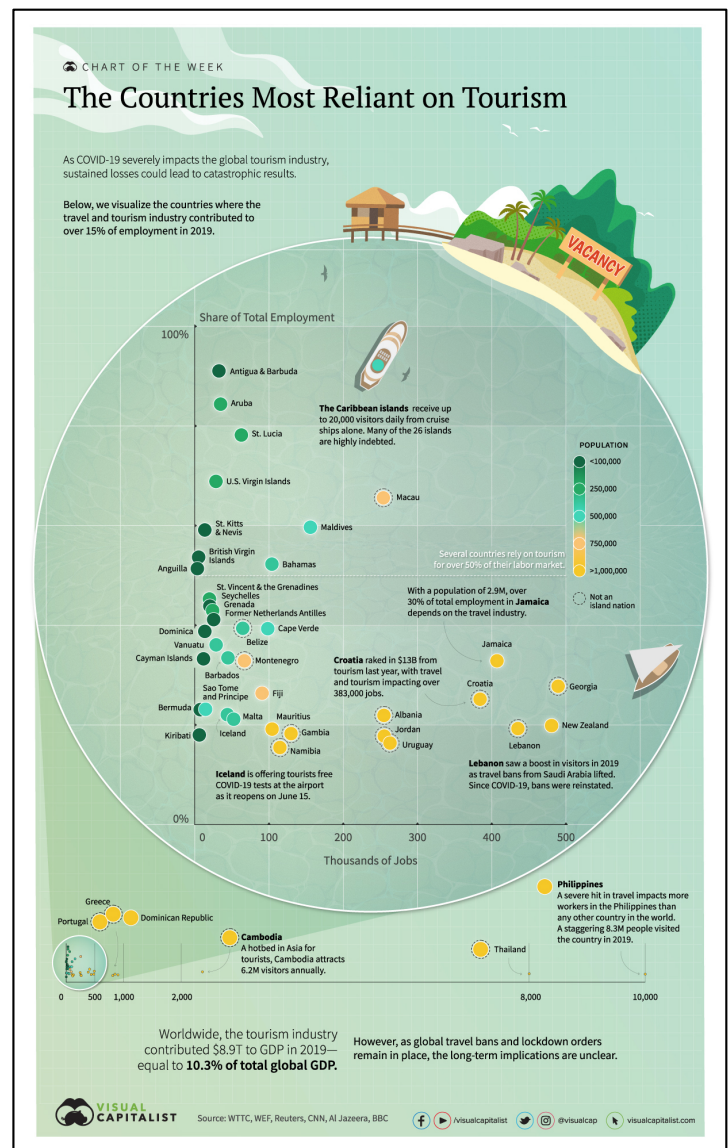
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12 There were 77,000 new registrations in 2007, 61,716 in 2008, and 47,477 in 2009. https://www.bvifsc.vg/sites/default/files/2007_annual_report_final_r_0.pdf
13 https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020

DOMESTIC

The Virgin Islands imposed a 14-day 24-hour lockdown from 4 April 2020. During this time, only essential workers were allowed to leave home. This closure included supermarkets and shops. As of April 29, a range of non-essential businesses are allowed to reopen between the hours of 6:00 a.m. and 1:00 p.m. In the short-run, it appears that the Virgin Islands' domestic economy will resume significant activity.

The majority of businesses in the Virgin Islands are small and medium-sized. Access to credit for many of these businesses is limited. The commercial banking sector is risk averse. There is a significant chance that a portion of tourism and tourism-related services might suffer insolvency due to the likely prolonged nature of the tourism shutdown.

CHART OF THE WEEK

The Countries Most Reliant on Tourism

As COVID-19 severely impacts the global tourism industry, sustained losses could lead to catastrophic results.

Below, we visualize the countries where the travel and tourism industry contributed to over 15% of employment in 2019.

Worldwide, the tourism industry contributed $8.9T to GDP in 2019—equal to **10.3% of total global GDP.**

However, as global travel bans and lockdown orders remain in place, the long-term implications are unclear.

VISUAL CAPITALIST   Source: WTTC, WEF, Reuters, CNN, Al Jazeera, BBC

IMPACT

MACROECONOMIC

Prior to the onset of the COVID-19 disease, the Virgin Islands expected real GDP growth in the range of 1% to 3%. The IMF's baseline scenario assumes that the COVID-19 pandemic fades globally during the second half of 2020, and allows the global economy to unwind the restrictions on economic activity. The prediction is for a 3% contraction in global economic activity and a 5.8% recovery in 2021.

To augment this baseline forecast, we consider a range of scenarios using a simple SIR-Macro model. Unlike past economic crises, the root of this current crisis is not due to weak fundamentals within the global economy, but to spinoffs from the effects of COVID-19 on travel and hospitality sectors and the second order impacts on other sectors. The impact on the financial services sector in the current scenario will therefore be determined by how the other sectors, both domestic and global, are impacted. As such, the analysis here focuses mainly on the tourism impact, with knock-on effects on the other sectors as endogenous to the model. The model has four phases, defined in weeks, which identify the various stages of the pandemic and the economic closures that are intended to limit the spread of COVID-19.

These phases are:

1. The pre-COVID-19 period where the economy operates without effect. This period lasts from 1 January 2020 to 3 March 2020.

2. COVID-19 first reaches the country and the infection spreads. This period ends on 28 March, 2020.

3. The country shuts the tourism sector, and the domestic economy works remotely—all except essential workers. We assume that some workers are high-flexibility workers who are 80% productive at home, while there are low-flexibility workers who are 50% productive at home. Tourism workers become unemployed. The effect of this shutdown slows the spread of COVID-19.

4. The post-COVID-19 period, which comprises two sub-phases: first the domestic economy reopens; second, the tourism sector reopens, likely at a later date.

Since we already know the lengths of the first two periods, our scenarios consider different dates for the reopening of the domestic economy. The data and parameters used for this simulation are included in the Technical Appendix.

Table 2: Macroeconomic Projections for Different Reopening Scenarios

Indicator	6-Week Lockdown Tourism restarts immediately		6-Week Lockdown Tourism restarts in August		6-Week Lockdown Tourism restarts November		6-Week Lockdown Tourism does not restart until 2022		24-Week Lockdown Tourism does not restart until 2022	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
GDP Growth	-8%	+7%	-11%	+9%	-13%	10%	-17%	1%	-23%	8%
Consumption	-4%	+5%	-13%	+14%	-21%	+24%	-14%	0%	-23%	+10%
Unemployment	5%	4%	12%	6%	17%	7%	22%	27%	22%	27%

Source: Author's calculations. GDP and consumption are measured in real terms. The baseline unemployment rate is 2.8% and is measured as an average unemployment rate for the full year.

The two central impacts of the COVID-19 pandemic on the macroeconomy stem from the lockdown of the domestic economy and the lockdown of the tourism sector. In the short-run the effects are obvious: tourism workers become unemployed and do not produce output; the domestic economy operates at a severely restricted rate.

The first main mechanism through which these shutdowns damage the economy in the medium term is the closure of businesses. We assume that around 20% of firms are liquidity constrained. The longer the shutdown lasts, the more likely these firms will become insolvent—both in the tourism and non-tourism sectors. This means that there is scarring from the recession, since not all tourism firms reopen after COVID-19 has passed, leaving the final level of output lower. The second main mechanism through which the shutdowns damage the domestic economy is the effect of tourism closure on demand for non-tourism goods and services. Based on the September 2001 terrorist attacks which represented an external shock, we estimate that a 1% decline in tourism activity over a two-year period is associated with a 0.44% decline in non-tourism activity. The closure of the tourism sector has repercussions for domestic firms because of the deep decline in domestic demand. Some of the domestic firms will become insolvent because of the "second-hand" effect from the shutdown of the tourism sector.

The worst-case scenario we consider is that the shutdown of the domestic economy lasts for 24 weeks and tourism activity does not restart within the forecast period (until the end of 2021). This would lead to a 23% decline in economic activity in 2020, with an 8% recovery in 2021. In this scenario, unemployment levels would be expected to reach up to 27% in 2022.

The best-case scenario we consider is that the shutdown of the domestic economy lasts 6 weeks, at which time the tourism sector is able to reopen. This is an unlikely scenario, but presents us with an idea of the damage that has already been done to the Virgin Islands economy. In this case, real GDP is predicted to decline by 8% in 2020 and recover by 7% in 2021. Because this model includes an epidemiological component, reopening the tourism sector immediately leaves the Virgin Islands at risk of a return of the virus. In this scenario, we observe an additional mechanism affecting the economy—there would be significant infection, reducing the size of the labour force and limiting output until at least October 2020. Unemployment rates would increase up to around 5% on average, and fall slightly to 4% in 2021.

The more likely scenarios are that tourism activity reopens in August or November 2020. These involve significant closures in the tourism sector. If tourism reopens in August we predict that around 5% of tourism jobs are permanently destroyed, while a November reopening predicts that around 8% of tourism jobs are permanently destroyed. The August scenario is predicted to lead to an 11% decline in GDP, while our November scenario would lead to a 13% decline in GDP. Under the August reopening, we expect average unemployment rates to increase to around 12% in 2020, while a November reopening would push that further up to 17%.

We consider a final scenario: one where the Virgin Islands economy reopens in May but operates without tourism until the end of the forecast period. This is quasi-autarky. The impact of closing the tourism sector is large, even while the domestic economy remains open. The model predicts that GDP would decline by 17% in 2020, and recover by 1% in 2021. Without a significant rearrangement of the domestic economy, unemployment rates would remain high. This scenario stems from the possibility that the international community does not get the COVID-19 virus under control, as might occur if immunity from COVID-19 lasts for a short period.

The GDP forecasts for the last two scenarios in Table 2 where there is no tourism in 2020 diverge by around 5 percentage points. This divergence is the effect of the additional domestic lockdown of around 18 weeks. Intuitively one might think this should lead to a larger decline. However, we assume that a significant portion of the population continues to work, especially essential services and high-flexibility workers. We assume high-flexibility workers operate at reduced productivity levels for three reasons: high-flexibility jobs are not all perfectly flexible; home care duties significantly reduce some workers' productivity; we account for likely mental health issues stemming from social distancing.

The greater the portion of the population employed in essential services and high-flexibility jobs, the smaller the divergence between these two scenarios and the lower the expected fallout from marginal increases in the domestic lockdown period.

We do not expect the COVID-19 crisis to have as severe an impact on the international financial services sector as the global financial recession did. The decline in global GDP is not being caused by a fundamental upheaval of the financial sector, and appears to be a temporary problem for many multinational firms and for international financial markets.

FISCAL

The fiscal effects of COVID-19 are based on two scenarios, a 6-week lockdown with tourism restarting in August 2020 and a 6-week lockdown with tourism restarting in November 2020. We estimate that revenue is likely to fall by between US$22 million (-6.3%) and US$38 million (-10.9%) in 2020. Taxes on goods and services are likely to fall by between US$7.5 million and US$18.2 million, representing the bulk of the decline. This category comprises mainly the taxes paid by the international business sector and even though some revenue is expected to be lost due to the reduction of new registrants, existing companies are likely to still pay fees especially for 2020.

If global growth continues to wane it is expected that this category could be adversely affected over the medium term.

Taxes on international trade, property taxes and other revenue are also expected to decline, falling cumulatively between US$12 million and US$15 million. The declines in these categories are driven mainly by dampened demand and lower economic activity.

Table 3: Fiscal Projections for Different Reopening Scenarios				
			6-Week Lockdown	**6-Week Lockdown**
	Actual 2018	**Estimate 2019**	**Tourism in August 2020**	**Tourism in November 2021**
Total Revenue	372.3	350.3	328.1	312.2
Income/Payroll Taxes	50.3	51.8	46.7	42.8
Taxes on Goods and Services	251.3	229.0	221.5	210.8
Property Tax	3.0	2.9	2.2	2.0
Taxes on International Trade	39.7	44.7	35.0	33.3
Total Expenditure	343.7	319.1	343.5	343.5
Recurrent Expenditure	323.3	293.4	325.5	325.5
Personal Emoluments	95.4	99.2	106.0	106.0
Employer Social Benefits	14.1	14.8	16.6	16.6
Social Contributions	16.3	17.3	19.7	19.7
Domestic Interest	4.3	3.1	2.9	2.9
Foreign Interest	1.3	2.9	4.2	4.2
Subsidies	0.4	0.2	0.4	0.4
Grants	109.7	82.5	85.8	85.8
Social Assistance Benefits	0.8	0.7	2.0	2.0
Property Expenses	1.9	1.2	1.6	1.6
Assistance Grants	7.4	8.0	11.5	11.5
Miscellaneous Other Expense	8.0	1.2	7.3	7.3
Capital Expenditure	20.4	25.7	18.1	18.1
Fiscal Balance	28.6	31.2	-15.4	-31.3
Primary Balance %GDP	34.3	37.1	-8.4	-24.3
Fiscal Balance %GDP	**2.8%**	**3.0%**	**-1.4%**	**-2.9%**
Primary Balance %GDP	**3.3%**	**3.6%**	**0.7%**	**-2.3%**

Government expenditure will likely increase due to COVID-19. The Government of the Virgin Islands has outlined some measures necessary to combat the pandemic and these include; the suspension of water rates, transfers to farmers and fisherfolk to ensure business continuity, social assistance, and expenditure related to building quarantine facilities and purchasing necessary supplies. These initiatives are estimated to cost around US$16 million. With the temporary closure of operations, it is likely that the Government will be able to shift some of the discretionary expenditure towards covering some COVID-19 related expenditure.

Not accounting for any reduction in non-discretionary spending, total expenditure is expected to increase by US$24.4 million when compared to 2019 estimates.

Taking into consideration the estimates for the fall in revenue and the likely increase in expenditure, this will likely result in a fiscal deficit between US$15 million and US$31 million, and a primary deficit between US$8 million and US$24 million.

SOCIAL

Our model includes predictions for different categories of workers. We simulate the effects on the four categories of workers outlined: tourism, non-essential high-flexibility workers, non-essential low-flexibility workers, and essential workers. Tourism workers are likely to be the most affected by the COVID-19 pandemic. The longer that the tourism industry remains closed, the greater the burden these workers bear.

Table 4 : Percentage Change in Incomes by Industry

	6-Week Lockdown	6-Week Lockdown	6-Week Lockdown	6-Week Lockdown	24-Week Lockdown
Sector	**2020**	**2020**	**2020**	**2020**	**2020**
Tourism	-13%	-37%	-60%	-77%	-77%
Non-Essential High-Flexibility	-4%	-10%	-16%	-11%	-18%
Non-Essential Low-Flexibility	-8%	-21%	-35%	-15%	-31%
Essential	-1%	-1%	0%	-1%	0%
Source: Author's calculations.					

Under the most likely scenarios of a reopening of tourism activity in August or November, incomes in the tourism sector are expected to decline between 37% and 60% in 2020. Workers in non-essential low-flexibility sectors are expected to bear a significant share of the burden as well, with their incomes declining by 21% or 35% in 2020. These suffer in part because of the domestic lockdown, but also in part due to the falling demand for domestic goods and services due to loss of tourism incomes. These calculations do not factor in any policy response by the Government in the shape of cash transfers to newly unemployed workers. The Virgin Islands economy faces an important complexity—much of its labour force is a migrant labour force. Those who have become permanent residents are expected not to have significant migration responses to the crisis.

However, those who remain in the Virgin Islands on work permits may be forced to leave the Virgin Islands under the conditions of their work permits. Unlike the aftermath of Hurricane Irma, there is not significant reconstruction activity to which this labour can be repurposed in the short term.

In 2014, the tourism industry benefited from the largest share of work permits issued—around 21%. An extended closure of the Virgin Islands tourism industry could see a significant exodus of many of these workers—up to 10% of the previously employed labour force. Further spillovers into the domestic economy could lead to additional outflows of workers. A survey conducted by the Government of the Virgin Islands in the wake of the COVID-19 pandemic found that by April 24, 329 workers had been laid off with 179 of those being identified as being work permit holders and a further 79 not specifying their status. This means that anywhere between 55% and 78% of those who have already become unemployed are likely to be migrant workers on work permits. Given that migrants earn 17% less than nationals, they are also at serious risk of falling into poverty.

Table 5: Labour Statistics by Gender and Employment Type				
	Male	**Female**	**% Female**	**Total**
Essential	1184	1288	52%	2472
Low-flex	4868	2648	35%	7516
High-flex	3160	3935	55%	7095
Tourism	992	1242	56%	2234
Source: Government of the Virgin Islands Central Statistics Office				

Data suggests that around 56% of workers in the accommodation and food services sector are women. We know that in the Virgin Islands around 63% of those who are poor or vulnerable are women. And women already have higher unemployment rates than men (4.1% versus 1.5% in 2015). Women are most likely to be at risk from the deep decline in tourism activity.

The 2010 Census suggests that females constitute the majority of single parent households.[14] Around 33% of women are single parents. Given that the average monthly wage of a single person is roughly 70% that of a married person (US$23,790.16 and US$32,281.39), this strongly suggests single mothers are a vulnerable category in BVI society.

The secondary impact of COVID-19 will further exacerbate the conditions of those living in poverty and increase the proportion of who fall below the poverty line. Data from 2003 suggests that the child poverty rate in the Virgin Islands was around 29%, translating to a total of 1773 children living in poverty. The impact of COVID-19 may contribute to increasing this rate and number. This place higher burden on single-parent households caring for children. Child poverty rates vary by nationality.[15] In particular, non-national (non-belonger) migrants from other Caribbean countries had child poverty rates that were around a third higher than Virgin Islands nationals (belongers).

Given that migrants constitute around 63% of the tourism labour force, children in migrant households will bear a significant portion of the burden of the COVID-19 pandemic. One qualitative concern is that non-national households may have access to significantly diminished family-based safety nets compared to nationals. In 2010, half of unemployed persons said that they were supported financially by friends and relatives. Coupled with lower migrant incomes relative to nationals, children in migrant families appear particularly vulnerable to the economic shock.

As a result of the school closures, online classrooms have been introduced where some students face disruption to quality learning due to connectivity and supplies setbacks. The longer the students remain disengaged from the learning process, the higher the probability they will drop out permanently—especially those from low income backgrounds. A survey covering 2,765 households with school-age children conducted by the Ministry of Education in the wake of the COVID-19 pandemic found that at least 340 households lack internet access and a further 446 had limited packages. Of those without internet access, 162 reported that they would be unable to purchase even a discounted internet plan.[16] Households surveyed covered 3,312 students across primary and secondary schools, and reported that 157 students did not have any device at their disposal, while a further 577 had only a tablet or a smart phone available for online learning.

14 http://www.bvi.gov.vg/content/virgin-islands-2010-population-and-housing-census-report
15 https://www.unicef.org/Child_Poverty_in_the_ECA_WEB_VERSION.pdf
16 https://www.bvibeacon.com/online-classes-start/

A more fundamental problem is the quality of the broadband, which the Government has recognized.[17] To begin to offset these concerns, education websites have been zero-rated and 25% discounted internet packages have been made available to students. Further, there have been donations of around 1,000 devices to be loaned to students to aid with online learning that began on May 4, 2020.[18]

Women are the majority of clerks, service workers and shop and market sales workers, and professionals. Most women are indeed service workers and shop and market sales workers, followed by professionals. While skilled professionals can work from home where feasible, the rest of these women are severely impacted by the COVID-19 crisis: the women working in tourism and in non-essential services are not earning a wage, with women working in tourism out of a job for an unknown amount of time. On the other hand, women who work in essential services continue working and struggle to cope with any childcare duties they might have. As a third of women are single mothers, we see two strains of problems arising: feeding their children for the unemployed women, looking after and homeschooling them for essential workers.

The year 2011 saw two important legal steps for women: the First National Gender Policy for Equity and Equality for the Virgin Islands and the Domestic Violence Act. However, gender discrimination is still widespread and so is Gender-Based Violence (GBV).[19] The Royal Virgin Islands Police Force domestic violence reports showed an increase in GBV from 2009 to 2012. Appealing to abusers to stop[20] and calling for peace in homes during the lockdown[21] is not enough to combat GBV. The Office of Gender Affairs must recognise that in an environment where women depend on men and are locked in the house with their abusers, encouraging women to report instances of domestic violence is not an effective policy. The Government, through the Social Development Department offers shelter and support for victims of GBV.

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17 http://www.virginislandsnewsonline.com/en/news/internet-providers-should-have-no-excuse-for-poor-service-premier-fahie
18 https://bvi.gov.vg/media-centre/students-receive-aid-remote-learning?fbclid=IwAR2PW7b47o7VI9Cc17R_bklTo7rUDDW5nue0BppRs74TdtEGtJEN0BuF9LY
19 http://www.virginislandsnewsonline.com/en/news/domestic-violence-stats-startling-top-cop-
20 https://bvi.gov.vg/content/gis-preview-premier-fahie-appeals-abusers-stop
21 http://www.bvi.gov.vg/media-centre/office-gender-affairs-calls-peace-homes-during-6-day-lockdown

RECOMMENDATIONS

Government launched a stimulus package designed to support vulnerable individuals manage the impacts of the pandemic. There was a suspension on charges for water for all Water and Sewerage Department customers for a 30-day period, ending mid-April as well as a US$2 million allocation to farmers and fisher folk to purchase critical supplies for business continuity.

These interventions are, in addition to the discretionary unemployment assistance, available under the Public Assistance Act No 14 of 2013, by application through the Social Development Departments of the Government of the Virgin Islands. As this income support is discretionary, support is reviewed on a case by case basis.

RESPONSE AND RELIEF

The response and relief phase is the period during which immediate interventions are necessary to mitigate as much as possible the impact on people, communities and businesses. These actions are undertaken in the short-term and are designed to ensure continued access to basic human rights and freedoms.

Use the framework created for the Financial Assistance Programme after Hurricanes Irma and Maria to provide temporary cash

The Government of the Virgin Islands social protection programmes are not readily able to rapidly scale up for the distribution of cash transfers in the wake of the COVID-19 crisis. However, after the passing of Hurricanes Irma and Maria, the Financial Assistance Programme was rolled out with the help of the BVI Red Cross, the British Red Cross, DFID - UK Department for International Development, and Caritas Antilles. This programme can be a template for providing multi-purpose cash to mitigate the secondary impact of COVID-19, building on existing targeting mechanisms, information management, coordination mechanisms, and creating linkages to other existing social services. Grants were given in the range of US$800 to US$1,200 per month for three months, representing enough to lift families out of the lowest income category. That total programme cost US$3.2 million. It is likely that the scope for this programme will need to be broadened to capture a much wider range of households given the increased number of persons with financial and social vulnerabilities—including formal and informal workers from the tourism sector.

Given the possibility that tourism activity might not return until late 2020 or even later, it is recommended that the length of the programme be dependent on the status of the domestic economy (under curfew or not), and the status of the tourism sector—where there are significant vulnerable categories. The previous programme was reported to have reached 12% of the population. A COVID-19 programme would then likely exceed the cost of the previous programme, but would be responsive to the context of the COVID-19 pandemic. With unemployment expected to peak around 18% to 19% in our central scenarios, this would require outlays of around US$3 million per month at the peak, and falling as the domestic economy reopens. Assuming that this is provided for the extent of the lockdown, and tourism reopens in August, this would cost approximately US$12 million in total. If payments are made dependent on income status beyond a three month period, then this would significantly increase the total programme cost.

Provide liquidity for small firms

Given the risk aversion of Caribbean banks, it is possible that there will be a number of micro, small, and medium enterprises (MSMEs) which do not have access to liquidity. We predict that between 5% and 8% of tourism firms are likely to fail. The longer the lockdown lasts, the more pressing the need to provide tourism-related firms with liquidity. This can be done in two ways: either directly through the Government of the Virgin Islands in the form of a grant, or indirectly through the commercial banking sector using Government guarantees to encourage lending.

The former places a greater burden on the Government, and might likely require outlays of around US$11 million assuming that 5% of tourism firms and 1% of other firms are likely to fail in the August reopening scenario. The Government guarantee approach requires much lower outlays in the immediate term, but relies on commercial banks having the liquidity to finance this lending.

Extend the period for work permit holders to find new jobs and implement rapid work permit transfers.

Given the potential for an extended closure of the tourism sector, the Virgin Islands' migrant labour force might suffer substantially. In order to retain workers so that there is not significant detachment, the Government of the Virgin Islands could extend the period where unemployed work permit holders are allowed to search for new jobs from three months until the reopening of the tourism industry. Further, allowing rapid work permit transfers during the period of the lockdown allows labour to be reallocated quickly from sectors with excess supply of labour to sectors with excess demand. The faster work permits are transferable, the more poverty is limited in the short run. In addition, migrant families returning to their home countries in the short run puts children in particular at risk of being uprooted. Given the higher incidence of Caribbean migrant child poverty, this is an important short-term economic response to protect vulnerable children.

A voluntary "Home Return" programme

The high proportion of migrants in the workforce, particularly within the tourism sector which is likely to be hardest hit, will create additional unemployment among the non-national population. Depending on how long the demand for tourism remains depressed, this unemployment could be protracted. With limited scope for broad coverage of income support programmes, a temporary migrant repatriation programme could be implemented that would provide support to those unemployed migrants and their families to return home.

This programme would be completely voluntary and could provide a simple process for migrants with work visas to apply for support to cover the basic return travel costs for them and/or their family members to their countries of origin. Migrants who participate in the programme could be given preference if they re-apply to return to the BVI after a specified period. This programme would have the benefit of allowing migrants to explore employment opportunities in their countries of origin. While the scale of the programme would be determined by the available resources and the number of individuals applying, it is clear that such a programme would result in a lower net per person cost than providing sustained income support over the short/medium-term. The proposed programme should be informed and guided by a human rights-based approach, ensuring that migrants rights and freedoms are fully protected and that the process does not reinforce existing inequalities.

Fiscal space

The Government of the Virgin Islands is constrained mainly by its fiscal rules. While it had, at the end of 2019, US$87.80 million in its Reserve and Contingency Funds, it is constrained to keep these above 25% of recurrent expenditure. At the end of 2019, this was approximately 29.3% of recurrent expenditure for 2019. These funds are available to use, but the Government will likely need to breach its established debt limits to use these funds to provide a significant economic response to the crisis.

In the short run, the Government of the Virgin Islands has a very low debt to GDP ratio, making it an attractive borrower. The Government is limited to a net debt level equivalent to 80% of recurrent revenues. Using 2019 estimates this would imply a net debt limit of US$250 million. With net debt estimated to be US$27.3 million, this gives the Government significant fiscal space. The Government is, however, constrained in its borrowing by the lack of an international credit rating.

The Government of the Virgin Islands therefore has access to the finances to provide a significant response—it is constrained mainly by its fiscal rules which will need to be breached given the severity of the situation.

RECOVERY AND RESILIENCE

The recovery and resilience phase is the next stage in the process, and represents the transition from the critical response and relief phase to medium and long-term interventions that help people rebuild their lives.

Implement a permanent unemployment benefit fund.

The increasing frequency of large economic shocks requires that a small country like the British Virgin Islands may benefit from some form of unemployment insurance. Low income households are especially vulnerable to large economic shocks. They can easily be plunged into temporary poverty if they do not have access to unemployment insurance during an economic shock. This limits the cost to the Government of the Virgin Islands during large negative shocks, and would allow a much faster automatic response to a crisis. This is particularly important given the fiscal rules faced by the Government. Assuming a requirement to cover each individual up to at least 60% of the average monthly income[22] at the baseline rate of unemployment, the cost of the fund would be approximately US$ 758,000 per month. While the initial capitalisation will require an injection by the government, ongoing replenishment would be funded by a small increase in social security contributions.

The main complexity faced in the implementation of such a fund would be the existence of a large migrant workforce. Given that there is a short period during which migrants on work permits are allowed to search for a new job, it seems reasonable to allow workers who have contributed to the scheme to access unemployment benefits while they search for a new job. At the individual level, this prevents migrant workers from falling into poverty in a country where they may have no informal safety net. This is particularly important given the relatively high incidence of child poverty for Caribbean migrants in the Virgin Islands. At the aggregate level, this retains both labour supply and domestic demand even during downturns.

Expand the coverage and targeting of the Public Assistance Programme.

The Public Assistance Programme offers cash payments that are not enough to lift households out of poverty. While it is not clear where the poverty line currently exists, the payments made are approximately US$350 per month, which compare unfavourably to the US$800 to US$1,200 that was paid in the wake of Hurricane Irma. The amount could be expanded in line with a rigorous assessment of the poverty line. The Public Assistance Programme also offers only temporary support, lasting only up to a year. This puts vulnerable households at risk. While it is appropriate to review the eligibility of recipients, benefits should not be explicitly short-term. The Programme could broaden its target groups to include all who fall into poverty, but targeting especially those who are vulnerable such as women, households with children, single parents with children, and the elderly.

This programme could be made responsive to all types of shocks, given the vulnerability of the Virgin Islands to significant economic shocks. To do so, objective criteria could be outlined so that the programme can be scaled up quickly and efficiently if a substantial portion of the population are pushed into poverty. This will require considering "relaxing" the criteria in times of shocks to ensure timely distribution of multi-purpose cash to households and recipients. The benefit amount could account for the size of the family, and in particular the number of children in a household. Broadening the scheme without further increases in benefit amounts will cost a small fraction of the Government's budget. The most recent figures suggest there are fewer than 100 beneficiaries, costing approximately US$420,000 per year in total. Assuming a rate of between US$700 (double the current rate) and US$1,000 (the mid-range of the previous post-hurricane income support), the vertical expansion of the programme would cost between US$840,000 and US$1.2 million. However, given the significant projected impact on unemployment, horizontal expansion to include additional beneficiaries would also be necessary to mitigate significant increases in poverty and vulnerability to poverty.

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22 The most recent Labour Force survey notes than the overall average monthly income for workers who stated their incomes was $2,215.30

Annex

COVID-19
The Model

June 3, 2020

Drawing from Eichenbaum et al. (2020) and Kaplan et al. (2020): combination of SIR and macro model to evaluate policy options in small open economies highly reliant on tourism.

SIR Model

SIR model for the epidemiological side. For sectors $i = (T, H, L, E)$ define

$$\text{Susceptible:} \quad S_{t+1}^i = S_t^i - T_t^i \tag{1}$$

$$\text{Infected:} \quad I_{t+1}^i = I_t^i + T_t^i - (\gamma + \mu) \cdot I_t^i \tag{2}$$

$$\text{Recovered:} \quad R_{t+1}^i = R_t^i + \gamma \cdot I_t^i \tag{3}$$

$$\text{Deceased:} \quad D_{t+1}^i = D_t^i + \mu \cdot I_t^i \tag{4}$$

$$\text{New infected:} \quad T_t^i = \beta \cdot (1 + \delta)^m \cdot (1 + \alpha^i \cdot \delta) \cdot S_t^i \cdot \sum_i I_t^i \tag{5}$$

$$\text{Population:} \quad Pop_{t+1} = Pop_0 - \sum_i D_t^i \tag{6}$$

with γ recovery rate, μ death rate, β infection rate, δ extra exposure from market work (instead of remote work or the sector being shut), m number of sectors working market, and α^i sector-specific weight.

The infection rate β is a function of public and health policy, for example strictness of quarantine rules, how well informed the public is about preventive measures, etc. The infection rate β is augmented by a factor δ for every sector that is open and operating normally (i.e. market), with $\delta \in [0, 1]$ infection risk from in-person interaction at work and m number of sectors operating as normal (market). The effect is multiplicative: if more sectors are operating normally then the risk of infection increases exponentially. The sector-specific weight α^i captures the increased (decreased) chances of being infected if working market

(remote).

$$\alpha^i = \begin{cases} 0 & \text{if } m = 0 \text{ or } m = 4 \\ +\dfrac{1}{m} & \text{if } 0 < m < 4 \text{ and market} \\ -\dfrac{1}{4-m} & \text{if } 0 < m < 4 \text{ and remote/shut} \end{cases} \tag{7}$$

Working market implies more in-person interactions and therefore a higher risk of infection. Working remote, by greatly limiting in-person interactions, decreases the risk of infection. For simplicity we assume that the extent of exposure and risk of infection is the same for all those working market, regardless of their job or sector.

Macro Model

In real terms (i.e. no prices). Three types of agents: households, firms, government. Households consume all disposable income and supply labour inelastically. Firms can belong to four sectors: tourism ($i = T$), high flexibility ($i = H$), low flexibility ($i = L$), or essential ($i = E$). High flex is for example software engineering, low flex is restaurants, essential is pharmacies. Generally sectors can either work market (i.e. regular work), work remotely (i.e. telecommuting), or be shut. If they work remotely they will be $\phi^i \in [0, 1]$ as productive as working market. If they are shut they will not produce. Unless shut, firms produce final goods Y^i using labour and technology (we do not consider capital). Finally, the government pays unemployment benefits and transfers to households, subsidies to firms, collects income tax from the first and corporate tax from the second.

Phases

The model has four phases, which we define in periods of weeks.

1. **First phase:** pre-COVID-19 period where the economy operates without effect.

2. **Second phase:** COVID-19 first reaches the country and the infection spreads uncontrolled.

3. **Third phase:** the country shuts the tourism sector and the domestic economy, apart from essential workers, works remote. High flexibility workers are able to work at home albeit with reduced productivity. Low flexibility workers work with a substantially reduced productivity. Tourism workers become unemployed. Shutting tourism and switching high and low flex sectors to remote working slows down the infection and flattens the curve.

4. **Fourth phase:** post-COVID-19 period. It comprises of two sub-phases:

(a) the domestic economy returns to normal: high and low flex sectors work market. Tourism remains shut,

(b) Tourism re-opens.

The model

In the real world when a sector is shut firms have no revenues but still have to pay fixed costs. These fixed costs pile up, and at some point the firm will not have enough liquidity to cover them. The longer the shutdown lasts and the more liquidity constraint a sector is, the higher the share of firms that fail. In our model the share of firms failing in sector i is $\rho_t^i \in [0, 1]$, and it follows

$$\rho_t^i = \begin{cases} 0 & \text{if } i = E \\ \dfrac{t - n^i}{n^{max}} \cdot \rho & \text{if shut} \\ \eta \cdot \dfrac{t - n^i}{n^{max}} \cdot \rho & \text{if not shut} \end{cases} \tag{8}$$

where n^i is the period when sector i shut down, n^{max} the maximum number of periods the sector can be shut for (i.e. length of periods 3 and 4), and ρ long-term failure probability.

We introduce this as a labour friction. If a share ρ_t^i of firms fail, since firms and workers are homogeneous and atomistic, it means that the same share ρ_t^i of workers is unemployed.

Labour

$$\text{if market/remote:} \quad N_t^i = (1 - \rho_t^i) \cdot (S_t^i + R_t^i) \tag{9}$$

$$\text{if shut:} \quad N_t^i = 0 \tag{10}$$

Healthy people can work. Unless the firms has failed or the sector is shut off, they do.

Production, with production function $Y = f(N_t) = A \cdot N_t$.

$$\text{if market:} \quad Y_t^i = A^i \cdot N_t^i \tag{11}$$

$$\text{if remote:} \quad Y_t^i = (\phi^i \cdot A^i) \cdot N_t^i \tag{12}$$

$$\text{if shut:} \quad Y_t^i = 0 \tag{13}$$

High-flex and low-flex sectors can switch to remote work, though this reduces their productivity by a factor ϕ^i, with $\phi^H > \phi^L$. Shut sectors do not produce any output.

Profits

$$\text{if market/remote:} \quad \Pi_t^i = (1 - \tau_F) \cdot \left(Y_t^i - w^i \cdot N_t^i - \lambda_F \cdot w^i \cdot (1 - \rho_t^i) \cdot I_t^i \right)$$

$$\text{if shut:} \quad \Pi_t^i = 0$$

If the sector is market or remote then firms who still operate have to pay wages and sick pay, as well as corporate tax τ_F. If the sector is shut then the firms

3

make no profits. Note that the failure rate is implicit in the workforce, and that only workers who are employed by firms that have not failed receive sick pay.

Income

if market/remote:
$$\Gamma_t^i = (1 - \tau_I) \cdot w^i \cdot N_t^i + (\lambda_F + \lambda_G) \cdot w^i \cdot (1 - \rho_t^i) \cdot I_t^i$$
$$+ \theta \cdot w^i \cdot (1 - \rho_t^i) \cdot (S_t^i + I_t^i + R_t^i) + \Pi_t^i \tag{14}$$

if shut:
$$\Gamma_t^i = \theta \cdot w^i \cdot (S_t^i + I_t^i + R_t^i) + \Pi_t^i \tag{15}$$

with τ_I income tax (same for all sectors), $(\lambda_G + \lambda_F)$ sick pay rate with λ_G share paid by the government and λ_F share paid by the firm, $\theta \in [0, 1]$ unemployment benefits rate paid by the government. Γ_t^i income, N_t^i labour in hours worked[1].

Consumption

$$C_t = (1 - \tau_C) \cdot MPC \cdot \sum_i \Gamma_t^i \tag{16}$$

where MPC is the marginal propensity to consume and τ_C consumption tax.

Government

$$B_t = \sum_i \left[\tau_I \cdot w^i \cdot N_t^i + \tau_F \cdot \left[Y_t^i - w^i \cdot N_t^i - \lambda_F \cdot w^i \cdot (1 - \rho_t^i) \cdot I_t^i \right] + \tau_C \cdot MPC \cdot \Gamma_t^i \right.$$

$$\left. - \lambda_G \cdot w^i \cdot (1 - \rho_t^i) \cdot I_t^i - \theta \cdot w^i \cdot (1 - \rho_t^i) \cdot \left(S_t^i + I_t^i + R_t^i \right) \right] \tag{17}$$

The governments revenues come from the income tax on the healthy people who work in firms that have not failed and from corporate tax on those firms. The government pays welfare transfers to households, subsidies to firms that have not failed, sick pay to the unhealthy individuals employed in firms that have not failed, and unemployment benefits to all those who were working in firms that failed or those working in shut sectors.

Trade: net of tourism Y_t^H that is not consumed by locals, net imports are

$$(IM - X) = C_t - \left(Y_t^H + Y_t^L + Y_t^E \right) \tag{18}$$

Initial conditions

During phase 1 (of length n_1) the population does not change:

$$Pop_t = \sum_i S_t^i = 1 \quad \forall t = 0, ..., n_1 \tag{19}$$

---

[1]We assume that everyone works full time, so N_t^i is the share of healthy employed population working in the sector.

At time $n_1 + 1$, when the infection starts[2]:

$$I^i_{n_1+1} = \varepsilon \cdot S^i_{n_1+1} \tag{20}$$
$$S^i_{n_1+1} = 1 - I^i_{n_1+1} \tag{21}$$
$$R^i_{n_1+1} = 0 \tag{22}$$
$$D^i_{n_1+1} = 0 \tag{23}$$
$$Pop_{n_1+1} = Pop_{n_1+1} \tag{24}$$

and from time $t = n_1 + 2$ onwards the infections spreads as described in the SIR Model section.

Calibration

Table 1: Health parameters

Parameter	Description	Value
γ	Recovery rate	$0.99 \cdot \dfrac{7}{14}$
μ	Mortality rate	$0.01 \cdot \dfrac{7}{14}$
β	Infection rate (health policy)	0.40
δ	Extra infection risk (work)	0.30
ε	Initial impact	0.001

The model is weekly. Since the illness lasts roughly 14 days, we adjust the health parameters of table 1 to a period being $\dfrac{7}{14}$ of the illness. 1% of people who contract covid-19 pass away, giving us a mortality rate of $0.01 \cdot \dfrac{7}{14}$. The remaining 99% recover, hence the recovery rate of $0.99 \cdot \dfrac{7}{14}$. We calibrate β and δ to be in line with the R0 parameters inferred by, among others, Liu et al. (2020) or Hellewell et al. (2020). We get β and δ from assuming $R_0 = 2.5$ when all economic activity continues as normal and $R_0 = 1.1$ when only the essential sector operates normally and everyone else either is shut or operates remotely. It must be noted that these R_0 are on the conservative side: R_0 was estimated to be almost 5.0 for Lombardy, for example. We choose lower R_0 because of the

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[2]Note that we assume the infection starts in all sectors simultaneously and with uniform probability

lower population density of the countries considered, as well as on the hypothesis that the virus spreads slower in hotter climates (Cookson, 2020). Then

$$
\begin{cases}
\beta \cdot (1 + \delta)^4 = 2.5 \cdot \dfrac{7}{14} \\
\beta \cdot (1 + \delta) = 1.1 \cdot \dfrac{7}{14}
\end{cases}
$$

and we approximate the results to $\beta = 0.4$ and $\delta = 0.3$. Last, the initial impact is $\varepsilon = 0.001$ as in Eichenbaum et al. (2020).

The model initial conditions are calibrated using data from the national statistical services. The economic parameters are the current tax rates, sick pay rates, and unemployment benefits rate. Productivity rates an educated guess, as there are no studies that measure the productivity of remote work. Changes in the productivity rates would rescale production during lockdown, but would not have long-term effects in this simple model. Last, we calibrate the probability of firms failing when shut down so that if the sector is shut until the end of the simulation (end of 2021) then 20% of the firms in the sector fail.

Note that we redistribute the elasticity of non-tourism activity to changes in tourism activity to high flex and low flex sectors only, leaving essential firms untouched, by calculating

$$
\eta = \eta' \cdot \frac{A_t^H \cdot N_t^H + A_t^L \cdot N_t^L + A_t^E \cdot N_t^E}{A_t^H \cdot N_t^H + A_t^L \cdot N_t^L}. \tag{25}
$$

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