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BARBADOS

**COVID-19 HEAT REPORT
HUMAN AND ECONOMIC ASSESSMENT OF IMPACT**

Based on research conducted by Dr. Simon Naitram

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COVID-19 HUMAN AND ECONOMIC ASSESSMENT OF IMPACT FOR BARBADOS

INDICATORS	VALUE
Demographic	
Age Dependency Ratio (World Bank, 2018)	49.6%
% of Labour Force Female	49.3%
All Ages Population	287,334
0-17	53,942
Girls	27,517
Boys	26,425
Macroeconomic	
GDP per capita (Central Bank of Barbados)	USD$18,156
GDP growth rate (Central Bank of Barbados)	-0.1%
Inflation (Central Bank of Barbados)	7.2%
Fiscal	
Debt to GDP ratio (Central Bank of Barbados)	118%
Fiscal Balance to GDP (Central Bank of Barbados)	6.1%
Interest to Revenue Ratio (Central Bank of Barbados)	8.4%
Social	
Unemployment (Barbados Statistical Service)	10%
Unemployment (female)	8.5%
Unemployment (male)	11.6%
Poverty rate (IADB, 2017)	17%
Poverty rate (female)	21%
Poverty rate (male)	14%
Poverty rate (children, CDB 2010)	32%
Number of school - going children (2017)	40,518
Global Health Security Index ranking	133/195
Note: All data is for 2019, unless otherwise stated.	

EXECUTIVE SUMMARY

The Barbados economy is the largest in the Eastern Caribbean and, pre-pandemic, was estimated to have shrunk by 0.1% in 2019. This contraction represents an overall GDP that is about 5% below its 2008 peak. Before the onset of the COVID-19 pandemic, the country's economy was predicted to grow between 1.25% and 1.75% by the Central Bank of Barbados. In June 2018, in response to the worsening fiscal and external liquidity position, the Government of Barbados announced the homegrown Barbados Economic Recovery and Transformation (BERT) Plan aimed at restoring macroeconomic stability while safeguarding the financial and social sectors. Included in the BERT Plan was the suspension of payments due on debt owed to external commercial creditors and a comprehensive domestic and external debt restructuring. Additionally, the Government of Barbados has been engaged in an IMF programme under the Extended Fund Facility since 2018. The programme's main target is a 60% debt to GDP ratio by 2033. A primary surplus of 6% of GDP each year is needed to reach that target. In fiscal year 2019/2020, Barbados achieved the primary surplus target of 6.1% of GDP.

Barbados relies heavily on tourism for foreign exchange earnings. The accommodation and food services sector accounts for approximately 17% of economic activity and 13% of total employment. Notably, women constitute around 62% of employment in the accommodation and food services industry.

Barbados' unemployment rate is estimated to be around 10%. The female unemployment rate is 8.5%, while the male unemployment rate is 11.6%. The within-year volatility of employment is significant with an average seasonal dip in employment of approximately 7,000 workers each year. This is likely due in large part to the highly seasonal nature of tourism activity in Barbados.

Based on the Inter-American Development Bank's Barbados Survey of Living Conditions 2016/2017, the overall levels of poverty were 17%, a 2% increase from 2010. A further 11% of the population was considered to be vulnerable. In a report on Barbados' Country Assessment of Living Conditions, 2010, the child poverty rate was 32%, demonstrating that children are more likely to live in poverty and face multiple deprivations.

The Government of Barbados declared a public health emergency on March 26, 2020. Initially this took the form of a 10-hour curfew, which was later expanded to a 24-hour curfew that ended on 3 May 2020. Currently, a curfew is in place from 8:00 pm to 5:00 am and a number of business sectors have been allowed to recommence activities with strict stipulations in place regarding social distancing and hygiene practices. The tourism sector has not reopened.

Even after the restart of the tourism sector, it is likely that deep recessions, consumer uncertainty, and more specific uncertainty about air travel will strongly suppress new demand for tourism services. The impact is already significant, with heightened unemployment, and significant social dislocation. A November 2020 reopening of tourism is predicted to lead to a 16% decline in GDP in 2020, and a 15% recovery in 2021. The unemployment rate, which has already exceeded the 10% last measured, is predicted to average 21% in 2020 and 13% in 2021.

This report outlines a number of recommendations including: enabling the availability of low-cost options for internet access to improve the livelihood potential of the most vulnerable in society and reduce inequalities due to moving to online learning by broadening access to the internet for children in poverty; inclusion of informal workers into the formal economy through the National Insurance Scheme which in the long term will increase the number of contributions and significantly improve the health of the National Insurance Fund; expansion of the Central Bank of Barbados' Credit Guarantee scheme; ensuring social assistance for all who need it, including making unemployment benefits for self-employed individuals permanent to reduce their vulnerability in times of uncertainty and increasing the attractiveness of the entrepreneurship sector which serves as the engine for economic growth; and increasing the limit on the Health Service Levy to expand healthcare facilities and make contributions progressive.

CONTEXT

MACROECONOMIC

The Barbados economy is the largest in the Eastern Caribbean and, pre-pandemic, was estimated to have shrunk by 0.1% in 2019. This contraction represents an overall GDP that is about 5% below its 2008 peak. Before the onset of the COVID-19 pandemic, the Barbados economy was predicted by the Central Bank of Barbados to grow between 1.25% and 1.75%.

The accommodation and food services account for approximately 17% of economic activity. From 2009 to 2018, this industry grew by 25% while the other industries shrank by 3%. The finance and insurance industry contributes a further 10%, while real estate and construction together generate around 17% of economic activity.

The wholesale and retail trade sector employs the largest share of Barbadians—around 16% in 2018. The accommodation and food services sector accounted for 13% of total employment. Women constitute around 62% of employment in the accommodation and food services industry.

Barbados relies heavily on tourism for foreign exchange earnings. In 2016, travel credits accounted for 43% of total goods and services credits. Merchandise good exports generate a further 22% of total credits, while the international business sector contributes around 10%. Barbados' gross international reserves represented 19 weeks of imports at the end of 2019.

FISCAL

In 2018, Barbados halted payments on its debt and began to negotiate with creditors to restructure its debt. The Government of Barbados has been engaged in an IMF programme under the Extended Fund Facility since 2018. The programme's main target is a 60% debt to GDP ratio by 2033. A primary surplus of 6% of GDP each year is needed to reach that target. In fiscal year 2019/2020, Barbados achieved the primary surplus target of 6.1% of GDP. This puts gross central government debt at 117.4% of GDP as at March 2020.

In 2019/20, total revenue was BBD $2,600 million, equivalent to 21.5% of GDP. The Government of Barbados uses a range of tax instruments. Its main revenue-collecting instruments are:

- The value added tax (VAT), which contributes 32% of total revenue,
- The personal income tax, which contributes 15% of total revenue,
- The corporation tax, which contributes 10% of total revenue,
- Excise taxes, which contribute 8% of total revenue, and
- Import duties, which contribute 8% of total revenue.

In 2019/20, the Government's total expenditure was BBD $3,024 million, equivalent to 25% of GDP. Like most developing countries, the Government's spending is largely dedicated to wages. At first glance, wages and salaries constitute only 31% of total spending. However, of the enormous share of money spent on transfers to state-owned enterprises (38%), the majority of this spending is estimated to be dedicated to wages. As a direct result of the Government's debt default and debt restructuring in 2018, interest payments in 2019/20 accounted for only 10% of total expenditure. Capital expenditure suffered, accounting for only 7% of GDP in 2019/20. In an effort to protect the poor and vulnerable, the IMF placed a floor on social spending to maintain the country's relatively strong social safety nets.

Due to the debt restructuring, the Government of Barbados no longer has access to market-based financing. This holds for both domestic and external debt. Instead, it has accessed new financing through the Caribbean Development Bank (CDB) and the Inter-American Development Bank (IADB). The Government has also received balance of payments support from the IMF. For 2019/20 these loans totalled BBD$344 million.

SOCIAL SECTOR

The unemployment rate is estimated to be around 10% in Barbados. The female unemployment rate is 8.5%, while the male unemployment rate is 11.6%. The female participation rate is 60% and the male participation rate is 67%. The within-year volatility of employment is significant for 2017 to 2019, with an average seasonal dip in employment of approximately 7,000 workers each year—or an average increase in the unemployment rate of 3 percentage points. This is likely due in large part to the highly seasonal nature of tourism activity in Barbados.

It is estimated that 4.7% of participants in the IADB's Survey of Living Conditions were working part-time: of these, 54% were women. Women were also more likely than men to be under-employed: 1.7% of employed women would work more hours, compared to 1.6% of employed men. Unpaid family workers tend to be exclusively female.

The Inter-American Development Bank's Barbados Survey of Living Conditions 2016/2017 found that overall levels of poverty were rising, up from 15% in 2010 to 17%. A further 11% of the population was considered to be vulnerable. The Survey estimated that 21% of women were poor while 14% of men were poor. In addition, 13% of women were considered vulnerable while 10% of men were considered vulnerable. Female poverty and vulnerability stems both from direct and indirect discrimination, in the workplace and in social contexts. The 2010 Country Assessment of Living Conditions found that 32% of children in Barbados live in poverty. The child poverty rate was nearly double for those households in which females were the main income earners than in those in which a male was the highest income earner: 41% compared to 22%.

Barbados' National Assistance Programme is targeted at assisting children, unemployed adults, persons with disabilities (those not receiving NIS benefits), and the elderly (not receiving a pension from any source). Benefits are disbursed per household. Approximately 4,980 households receive cash benefits and 6,600 households receive benefits in kind. Cash benefits amount to BBD $1,458 per month and are paid by cheque. In 2018/19, grants to individuals cost the Government of Barbados BBD $12.2 million. This outlay was expected to increase to BBD $22.8 million in 2019/20 prior to the onset of COVID-19. This includes both cash payments and benefits in kind. There are no defined eligibility criteria, and instead households are assessed based on factors including income, expenditure, education. A universal intake form presently exists for data-gathering purposes, methodology. Proxy means testing is under development.

Barbados provides social assistance through the Poverty Alleviation and Reduction Programme. Barbados is also auditing the Poverty Eradication Fund, which aims to combine direct intervention with networking to reduce poverty, inequity and inequality and promote entrepreneurship. The Poverty Eradication Fund includes the provision of assistance to individuals/families whose total income falls below the poverty line ($7,861), with water and electricity, house and land rent, house repairs and bathroom facilities, micro-business support and tuition fees. Other social assistance also includes monetary and in-kind assistance to people with HIV/Aids, including food vouchers.[1]

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1 Barbados/IDB (2018) Social Services Directory. Strengthening Human and Social Development Project.

SOCIAL SECTOR CONT'D

Table 1: Children (0-14) by household composition and benefits				
	Share of total children%	**No support %**	**Government grant %**	**Maintenance or alimony %**
Both parents in household	38.35	92.15	2.53	5.31
Only mother in in household	46.83	37.42	5.05	57.76
Source: Barbados Survey of Living Conditions 2016				

According to the 2016 Survey of Living Conditions, single mothers are twice as likely to receive government grants, compared to families with both parents in the household. Over 60% of single mothers receive support either in government grants, or maintenance or alimony, while caring for almost half of the children. Households with both parents care for less than 40% of the children, and most of them are self-sufficient: less than 10% of them receive support.

Education net enrolment in Barbados is well above 90% for both primary and secondary education however pre-primary is only above 80%[2] with an ECD index of 96.6.[3] In 2015/2016 there were 77 public and 36 private pre-primary education institutions with 5,966 students enrolled. There were 68 public and 26 private primary schools with 20,148 students enrolled. There were 22 public and 9 private secondary schools with 20,370 students enrolled. As a measure of access to online learning resources, 82% of Barbadians were estimated to have access to the internet in 2017.

Barbados provides universal health care for all residents through 8 public polyclinics and 1 public hospital. The Queen Elizabeth Hospital has 519 beds. There is 1 private hospital and 3 main private medical clinics.

2 http://uis.unesco.org/en/country/bb
3 https://www.unicef.org/easterncaribbean/reports/situation-analysis-children-eastern-caribbean-area

CHANNEL OF TRANSFORMATION

EXTERNAL

Barbados' main tourism source markets are the United Kingdom, the United States, and other European countries. The United Kingdom and the United States comprise almost two-thirds of total arrivals.

Table 2: Tourism Arrivals by Source Market and Contribution to GDP			
Market	**Share**	**GDP growth 2020 (%)**	**GDP growth 2021 (%)**
United Kingdom	33%	-6.5	4.0
United States	31%	-5.9	4.7
CARICOM	15%	-5.2	3.4
European Union	5.6%	-7.5	4.7

Source: Tourist arrivals data is sourced from the Central Bank of Barbados for 2019. GDP growth predictions are from the IMF's World Economic Outlook April 2020.

In the short-run the biggest impact of COVID-19 will be felt through the closure of Barbados' tourism industry. While Barbados' borders are not explicitly closed to visitors, travel restrictions have forced the cancellation of most flights into Barbados. In the short run, tourism activity is effectively zero. For 79 hotels under the Barbados Hotel and Tourism Association with a 5,161 room stock, 95% of the room stock is reported to have closed. Of the 6,515 employees under those hotels, 5,287 or 81% of them are reported to not be working. [4] The Government of Barbados hopes that airlines will restart flights by July with public health protocols.

After the restart of the tourism sector, it is likely that deep recessions, consumer uncertainty, and more specific uncertainty about air travel will strongly suppress new demand for tourism services. Note that initial survey findings suggest that many airlines have issued travel credit to customers for cancelled flights, which delays rather than cancels the visit.[3] This hangover might benefit Barbados after the restart of tourism activity.

In 2021, the long-term rebound of tourism demand will depend on the speed of the economic recovery in major source markets and whether there are subsequent waves of the COVID-19 virus.

The World Bank estimates inward remittances to Barbados to have been 2.2% of GDP in 2019. Barbados has a relatively large diaspora (114,000) relative to its resident population (290,000). In the short run, the large spikes in unemployment rates in advanced countries are likely to lead to substantial declines in the remittances received by Barbadians.

4 https://barbadostoday.bb/2020/04/16/nine-out-of-ten-hotels-closed-in-industrys-worstcrisis/fbclid=IwAR3jApAk2LJRqrR3pP9eKzR8UhvIZtp3hUae4cE9g63tPbgXGByL44nLork
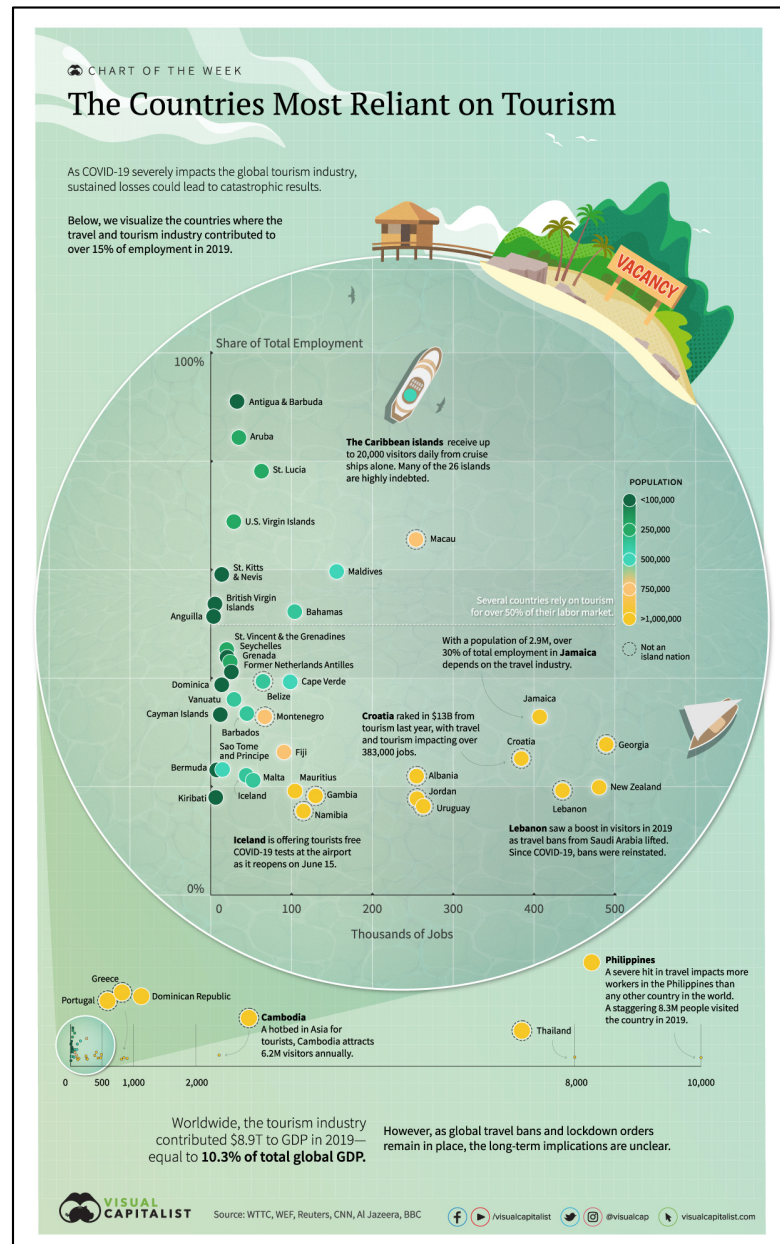5 https://www.bankrate.com/finance/credit-cards/cancelled-events-survey/

DOMESTIC

The Government of Barbados declared a public health emergency on March 26 2020 after 24 cases of COVID-19 were confirmed. Initially this took the form of a 10-hour curfew, with movement allowed between 6am and 8pm. This was expanded to a 24-hour curfew, and the deadline was extended from April 14 to May 3 2020. Only essential services were allowed to operate during this time.

The shutdown had the immediate effect of reducing output. Many businesses took the further step of reducing the number of employees. Other businesses maintained connections with workers but either reduced their hours, asked them to take vacation, or were simply unable to pay workers.

It is likely that many firms in Barbados are credit constrained. The Inter-American Development Bank's PROTEqIN survey of 123 Barbadian firms in 2014 found that while 74 firms had outstanding loans, 32 firms did not have loans either because they were rejected, or they found the terms of the loans unfavourable. These firms employ 29.7% of the employees covered in the survey. The survey found that access to finance and the cost of finance were the 2nd and 4th most pressing problems these firms had. Further, the difficulty of accessing finance is particularly pressing for small firms.[6] This raises concern of whether all firms will be able to survive the domestic curfew. This concern is greater for tourism-related firms which might remain closed for an extended period. This closure of firms erases jobs, and might lead to a lower than expected rebound in 2021.

There are likely to be spillover effects on the domestic economy through the decline in tourism income, even beyond the domestic public health emergency. From 2000 to 2002, an 8.5% decline in tourism activity was associated with a 2% decline in non-tourism activity—a spillover elasticity of around 0.24.

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

The IMF predicts a 7.8% decline in Barbados' GDP in 2020, and a 7.1% rebound in 2021. 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. 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 3: Macroeconomic Projections for Different Reopening Scenarios

	5-Week Lockdown		5-Week Lockdown		5-Week Lockdown		5-Week Lockdown		23-Week Lockdown	
	Tourism restarts immediately		Tourism restarts in August		Tourism restarts November		Tourism does not restarts untill 2022		Tourism does not restarts untill 2022	
Indicator	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
GDP Growth	-7%	+6%	-12%	+11%	-16%	+15%	-19%	-1%	-23%	0%
Consumption	-9%	+3%	-16%	+4%	-23%	+12%	-9%	-3%	-24%	-26%
Unemployment	12%	10%	17%	12%	21%	13%	24%	28%	24%	28%

Source: Author's calculations. GDP and consumption are measured in real terms. The baseline unemployment rate is 10.1% and is measured as an average unemployment rate for the full year.

MACROECONOMIC CONT'D

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. Using the PROTEqIN Survey[7] done by the IADB in 2014, we identify firms which do not have credit from a financial institution either because their applications were denied, or the terms of the loan arrangement were unfavourable. This data suggests that around 30% of employees were attached to firms without access to credit from financial institutions. We use this as a proxy for liquidity constrained firms, assuming that around two-thirds of these 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 0.24% 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 23 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 no recovery in 2021.

Unemployment levels would be expected to reach up to 28%. The notion of a second wave would be reflected in this scenario. The impact of such an event would be compounded if the second global wave is not quickly contained and increases the domestic prevalence of the disease significantly. This would likely result in another round of business closures, pushing unemployment above 28%, further constraining the fiscal position and forcing poverty levels higher.

The best-case scenario we consider is that the shutdown of the domestic economy ends in May 2020, 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 Barbados economy. In this case, real GDP is predicted to decline by 7% in 2020 and recover by 6% in 2021. Because this model includes an epidemiological component, reopening the tourism sector immediately leaves Barbados 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 12% on average, and return to the baseline 10% 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 lost, while a November reopening predicts that around 8% of tourism jobs are permanently lost. An August reopening of tourism is predicted to lead to a 12% decline in GDP in 2020, with an 11% rebound in 2021. This passes through to a 17% unemployment rate in 2020, and an 11% unemployment rate in 2021. A November reopening of tourism is predicted to lead to a 16% decline in GDP in 2020, and a 15% recovery in 2021. The unemployment rate is predicted to average 21% in 2020 and 13% in 2021.

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[7] https://publications.iadb.org/en/productivity-technology-innovation-caribbean

MACROECONOMIC CONT'D

We consider a final scenario: one where the Barbados economy reopens in May but operates without tourism until the end of the forecast period. The impact of closing the tourism sector is large, even while the domestic economy remains open. The model predicts that GDP would decline by 19% in 2020, and 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 3 where there is no tourism in 2020 diverge by around 4 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' ability to work in paid settings; 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.

Foreign exchange reserves in Barbados are mainly driven positively by tourism activity and negatively by consumption patterns. The COVID-19 pandemic works to reduce both tourism activity and consumption. These will have an offsetting effect, but the decline in foreign exchange reserves due to the fall in tourism activity will likely outstrip the dampening of consumer imports. Under the scenarios where tourism activity reopens in August, we predict that these two effects net out to a decline in foreign reserves of BBD $320 million in 2020. A November reopening nets out to a decline of BBD $600 million in 2020. Barbados' reserves stood at BBD $1,575 million at the end of March 2020. Declines in oil prices and expected inflows of multilateral borrowing should provide a buffer for these pure pandemic-related effects.

FISCAL

We examine the fiscal fallout from two scenarios: the reopening of tourism in August, and the reopening of tourism in November. In these scenarios GDP falls between 12% and 16%. It is expected that this loss in economic activity will have negative effects on most revenue categories in 2020/21. Personal income taxes are likely to be lower than 2019/ 20 by between BBD $80 million and BBD $101 million, as a result of job losses and shorter working hours in most sectors. Additionally, the fall in nominal income will significantly impact corporations' profits, the demand for properties and may lead to increased non-compliance.

The estimated impact is that corporation taxes and property taxes are likely to be lower than last year's outturn by between BBD $26 million and BBD $41 million, and between BBD $31 million and BBD $42 million, respectively. Due to dampened demand and the loss of tourism activity, VAT collections are expected to fall between BBD $127 million and BBD $174 million, excise taxes are expected to fall between BBD$30 million and BBD$43 million, while import duties are projected to fall between BBD$30 million and BBD$42 million.

FISCAL CONT'D

$BBDM	Actual 2018/19	Estimates 2019/20	Tourism in August 2020/21	Tourism in November 2020/21
Table 4: Fiscal Projections for Different Reopening Scenarios				
Total Revenue	2,993.6	2,984.2	2,586.2	2,450.1
Tax Revenue	2,812.4	2,771.2	2,382.6	2,246.6
Personal Income Tax	482.1	454.7	375.0	352.8
Corporate Tax	355.5	309.0	283.4	268.4
Property	161.3	214.7	183.6	173.1
VAT	940.9	966.9	840.0	792.9
Excises	271.2	250.9	220.9	207.7
Import Duties	213.8	231.8	201.4	190.1
Non-Tax Revenue & Grants	181.2	213.0	203.6	203.6
Total Expenditure	3,024.1	2,599.7	2,833.3	2,833.3
Current Expenditure	2,826.4	2,407.9	2,615.7	2,615.7
Wages & Salaries	811.9	807.4	811.9	811.9
Goods & Services	356.3	375.5	398.0	398.0
Interest	384.9	249.7	348.0	348.0
External	48.0	62.7	114.7	114.7
Domestic	336.9	187.0	200.9	200.9
Transfers & Subsidies	1,273.3	975.3	1,057.8	1,057.8
Capital Expenditure	197.8	191.8	207.7	207.7
Fiscal Deficit	-30. 5	384.5	-247.1	-383.1
Primary Deficif	354.3	634.2	100.9	-35.1
Fiscal Deficit/GDP	-03%	3.7%	-2.8%	-4.5%
Primary Balance/GDP	3.5%	6.1%	1.1%	-0.4%

FISCAL CONT'D

The expenditure in both scenarios assume spending associated with containment and treatment of the COVID-19 as well as spurring economic activity. As announced in the Prime Minister's address on 29 April 2020, the following are expected to increase expenditure: BBD $40 million to refurbish the QEH and local polyclinics and supply them with critical equipment and any supplementary goods needed to combat the pandemic, BBD $7.5 million for essential medication, BBD $20 million in capital expenditure for the construction and outfitting of a quarantine and isolation facility. The Government plans to continue capital spending in key areas with the hope of reducing the adverse economic effects of COVID-19, this includes repairs to the Industrial Development Complex buildings (BBD $15 million), selected government buildings (BBD $20 million), schools (BBD $20 million), and the school meals building (BBD $6 million).

The Government has also announced a Household Survival Programme (BBD $20 million), a 40% increase in welfare rates and fees paid (BBD $10 million), and a newly created Adopt a Family Programme to be supported by private donations.

These developments are expected to result in a primary balance of between 1.1% and -0.4% of GDP and a fiscal balance of -2.8% and -4.5% of GDP. The Prime Minister indicated that the International Monetary Fund will relax the targeted 6% of GDP primary surplus to 1% of GDP and this is in line with our August scenario. If tourism remains closed for longer, this target will be breached. Barbados is committed to borrowing from multilateral agencies and based on the Extended Fund Facility and the pledged Inter-American Development amounts Barbados should receive around BBD $350 million for 2020/21, enough to fill the gap created by the loss in revenue.

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 5: Percentage Change in Incomes by Industry

	5-Week Lockdown		5-Week Lockdown		5-Week Lockdown		5-Week Lockdown		23-Week Lockdown	
	Tourism restarts immediately		Tourism restarts in August		Tourism restarts November		Tourism does not restart untill 2022		Tourism does not restart untill 2022	
Sector	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Tourism	-4%	2%	-13%	8%	-32%	34%	-39%	-100%	-39%	-100%
Non-Essential High-Flexibility	-3%	2%	-4%	1%	-4%	0%	-5%	-2%	-13%	5%
Non-Essential Low-Flexibility	-7%	6%	-7%	5%	-7%	4%	-9%	1%	-27%	26%
Essential	-1%	0%	-1%	0%	-1%	0%	-1%	0%	0%	-1%

Source: Author's calculations.

SOCIAL CONT'D

Based on these expected industry-level impacts, we can examine the share of workers in each industry who are likely to be severely affected. We examine the share of workers in each industry who fall into low income categories (which approximate the definitions of poverty and vulnerability).

We then further disaggregated low-income workers by gender. This data is taken from the Barbados Survey of Living Conditions 2016.

Table 6: Percent of Workers in Low Icome Categories by Industry and Sex							
		$700 <Income<$900 (vulnerable)			Income<$700 (poor)		
	Type	Total	Men	Women	Total	Men	Women
Acommodation/Food Services	Tourism	4.96	0.77	4.19	4.97	2.22	2.75
Administration	High-flex	0			4.33	3.08	1.25
Agriculture/Fisheries	Essential	3.40	0.95	2.45	12.42	8.14	4.28
Construction/Mining/Quarrying	Low-flex	2.78	2.78	0	2.25	2.25	0
Education	Low-flex	0			3.69	1.78	1.91
Electricity/Energy/Water	Essential	0			0		
Financial Services	High-flex	1.00	0	1.00	0		
Health and Social Work	Essential	1.82	1.82	0.00	3.2	0	3.2
Information and Communication	Essential	0	0	0	0		
Manufacturing	Low-flex	0.95	0	0.95	8.67	1.43	7.24
Professional/Technical Activities	High-flex	3.04	3.04	0	1.99	1.99	0
Transport	Essential	0.76	0.00	0.76	8.75	8.75	0
Wholesale/Retail Trade	Low-flex	3.93	1.09	2.84	7.63	1.73	5.9
Other	Low-flex	3.63	2.45	1.18	12.31	3.36	8.95

Source: IADB's Barbados Survey of Living Conditions 2016/2017. These categories are discrete, but closely related to the IADB's definitions of poverty and vulnerability.

SOCIAL CONT'D

Accommodation and food service workers carry a high percentage of workers whose incomes are below BBD $700 and between BBD $700 and BBD $900. A large share of these workers are women—particularly in the vulnerable category. There exists a significant gender wage gap in the tourism industry: the IADB's Survey of Living Conditions found that men's average income in the sector was BBD $2,600, while women's average incomes were BBD $1,768. In the most likely scenarios, tourism incomes are expected to fall by 13% to 32% even when accounting for the unemployment benefits provided by the National Insurance Scheme. A 32% average decline in incomes pushes all vulnerable tourism workers into poverty, and could affect low-income workers more severely. This not only means that Barbados is likely to experience an increase in the number of individuals in poverty, but this category is likely to be made up of an increasing share of women. As of 28 May 2020, approximately 42,000 workers had filed for unemployment benefits through the National Insurance Scheme.

In addition, 54% of those who worked part-time during the IADB's Survey of Living Conditions were women. Women were also more likely to be underemployed: 1.73% of employed women would work more hours, compared to 1.60% of employed men. This suggests that women are more detachable from the workforce, and are more likely to bear the burden of unemployment during the crisis.

On aggregate, if the tourism industry remains closed until August, we expect an increase in working poverty (as a share of the working population) by around 0.6 percentage points. If tourism is closed until November, that rises to around 1 percentage point.

The 2010 Census measured 226,193 individuals and 78,665 head of households, of which 52.55% were male (41,335 individuals) and 47.45% female (37,330 individuals). Of the 117,970 Barbadian adult women in the 2010 Census, 31.12% (37,330) were head of the household, compared to 38.19% of men (41,335 out of 108,223). According to the 2010 Census 48,860 out of 79,300 women had children, or 61.61%.

Moreover, the Census found that 73.5% of children in poverty lived households in which a female was the primary income earner.

The COVID-19 shock is expected to disproportionately affect the tourism sector. The tourism sector disproportionately employs women (62%) but pays them significantly less (68% of men's wages). The vast majority of vulnerable workers in tourism are women (85%), and a majority of workers below the poverty line in tourism are women (55%). Women will be the group most impacted by the shutdown of the tourism sector. Children who live in poverty disproportionately live in households in which females are the primary income earners, so that an increase in women in poverty will significantly increase the number of children living in poverty.

The shift to online education in the short run will disproportionately affect children who live in poverty. Barbados does not have full penetration of internet access, meaning that all children will not have equitable access to online learning. We further know that non-school factors play an important role in exacerbating educational inequalities between students, shown by the fact that educational inequalities between students from high-income and low income backgrounds widen during summer holidays.[8] The longer the school closures, the more severe the learning consequences. In addition, while the Government of Barbados' School Meals Department provides low cost lunches for primary school students during term time, students from low socioeconomic backgrounds do not have access to these lunches during the period of online learning. The Government has noted that they have identified at least around 4,000 students who do not have appropriate access to devices needed for online learning. One internet service provider has agreed to zero-rate the online learning platform. School restarted on May 4, 2020.

[8]Alexander, K.L., Entwisle, D.R. and Olson, L.S., 2007. Lasting consequences of the summer learning gap. American sociological review, 72(2), pp.167-180.

SOCIAL CONT'D

Extended school closures also put a strain on mothers, especially single mothers who work in essential sectors. Women are already found to be leading in household responsibility and childcare: they provide a disproportionate share of housework and are in charge of looking after the young or vulnerable members of the household. COVID-19 is likely to exacerbate the imbalance in household responsibilities for dual-parent households , and will put an enormous strain on single mothers. School closures combined with social distancing means single mothers cannot rely on schools, daycare centres, or informal childcare provided by relatives. They have to juggle work and home-schooling their children. Women employed in flexible work sectors will not be immune to the effects of the crisis: their increased domestic duties will make them less productive in their paid work. Flexible work arrangements are not guaranteed to push towards equality: in the case of Barbados they may make women less productive, and exacerbate the gender wage gap.

Women are impacted by COVID-19 in many ways: care duties are increased, while employment suffers due to high rates of female employment in tourism activity. Gender-based violence (GBV) is another likely outcome of the lockdown. Around 27% of women experienced intimate domestic violence in Barbados in 2018.[9] It is expected this number will increase significantly as a result of both the lockdown itself and the economic consequences of COVID-19. There is one 25-bed shelter in Barbados, catering to victims of GBV. On one occasion the shelter catered to 36 persons. There are currently 6 women and 4 children at the shelter, which continues to accept new women and children during the lockdown.

Peters (2017) estimates that the share of the informal economy in Barbados is around 30-40% of total economic activity. This corresponds with estimates from Schneider, Buehn, and Montenegro (2010), Kamau & Lin (2015), and Greenidge, Holder, and Mayers (2009). Informal workers by definition do not have access to formal social protection. Many informal workers will see their income decline during this time. In particular, it is likely that a significant proportion of informal workers are engaged in tourism-related business.

While we do not have clear data on the demographics and income characteristics of those in the informal sector, we can make three informed assumptions. First, WIEGO (2014) estimates that at least 54% of the informal workforce is made up of women in Latin America and the Caribbean. Second, we can reasonably suggest that those in informal sectors are typically low-income workers. Third, it is clear that they would not have access to any formal means of finance/social security.

There are three qualitative implications here. The first is that women will be disproportionately impacted by the closure of the informal industries, and particularly by the prolonged closure of the tourism industry. The second is that a substantial proportion of these workers will be pushed into poverty by the COVID-19 crisis without any formal social security available to them. Some may have access to social assistance programmes. Third, many informal businesses will not have the appropriate liquidity to meet any fixed costs of doing business that have not been removed during the shutdown.

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[9] Women's Peace and Security (WPS) index, https://giwps.georgetown.edu/the-index/

RECOMMENDATIONS

The Government of Barbados has already formulated a significant policy response. On the household side, the main policies are the existing unemployment benefit system which is expected to pay out BBD $200 million; the expansion of unemployment benefits to self-employed workers at the rate of BBD$1,500 per month for two months; the vertical expansion of existing National Assistance payments by BBD $10 million; and the broadening of horizontal coverage under the National Assistance programme by BBD $10 million.

On the business side, the Government has established a $40 million VAT Loan Fund offering interest-free 12-month loans, a BBD $20 million Small Business Wage Fund which will contribute to workers' wages at the rate of $500 per month per employee up to 5 employees, and a BBD $200 million Barbados Tourism Facility to provide working capital to hotels.

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 enjoyment of basic human rights and freedoms.

Bring informal workers into the formal economy through the National Insurance Scheme

The government should offer non-contributory workers who have lost their incomes due to the pandemic a cash payment under the conditions that they register under the National Insurance Scheme. Given the significant size of the informal economy in Barbados (30%-40% of economic activity), this policy can pay long-run dividends. In the short-run, the unemployment fund is expected to need recapitalisation to the tune of BBD $250 million.[10] In the long-run, increasing the number of contributions can significantly improve the health of the National Insurance Fund. These benefits would spill over to the healthcare sector through the increased contribution to the Health Service Levy. Payments made can be smaller than contributory benefits, and can be made equivalent to that under the Government's Household Survival Programme (BBD $600 per month).

Expand social assistance benefits further to ensure coverage of increased needs in the short to medium term

Children are more likely to live in poverty, driven by the increase in job loss from female workers in the tourism sector. The government's proposal to top up benefits for families with four or more children should be expanded to all households with children receiving benefits. This would recognise the increased burden of care for parents and caregivers, including with online education learning. It would further account for the greater need of single-headed households—particularly single mothers who are twice as likely to require government grants while caring for the majority of children (compared to households with both parents who care for less than 40% of children in Barbados).

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[10] https://gisbarbados.gov.bb/blog/government-pledges-to-support-nis/

RESPONSE AND RELIEF CONT'D

Quality and coverage of broadband connectivity is a fundamental need for all households

The COVID-19 pandemic has highlighted the critical role of technology, and in particular the internet. It has also highlighted the inequitable access to the internet in Barbados. The internet is a critical tool for access to learning, jobs, entrepreneurship, ideas, markets, finance, and even to social protection. It should therefore be treated as a basic right and regulated as a utility. Internet service providers can be engaged to provide low-cost, low-speed options. This expands their customer base while improving the livelihoods of the most vulnerable in society. Further, it limits the problem of educational inequalities due to moving to online learning by broadening access to the internet for children in poverty. Immediate response and relief effort should provide all families that are accessing online education platforms with quality internet access to ensure learning is not disrupted for children. Where the cost needs to be absorbed by the Government, it can first be treated as a social transfer and later designed as a government subsidy. At present, benefits under the National Assistance Programme include utilities and rents, where utilities include water and electricity. The Government of Barbados should extend this to include internet access.

Expand the Central Bank of Barbados' Credit Guarantee scheme

The model suggests that firm death is the main mechanism through which the COVID-19 pandemic damages long run output. This particularly applies to micro, small, and medium-sized enterprises (MSMEs) who make up 61% of total private sector employment.[11] The Central Bank of Barbados should intervene to ensure that all firms have access to liquidity during the crisis. The Central Bank of Barbados has an existing Credit Guarantee Scheme for businesses. The aim of the scheme is to offer substantial protection from credit risk to financial intermediaries who lend to small businesses. At present the scheme requires an upfront contribution of 10% of the size of the loan. This is prohibitive during the crisis and this stipulation should be removed. While credit facilities can last up to 15 years, it is likely that short-term loans for working capital would be the main requirement for firms.

According to the Central Bank's regulations, these can be offered for up to BBD $300,000 and a maximum of 3 years. The terms of the credit guarantee protect the lender from insolvency of the borrower and from protracted default by the borrower. Under these unfortunate circumstances, the Central Bank steps in to indemnify the credit institutions to the extent of 80% of the loss sustained. The benefits of this approach are:

1. It does not require the Government of Barbados to use its limited fiscal space,

2. It does not create an immediate liability for the Central Bank of Barbados, and

3. It does not create a liability for the full amount of the loans made to these firms.

This approach encourages financial institutions to use the substantial liquidity available to them. Commercial banks had an excess cash ratio of 18.4% at the end of 2019 according to the Central Bank of Barbados.[12]

Encourage gender-sensitive community-based organisations to check up on gender-based violence during lockdown

The Government of Barbados should support gender-sensitive community-based civil society organisations (CSO) to play a role in the prevention and response to gender-based violence, at the onset, during and after the COVID-19 pandemic most notably by encouraging the reporting of incidences. Stay at home orders which seek to contain the spread of the virus have resulted in women with violent partners increasingly finding themselves isolated from the people and resources that can help them. These institutions should be supported and empowered to make connection and as much as possible conduct check-ins with their members to determine their safety and wellbeing. This must be done in such a way not to potentially endanger the lives of the women they are aiming to help. This activity should be bolstered by increased police patrolling in hot spot neighbourhoods. To facilitate this work, Government could mobilise national capacity (both in Government and in the CSO network) to provide relevant training on gender-sensitive psychosocial support to key frontline staff, including within the very same CSO network, to ensure that all support is aligned with the human rights based approach to crisis response and recovery.

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[11] https://www.sba.bb/sba/index.php/news-research/research/summary/2-research/3-the-state-of-small-business-in-barbados
[12] http://www.centralbank.org.bb/news/article/9782/central-bank-of-barbados-review-of-the-economy-in-2019

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

Make unemployment benefits for self-employed individuals permanent.

Unemployment benefits are typically reserved for employees. However, the crisis has highlighted the vulnerability of self-employed workers during national crises. The Government of Barbados recognises the need for entrepreneurship to drive economic growth. Providing self-employed workers with formal social protections can serve to improve the attractiveness of entrepreneurship and drive recovery. Self-employed workers would need to have registered businesses, and would be defined as being unemployed when:

- Their business closes, or
- There is a material disruption to their industry

They would be allowed to access benefits if they have contributed for a predefined period, and it is possible to limit the benefits they can receive based on the amount of benefits they have paid. This policy has no associated cost.

Increase the limit on the Health Service Levy to expand healthcare facilities and make contributions progressive

Barbados does not have the critical healthcare capacity to deal with a serious outbreak of an epidemic or a natural disaster. The need to build additional facilities reflects this vulnerability in the healthcare system. The healthcare system needs additional funding to expand capacity and improve preparedness. The public health sector is funded through the Health Service Levy, which is collected and distributed by the National Insurance Scheme. Total contributions are paid at a rate of 23.85% up to a maximum insurable earnings of BBD $4,820 per month. The Health Service Levy accounts for 2.5% of earnings, 1% of which is paid by the worker and 1.5% of which is paid by the employer. The maximum for the insurable amount makes the Health Service levy a regressive contribution. The Government of Barbados should increase the maximum insurable earnings for the Health Service Levy, effectively making the marginal contribution on incomes above $4,820 equal to 2.5%. This makes the system more progressive, leaving unchanged the contributions of those making less than $4,820 per month while equalising the burden on the Health Service Levy on all workers. Further, it would significantly expand the funding available to increase capacity in the public health sector.

RECOVERY AND RESILIENCE CONT'D

Increase the progressivity of the income tax system to mutualise the burden of the pandemic

The gains and losses from closing the tourism industry and non-essential sectors of the economy as a COVID-19 mitigation strategy are very unequally distributed. The COVID-19 virus disproportionately affects the old, meaning they have the most to gain from slowing the virus. Wealth and savings are concentrated among the old. In contrast, younger workers who are less susceptible to the virus and who work in shuttered industries have the most to lose.

Further, high-flexibility workers who are less susceptible to job losses during the pandemic are more likely to be higher paid workers given that their jobs likely involve greater use of technology. The Government of Barbados recognises this inequitable distribution of the burden of the pandemic, issuing a call for 5,200 individuals with annual earnings over $100,000 to donate to low-income households. This makes a clear normative statement for mutualisation of the burden of the crisis. This normative perspective can be implemented by increasing the top marginal tax rate on those individuals with annual earnings exceeding $100,000. This would provide significant support to the Government of Barbados' return to fiscal and debt sustainability after the pandemic under the IMF Extended Fund Facility Programme.

Redesign social protection for vulnerable persons to be responsive to severe shocks

The COVID-19 crisis has shown that the current design of the social protection system is not easily scalable. This is highlighted by the need to create a new social assistance programme—the Adopt a Family Programme—to meet addition needs. To allow for more efficient use of financial and human resources in response to shocks, the Government should:

- Streamline administrative procedures by integrating social assistance programmes
- Review targeting mechanisms to incorporate the reality of non-monetary vulnerability
- Refine programme delivery to identify people in need and allow them to register online
- Manage the information of registered across sectors, particularly with the Department of Emergency Management
- Move toward a unified social registry to facilitate better coordination, integration, and comprehensive social protection systems

Legislate paid paternity leave to limit the gender inequality in childcare

The COVID-19 crisis highlights the gender inequality in childcare. Implementing dual parental leave would help rebalance the gender inequality in childcare and have long-lasting consequences in breaking gender stereotypes. One consideration is that paid paternity leave might not be equally split between both parents if there is a significant wage gap between the parents. The other consideration is that a paternity leave policy should not penalise single mothers.

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

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

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

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: $\quad \Gamma_t^i = (1 - \tau_I) \cdot w^i \cdot N_t^i + (\lambda_F + \lambda_G) \cdot w^i \cdot (1 - \rho_t^i) \cdot I_t^i$

$$+ \theta \cdot w^i \cdot (1 - \rho_t^i) \cdot (S_t^i + I_t^i + R_t^i) + \Pi_t^i \tag{14}$$

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

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:

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

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[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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