BRUNEI ECONOMIC UPDATE

JULY 2020

Highlights

Recent Developments

- The COVID-19 pandemic has severely disrupted global economic activity. The global economy in 2020 is projected to suffer the deepest recession since World War II, despite unprecedented policy support.
- Pandemic containment measures, such as international travel bans and domestic lockdowns, while necessary to control disease spread, have brought global travel and tourism to a virtual halt.
- Brunei has managed to control its COVID-19 outbreak by imposing containment measures early. This has, however, affected activity in several service sub-sectors. In Q1, growth moderated to 2.4 percent but growth in Q2 is expected to experience a sharper slowdown due to stringent measures implemented in mid-March.
- Brunei's growth in 2020 has been revised downwards to between 1 and 2 percent.

Special Feature: Impact of COVID-19 in Brunei using near real-time measures

- Using Google search data as a proxy for consumer demand, the travel-related and consumer-facing service sectors in Brunei experienced steep contractions from mid-March to May when containment measures were most intense. Economic activity has gradually recovered since early June.


Recent Global Developments

Pandemic-induced disruptions to economic activity. The COVID-19 pandemic continues to escalate. As of July 12, 2020, there are more than 12.5 million confirmed cases and 560 thousand deaths worldwide (WHO 2020; Figure 1). Countries around the world have responded by imposing containment measures, such as school and non-essential business closures, travel restrictions, and lockdowns. While these measures have helped to limit the spread of COVID-19 and eased the strain on healthcare systems, they have severely restricted labour supply and disrupted production as well as sharply curbed consumption and investment. The stringency and duration of the measures vary across countries. Poorer countries have more than proportionately implemented lockdowns, in part due to their limited healthcare capacity to effectively respond to outbreaks. Globally, lockdowns were most intense and widespread from mid-March to mid-May. Many countries are now starting to exit lockdowns but mobility remains depressed, suggesting some degree of voluntary physical distancing.

Global growth contraction. In Q1, global industrial production suffered its steepest decline since the global financial crisis. Output in China contracted sharply by 6.8 percent year-on-year (y/y) in Q1—the first contraction since quarterly data began in 1992 (Figure 2). The services sector, particularly retail sales, took a large hit as private consumption slumped. Exports also plunged due to temporary factory closures and weak external demand. Economic activity has started to normalize following the relaxation of containment measures in April. In the United States, output growth fell to 0.3 percent y/y in Q1. As large-scale pandemic measures were only instituted from mid-March onwards, Q2 growth is expected to decline considerably, as indicated by an unprecedented collapse in services and travel in April and May. A staggering 20.5 million jobs were slashed in April, with the unemployment rate soaring to 14.7 percent—the highest since the Great Depression. Despite still elevated numbers of daily new cases of COVID-19, most states are gradually unwinding lockdown measures and economic activity began to recover in May. Euro Area output contracted by 3.1 percent y/y in Q1, with steep declines in retail sales and industrial production. The composite Purchasing Managers' Index (PMI) collapsed to 13.6 in April, and despite recovering to 31.9 in May, an unprecedented decline in Q2 output is expected (ECB 2020). In Japan, Q1 output fell by 1.9 percent y/y. There are little signs of recovery, compounded by the postponement of the Tokyo 2020 Olympics.

Global trade slump. The fall in global trade reflected disruptions to international travel and supply chains. The services sector, particularly travel and tourism, has been severely affected by the pandemic (Figure 3), posing a threat to countries that rely heavily on tourism as a source of foreign exchange and as a key employer of the local workforce. More than 90 percent of international flights have been cancelled since early April. Outright travel bans and lockdowns have limited the supply of critical inputs and has curtailed production, particularly in the automotive and electronics sectors. Global trade is expected to

Figure 1. Global COVID-19 cases and stringency level
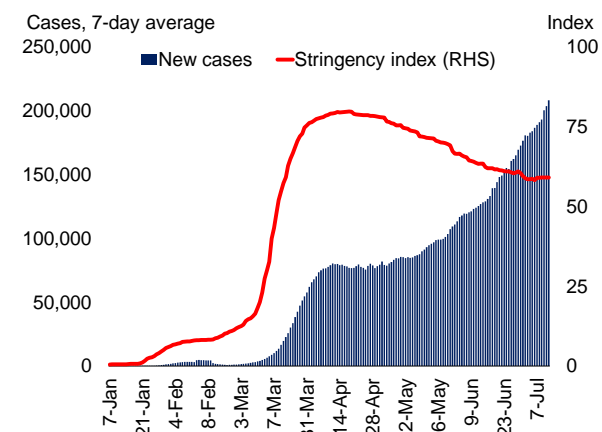
Source: European Centre for Disease Prevention and Control, Oxford COVID-19 Government Response Tracker
Note: The Stringency Index is a composite measure of nine policy measures: school closing, workplace closing, cancel public events, restrictions on gatherings, close public transport, stay at home requirements, restrictions on internal movement, international travel controls, and public info campaigns. Last observation is July 12, 2020.

Figure 2. Growth in 2020Q1
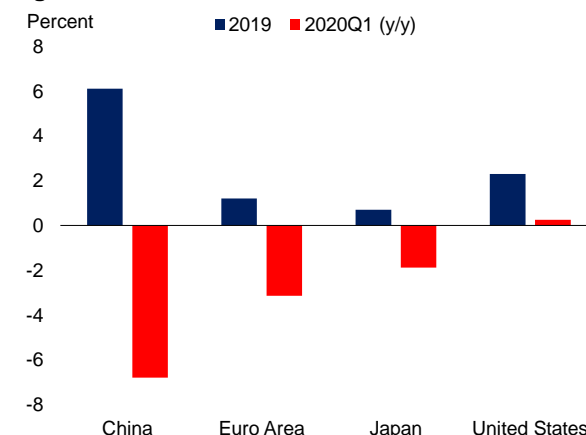
Source: OECD

Figure 3. Container shipping and global PMI
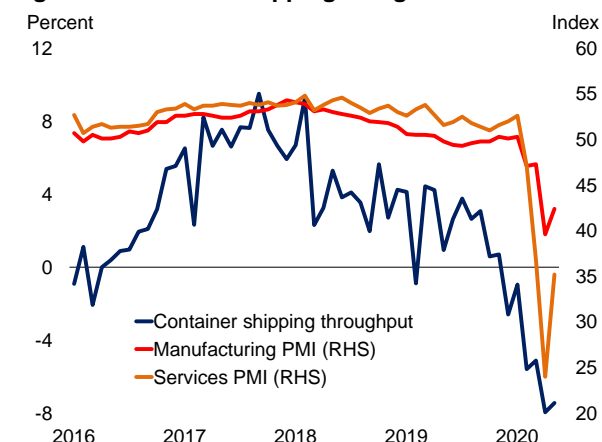
Source: Haver Analytics, Institute of Shipping Economics and Logistics
Note: PMI (Purchasing Managers' Index) readings above (below) 50 indicate an expansion (contraction) in economic activity. Last observation is May 2020.

decline by between 13 and 32 percent in 2020 (WTO 2020).

Oil price plunge. Commodity prices declined in the first four months of the year due to a steep fall in global demand (Figure 4). Widespread flight cancellations, declines in container shipping volumes, and lockdowns due to COVID-19 have sharply reduced transportation demand. Brent crude oil prices plunged more than 60 percent between January and April. The average price of US$23 per barrel in April was the lowest since 2002. In other benchmarks, the West Texas Intermediate Cushing contract for May delivery dramatically collapsed to as low as -US$38 per barrel as physical storage capacity ran out. Oil prices recovered in May, however, buoyed by new production cuts by OPEC+ and a relaxation of lockdown measures in some countries. Oil demand in 2020 is expected to fall by nearly 9 percent—an unprecedented decline (IEA 2020)—and oil prices projected to average US$35 per barrel (World Bank 2020a).

Financial market turmoil. Global equity markets plunged in March amid spikes in market volatility unseen since the global financial crisis. Emerging markets suffered record portfolio outflows in March—larger than the peak outflows in 2008Q4 during the global financial crisis and the "taper tantrum" in 2013Q2 (Figure 5). This resulted in sharp increases in borrowing costs and large exchange rate depreciations. Unprecedented monetary and fiscal policy response helped to ease financial conditions, as central banks around the world injected liquidity into financial markets, including through large-scale asset purchases and policy rate cuts. The Federal Reserve provided swap arrangements to a larger number of countries to lessen strains in U.S. dollar funding markets. Announced global fiscal support measures, with the G20 countries accounting for the bulk, have already far exceeded those during the global financial crisis (IMF 2020a). Capital outflows from emerging markets have stabilized since April, and borrowing costs have dropped sharply, though they remain elevated.

Bleak global growth outlook. Initial expectation of COVID-19's impact on the global economy was that it would be limited and temporary. However, the situation has changed drastically. Global growth forecasts for 2020 have been substantially revised downwards, reflecting the alarming speed and scale of the pandemic. Global GDP in 2020 is projected to contract by 4.9 to 6 percent (Figure 6)—the steepest decline in post-war history. This outlook is subject to several uncertainty factors, including the development of therapeutics and vaccines, a renewed surge in cases that necessitates the re-imposition of lockdowns, voluntary social distancing, displaced workers' ability to find employment, impact on productivity due to workplace safety measures and supply chain reconfigurations, effectiveness of policy stimulus, and risks pertaining to rising debt that increase financial market stress (IMF 2020b; OECD 2020; World Bank 2020b). Global recovery is projected in 2021 but output is not expected to return to pre-pandemic levels.

Figure 4. Commodity prices
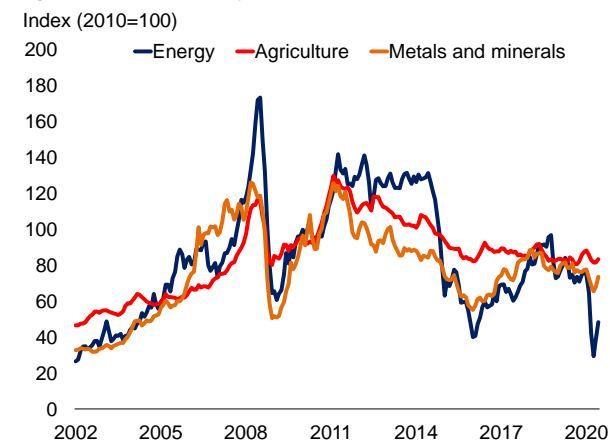
Source: World Bank
Note: Last observation is June 2020.

Figure 5. Total portfolio flows into emerging markets
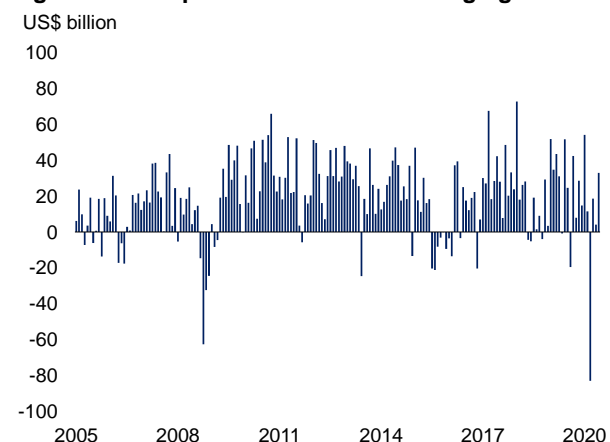
Source: Institute of International Finance
Note: Net non-resident purchases of emerging market stocks (portfolio equity flows) and bonds (portfolio debt flows). Last observation is June 2020.

Figure 6. Global growth outlook

Source: IMF, OECD, World Bank
Note: IMF and World Bank forecasts in January and June 2020; OECD forecasts in March and June, 2020.

Recent Regional Developments

COVID-19 disruptions to travel and tourism. The first confirmed case outside China was reported on January 13, 2020 in Thailand. Several ASEAN member states responded swiftly by instituting border controls. By early February, Brunei, Malaysia, Philippines Singapore, and Vietnam had restricted 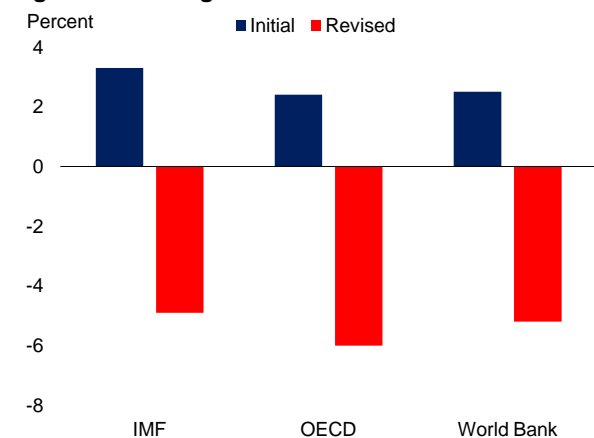arrivals from high-risk regions to contain the importation of cases. While travel restrictions can limit disease spread, they inadvertently affect the tourism sector and the broader economy (AMRO 2020). Countries that depend heavily on tourism receipts (Cambodia, Philippines, Thailand) suffered steep output declines in Q1. In 2018, Chinese tourists made up one-third of all tourists in Cambodia, and more than one-quarter in Thailand.

Sharp fall in mobility. Besides the air transport and hotel sectors, retail and food services have also been adversely affected. Lockdowns in several countries have severely restricted mobility (Figure 7). Cinemas, shopping malls, and restaurants were shut down, although takeaway, delivery, and online sales provided some relief. Manufacturing has been less affected but production was curtailed in some sectors, such as automotives, due to a shortage of raw materials. Most countries experienced lower output growth in Q1 y/y (Indonesia 3 percent, Malaysia 0.7 percent, Philippines -0.2 percent, Singapore -0.7 percent, Thailand -1.8 percent, Vietnam 3.8 percent). Mobility is gradually recovering following an easing of lockdown measures.

Financial market disruptions. Foreign investments into the region had already moderated before the COVID-19 outbreak, as investors pulled out from emerging markets, including Southeast Asia, due to heightened uncertainty from trade tensions. As financial conditions tightened, triggered by the pandemic, rapid capital outflows in March led to large exchange rate depreciations and equity valuation losses. Financial conditions recovered moderately in May.

Varied national responses to COVID-19. ASEAN member states have responded to the crisis by imposing stringent measures, but their timeliness varied widely. In general, those that implemented measures early fared better (Brunei, Vietnam; Figure 8). Others were forced to impose lockdowns and enhanced community quarantine to contain a surge in cases. Most countries have employed various fiscal and monetary policy stimulus packages to support businesses and households. Fiscal measures include tax exemptions or deferrals and financial subsidies for affected SMEs in hard-hit sectors, government guarantees on loans, and cash assistance to households and workers. Central banks have cut policy interest rates, lowered reserve requirements, and facilitated temporary suspensions of loan principal and interest repayments.

Downward growth revisions. Growth forecasts in 2020 have been revised downwards (Figure 9). Over a two-month period, strict containment measures have severely disrupted economic activity (ADB 2020). Countries that are deeply integrated in global value chains and heavily dependent on trade, including tourism, are expected to suffer disproportionately (Cambodia, Malaysia, Philippines, Singapore, Thailand).

Figure 7. Mobility
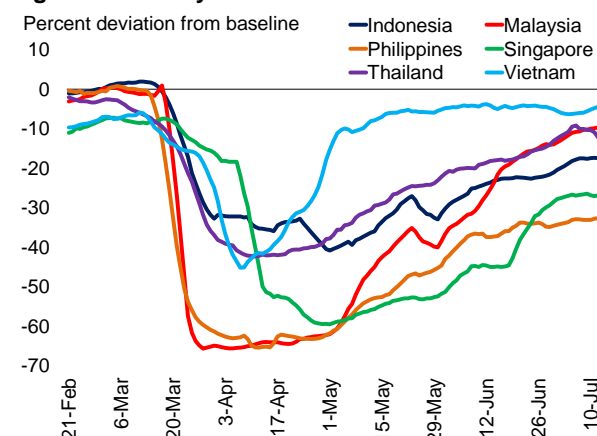
Source: Google Community Mobility Reports
Note: Seven-day average mobility for grocery and pharmacy, parks, transit stations, retail and recreation, and workplaces, relative to the baseline (corresponding day of the week during Jan 3 – Feb 6, 2020). Last observation is July 12, 2020.

Figure 8. COVID-19 trajectories
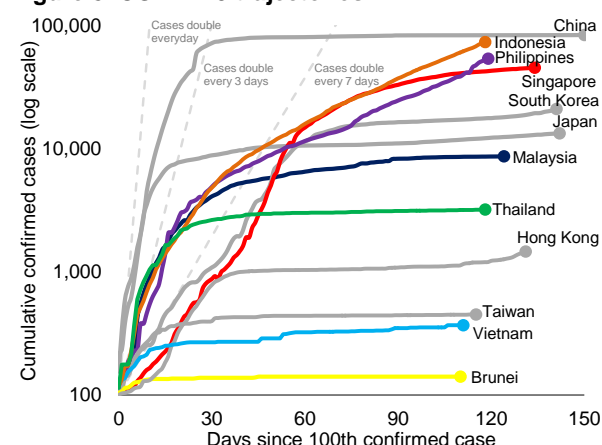
Source: CSPS, European Centre for Disease Prevention and Control
Note: Last observation is July 12, 2020.

Figure 9. ASEAN growth outlook
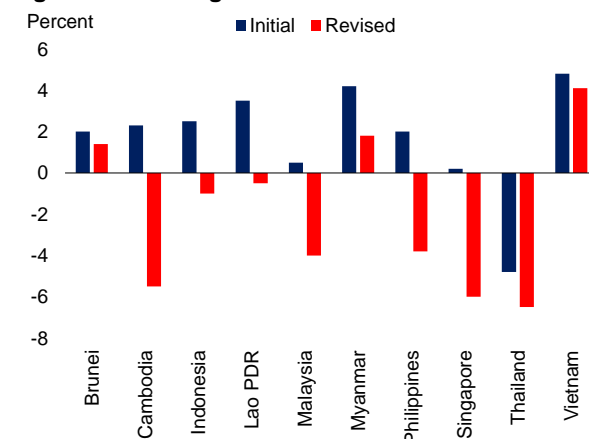
Source: ADB
Note: Forecasts in April and June, 2020.

Recent Developments in Brunei

Swift response to COVID-19. Brunei's first COVID-19 case was reported on March 9, 2020. Within 15 days, 100 additional cases were detected. Initial estimate of the reproduction number (R)—the expected number of secondary cases generated by an index case—was 2.3 (Figure 10). A series of containment measures was swiftly implemented, including closing schools, prohibiting mass gatherings, travel bans, and unprecedented nationwide mosque closures. These timely measures have been effective in limiting viral transmission, bringing R to below one—suggesting that the outbreak is under control—in just over a week. Other factors that have contributed to Brunei's success include enhanced surveillance, "test, trace, and isolate", and transparent public communications through daily press briefings (Wong et al. 2020). In the investigation of its first case, Brunei recognized and alerted the global health community of an international super-spreading event—the Tablighi Ja'maat cluster in Kuala Lumpur, which was attended by more than 19,000 congregants from around the world (Mat et al. 2020). Brunei adopted testing in the absence of clinical symptoms early in its outbreak, and is among the world's highest in number of COVID-19 tests per capita. A new virology laboratory was built in two weeks to increase the country's testing capacity by 10-fold and an extension of the National Isolation Centre to double its bed capacity was completed in three weeks. The government's swift crisis response has won public trust, with significant local grassroots movements and volunteerism reinforcing the official stance on social distancing. Compliance appears to be high and nearly 90 percent of the population has subscribed to BruHealth, a mobile application with contact tracing capabilities. As of July 12, Brunei has reported 141 confirmed cases and three fatalities.

Sharp declines in travel, tourism, and retail. The public health measures taken have inevitably disrupted economic activity, particularly in the travel and tourism-related sectors. More than 90 percent of international flights to and from the Brunei International Airport have been cancelled since end March. Tourist arrivals, which had been on a rising trend, plunged by more than 70 percent y/y in March, and hotel occupancy rates tumbled to 26.3 percent (Figure 11). The air transport, travel agency and tour operator, and hotel sub-sectors contracted by 21.8 percent, 20.0 percent, and 4.0 percent in Q1 y/y, respectively (Figure 12). The consumer-facing sector also suffered a setback, albeit by less than the travel-related sector. Government-enforced measures, such as prohibiting restaurant dine-ins, as well as voluntary social distancing led to a slowdown in the restaurant and retail trade sub-sectors, as output growth fell to -0.2 percent and 1.9 percent in Q1 y/y, respectively.

Targeted economic relief measures. Announced economic relief and stimulus measures totaled B$450 million (3.2 percent of GDP; IMF 2020c). Targeted measures aim to support the private sector, particularly micro, small, and medium enterprises (MSMEs) in the tourism, hospitality, restaurants, and transportation sectors, and to ensure job security for locals. These temporary measures include corporate income tax discounts, wage subsidies, deferment of social security

Figure 10. SARS-CoV-2 transmission and social distancing measures
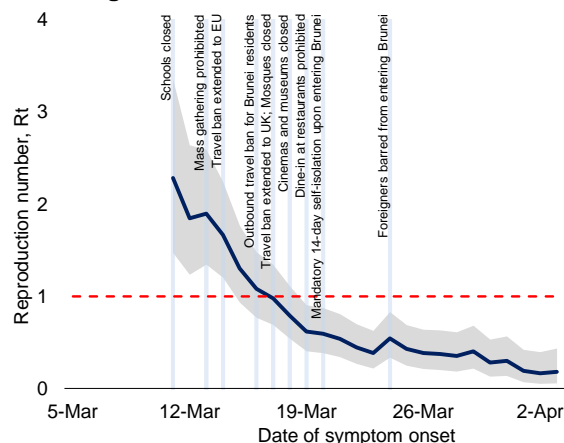
Source: CSPS, Ministry of Health
Note: The time-varying reproduction number, R_t, is the expected number of secondary cases generated by an index case at time t. R_t is estimated using the methods developed by Thompson et al. (2019). The dark blue solid line is the estimated median R_t and the grey areas are the 95% credible intervals. The red dashed line indicates $R_t=1$, below which suggests that a sustained outbreak is unlikely if control measures remain in place.

Figure 11. Tourist arrivals and hotel occupancy rates
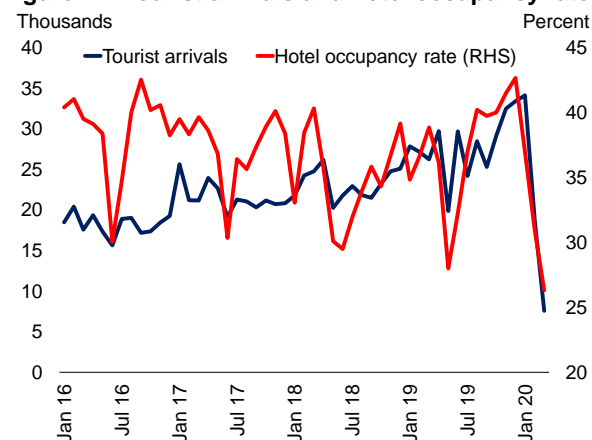
Source: CSPS, Ministry of Primary Resources and Tourism
Note: Last observation is March 2020.

Figure 12. Services sector growth in 2020Q1

Source: CSPS, Department of Economic Planning and Statistics

contributions, discounts on utilities and rental rates of government buildings, expanding the i-Ready apprentice scheme (program for unemployed jobseeker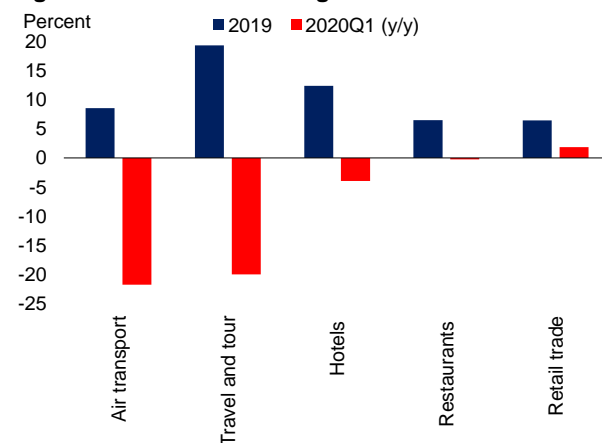s to gain industry experience), and deferment of loan principal repayments (Brunei Government 2020). Increased use of online platforms and digital banking services were also encouraged. Co-matching grants have been made available to businesses engaged in e-commerce and logistics services, and online local interbank transfer charges have been waived.

Moderation in Q1 growth. Output growth moderated to 2.4 percent y/y in Q1, reflecting the early impact of global and domestic measures in containing COVID-19 (Figure 13). Due to the impact of sharp slowdowns in travel and tourism on the broader economy, the services sector contracted by 2.4 percent y/y. The finance sub-sector contracted markedly by 14.4 percent y/y while government services declined by 5.1 percent y/y. Health services, on the other hand, expanded by 6.3 percent y/y. The mining sector contracted by 4.4 percent y/y as crude oil production declined to 116 thousand barrels per day (tbpd) from 127 tbpd in 2019 Q1. Growth in Q1 was largely supported by the manufacturing sector, which grew by 30.3 percent y/y on increased production of petrochemicals.

Large increase in downstream oil and gas exports. Exports other than crude oil and liquefied natural gas (LNG) continue to increase (Figure 14). Exports of refined products and petrochemicals have surged since late last year after Hengyi Industries began operations. In April, the share of crude oil and LNG in total exports declined to a record low of 45 percent. Imports fell in Q1 after a surge in 2019Q4, which had been buoyed by imports of crude oil as feedstock to Hengyi's production. Trade surplus in Q1 widened to B$2 billion, the highest in nearly six years, but declined substantially in April largely due to a collapse in crude oil prices.

Inflation edged higher. Headline inflation, as measured by the y/y percent change in the Consumer Price Index (CPI), has risen for nine consecutive months (Figure 15). In May, the CPI rose 2.5 percent y/y—the highest since October 2008—largely due to higher prices of insurance premiums, air transport, vegetables, beverages, and garments. Global production and supply chain disruptions have led to higher prices of imported food items, household products, and medical supplies, most widely seen in the price hikes of face masks and hand sanitizers. Price declines, on the other hand, were reported for accommodation services and package holidays.

Stable, but uncertain, growth outlook. Growth in 2020 has been revised downwards to between 1 and 2 percent. This reflects expectations of weak growth in Q2 as containment measures put a drag on economic activity, before picking up in the second half of the year. Downside risks to the outlook include a resurgence of cases and renewed social distancing measures, as well as further declines in oil and gas prices that erode government revenues and hence set back fiscal spending.

Figure 13. Contribution to growth by economic sector

Source: CSPS, Department of Economic Planning and Statistics

Figure 14. Trade

Source: CSPS, Department of Economic Planning and Statistics
Note: Quarterly values are the three-month averages. Exports (imports) indicated by positive (negative) values.
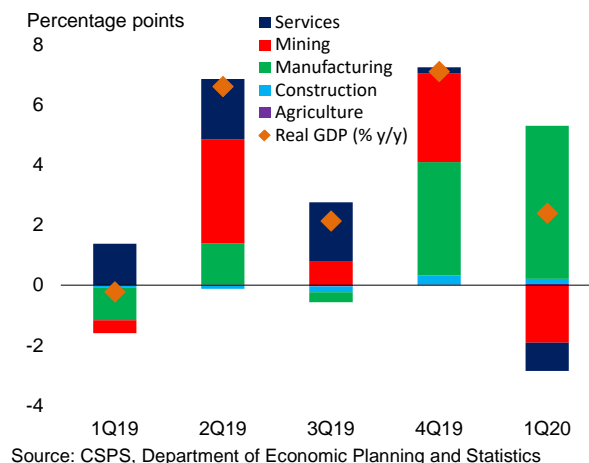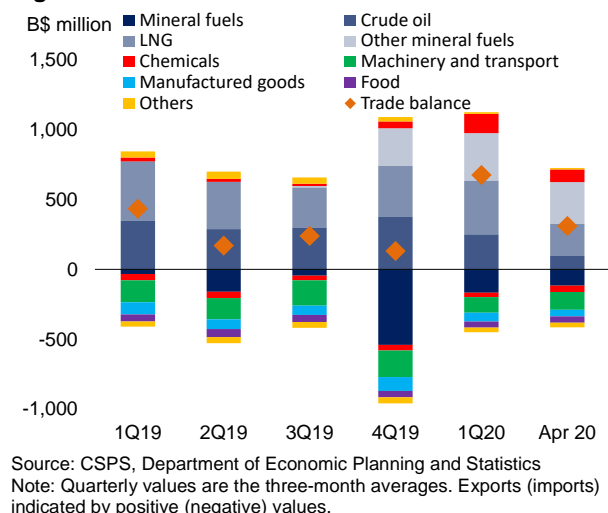
Figure 15. Contribution to inflation by category

Source: CSPS, Department of Economic Planning and Statistics
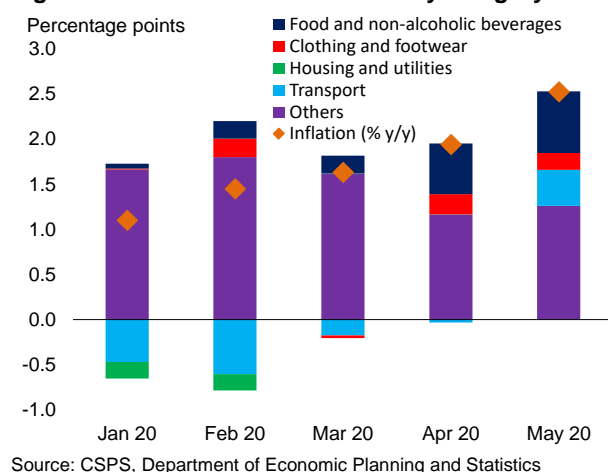
Special Feature

Differential impact of COVID-19 on service sectors in Brunei: near real-time measures using Google search data

Introduction

In the absence of effective therapeutics or vaccines, non-pharmaceutical interventions (NPIs) can be effective in containing the spread of COVID-19 (Kucharski et al. 2020). Countries around the world have implemented various forms of NPIs, such as international travel restrictions, schools and workplace closures, and lockdowns. These measures have inevitably disrupted economic activity. Yet, the impact has varied across economic sectors. Policymakers need an assessment of which sectors are disproportionately affected to design policies for redistribution and recovery. However, most economic statistics are typically available only after considerable delays; for example, one month for production or sales, one quarter for GDP, and one year for disaggregated household expenditure data. High-frequency and real-time indicators are therefore required to monitor the impact of COVID-19. In this special feature, we use near real-time Google search data in assessing the immediate effects of public health measures on various service sectors in Brunei.

Methods

Google provides details of searches made by users through the Google Trends tool virtually in real time. Data on relative search intensity for a given term in a geolocation over a given period is made publicly available. The data is transformed into an index between 0 and 100, where the highest search volume for a given search term is normalized to 100 and the others are scaled relative to this maximum data point.

Within two weeks following the detection of Brunei's first COVID-19 case, a series of public health measures were put in place: school closures, ban on mass gatherings such as weddings and sports, international travel bans, mosque closures, cinemas and museums shut down, and restaurant dine-ins prohibited. Since these measures have severely affected travel-related and consumer-facing sectors, we focus on the impact on specific service categories: (i) air transport; (ii) hotels; (iii) restaurants; (iv) retail trade; (v) entertainment; (vi) recreation; (vii) info-communications technology (ICT); and (viii) delivery services.

For each respective category, we select a representative search term to capture the temporal variation in demand: (i) "flight"; (ii) "hotel"; (iii) "restaurant"; (iv) "mall"; (v) "cinema"; (vi) "sports"; (vii) "zoom"; and (viii) "delivery". Google search data can be a good proxy of consumer demand as its relative search volume provides signals on consumer purchase intentions. We download weekly data from Google Trends for the period January 1, 2016 to July 11, 2020 for searches made within Brunei. We use the Stringency Index for Brunei in the Oxford COVID-19 Government Response Tracker (OxCGRT) database to assess how economic activity varies with the stringency of the implemented public health measures.

Results and discussion

Figure SF1 shows the temporal evolution of Google searches, as a proxy for demand in the service categories. Seasonal patterns are evident in some data series. For instance, demand for hotels peaks during the December holidays, and demand for restaurant services peaks during the month of Ramadan. The impact of COVID-19 and public health measures on consumer demand is striking. Demand for "flight", "hotel", "restaurant", "mall", "cinema", and "sports" declined sharply from mid-March to May when COVID-19 cases surged and social distancing measures were most intense, but began to gradually recover in early June after the outbreak was under control and some measures were relaxed. On the other hand, demand for "zoom" and "delivery" jumped during the outbreak, as schools and workplaces operated online with Zoom's video conferencing software gaining in popularity, and consumers increasingly used delivery services for food and grocery purchases.

**Figure SF1. Google search terms within Brunei**
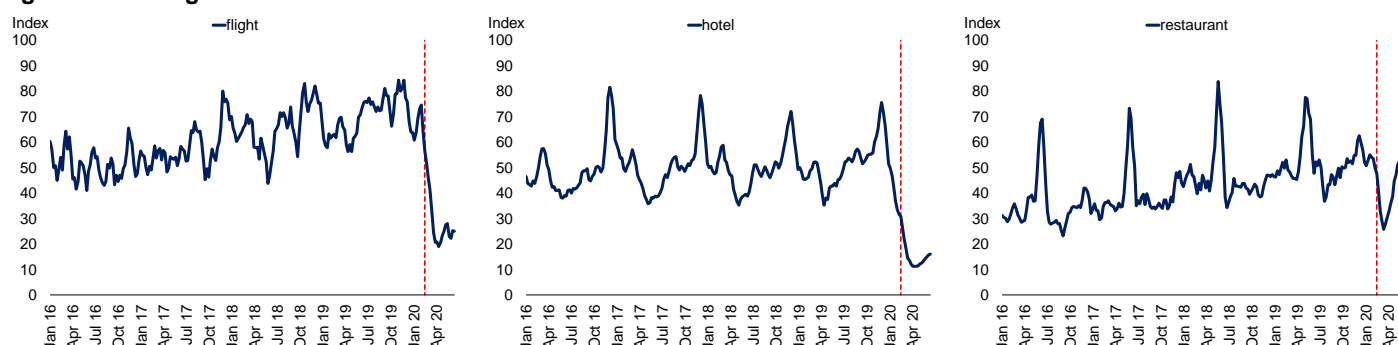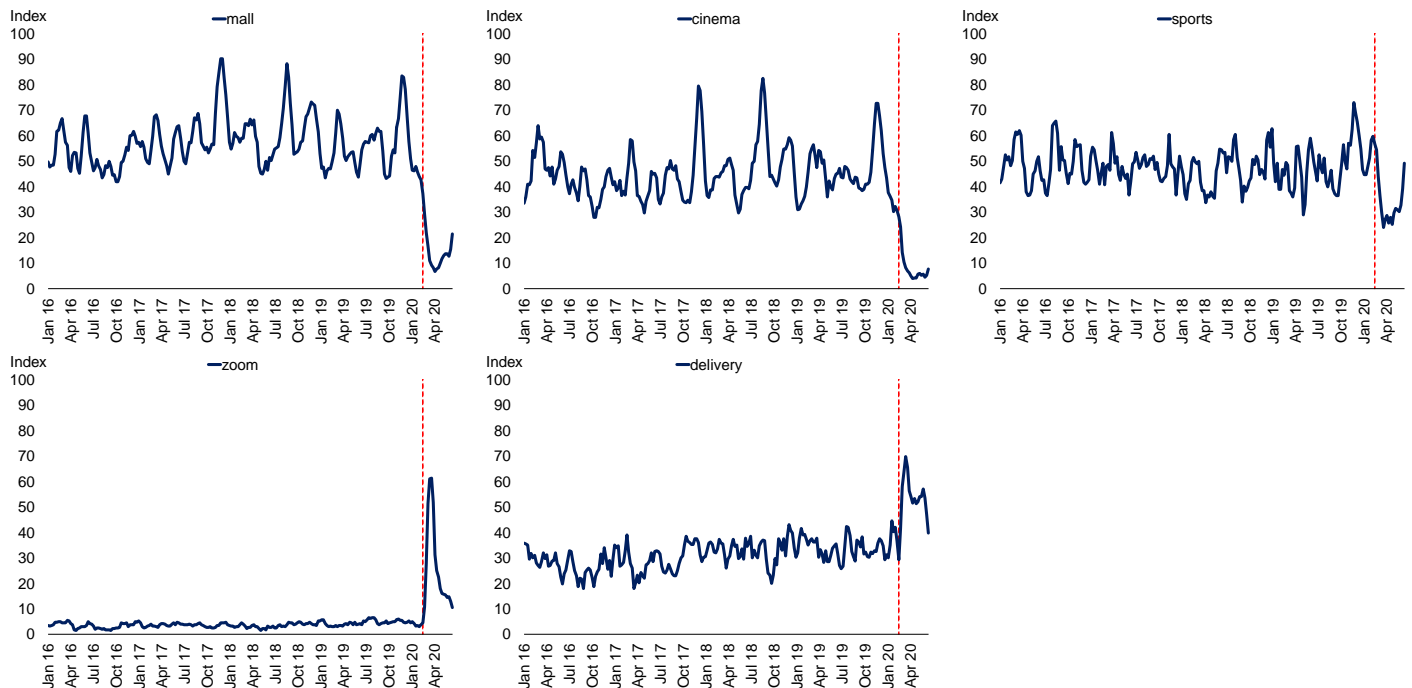
Source: CSPS, Google Trends
Note: Data shows 4-week moving average to improve readability. The red dashed line is the week the first COVID-19 case was reported in Brunei. Last observation is the week of July 5-11, 2020.

To validate that Google Trends data captures consumer demand, we compare the search index with high-frequency data at our disposal. Figure SF2 shows the search term "flight" and monthly tourist arrivals in Brunei, as well as "hotel" and monthly observed hotel occupancy rates. The time series appear to move somewhat in tandem, although with occasional lags. The correlation between "flight" and tourist arrivals is 0.65 and the correlation between "hotel" and hotel occupancy rates is 0.61. Although searches made within Brunei may include hotels outside the country, related queries reveal that four of the top five searches are for local hotels. This suggests high interest within the country for "staycation".

Figure SF2. Google search term "flight" and monthly tourist arrivals and "hotel" and monthly hotel occupancy rates
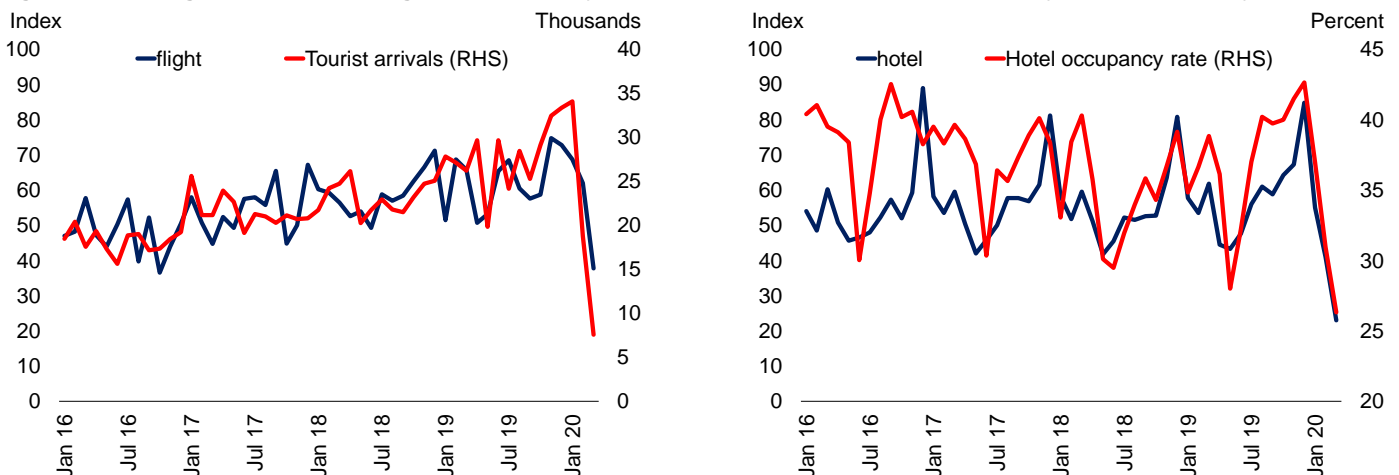
Source: CSPS, Google Trends, Ministry of Primary Resources and Tourism
Note: Weekly search data is averaged to obtain a monthly series. Last observation is March 2020.

How can we interpret the observed changes in demand for services? The outbreak can be thought of as an adverse supply shock initially, as certain economic activities are rendered impossible or difficult to perform due to government-enforced measures. For instance, international travel bans grounded all flights to a halt, and prohibiting dine-ins forced food service providers to operate takeaways and delivery services. Some business owners may see sales fall and furloughed or displaced workers suffer income losses. Consequently, the outbreak becomes a simultaneous adverse demand shock, as consumers

spend less and increase precautionary savings. In addition, fear of contracting the virus may induce voluntary social distancing and consumers curb spending on non-essential items. We do not attempt to disentangle the supply and demand effects here. Instead, we quantify the impact of both shocks on demand for services by regressing each Google search term on the stringency of public health measures and the number of new weekly COVID-19 cases, while controlling for seasonal variation in demand.

The results are displayed in Table SF1. More stringent measures are associated with significant declines in demand for "flight", "hotel", "mall", "cinema", and "sports", and increases in demand for "zoom" and "delivery". Demand for "restaurants" appears to be affected only by an increase in the number of cases.

Table SF1. The impact of public health measures on demand for services

	flight	hotel	restaurant	mall	cinema	sports	zoom	delivery
Measures	-0.129***	-0.195***	0.021	-0.243***	-0.336***	-0.041**	0.257***	0.084***
Cases	0.006	-0.083***	-0.109***	-0.140***	-0.085*	-0.037	0310***	0.099*
R-squared	0.491	0.876	0.351	0.750	0.738	0.283	0.547	0.297

Note: Google search data is transformed into logarithms, while the public health measures (Stringency Index) and the new weekly cases are transformed using the inverse hyperbolic sine function. The estimated coefficients can hence be interpreted as elasticities. Each regression has 236 observations, and weekly time dummy variables are included. ***, **, * denotes significance at the 1%, 5%, and 10% level, respectively.

The results can be interpreted as follows: a 10 percent increase in the stringency of the measures leads to a 2.4 percent decline in retail trade ("mall"). This magnitude is quite large. Using the week of March 8-14 as the benchmark, the stringency of public health measures increased more than 2.7 times over a four-week period. This translates to a cumulative fall in retail demand by 66 percent in four weeks. The impact on other service categories can be interpreted in a similar way.

Policy implications

The interventions to control the spread of COVID-19 inherently present trade-offs between public health and economic wealth. Targeted measures can minimize the associated costs. Quantifying the immediate economic impact in near real-time is an important first step toward designing appropriate policies. The pandemic has clearly exposed the limitations of relying on indicators based on surveys of households and businesses conducted by the government as they are only typically available with a significant time lag.

The use of alternative economic measures has played an important role in facilitating ongoing evaluation of the pandemic. Near real-time indicators include daily electricity consumption, weekly unemployment claims, satellite readings of tropospheric nitrogen dioxide densities, nighttime lights visible from space, mobility inferred from mobile phone location data, consumer transaction data, and internet search data (Abay et al. 2020; Beyer et al. 2020; Carvalho et al. 2020; Chen et al. 2020; Chetty et al. 2020; Demirgüç-Kunt et al. 2020). Leveraging these new sources of information requires not only novel empirical approaches but also collaborations between the private sector, public sector, and research institutions.

Using publicly available Google search data, we show that the decline in demand in travel-related and consumer-facing sectors in Brunei can be large. This, however, may not fully correspond to the actual impact if the assumption that internet search predicts consumer demand fails. We suggest building a national data visualization platform to track economic activity at high frequency and in near real-time and to assess at a granular level variations across industries and socio-demographic groups to guide policymaking. This would require active participation of the private sector and government agencies in data sharing, and pooling of intellectual resources. Privacy concerns can be addressed by anonymizing the data at source, and an interdisciplinary research team can be mobilized within think tanks and universities.

Real-time public health surveillance has been valuable in bringing the outbreak under control. Similar efforts need to be put in place to monitor the economic impact on businesses, workers, and households. Understanding the heterogeneous impacts can help policymakers calibrate policy measures to support affected groups. As future waves of COVID-19 are anticipated, and with little prospect of a vaccine becoming widely available anytime soon, policymakers need to find a balance between public health interventions and preventing widespread economic hardship. Early collaborative efforts in sharing new data sources and more granular information to support real-time impact assessment are therefore crucial in effectively responding to future outbreaks.

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