

# PRELIMINARY ESTIMATE OF THE ECONOMIC IMPACT OF THE COVID-19 VIRUS IN PUERTO RICO

March 26, 2020



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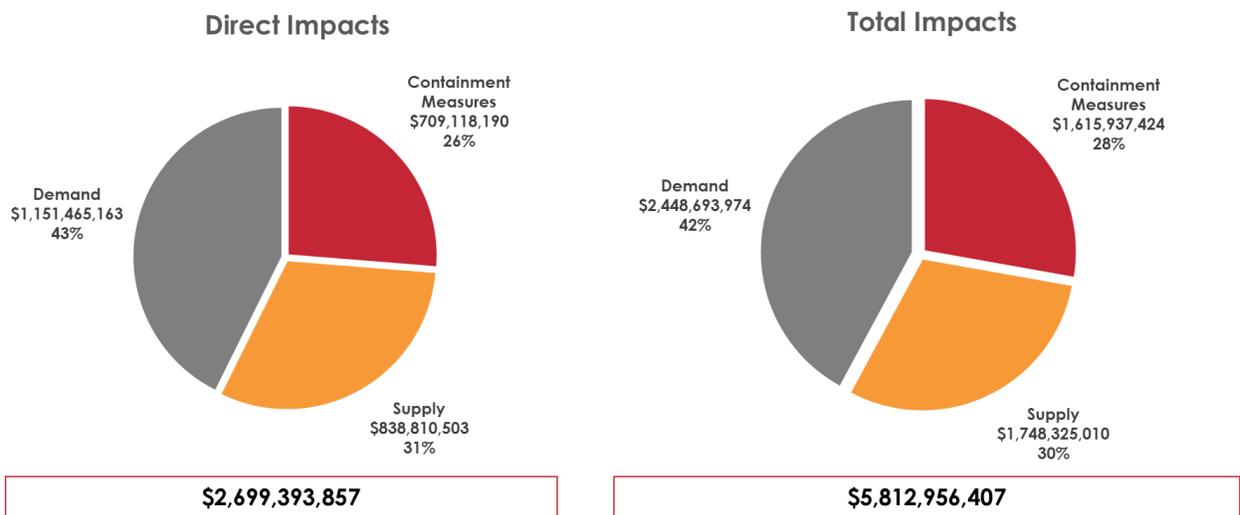
# PRELIMINARY ESTIMATE OF THE ECONOMIC IMPACT OF THE COVID-19 VIRUS IN PUERTO RICO

## INTRODUCTION

Estudios Tecnicos, Inc. (ETI) is actively following the development of the Covid-19 Virus and providing estimates of its economic impacts. Based on the information known as of March 25, 2020, the firm estimates that directly affected sectors will suffer a loss of \$2.7 billion dollars in direct economic activity during the remainder of 2020, which may in turn drag the economy into a total loss of \$5.8 billion when indirect impacts are factored in. Total impacts on demand were estimated at \$2.5 billion; while supply side impacts amounted to \$1.8 million. The impact of containment measures on economic activity was estimated at \$1.6 billion. The various components of the impact estimates are described in this report.

If the spread of the virus continues to accelerate in Puerto Rico and the U.S., ETI expects an extension of the local lockdown period, broader lockdown mandates at a national level, stringent national and international travel restrictions and greater supply chain impacts. Under these circumstances, the economic impacts will certainly increase. Nevertheless, stimulus packages and emergency programs will soften the macroeconomic impacts of the COVID-19 crisis. As additional information becomes available, these estimates will be revised on a weekly and, as necessary, on a daily basis. The make up of the summary graphs below is explained in the report.

Figure 1: Direct and Total Impact of the Coronavirus in Puerto Rico, as of March 23, 2020



Source: Estudios Técnicos, Inc.

## APPROACH

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### Conceptual Framework

To adequately map the overall scale of impacts from the pandemic, ETI used the framework prepared by the Organization for Economic Cooperation and Development (OECD) to group and summarize the main economic channels driving the loss of global economic output.<sup>1</sup> These economic channels are grouped into three main impact areas:

- 1) Impacts from containment measures – these include all effects directly associated with policy measures enacted to contain the pandemic, such as quarantines, travel bans restrictions, and closures of public places.
- 2) Impacts on the supply of goods and services – these contain all business-side impacts resulting from the enactment of containment measures as well as the indirect effect of the virus in the global supply chain. The OECD details three main economic channels in the supply side: business and factory closures, cutbacks in service provisions by the public and private sector, and disruptions in the supply chain.
- 3) Impacts on the demand side – these contain all the consumption-side effects associated with the halting of economic activity, including a) loss of confidence, b) stagnation of business and tourism travels, c) critical impacts on education and entertainment centers, as well as restaurants and other public venues.

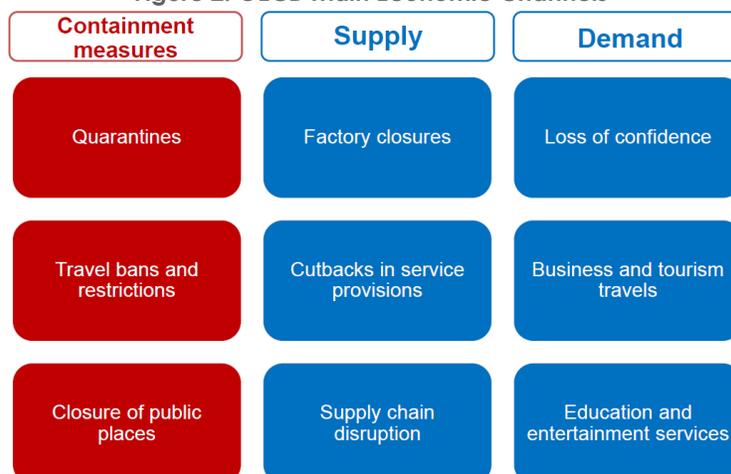
The following diagram organizes the measures outlined in the OECD framework by main channel and area of effect:<sup>2</sup>

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<sup>1</sup> See Boone, L. (March 2, 2020). *Coronavirus: the world economy at risk* [OECD Interim Economic Outlook]. Retrieved from <http://www.oecd.org/economy/outlook/>.

<sup>2</sup> Ibid.

Figure 2: OECD Main Economic Channels



## Estimation of Direct Impacts

In order to transform these concepts to monetary values, an inventory of available economic and social indicators to measure these impacts was developed, which formed the empirical basis for measuring each economic impact. Due to information availability problems, some estimates were based upon reasonable assumptions extrapolated from other sources. The following sections detail the indicators and formulas used to measure each impact.

### Direct Impact of Containment Measures

The following indicators were used to estimate the direct impact of containment measures:

- Number of Lockdown Days
- Cost estimate of average hospital stay<sup>3</sup>
- Number and Spending of Tourist Visitors (Airborne)
- Number and Spending of Excursion Visitors (Seaborne)
- Estimated Spending Shares for Hotel Services and Airline Tickets<sup>4</sup>
- Output in Leisure Transportation (NAICS 485,488) and Recreation Services (NAICS 71)

The formulas used to value the impact of containment measures are provided in the next table by concept and indicator.

<sup>3</sup> Estimated by multiplying the costs of average hospital stay in the US (\$15,734) by the ratio of total healthcare cost in Puerto Rico (\$4,549) to the US (\$10,739). This yielded an estimated average cost of hospital stays per person of \$6,665.

<sup>4</sup> Estimated spending shares for 2012 were ~50% for Airline Tickets, ~23% for Hotel Stays. As the fully-weighted 2017 Visitor Survey was not available, a rounded estimate of the 2012 amounts was deemed as the next-best estimator. This will be changed once fully-weighted data from the 2017 Visitor Survey become available.

## Formulas - Containment Measures

Concept	Indicator	Formula
<b>Quarantine Costs</b>	Direct Costs of Hospital Stays due to Quarantine	<i>Estimated Patients due to Quarantine × Average Cost of Hospital Stay for Influenza</i>
<b>Travel &amp; Tourism Restrictions</b>	Foregone Airline Ticket Spending	<i>50% × 2 – month visitor volume × Average Tourism Expenditures (Airborne)</i>
<b>Travel &amp; Tourism Restrictions</b>	Foregone Hotel Spending	<i>23% × 2 – month visitor volume × Average Tourism Expenditures (Airborne &amp; Seaborne)</i>
<b>Travel &amp; Tourism Restrictions</b>	Discretionary Visitor Spending	<i>Total Tourism Expenditures (Airborne &amp; Seaborne) × 2 – month visitor period ÷ 12 months in estimate – Airline Ticket &amp; Hotel Expenses</i>
<b>Closure of Public Places</b>	Restaurant Output Losses	<i>70% of Restaurant Output ÷ 12 months in estimate × 2 – month equivalent impact</i>
<b>Closure of Public Places</b>	Leisure and Land (Passenger) Transportation Output Losses	<i>Share of Leisure and Land (Passenger) Transportation × Transportation Output ÷ 12 months in estimate × 2 – month equivalent impact</i>

### Impact on Supply of Goods and Services

The following indicators were used in the impact estimates on the supply side:<sup>5</sup>

- Lockdown days
- Manufacturing and Small/Medium Business Employment and Wages
- Average Weekly Hours Worked in Manufacturing
- Nonfarm employment in Puerto Rico
- Output of Wholesale Trade, Land and Maritime Transportation
- Imports of Business Supplies and Food

The formulas used to value the impact of containment measures are included in the next table by concept and indicator.

#### Formulas – Supply Side Impacts

Concept	Indicator	Formula
<b>Factory &amp; Business Closings</b>	Affected Wages from Manufacturing Establishments	$90\% \text{ of Manufacturing Employment} \times \text{Number of Hours Impacted} \times \text{Average Hourly Wage}$
<b>Factory &amp; Business Closings</b>	Affected Wages of Small and Medium Businesses	$\text{Average Wages in Puerto Rico} \times \% \text{ of 2,080 hours affected} \times \text{Small and Medium Business Employment}$
<b>Factory &amp; Business Closings</b>	Impact to Unemployment, Vacations and Illness Benefits	$\text{Affected hours due to lockdown} \times \text{Average Hourly Wages in Puerto Rico} \times 70\% \text{ of Employment in Puerto Rico}$
<b>Cuts to Service Provision</b>	Impact to Health Care Output	$\text{Temporary Increase of 25\% to Health Services in 2 months} \times \text{Healthcare Output} \div 12 \text{ months in estimate}$
<b>Cuts to Service Provision</b>	Impact to Services Establishments Output	$50\% \text{ of Output in Services Sectors} \times \% \text{ of Affected Service Sectors} \times 2 - \text{month impact period} \div 12 \text{ months in estimate}$

<sup>5</sup> The lockdown period was assumed to impact the equivalent of two (2) full months of economic output – one month fully due to the lockdown period, and another due to start-up delays in economic output due to the drag in economic activity experienced by consumers.

Concept	Indicator	Formula
<b>Supply Chain Disruption</b>	Affected Imports due to Slowdown in the Supply Chain	$(70\% \text{ of Business Inputs} + 10\% \text{ capital goods}) \times 2 - \text{month equivalent impact} \div 12 \text{ months in estimate}$
<b>Supply Chain Disruption</b>	Impact to Wholesale Trade	$\text{Temporary Increase of } 10\% \text{ to Wholesale Trade} \times \text{Wholesale Trade Output} \times 2 - \text{month equivalent impact} \div 12 \text{ months in estimate}$
<b>Supply Chain Disruption</b>	Impact to Cargo Transportation	$\text{Temporary Increase of } 25\% \text{ to Transportation} \times 50\% \text{ of Transportation Output} \times 2 - \text{month equivalent impact} \div 12 \text{ months in estimate}$

### Impact on Demand

The indicators used to estimate demand impacts included:

- US Index of Consumer Sentiment, a proxy for local consumer sentiment<sup>6</sup>
- PR Consumption Expenditures
- An expected influx of \$100 million of NAP funding
- WTI Oil Prices

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<sup>6</sup> Confidence shocks in the island are expected to be analogous to the mainland in terms of the Coronavirus Effect.

## Formulas – Demand Side Impacts

Concept	Indicator	Formula
<b>Loss of Consumer Confidence</b>	Impact upon Local Consumption	Estimated from Dynamic Multiplier of ARIMA(2,1,0) in logarithms, in response to a 16-point shock in the US consumer confidence index.
<b>Oil Price Shocks</b>	Impact upon Local Consumption	Estimated from Dynamic Multiplier of ARIMA(1,1,0) in logarithms, in response to the \$17 / barrel decline in oil price from February 20 thru March 17, 2020.
<b>Consumer Demand</b>	Reduction in Recreation Spending due to Lockdown and Social Isolation	$20\% \text{ of Recreation Spending} \times 2 - \text{month impact period} \div 12 \text{ months in estimate}$
<b>Consumer Demand</b>	Reduction in Education Spending due to Lockdown and Social Isolation	$20\% \text{ of Education Spending} \times 2 - \text{month impact period} \div 12 \text{ months in estimate}$
<b>Consumer Demand</b>	Foregone Spending in Restaurants and Other Drinking Places	$50\% \text{ of Restaurant Spending} \times 2 - \text{month impact period} \div 12 \text{ months in estimate}$
<b>Consumer Demand</b>	Impact in Food Spending	$\text{Temporary } 5\% \text{ decline in Food Spending} \times 2 - \text{month impact period} \div 12 \text{ months in estimate} - \$100 \text{ million NAP Influx}$
<b>Consumer Demand</b>	Reduction in Transportation Spending by Consumers (Fuel, etc.)	$40\% \text{ of Transportation Spending} \times 2 - \text{month impact period} \div 12 \text{ months in estimate}$

The following table shows the aggregate monetary impacts by economic channel, as estimated from each of these indicators, assumptions, and formulas. As can be seen, consumer demand, travel restrictions and supply chain disruptions are the principal effects, with the demand-side components being the main drivers of the direct impact.

**Table 1: Direct Impacts (OECD Framework) by Economic Channel, As of March 23, 2020**

Containment Measures		Subtotal – Containment
Quarantine Costs	\$47,987,015	
Travel & Tourism Restrictions	\$546,933,333	\$709,118,190
Closure of Public Places	\$114,197,842	
Supply		Subtotal - Supply
Factory & Business Closings	\$207,961,470	
Cuts to Service Provision	\$57,972,929	\$838,810,503
Supply Chain Disruption	\$572,876,104	
Demand		Subtotal - Demand
Loss of Consumer Confidence	\$335,805,329	
Education & Entertainment	\$242,373,333	\$1,151,465,163
Consumer Demand	\$573,286,501	
<b>Grand Total</b>		<b>\$2,699,393,856</b>

## Estimation of Total Impacts: An Input-Output Approach

While the OECD framework provides a concise outline for the direct impacts under the previously detailed assumptions and indicators, the total impact of the pandemic must include the associated system wide “ripple effects” or “spillovers” on the economy as a result of these direct impacts. The instrument used to account for these effects is the Input-Output matrix, which estimates the direct, indirect, and induced effects from output changes across industrial sectors. The latest Input-Output matrix estimated for Puerto Rico is for fiscal 2007 (ETI partially updated the 2007 matrix, but for this exercise the Planning Board’s 2007 matrix was used). The matrix was used as the basis for the following analyses:

### Estimating Final Demand Vectors

In order to employ the Input-Output matrix as an instrument, one must convert the total numeric estimates into final demand vectors by distributing the impacts according to the component of final demand most suitable for each conversion. This is complicated by the fact that the pandemic encompasses sector-specific and generalized impacts

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across different components of final demand. Sector-specific effects often target more than one sector and must be distributed by the relative composition of the sectors they affect. Likewise, generalized impacts must be distributed by the final demand component across all sectors.

The following table shows the sector-specific and generalized impacts associated with each economic channel and indicator. These are further identified by the component of final demand used to distribute their values.

**Table 2: Distribution of Sector-Specific and Generalized Impacts by Sectors and Associated Final Demand Component**

Sector-Specific Impacts				
Effect Area	Economic Channel	Indicator	Affected Sectors	Associated Component of Final Demand
Containment Measures	Closure of Public Places	Foregone Spending in Restaurants and Other Drinking Places	722	Total Output
Containment Measures	Closure of Public Places	Reduction in Transportation Output	491,492	Total Output
Containment Measures	Quarantine Costs	Direct Costs of Hospital Stays due to Quarantine	6211,6212,6213,6214,6215,6216,6219,622,623	Final Demand
Containment Measures	Travel & Tourism Restrictions	Foregone Airline Ticket Spending	481	Final Demand
Containment Measures	Travel & Tourism Restrictions	Foregone Hotel Spending	721	Final Demand
Demand	Consumer Demand	Impact in Food Spending	42-45	Final Demand
Demand	Consumer Demand	Reduction in Education Spending due to Lockdown and Social Isolation	722	Final Demand
Demand	Consumer Demand	Reduction in Transportation Spending by Consumers (Fuel, etc.)	481,483,484,485,486,487,488	Final Demand
Demand	Consumer Demand	Reduction in Education Spending due to Lockdown and Social Isolation	611	Final Demand
Demand	Consumer Demand	Reduction in Recreation Spending due to Lockdown and Social Isolation	713	Final Demand
Supply	Cuts to Service Provision	Impact to Health Care Output	6211,6212,6213,6214,6215,6216,6219,622,623	Total Output
Supply	Cuts to Service Provision	Impact to Services Establishments Output	511,512,515,517,518,519,5411,5412,5413,5414,5415,5416,5417,5418,5419,5511,561,562,8111,8112,8113,8114,8121,8122,8123,8129,813	Total Output
Supply	Supply Chain Disruption	Impact to Wholesale Trade	42-45	Final Demand
Supply	Supply Chain Disruption	Impact to Cargo Transportation	481,483,484,485,486,487,488,491,492,493	Total Output
Generalized Impacts				
Effect Area	Economic Channel	Indicator	Affected Sectors	Associated Component of Final Demand
Containment Measures	Travel & Tourism Restrictions	Discretionary Visitor Spending	All	Visitor Spending
Supply	Factory & Business Closings	Affected Wages of Small and Medium Businesses	All	Final Demand
Supply	Cuts to Service Provision	Impact to Unemployment, Vacations and Illness Benefits	All	Final Demand
Supply	Supply Chain Disruption	Affected Imports due to Slowdown in the Supply Chain	All	Intermediate Demand (Imports)
Demand	Loss of Consumer Confidence	Impact upon Local Consumption	All	Final Demand
Demand	Oil Price Shocks	Impact upon Local Consumption	All	Final Demand

## Summary of Results

The results from the Input-Output matrix analysis on the direct impacts are outlined below. As expected, the three main drivers of the direct impact – consumer demand, travel restrictions and supply chain disruption – are also the main impact components.

**Table 3. Total Impacts**

Containment Measures		Subtotal – Containment
Quarantine Costs	\$102,336,181	
Travel & Tourism Restrictions	\$1,224,500,879	\$1,615,937,424
Closure of Public Places	\$289,100,364	
Supply		Subtotal - Supply
Factory & Business Closings	\$427,722,882	
Cuts to Service Provision	\$54,596,635	\$1,748,325,010
Supply Chain Disruption	\$1,266,005,492	
Demand		Subtotal - Demand
Loss of Consumer Confidence	\$679,101,668	
Education and Entertainment	\$535,680,012	\$2,448,693,974
Consumer Demand	\$1,233,912,293	
<b>Grand Total</b>		<b>\$5,812,956,408</b>

## ADDITIONAL IMPACTS & KEY DEVELOPMENTS

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While the OECD framework provides for a basic benchmark of the economic impacts experienced, other important repercussions arise from the pandemic that are not captured with these concepts. For example, the U.S. stock market lost close to a third of its value as a result of the pandemic, impacting the value of capital investments of residents, including 401K accounts, local institutions and pension funds (this loss was subsequently partially recovered). In Puerto Rico, the value of publicly traded local stocks (mostly bank stocks) fell about 35% since their peak in February 2020. The loss of capital wealth of the consumer is theorized to have a “wealth effect” that is, people spend less as the value of their assets declines.

In addition, not all impacts are negative from the Covid-19 virus. The severity of the pandemic has triggered the enactment of historically high economic stimulus packages by federal, state, and local governments across the world. In the US, the most recently discussed stimulus is a \$2 trillion package aimed at supporting critical and severely affected sectors of the economy, mainly the health system, critical government services, small businesses, severely impacted industries, state and local governments and the consumer. These measures should positively impact the economy and serve as a cushion to the estimated impact of the crisis; however, these developing issues are not yet considered in the impact estimate.

Some of the key developing events include:

- repurposing of funds by the Fiscal Control Board that were reserved for debt payments
- The U.S. Congress Bill for a \$2.0 trillion mitigation package
- Local banks will be required to provide a three-month moratorium on the debt payments
- repurposing of allocated federal funding for Covid-19 related activities
- Extension of the lockdown for two additional weeks

## CONCLUDING REMARKS

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ETI is expecting an extension of the local lockdown period, broader lockdown mandates at a national level, stringent national and international travel restrictions, greater supply chain impacts and inflationary pressures in certain commodities. Under these circumstances, the economic impacts will certainly increase. Nevertheless, the stimulus packages and emergency programs which are being developed as policy makers understand the economic implications and ramifications of the pandemic will certainly help lessen the economic damage the pandemic is causing to the economy and society as a whole.

The local government has proposed a number of measures that will mitigate some of the impacts of the COVID-19 situation. It is not yet clear, however, how the diffusion of the virus is occurring. One of the factors that will make adjustments necessary going forward is, precisely, the progress of the epidemic, since this has direct bearing on costs. Obviously, the federal mitigation initiatives will play a key role once they are implemented.

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