The Economic Impacts of COVID-19: Evidence from a New Public Database Built Using Private Sector Data

Raj Chetty, Harvard
John N. Friedman, Brown
Nathaniel Hendren, Harvard
Michael Stepner, University of Toronto
and the Opportunity Insights Team

June 2021
Motivation: Measuring the Impacts of COVID-19

- How has COVID-19 affected the American economy and what policies can best mitigate its adverse impacts going forward?

- Since Kuznets (1941), macroeconomic policy decisions have been based on data from surveys of households and businesses.

- These data provide vital aggregate information (GDP, unemployment rates), but have two key limitations:
  1. Some statistics available only at low frequencies, often with significant lags.
  2. Some statistics cannot be disaggregated to examine variation across areas or subgroups.
We build a publicly available economic tracker using transaction data from several private companies to measure daily economic activity by ZIP code, income group, and industry.

Use these new data to analyze economic impacts of COVID-19 pandemic:


2. [Policy Responses] Causal effects of fiscal stabilization policies enacted to date

This work serves as a prototype motivating further development in collaboration with federal statistical agencies.
Data Construction
Constructing Publicly Available Economic Indices Based on Private-Sector Data

- Starting from raw data, construct series suitable for economic analysis as follows:

  1. **Clean** series to remove artifacts that arise in transaction data
  2. **Smooth** seasonal fluctuations using data from 2019
  3. **Protect privacy**: index to January 2020 values, exclude small cells, combine data from multiple companies
  4. **Benchmark** to national statistics to characterize group each dataset represents to mitigate bias from non-representative selection
National Employment Trends (Paychex, Intuit, Earnin)
Tracker vs CPS

Change in Employment vs. January 2020 (%)
Employment Trends - California

Change in Employment vs. January 2020 (%)
Change in Employment vs. January 2020 (%)

- Low-Income (Unadjusted)
- CPS Low-Income
- Pooled (Unadjusted)
- CPS Pooled

National Employment Trends (Paychex, Intuit, Earnin) Tracker vs CPS
Impacts of COVID-19
National Accounts Data: Changes in GDP and its Components

Change in Real GDP from Q1 2020 to Q2 2020 (in trillions of chained 2012 dollars)

Gross Domestic Product

- $1.73T
  (-31.7%)
Change in Real GDP from Q1 2020 to Q2 2020 (in trillions of chained 2012 dollars)

- Gross Domestic Product: -$1.73T (-31.7%)
- Private Domestic Investment: -$0.47T
- Govt. Expend.: $0.04T
- Net Exports: $0.05T
- Personal Consumption Expend. (PCE): -$1.35T
National Accounts Data: Changes in GDP and its Components

Change in Real GDP from Q1 2020 to Q2 2020 (in trillions of chained 2012 dollars)

- Gross Domestic Product: -$1.73T (-31.7%)
- Private Domestic Investment: -$0.47T
- Govt. Expend.: $0.04T
- Net Exports: $0.05T
- Personal Consumption Expend. (PCE): -$1.35T
- Credit Card Spending in PCE: -$1.03T

Credit Card Spending in PCE

National Accounts Data: Changes in GDP and its Components
Consumer Spending by Income Quartile

- **2019 Top Income Quartile**
  - Feb 1: $8.0 Billion
  - Apr 1: -$3.1 Billion (-37.5%)

- **2020 Top Income Quartile**
  - Feb 1: $8.0 Billion
  - Apr 1: -$0.7 Billion (-7.3%)
Consumer Spending by Income Quartile

- **2019 Top Income Quartile**
  - Feb: $+0.2 Billion (+4.5%)
  - Apr: $-3.1 Billion (-37.5%)
  - Jun: $-1.0 Billion (-26.7%)
  - Aug: $-0.7 Billion (-7.3%)

- **2020 Top Income Quartile**
  - Feb: $+0.2 Billion (+4.5%)
  - Apr: 
  - Jun: 
  - Aug: 

- **2019 Bottom Income Quartile**
  - Feb: 
  - Apr: 
  - Jun: 
  - Aug: 

- **2020 Bottom Income Quartile**
  - Feb: 
  - Apr: 
  - Jun: 
  - Aug: 

*Note: The graph shows consumer spending per day in billions from February 1 to December 1, with quarterly comparisons and percentage changes indicated.*
Changes in Small Business Revenues from January to April by ZIP Code
San Francisco
**Changes in Small Business Revenues vs. Rent, by ZIP Code**

From January to April 2020

\[ \text{Slope} = -13\% \text{ per } \$1000 \text{ (s.e. = 0.38)} \]

<table>
<thead>
<tr>
<th>Median Two Bedroom Monthly Rent in 2018</th>
<th>Change in Small Business Revenue Relative to January</th>
</tr>
</thead>
<tbody>
<tr>
<td>$500</td>
<td>-60%</td>
</tr>
<tr>
<td>$1,000</td>
<td>-50%</td>
</tr>
<tr>
<td>$1,500</td>
<td>-40%</td>
</tr>
<tr>
<td>$2,000</td>
<td>-30%</td>
</tr>
<tr>
<td>$2,500</td>
<td>-20%</td>
</tr>
<tr>
<td>$3,000</td>
<td>-10%</td>
</tr>
</tbody>
</table>
Employment Changes by Income Quartile

<table>
<thead>
<tr>
<th>Date</th>
<th>Top Income Quartile</th>
<th>Second Quartile</th>
<th>Third Quartile</th>
<th>Bottom Income Quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 1</td>
<td>-11% (-3.7m)</td>
<td>-17% (-5.5m)</td>
<td>-24% (-7.7m)</td>
<td>-35% (-11.2m)</td>
</tr>
<tr>
<td>Apr 15</td>
<td>-1% (0.2m)</td>
<td>-6% (2.0m)</td>
<td>-12% (3.8m)</td>
<td>-22% (7.0m)</td>
</tr>
<tr>
<td>Jun 10</td>
<td>-8% (2.6m)</td>
<td>-12% (3.8m)</td>
<td>-17% (5.5m)</td>
<td>-22% (7.0m)</td>
</tr>
<tr>
<td>Apr 1</td>
<td>2% (-0.7m)</td>
<td>-1% (0.3m)</td>
<td>-8% (2.6m)</td>
<td>-24% (7.6m)</td>
</tr>
</tbody>
</table>

Change in Employment (%) Relative to January 2020

Jobs lost
National Trends in Consumer Spending vs. Employment Rates

Retail Trade

Change Relative to January 2020 (%)
National Trends in Consumer Spending vs. Employment Rates
Retail Trade

Change Relative to January 2020 (%)
National Trends in Consumer Spending vs. Employment Rates
Retail Trade

Change Relative to January 2020 (%)

- 62.6% Minimum Req.'s Job Postings
- 6.4% Top Wage Quartile Employment
- 29.0% Consumer Spending
- -14.8% Bottom Wage Quartile Employment

Feb 1 Mar 1 Apr 1 May 1 Jun 1 Jul 1 Aug 1 Sep 1 Oct 1 Nov 1 Dec 1 Jan 1 Feb 1 Mar 1 Apr 1
Effects of Stimulus Payments
Coronavirus Aid, Relief, and Economic Security (CARES) Act of April 2020

- $1200 checks (phased out at higher incomes, supplement for children)
- April 15, 2020 deposits for the majority of payments

Coronavirus Response and Relief Act of December 2020

- $600 checks (phased out at higher incomes, supplement for children)
- January 4, 2021 or January 6, 2021 deposits for the majority of payments

Were stimulus payments effective in increasing consumer spending?
Effect of the **January 2021** Stimulus Checks on Daily Consumer Spending

**Bottom Income Quartile ZIP Codes**
Median Household Income < $46,000

- **$600 Stimulus Checks Disbursed on Jan 4**
- Spending Increased 7.9 p.p.
  (s.e. = 2.2 p.p)

![Chart showing the impact of stimulus checks on consumer spending]

Consumer Spending
Seasonally Adjusted

- +10 p.p.
- 0 p.p.
- -10 p.p.

- **4th, 7th, 10th, 13th, 16th, 19th**
- December, January

- **Bottom Income Quartile ZIP Codes**
  Median Household Income < $46,000

- **Effect of the January 2021 Stimulus Checks on Daily Consumer Spending**
  - **–10 p.p.**
  - **0 p.p.**
  - **+10 p.p.**
  - **+20 p.p.**
  - **+30 p.p.**
Effect of the **January 2021** Stimulus Checks on Daily Consumer Spending

Bottom Income Quartile ZIP Codes
Median Household Income < $46,000

- Spending Increased 7.9 p.p. (s.e. = 2.2 p.p)

Top Income Quartile ZIP Codes
Median Household Income > $78,000

- Spending Increased 0.2 p.p. (s.e. = 1.6 p.p)
Effect of the COVID Stimulus Bills on Spending, by Income Group

Consumer Spending
Estimate of 1-month spending per $600

<table>
<thead>
<tr>
<th>Income Group</th>
<th>ZIP Code Median Household Income</th>
<th>Spending per $600</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$46,000</td>
<td>$126</td>
<td></td>
</tr>
<tr>
<td>$46,000 to $59,000</td>
<td>$140</td>
<td></td>
</tr>
<tr>
<td>$59,000 to $78,000</td>
<td>$90</td>
<td></td>
</tr>
<tr>
<td>&gt;$78,000</td>
<td>$45</td>
<td></td>
</tr>
</tbody>
</table>
Effect of the COVID Stimulus Bills on Spending, by Income Group

Consumer Spending
Estimate of 1-month spending per $600

<table>
<thead>
<tr>
<th>ZIP Code Median Household Income</th>
<th>CARES Act (April 2020)</th>
<th>COVID Relief Act (January 2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$46,000</td>
<td>$189</td>
<td>$126</td>
</tr>
<tr>
<td>$46,000 to $59,000</td>
<td>$225</td>
<td>$140</td>
</tr>
<tr>
<td>$59,000 to $78,000</td>
<td>$229</td>
<td>$90</td>
</tr>
<tr>
<td>&gt;$78,000</td>
<td>$235</td>
<td>$45</td>
</tr>
</tbody>
</table>
Estimated Cumulative Increase in Savings

Savings = Earnings + Unemployment Insurance + Stimulus Checks – Spending

Δ Savings Per Person compared to 2019

- Top Quartile: $4,000
- Q3: $2,500
- Q2: $2,000
- Q1: $1,300
- Bottom Quartile: $1,300
Projected Effect of Stimulus Checks on Spending
Couple with No Children

January 2021
Stimulus Policy

Household Income

March 2021
Stimulus Policy Proposal

Household Income
Projected Effect of Stimulus Checks on Spending

Couple with No Children

January 2021 Stimulus Policy

Fiscal cost = $200 billion
Projected 1-month spending increase < $15 billion
Projected Effect of Stimulus Checks on Spending

Couple with No Children

January 2021 Stimulus Policy

March 2021 Stimulus Policy

$600

$150,000

$75,000

$1400

$0

$150,000

$174,000

$0

$160,000

$200,000

$20 billion reallocated
Broader Implications and Future Work

1. Research: we hope these new public data (www.tracktherecovery.org) will be helpful in supporting future work in this recession and beyond

2. Policy: fine tuning based on state of the economy and observed policy impacts
   - Help target proposed $100 billion in job re-training programs, avert jobless recovery

3. Contribute to Economic Statistics
   - On-going collaboration with federal statistical agencies using these data to improve existing methodologies and develop new statistics
Appendix
Consumer Spending Benchmarking
Credit/Debit Card Data (Affinity Solutions) vs. National Accounts (Advance Monthly Retail Trade Survey)

Change in Consumer Spending Relative to January

-50%
-25%
0%
+25%
+50%

Retail
Affinity
National Accounts
Food and Accommodation

January 2019
April
July
October
January 2020
April
July
October
January 2021
Change in Consumer Spending by Sector

In-Person Services (68%)

Remote Services

Health Care

Transportation

Hotels & Food

Share of Decline (Jan to Mar 25-Apr 14)

In-Person Services: (33%)

Remote Services

Health Care

Transportation

Hotels & Food

Share of Pre-COVID Spending
Change in Consumer Spending by Sector
COVID vs Great Recession

- Durables: Great Recession 58.6%, COVID-19 19.5%
- Non-Durables: Great Recession 44.3%, COVID-19 13.3%
- Services: Great Recession -2.9%, COVID-19 67.2%
Changes in Bottom Quartile Employment Rates from January to April 2020 by ZIP Code

San Francisco

Change in Low-Income Employment at Small Businesses (Earning Data)

- < -92.1%
- -92.1% to -70.4%
- -70.4% to -66.1%
- -66.1% to -58.8%
- -58.8% to -51.1%
- -51.1% to -44.6%
- -44.6% to -36.5%
- -36.5% to -29.2%
- -29.2% to -16.0%
- > -16.0%
- No Data
Paycheck Protection Program

- CARES Act also provided $500 billion in loans to small businesses starting on April 3

- Loans were forgivable if payroll was not reduced significantly relative to pre-COVID levels

- Firms with fewer than 500 employees were eligible for these loans (with some exceptions)
PPP Program Begins April 3

Estimated Effect to August 15: 1.78 p.p. (s.e. = 1.99 p.p.)

- 501-800 Employees (ineligible)
- 100-500 Employees (eligible)

Change in Employment (%)
Relative to January 2020

Impact of Paycheck Protection Program on Employment
Reweighted to Match Industries (Excl. Food Services), with NAICS x County x Income Quartile FE
Impact of Paycheck Protection Program on Employment
Reweighted to Match Industries (Excl. Food Services), with NAICS x County x Income Quartile FE

Cost Per Job Saved = $377K
($119K at lower bound of 95% CI)

501-800 Employees (ineligible)
100-500 Employees (eligible)

Estimated Effect to August 15: 1.78 p.p. (s.e. = 1.99 p.p.)
Paycheck Protection Program

- Why has PPP had limited impact on employment despite substantial expenditure?
  - Businesses who took up loans may not have intended to lay off their workers to begin with
  - Ex: very high take-up rate among firms providing professional and scientific services despite low job losses in that sector
  - Consistent with evidence that loans flowed to areas with smaller employment losses in March [Granja, Makridis, Yannelis, Zwick 2020]