

Impacts of COVID-19 on the U.S. Economy

Terrie Walmsley

CREATE and Department of Economics, USC

Adam Rose

CREATE and Price School of Public Policy, USC

Dan Wei

CREATE and Price School of Public Policy, USC

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Background

- CREATE Team performing several related studies
 - CAOIE: short-term analysis using secondary data
 - CAOIE: long-term analysis collecting primary data (health costs, avoidance behavior, pent-up demand)
 - CDC: impacts of proposed new rule on contact tracing
 - NASA: use of satellite data on openings and avoidance
- Initial Analysis -- Macro Impacts of Closures
 - status in U.S. and Rest of the World as of April 7
 - use of multi-country computable general equilibrium model
 - 3- and

Outline of Presentation

- Background
 - Scenarios
 - CREATE Economic Consequence Analysis Framework
- Data Inputs
 - sources and major assumptions
 - sector closures, services trade, telework potential
- Methodology
 - overview of CGE model
 - major assumptions underlying the analysis
- Results
 - impacts on major macroeconomic indicators
 - interpretation of the results
- Conclusion

Scenarios

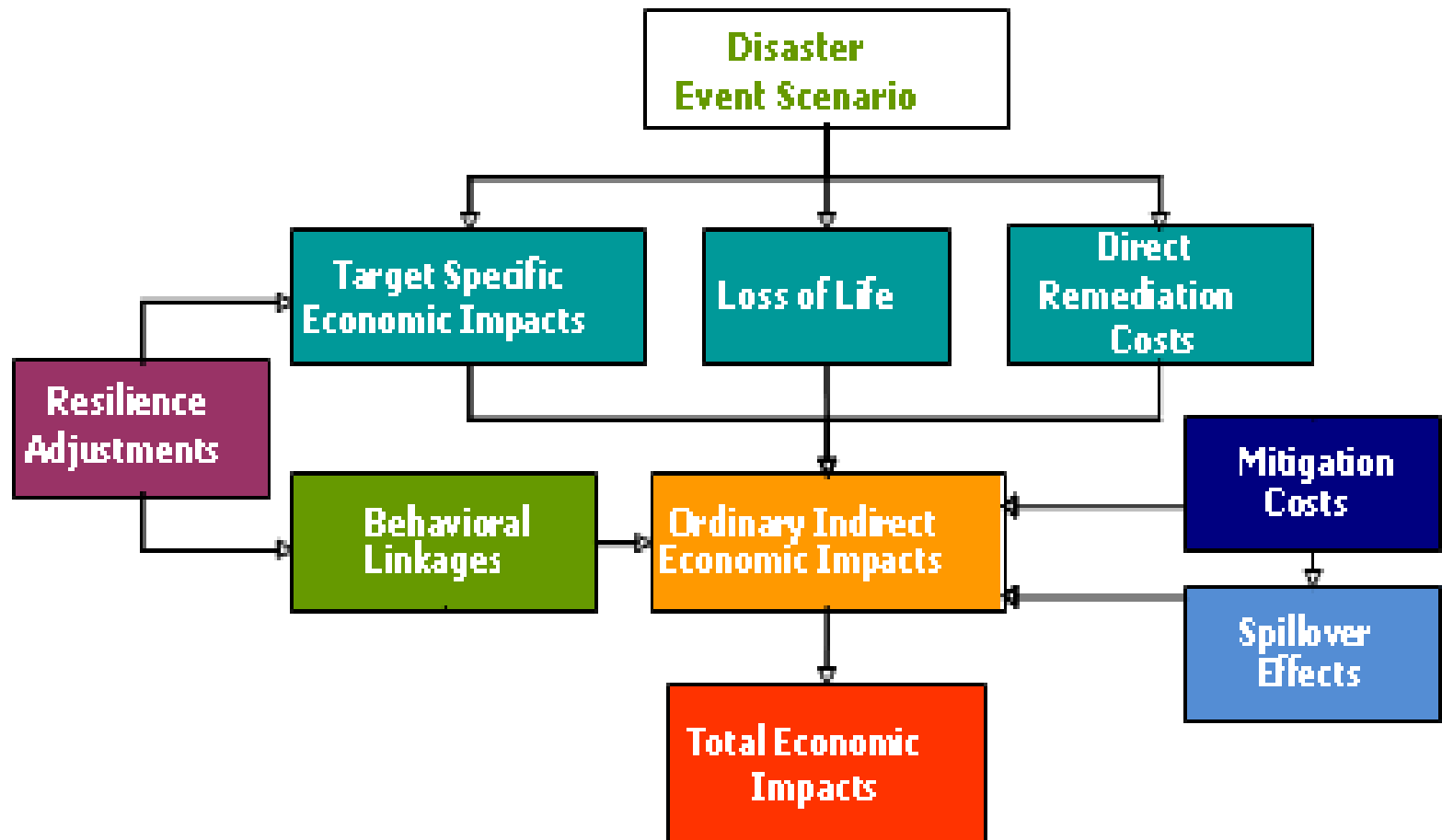
Scenario	Severity & Trend after Mandatory Closures	Initial Reopening	Second Wave of Closure	Second Wave of Reopening	Travel Ban	Vaccine Timing	Avoidance Behavior	Pent-up Demand
1.	Moderate & Declining	3 months	none	n.a.	limited	none	minimal	weak
2.	Moderate & Increasing No Second Wave Vaccine	12 months	none	n.a.	complete	18 months	extensive	moderate
3.	Extensive & Increasing Second Wave No Vaccine	3 months	6 months	30 months	complete	none	extensive	strong

Causal Factors

- Mandatory closures
- Reopenings
- Resilience through telework
- Workforce declines due to health issues
- Consumption & workforce declines due to avoidance
- Changes in demand for health care services
- Increases in demand for communication services
- Pent-up demand

(Countervailing policies not included)

CREATE Economic Consequence Analysis Framework



Background on Economic Resilience

- Two major perspectives:
 1. Include everything to reduce losses, pre- and post-disaster (focus is mitigation of property damage)
 2. Limit to actions implemented after the disaster strikes (but resilience is a process; can build resilience capacity)
 - e.g., emergency drills, back-up generators, alternative suppliers
 - however, these are not implemented until after the disaster hits
- The latter perspective may strike some as odd:
 - How can you reduce property damage post-disaster?
 - You can't; but you can reduce business interruption (BI) (definition of resilience synonymous with business continuity)

Economic Resilience

- Static:
 - General Definition: Ability of a system to *maintain function* when shocked.
 - Econ Definition: *Efficient use of remaining resources* at a given point in time to produce as much as possible.
- Dynamic
 - General: *Ability & speed* of a system to *recover*.
 - Economic: *Efficient* use of resources *over time* for investment in repair and reconstruction, including expediting the process & adapting to change.
- *Metric: averted losses as % of potential losses*

Behavioral Linkages

- Off-site responses associated with behavioral changes (business, household, investor, worker)
- Emanates from social amplification of risk & stigma effects (media coverage, rumor)
- Fear feeds on itself and spreads
- Translates into direct and indirect BI losses
- Can increase losses by 2 to 3 orders of magnitude

Behavioral Linkage Examples

- 9/11 led to a 2-year reduction in air travel
- Workers fear of riding the subway/bus
- Business fear of staying open after dark
- Investor fear of taking high risk
- General avoidance behavior
- Gov't premature shutdown or evacuation

Economic Consequence Analysis Tool (E- CAT)

- Develop a standardized capability to estimate economic consequences of 30+ types of threats
 - includes a comprehensive set of impact categories
 - standardization facilitates comparisons
- Decision-support software tool for high-level analysis
 - risk mgt: resource allocation across multiple threats
 - rapid response: estimates for remediation/aid/recovery
- Second volume in Springer IDRiM Book Series, 2017 (with Fynn Prager, Zhenhua Chen, Sam Chatterjee)

Summary of Data Inputs

- Data sources and assumptions
 - “Stay-at-home” orders implemented across the states as of end of May (Source: New York Times)
 - List of Essential Critical Infrastructure Sectors during COVID-19 (Source: DHS Cybersecurity and Infrastructure Security Agency)
 - GDP by sector and by state (Source: BEA GDP & Income Regional Database)
 - Telework potential by sector (Source: BLS American Time Use Survey)

Sector Closures

- Three categories of sectors
 - Entirely non-essential and thus assumed to be shut down (e.g., Non-critical Mfg, Recreation & Entertainment; Education; but consider telework potentials)
 - Some subsectors are non-essential (e.g., Retail Trade, Food Services, Business Services, etc.)
 - Essential and thus still able to operate in its usual manner to the extent possible (e.g., Agriculture, Critical Mfg, Utilities, Healthcare)

Services and Trade

- Restrictions on trade in services based on importance of tourism and movement of persons who must accompany the supply of these services:
 - construction
 - accomodation, food and services
 - real estate
 - recreation and other services
 - business services
 - financial services
 - education
- Trade between all countries restricted somewhat
- Many countries now restrict the movement of people across national borders.

U.S. Stay-at-Home Orders Between March & May

State	Order Declared	Order Expired	Days of Closure	State	Order Declared	Order Expired	Days of Closure
Alabama	3-Apr	30-Apr	27	Missouri	6-Apr	3-May	27
Alaska	28-Mar	24-Apr	27	Montana	26-Mar	26-Apr	31
Arizona	30-Mar	15-May	46	Nebraska			
Arkansas				Nevada	1-Apr	9-May	38
California	19-Mar	12-May	54	New Hampshire	27-Mar	11-May	45
Colorado	26-Mar	26-Apr	31	New Jersey	21-Mar	5-Jun	76
Connecticut	23-Mar	20-May	58	New Mexico	24-Mar	16-May	53
DC	1-Apr	8-Jun	68	New York	22-Mar	15-May	54
Delaware	24-Mar	31-May	68	North Carolina	30-Mar	8-May	39
Florida	3-Apr	4-May	31	North Dakota			
Georgia	3-Apr	30-Apr	27	Ohio	23-Mar	15-May	53
Hawaii	25-Mar	7-May	43	Oklahoma			
Idaho	25-Mar	30-Apr	36	Oregon	23-Mar	15-May	53
Illinois	21-Mar	31-May	71	Pennsylvania	1-Apr	8-May	37
Indiana	25-Mar	4-May	40	Rhode Island	28-Mar	8-May	41
Iowa				South Carolina	7-Apr	4-May	27
Kansas	30-Mar	3-May	34	South Dakota			
Kentucky	26-Mar	20-May	55	Tennessee	1-Apr	30-Apr	29
Louisiana	22-Mar	15-May	54	Texas	2-Apr	30-Apr	28
Maine	2-Apr	11-May	39	Utah			
Maryland	30-Mar	15-May	46	Vermont	24-Mar	15-May	52
Massachusetts	24-Mar	18-May	55	Virginia	30-Mar	15-May	46
Michigan	24-Mar	28-May	65	Washington	25-Mar	11-May	47
Minnesota	27-Mar	17-May	51	West Virginia	23-Mar	3-May	41
Mississippi	3-Apr	27-Apr	24	Wisconsin	24-Mar	13-May	50
Missouri	6-Apr	3-May	27	Wyoming			15

Telework Potentials

Industry	% Workers Who Could WFH	% of Workers Who Did WFH at Least Occasionally	Average
Agriculture, forestry, fishing, hunting	11.1	10.4	10.8
Construction	17.2	14.4	15.8
Manufacturing	30.3	25.7	28.0
Wholesale and retail trade	16.5	13.9	15.2
Transportation and utilities	14.0	12.5	13.3
Information	53.3	45.1	49.2
Financial activities	57.4	46.7	52.1
Professional and business services	53.4	47.4	50.4
Education and health services	25.9	23.7	24.8
Leisure and hospitality	8.8	6.8	7.8
Other services	27.7	22.6	25.2
Public administration	29.8	21.8	25.8
Federal government	31.4	24.5	28.0

Source: Adapted from BLS (2019).

Percentage Reduction of Output by Sector under Mandatory Closures (with Telecommuting)

#	Sector	Mandatory Closure Category	% Direct Reduction in U.S. Annual GDP	
			Scenarios 1 & 2	Scenario 3
26	Beverages and Tobacco products	2	2.9%	11.4%
27	Manufacture of textiles	1	10.4%	48.5%
28	Manufacture of wearing apparel	1	13.2%	48.1%
29	Manufacture of leather and related products	1	13.2%	46.3%
35	Manufacture of rubber and plastic products	1	11.3%	47.3%
36	Manufacture of other non-metallic mineral products	1	11.9%	46.5%
40	Manufacture of computer, electronic and optical products	1	12.8%	45.3%
45	Other Manufacturing: includes furniture	1	12.4%	48.3%
49	Construction	2	8.9%	36.3%
50	Wholesale and retail trade	2	5.1%	20.2%
51	Accommodation, Food and service activities	2	9.0%	35.4%
52	Land transport and transport via pipelines	2	1.3%	7.6%
53	Water transport	2	3.1%	18.5%
54	Air transport	2	5.4%	32.1%
56	Information and communication	2	0.6%	2.4%
57	Other Financial Intermediation	2	1.5%	5.7%
59	Real estate activities	1	6.0%	23.1%
60	Other Business Services	2	4.7%	18.0%
61	Recreation & Other Services	1	11.6%	44.6%
62	Other Services (Government)	2	4.3%	17.9%
63	Education	1	9.7%	36.3%

Computable General Equilibrium Model

- Model of the entire economy based on decisions by individual producers & consumers in response to price signals, regulations & external shocks within limits of available capital, labor & natural resources.
- The economy as a set of interrelated supply chains
- ImpactECON Model
 - Extension of the GTAP World Trade Model
 - 141 countries aggregated to USA, China and ROW
 - 65 goods and services (or sectors)

Assumptions Underlying Model

- Comparative static short-run analysis
 - impacts are the declines in real GDP or employment relative to baseline in the short run (1-2 years)
 - Note employment impacts are not the maximum fall in employment we can expect in 2020
- Short run is defined by
 - sector specific capital, land and natural resources
 - unemployment of labor
 - fixed trade balance

Real GDP Impacts (billions of 2018\$ U.S.)

Country/ Region	Mandatory Closure & Reopening	Avoidance Behavior	Communi- cation Demand	Deaths & Illness	Health Expenses	Pent-up Demand	Total Impacts
Scenario 1							
USA	-4,780.8	-6.7	208.7	-0.7	21.4	1,394.3	-3,163.7 (-14.8)
China	-1,210.9	-7.9	83.3	0.0	0.2	394.2	-741.2 (-5.2)
ROW	-8,301.9	-66.7	710.8	-0.3	4.5	2,503.7	-5,123.1 (-9.8)
Scenario 3							
USA	-12,996.8	-885.1	577.8	-5.1	189.8	8,186.6	-4,932.8 (-23.0)
China	-3,513.0	-539.8	119.3	-0.2	1.2	2,993.5	-939.0 (-6.6)
ROW	-26,251.3	-2,596.3	1,768.1	1.1	22.1	17,697.1	-9,359.3 (-17.8)

Interpretation

- Negative impacts are considerable world-wide
- Impacts greater than direct effects of closures
 - unemployed workers have less money to spend
 - supply chains are impacted: e.g., restaurants close => demand for agriculture declines
- Impacts on US are larger than other areas due to:
 - Higher portion of country impacted by closures/for longer
 - Greater importance of non-essential sectors to the economy
 - Large share of workers in non-essential services sectors tend to need more labor than essential agricultural sectors₂₁

Summary

- GDP impacts
 - US: \$3.2 trillion to \$4.9 trillion
 - Direct impacts on China magnified by world trade
 - Rest of the world: \$5.1 to \$9.4 trillion
- Influence of causal factors in the US
 - Mandatory Closures/Reopenings: \$4.8 to \$13.0 trillion
 - Avoidance Behavior swamped by mandatory closures
 - Pent-Up Demand reduction by one-third to two-thirds
- Future research
 - DHS: primary data and use of a dynamic model
 - CDC: contact tracing on international flights
 - General: incorporate countervailing policies

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