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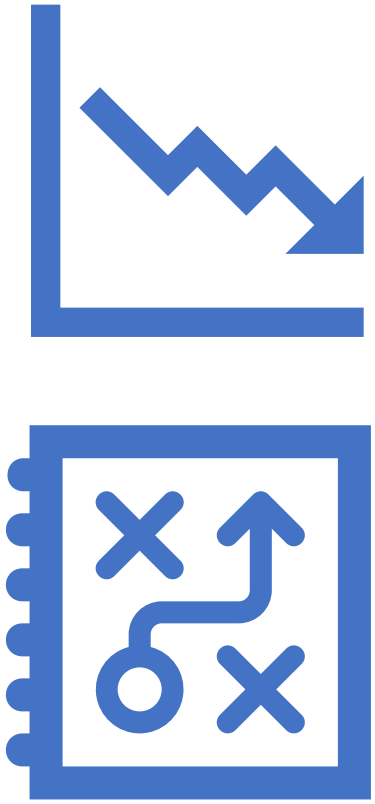


Coping with the COVID-19 Recession

Lessons from coping with Adversity

Is there a playbook?

Roadmap

Learning from shocks: *Coping with Adversity: Regional economic resilience and public policy (Cornell, 2017)*

COVID-19 Recession: Examine the changes to US GDP in 2002(1) and provide a guesstimate on sustained recovery

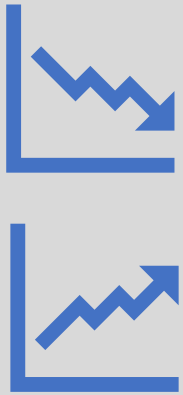
State public policies

Learning from shocks

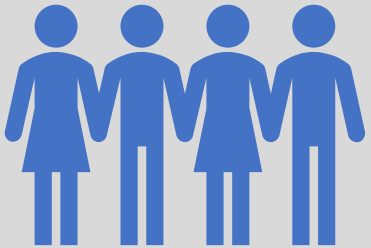
Responses to Shocks Differ

Length of time to recovery gotten longer

Gross Product



Employment

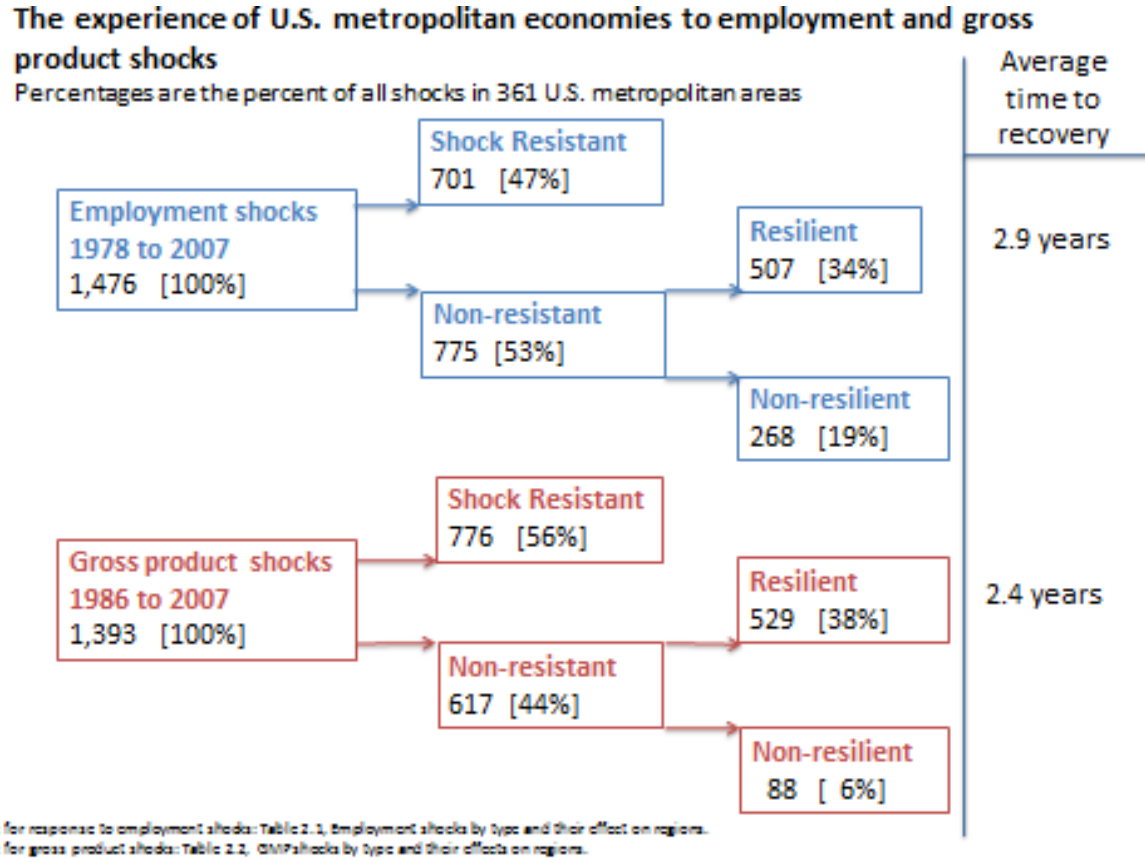


Shocks from 1978 to 2007

Evidence of Labor Hording

GMP more cyclically sensitive

Employment takes a half year longer to recover

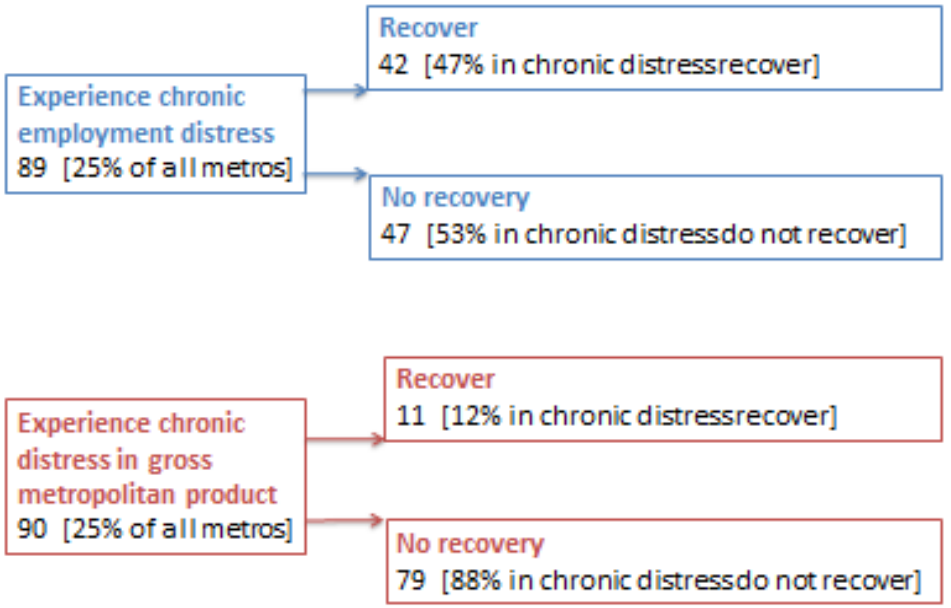


Chronic distress 1978 to 2007:

Recovering GMP is more difficult than in other regions

The experience of U.S. metropolitan economies experiencing chronic distress

Number reported is number of metropolitan areas that meet the condition from 361 U.S. metropolitan areas



Source: Table 5.1 Regional Differences in the number of chronically distress metropolitan regions

Markets usually work:

Shocks from 1978 to 2007

1,476 Metro Employment Shocks

Regions are ***resistant*** to 47% of all shocks

Of those shocked 65% were ***resilient***, returning to their previous growth path within a four-year period

Not resilient: 35%

Average time to growth rate recovery: 2.9 years

Average time to regain previous job level: 5.1 years

Great Recession

Cyclical shocks most common & dominated by resilience

Great Recession

- Affected 92% metropolitan economies
- 8.3% shock ***resistant***
- 79% were ***resilient***
- 21% [70] were ***not resilient*** over 4 years after their last shock
- Average number of years to recover pre-shock growth rate from a national recession: 2.7 (vs 2.3 for previous recessions

Structural shocks 65% resilience rate

- Require restructuring & new products

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There are no silver bullets

Poorly educated population more likely to experience a downturn and more likely to be resilient

Higher dependence on manufacturing more likely to experience a downturn and more likely to be resilient

Income inequality is associated with smaller chance of ***GMP*** recession, ***more likely*** to be resilient (Think product cycle & labor markets)

Income inequality make region ***less likely*** to be resilient in terms of ***employment*** (Think product cycle & labor markets)

Export diversity protects against employment shocks

Right-to-work positively related to resilience to both employment & GMP shocks

Regional development paths

Rebound implies cyclical forces at work

Economic base will change

New equilibrium implies *adaptive capacity*: The ability to reconfigure

The COVID-19 Recession

Reshaping the domestic economy

COVID shocks

Annualized GDP quarterly growth rate 2020(1), 2nd estimates

2019(4): 2.1%

2020(4): -5%

7 percentage point change in three weeks or a drop of 2.3 percent per week

COVID-19 wreckage contributing to a -5% growth rate Ground Zero

Contributions to the percent change in GDP

Household consumption: -5.8%

Travel & Leisure: -3.5%

- Recreational Services -1.1%
- Transportation services -0.7%
- Food services & accommodation -1.7%

Health care -2.2%

Retail

- Clothing & Footwear -0.8%
- Groceries & take-out 1.3%

Industry	Percent Change
Real Gross Domestic Product	**-5.0**
Personal consumption expenditures	
Goods	**0.1**
Motor vehicles and parts	-0.8
Clothing and footwear	-0.8
Food and beverages purchased for off-premises consumption	1.3
Services	**-4.8**
Household consumption expenditures (for services)	-5.8
Health care	-2.2
Transportation services	-0.7
Recreation services	-1.1
Food services and accommodations	-1.7
Other services	-0.4
Gross Private Domestic Investment	
Nonresidential	-1.1
Nonresidential Structures	-0.1
Nonresidential Equipment	-1.0
Information processing equipment	-0.3
Industrial equipment	-0.1
Transportation equipment	-0.5
Other equipment	-0.1
Change in private inventories	
Nonfarm	-1.5

COVID-19 wreckage contributing to a -5% growth rate Other consumer goods

Motor vehicle & parts -0.8%

Other durable goods -1.8%

Gasoline & energy goods -0.2%

Industry	Percent Change
Real Gross Domestic Product	**-5.0**
Personal consumption expenditures	
Goods	**0.1**
Motor vehicles and parts	-0.8
Clothing and footwear	-0.8
Food and beverages purchased for off-premises consumption	1.3
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Transportation equipment	-0.5
Other equipment	-0.1
Change in private inventories	
Nonfarm	-1.5

COVID-19 wreckage contributing to a -5% growth rate business investment

Nonresidential equipment	-1.1%
Information processing	-0.3
Industrial equipment	-0.1
Transportation equipment	-0.5
Nonfarm inventories	-1.5

Industry	Percent Change
Real Gross Domestic Product	**-5.0**
Personal consumption expenditures	
Goods	**0.1**
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Clothing and footwear	-0.8
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Change in private inventories	
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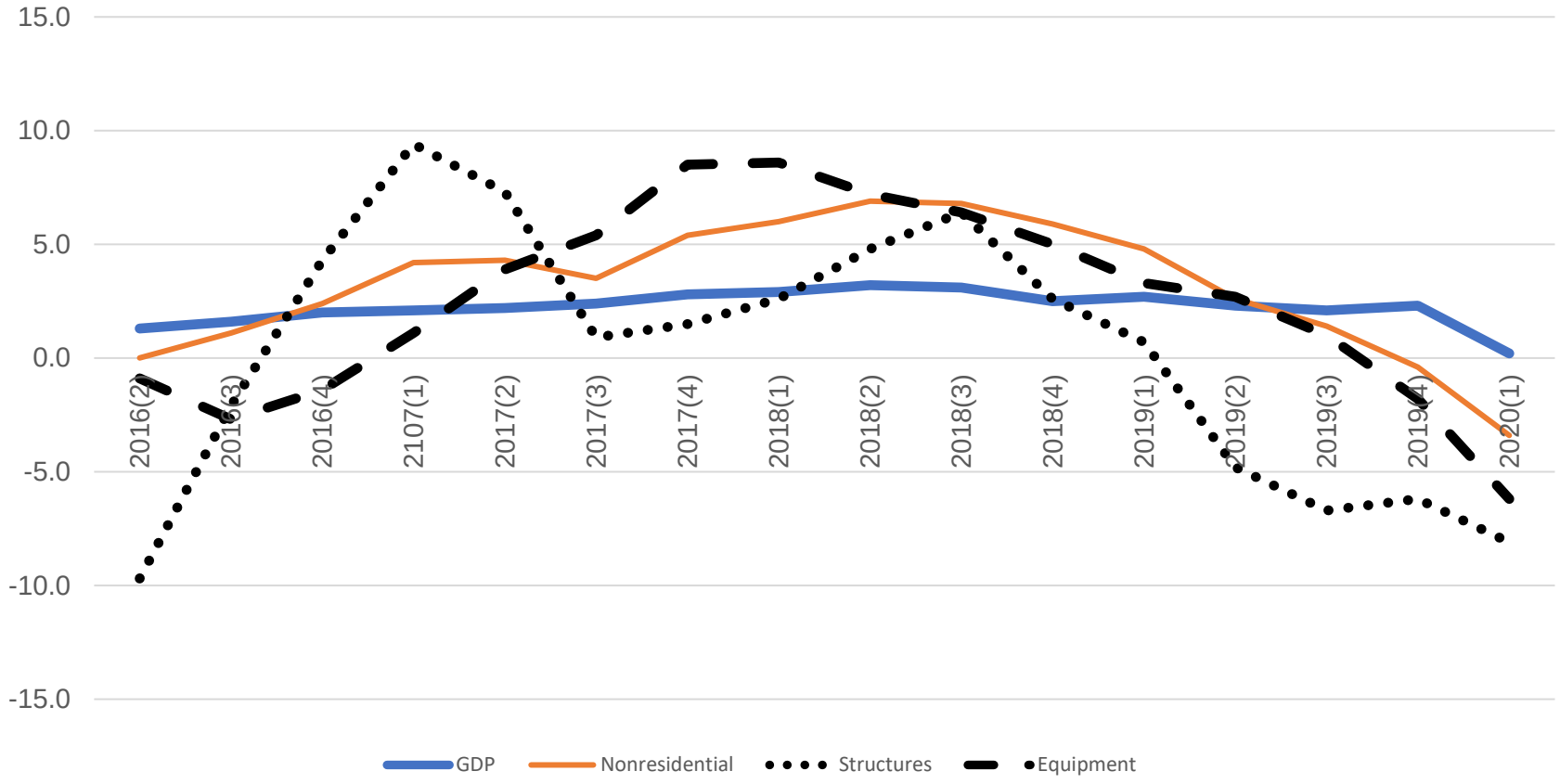
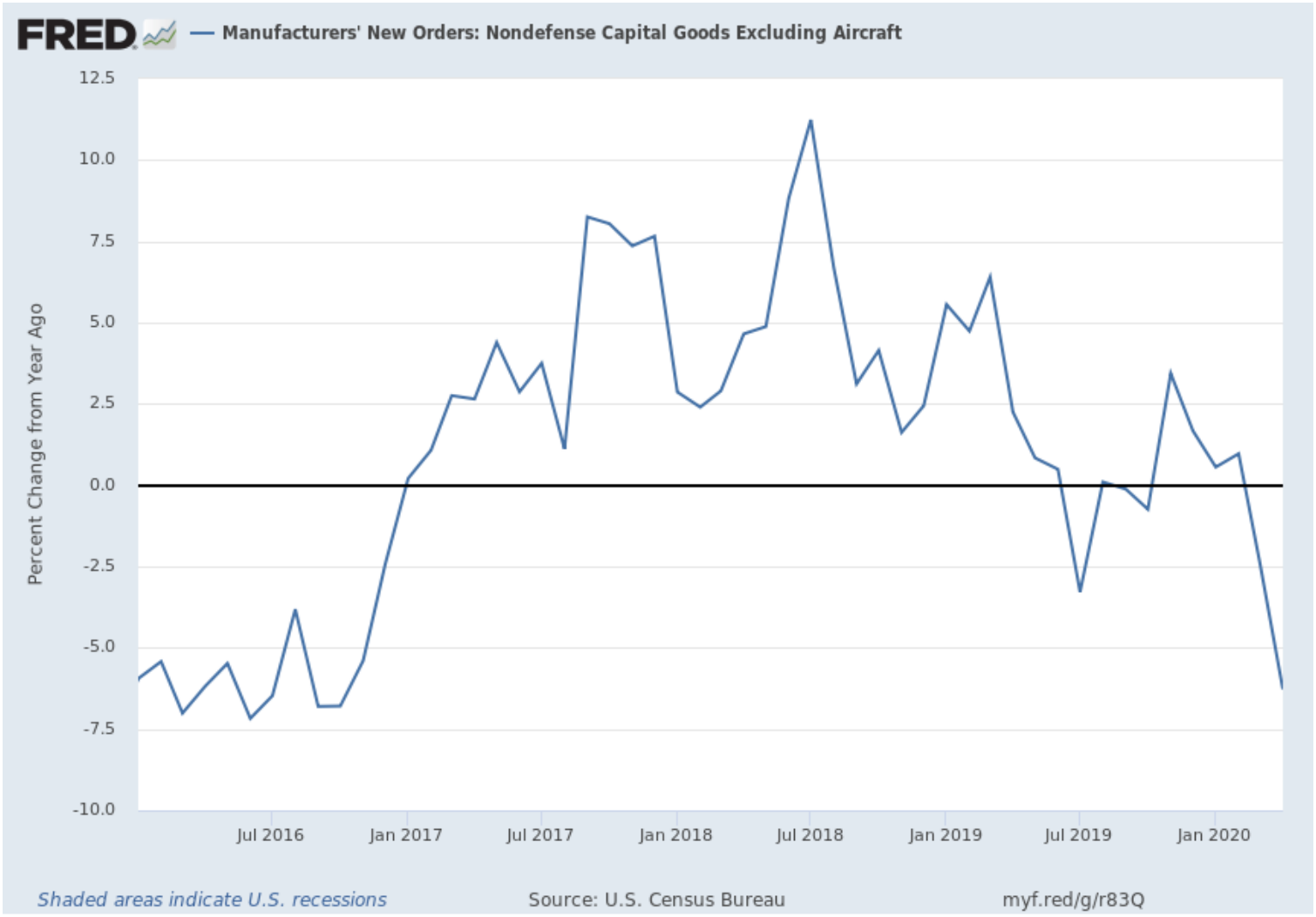
12-month percent change in growth rate of business fix asset investments from 2016(1) to 2020(1)
Decline since 2019



Source: Real GDP Accounts, 2020(1) 2nd estimate, Table 6

12-month percent change in nondefense capital goods, except aircraft: Decline July 2018

Monthly January 2016 to April 2020



U.S. Census Bureau, Manufacturers' New Orders: Nondefense Capital Goods Excluding Aircraft [NEWORDER], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/NEWORDER, June 1, 2020.

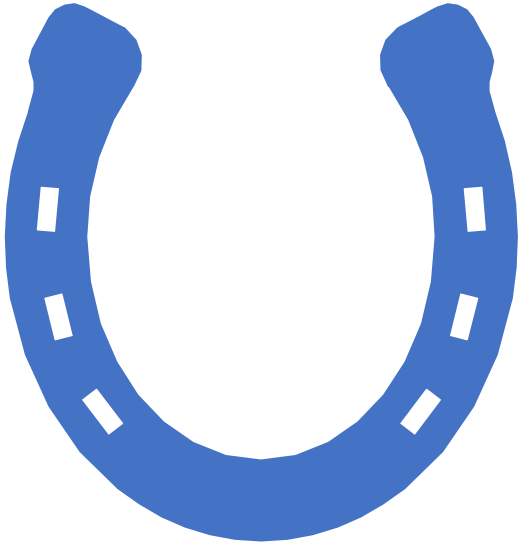
Vaccine horse race

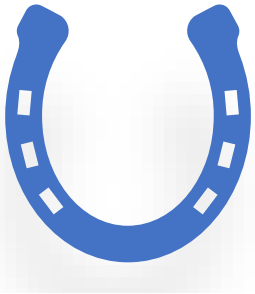
Dr. Anthony Fauci: Vaccine can be available in 12 to 18 months, giving a window from late spring 2021 to the end of 2021.

Johnson & Johnson partnered with Catalent to enable 24-hour, seven-day-a-week production schedule for its vaccine candidate by January 2021. The trouble is that the vaccine has not begun trials.

Geoffrey Porges, an analyst at SVB Leerink (April 21) client report:

- A two- to three-year timeline more realistic estimate vaccine widely
- If an approved, effective, safe general use vaccine available a year from now (spring 2021) still take *several years* to confer sufficient 'herd immunity' to prevent endemic spread of COVID-19
- Believe achieving *herd immunity sufficient to prevent epidemic spread is likely to occur in 2023 or 2024.*"





Horses

Company/Team	Human Trials Start*	Status*	Comment	Status**
Moderna	March 16	Phase 2	Data released May 18 Small trial Recruiting Phase 2 subjects	Phase 1/2
CanSino Biologics	March 17	Phase 2	First to Phase 2, Peer reviewed Phase 1 publication	Phase 1 & 2
Inovio	April 6	Phase 2	Begins in summer	Phase 1
Pfizer & BioTech	April 23	Phase 1	Data May/June	
Sinovac	April 13	Phase 1	Enrolling	Phase 1
Institute Biological Sciences Beijing & Wuhan				Phase 1
Oxford & AstraZeneca	Late April	Phase 1	Data in May	Phase 1/2
Shenzhen Geno-Immune Medical Institute				Phase 1/2
Johnson & Johnson	September		Lead candidate selected	
Sanofi & Glaxo, Smith, Klein	2nd half 2020		Preliminary research	

* from Gardner; ** from Laurie et al.

Sources:

Jonathan Gardner. “A coronavirus vaccine may arrive next year. 'Herd immunity' will take longer.” BiopharmaDive, May 4, 2020.

Nicole Lurie, et al. “Developing Covid-19 Vaccines at Pandemic Speed,” New England Journal of Medicine, May 21,2020

Alaric Dearment. “CanSino beats Moderna again, this time to peer-reviewed, published Covid-19 vaccine data.” MedCity News, May 22, 2020.

Nsikan Akpan. “A COVID-19 vaccine has passed its first human trial. But is it the frontrunner?” National Geographic, May 29, 2020.

What does biopharma research have to do with ending a recession?

L, V, U or W?

Reasonable concerns

Society will adapt to the virus as time goes passes

Workplaces and work routines will change to remote work and greater distancing

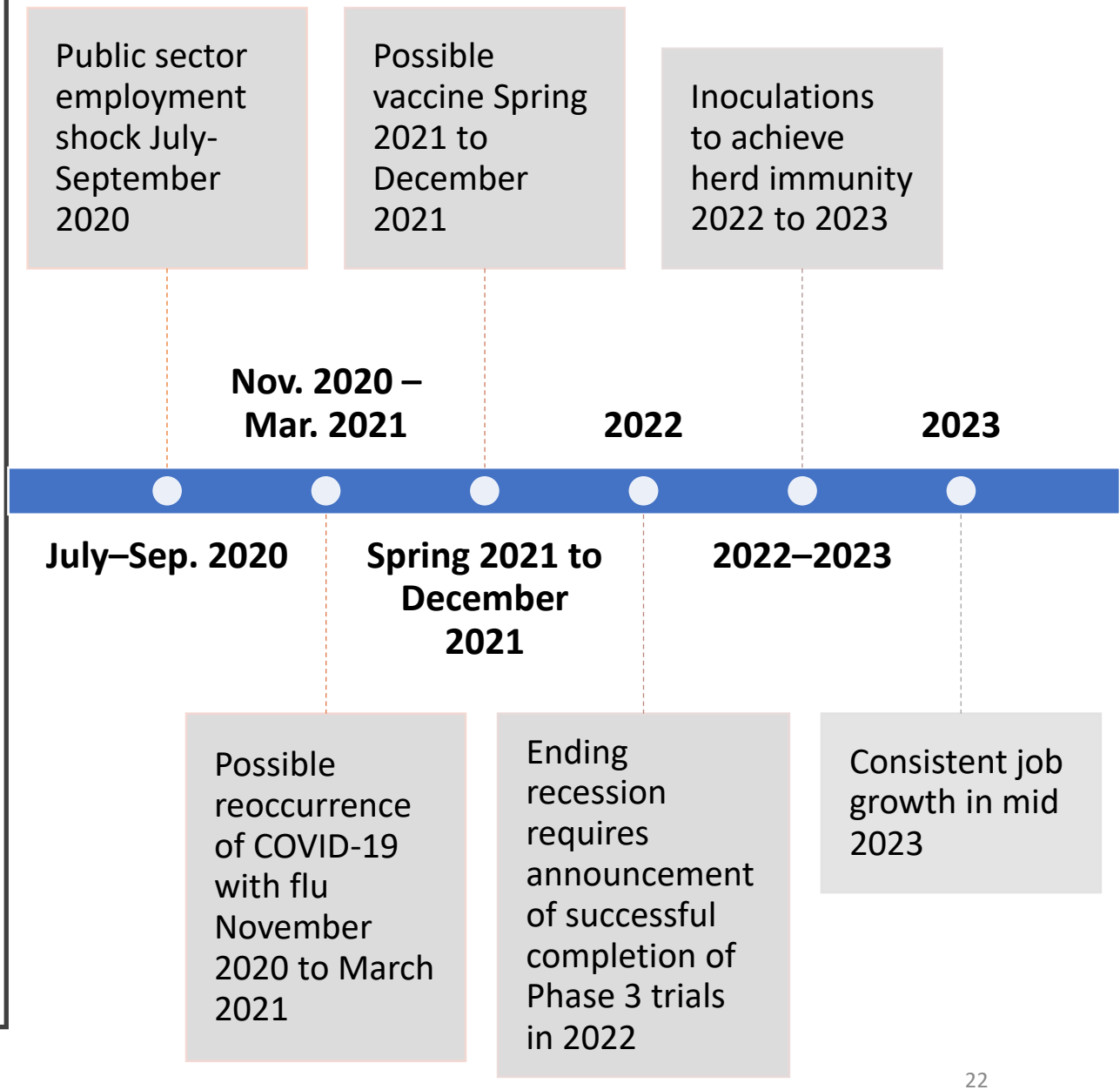
The economy will begin to rebound

Two looming events can turn the recovery into a W

Public sector after-shock: public sector employment and its supply chains will begin layoffs in July as new budget years begin—this has already begun

COVID-19 2.0: Re-occurrence of COVID-19, possibly coupled with flu, between November 2020 and March 2021

How long until sustained recovery?



Policy advice

States & localities: Recognize limits

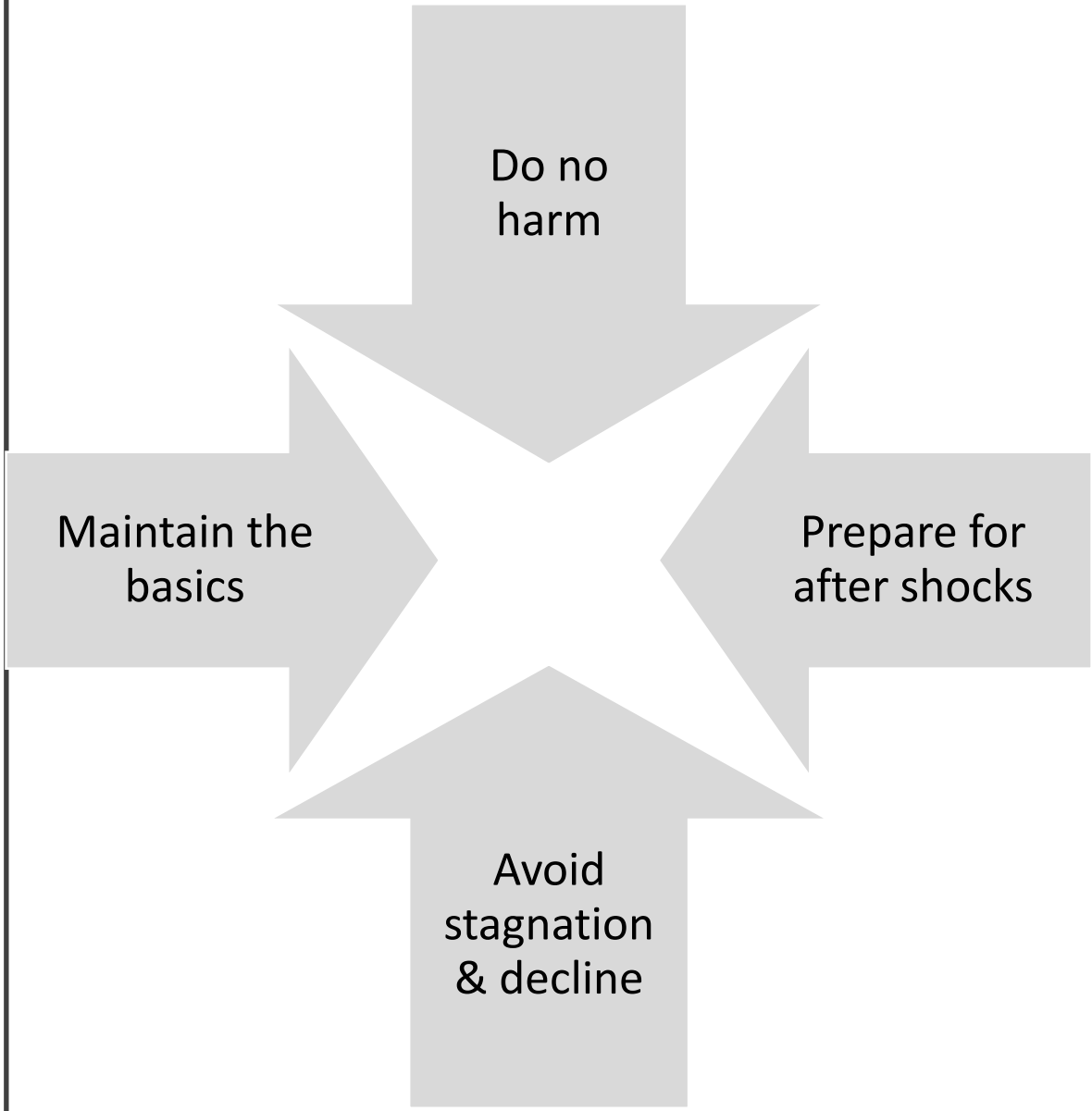
Optimize the use of federal stimulus fund

Do no harm when there is no gain

Spend when its money can influence sustainable outcomes

Recognize that actions by government has private sector employment impacts

Cyclical policies: Short run



Regional policies that work are structural, not cyclical

Economic Development Observations

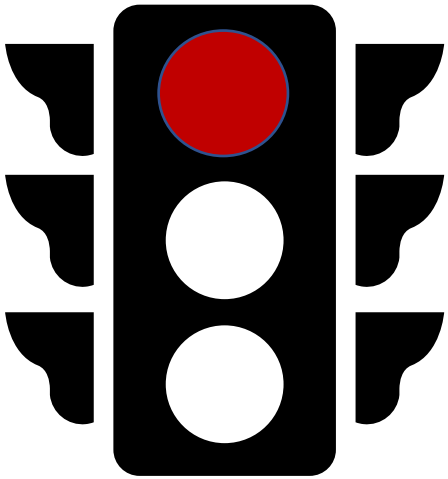
Silver bullets that are not in the chamber

ON-SHORING & SUPPLY CHAINS

ATTRACTION

DIGITAL MANUFACTURING (IOT AND INDUSTRY 4.0)

Thank you



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