Supply and Use Table Extensions for the United States

Gabriel Medeiros

International Workshop on Supply and Use Tables

Beijing, China, Sept 11-13

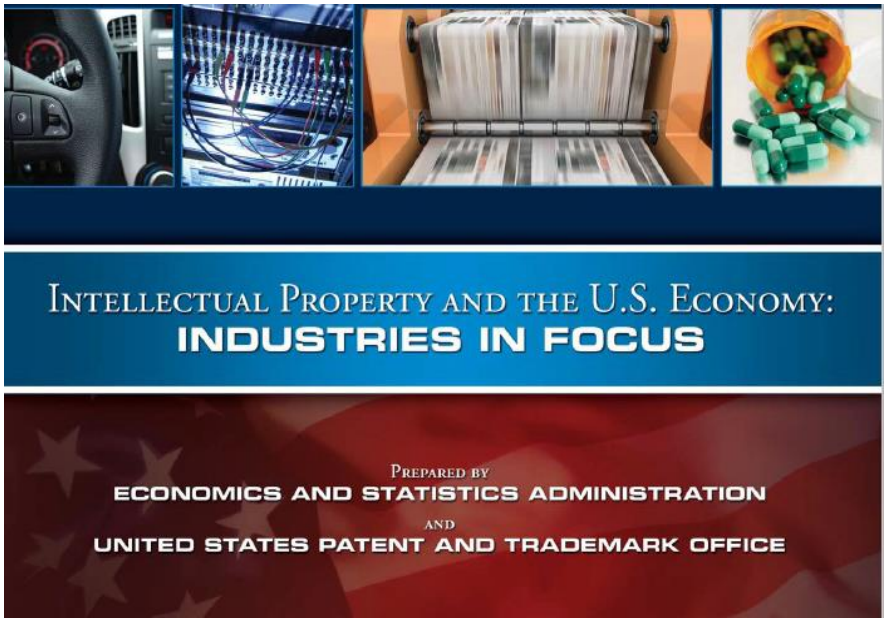
Outline

- Impact analysis
- SUT Expansions
  - Satellite accounts
  - Global Value Chain Analysis
  - Extended tables
  - GDP by industry
  - GDP by state
  - Integrated Production Accounts – KLEMS statistics
- Conclusions and future directions

Impact Analysis

Effects of the 2008–10 automotive industry crisis on the United States

U.S. Department of Commerce
Economics and Statistics Administration



What is Made in America?

Executive Summary

Accurately determining how much of our economy's total production is American-made can be a daunting task. However, data from the Commerce Department's U.S. Census Bureau and the Bureau of Economic Analysis (BEA) can help shed light on the dollar value of what America produces, and what percentage of the dollar value of an industry's output that is considered domestic. Gross output, value added, domestically-sourced inputs, and domestic content are all concepts that can be used to measure U.S.

Satellite Accounts

Frameworks designed to expand the analytical capacity of the standard accounts without interfering with their general purpose

- Allows more focus on a specific activity
- Provides a laboratory for development of concepts and methodologies
- Expands the detail of the accounts
- Flexible classification structure

Satellite Accounts

- Testing out Conceptual/Definition Changes
  - R&D Satellite Account (now part of core accounts)
  - Health Satellite Account

- Focus on specific activity that cuts across standard categories
  - Travel and tourism Satellite Account
  - Arts and Culture Satellite Account
  - Outdoor recreation Satellite Account
  - Digital Economy Satellite Account

Estimation Process

Supply Table

		Industries									Imports	Margins and Taxes	Total Commodity Output
		Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Other			
Commodities	Agriculture	453	0	0	0	0	1	0	0	4	53	149	661
	Mining	0	398	0	1	0	0	0	0	0	145	96	640
	Construction	1	21	1,352	12	1	10	0	31	18	0	0	1,446
	Manufacturing	0	15	0	5,577	0	24	0	4	7	1,856	2,877	10,359
	Transportation	0	0	0	0	1,052	6	0	1	29	26	-410	703
	Trade	0	0	0	49	0	2,535	0	49	5	0	-2,538	101
	Finance	0	0	0	0	0	5	2,170	1	26	47	25	2,274
	Services	2	1	0	159	5	236	81	13,016	653	142	266	14,560
	Other	0	0	0	4	0	0	0	3	2,802	250	113	3,172
Total Industry Output		455	436	1,353	5,802	1,058	2,817	2,251	13,105	3,544	2,519	576	

Estimation Process

Use Table

		Industries									Final Demand	Total Commodity Output
		Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Other		
Commodities	Agriculture	121	0	2	308	0	5	0	13	4	207	661
	Mining	4	40	20	353	2	0	0	60	24	138	640
	Construction	3	5	0	12	6	4	2	152	75	1,187	1,446
	Manufacturing	98	37	469	2,226	178	113	20	867	377	5,975	10,359
	Transportation	2	1	2	24	129	129	20	110	46	241	703
	Trade	3	0	0	28	0	51	0	12	0	5	101
	Finance	15	5	9	37	32	65	595	388	63	1,064	2,274
	Services	24	34	115	622	148	658	302	3,268	568	8,823	14,560
	Other	1	1	4	49	38	21	45	74	25	2,915	3,172
Value Added		184	314	732	2,142	526	1,773	1,266	8,162	2,362		17,460
Total Industry Output		455	436	1,353	5,802	1,058	2,817	2,251	13,105	3,544	20,556	

Estimation Process

Estimating a Satellite Account:

1) Identify commodities
2) Estimate partials
3) Identify industries
4) Calculate direct output
5) Calculate direct value added and compensation
6) Calculate direct employment
7) Calculate indirect effects

Estimation Process

Estimating a Satellite Account:

1) **Identify commodities**
2) **Estimate partials**
3) Identify industries
4) Calculate direct output
5) Calculate direct value added and compensation
6) Calculate direct employment
7) Calculate indirect effects

Estimation Process

Step 1: Identify commodities

Supply Table

		Industries											Imports	Margins and Taxes	Total Commodity Output
		Agriculture													
Commodities	Agriculture	43									4		53	149	661
	Mining	0									0		145	96	640
	Construction	1									18		0	0	1,446
	Manufacturing	0									7		1,856	2,877	10,359
	Transportation	0									29		26	-410	703
	Trade										5		0	-2,538	101
	Finance	0	0	0	0	0	5	2,170	1	26			47	25	2,274
	Services	2	1	0	159	5	236	81	13,016	653			142	266	14,560
	Other	0	0	0	4	0	0	0	3	2,802			250	113	3,172
	Total Industry Output	455	436	1,353	5,802	1,058	2,817	2,251	13,105	3,544			2,519	576	

Men's and boys' cut and sew suits, coats, and overcoats	Partial
Men's' and boys' cut and sew shirts	Out
Men's and boys' cut and sew trousers, slacks and jeans	Partial
Men's and boys' cut and sew work clothing	Out
Other men's and boys' cut and sew outerwear	In
Women's, misses', juniors', and girls' shirts and blouses	Out
Women's and girls' cut and sew suits, coats tailored jackets,	Partial
Other women's and girls' cut and sew outerwear	In
Infants' cut and sew apparel	Partial

* There are approximately 5,000 distinct goods and services at the working level of detail

Estimation Process

Step 2: Estimate partials

Supply Table

		Industries											Total Commodity Output
		Agriculture									Imports	s and	
Commodities	Agriculture	453								4	53	149	661
	Mining	0								0	14	5	640
	Construction	1										0	1,446
	Manufacturing	0								7	1,856		10,359
	Transportation	0								29	26	-410	703
	Trade									5		3	101
	Finance	0	0	0	0	0	5	2,170	1	26	4	5	2,274
	Services	2	1	0	159	5	236	81	13,016	653	142	266	14,560
	Other	0	0	0	4	0	0	0	3	2,802	250	113	3,172
Total Industry Output		455	436	1,353	5,802	1,058	2,817	2,251	13,105	3,544	2,519	576	

Men's and boys' cut and sew suits, coats, and overcoats	Partial
Men's' and boys' cut and sew shirts	Out
Men's and boys' cut and sew trousers, slacks and jeans	Partial
Men's and boys' cut and sew work clothing	Out
Other men's and boys' cut and sew outerwear	In
Women's, misses', juniors', and girls' shirts and blouses	Out
Women's and girls' cut and sew suits, coats tailored jackets,	Partial
Other women's and girls' cut and sew outerwear	In
Infants' cut and sew apparel	Partial

40%

5%

20%

2%

Estimation Process

Steps 3-7: Identify industries; calculate direct output, compensation, employment, etc.; calculate indirect effects

Supply Table

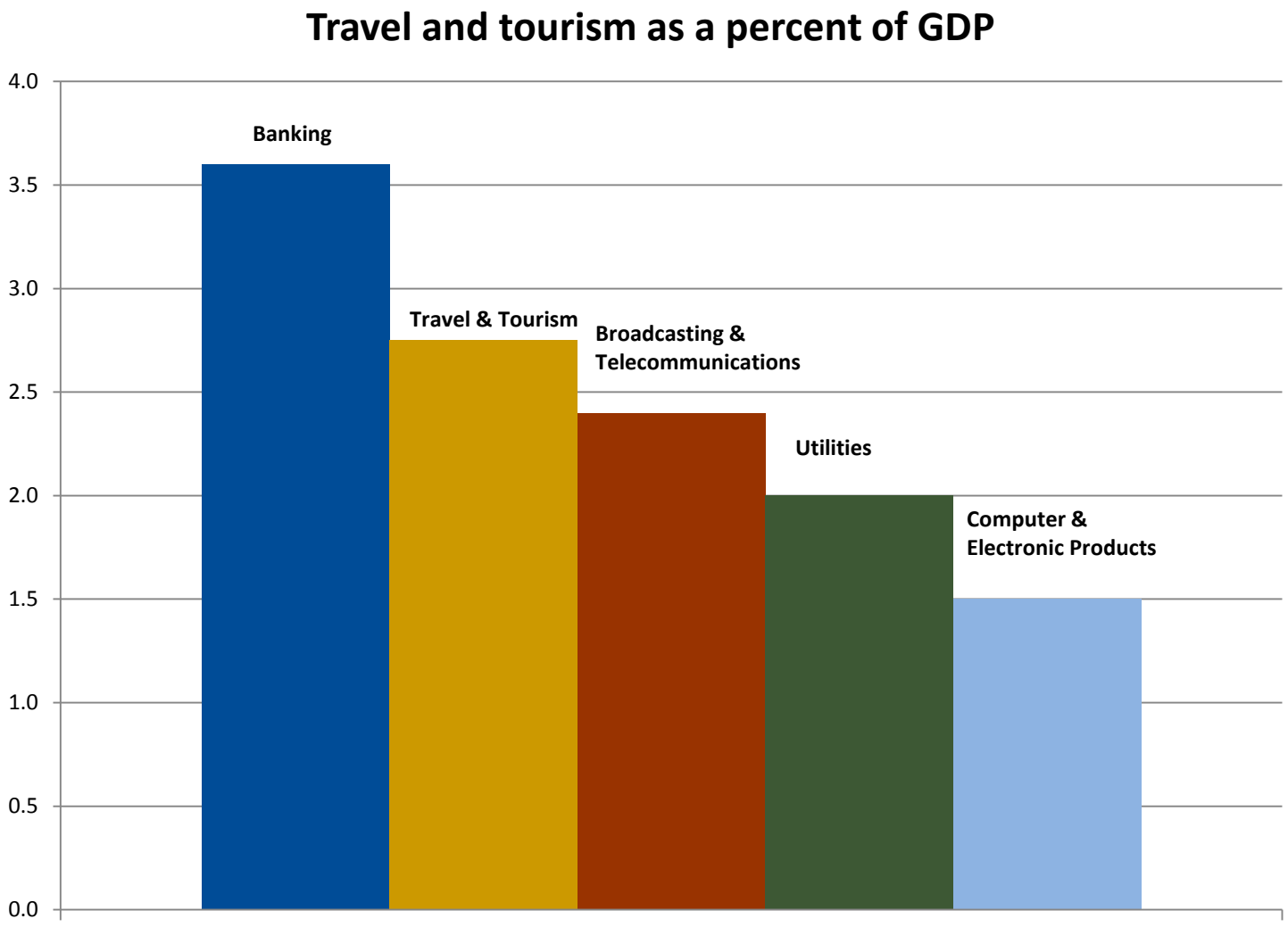
		Industries											
		Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Other	Imports	Margins and Taxes	Total Commodity Output
Commodities	Agriculture	453	0	0	0	0	1	0	0	4	53	149	661
	Mining	0	398	0	1	0	0	0	0	0	145	96	640
	Construction	1	21	1,352	12	1	10	0	31	18	0	0	1,446
	Manufacturing	0	15	0	5,577	0	24	0	4	7	1,856	2,877	10,359
	Transportation	0	0	0	0	1,052	6	0	1	29	26	-410	703
		0	0	0	49	0	2,535	0	49	5	0	-2,538	101
		0	0	0	0	0	5	2,170	1	26	47	25	2,274
						5	236	81	13,016	653	142	266	14,560
						0	0	0	3	2,802	250	113	3,172
						058	2,817	2,251	13,105	3,544	2,519	576	

Use Table

		Industries										
		Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Other	Final Demand	Total Commodity Output
Commodities	Agriculture	121	0	2	308	0	5	0	13	4	207	661
	Mining	4	40	20	353	2	0	0	60	24	138	640
	Construction	3	5	0	12	6	4	2	152	75	1,187	1,446
	Manufacturing	98	37	469	2,226	178	113	20	867	377	5,975	10,359
	Transportation	2	1	2	24	129	129	20	110	46	241	703
	Trade	3	0	0	28	0	51	0	12	0	5	101
	Finance	15	5	9	37	32	65	595	388	63	1,064	2,274
	Services	24	34	115	622	148	658	302	3,268	568	8,823	14,560
	Other	1	1	4	49	38	21	45	74	25	2,915	3,172
Value Added		184	314	732	2,142	526	1,773	1,266	8,162	2,362		17,460
Total Industry Output		455	436	1,353	5,802	1,058	2,817	2,251	13,105	3,544	20,556	

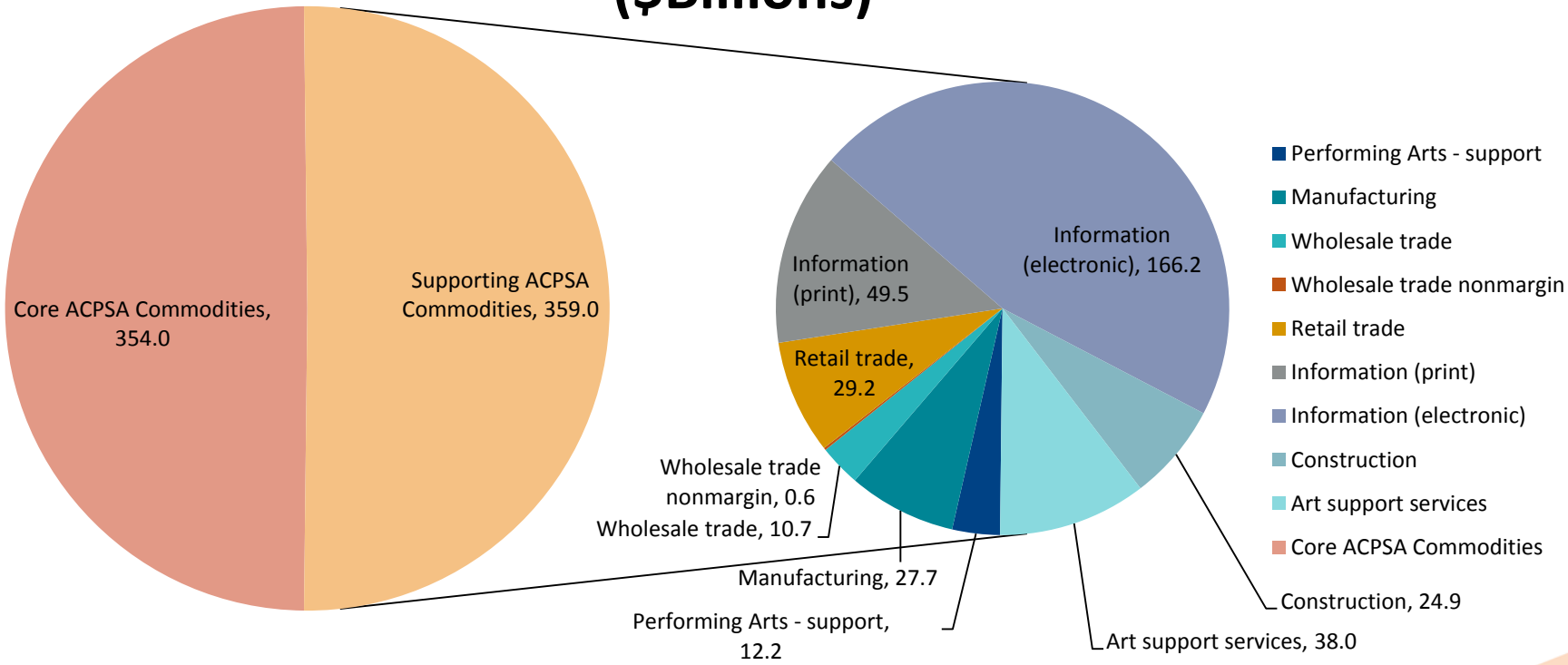
Travel and Tourism (TTSA)

Travel and Tourism (TTSA)



Arts and Cultural Production (ASPCA)

Supporting Arts and Cultural Production Output, 2002 ($Billions)



Digital Economy

The digital economy includes:

1. **Digital-enabling infrastructure:** the goods and services needed for an interconnected computer network to exist and operate.
   - Hardware
   - Software
   - Telecommunications equipment and services
   - Structures
   - The Internet of Things (IoT)
   - Support services
2. **E-commerce**: the digital transactions that take place using that system.
   - Business-to-business
   - Business-to-consumer
   - Peer-to-peer ("sharing" economy)
3. **Digital media**: the content that digital economy users create and access.
   - Direct sale/subscriptions
   - Free (often supported by advertising or marketing revenue)
   - Big data

Digital Economy

- Initial estimates reflect only economic activity associated with **primarily digital goods and services**

  ➡ Conceptual definition includes ALL digital goods and services

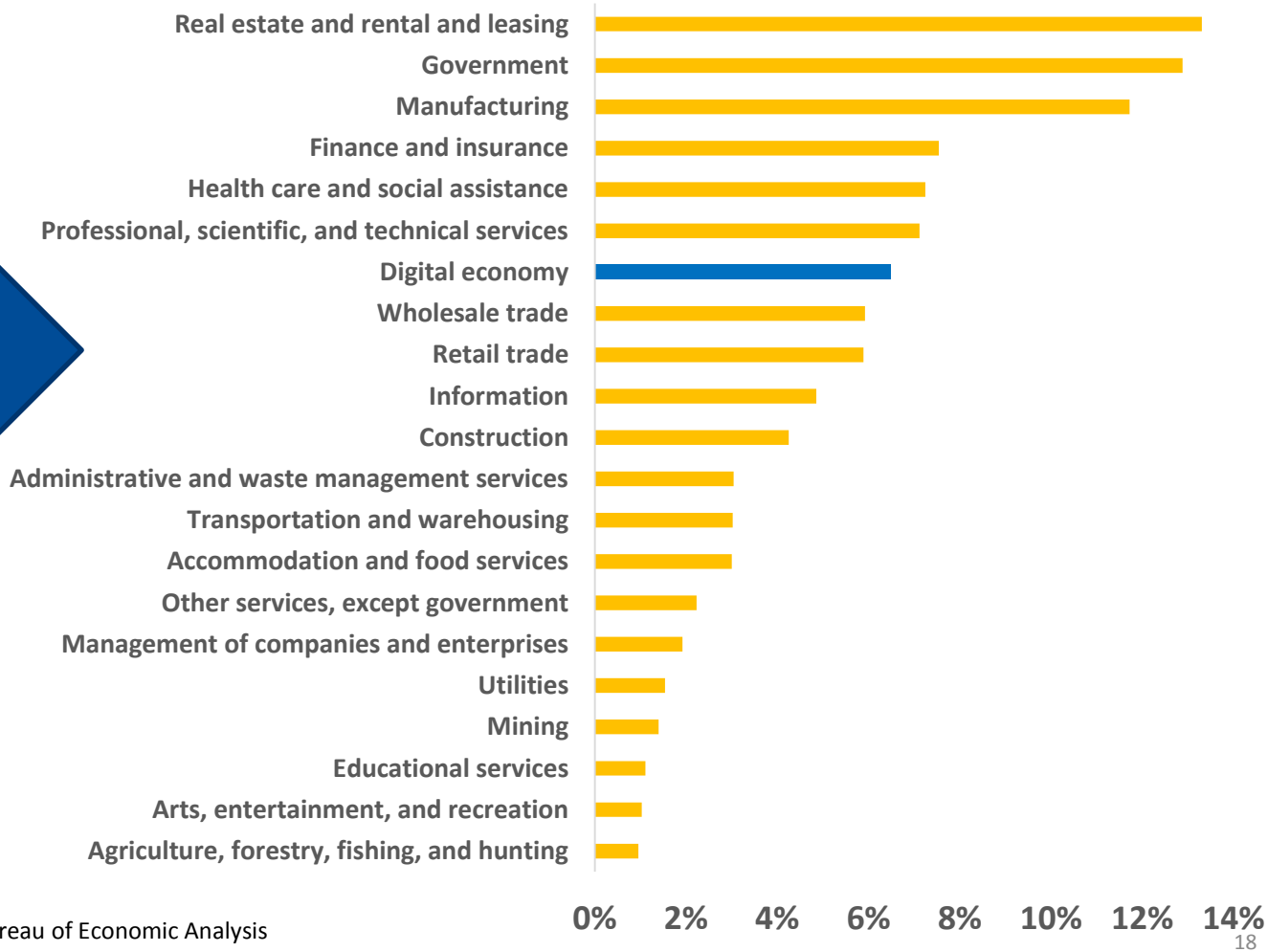
- Partially digital goods and services
  - Categories with both fully digital and fully non-digital goods or services (example: electronic toys and games)
  - Categories with goods and services that individually have a digital and non-digital component

    (example: Smart refrigerators in household refrigerator and home freezer manufacturing)

Digital Economy

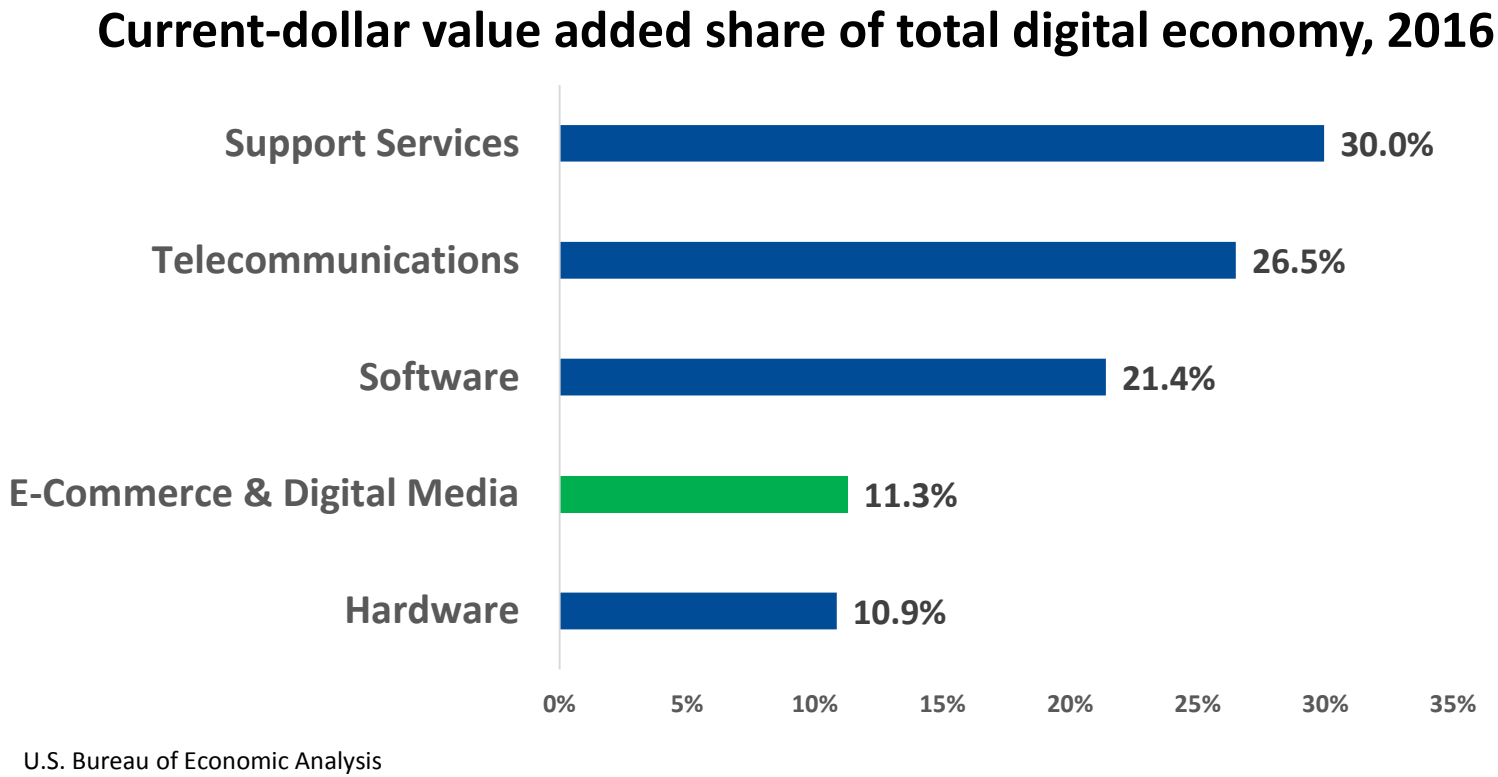
The digital economy accounted for 6.5% ($1.21 trillion) of total U.S. GDP in 2016.

Share of total gross domestic product, 2016



U.S. Bureau of Economic Analysis

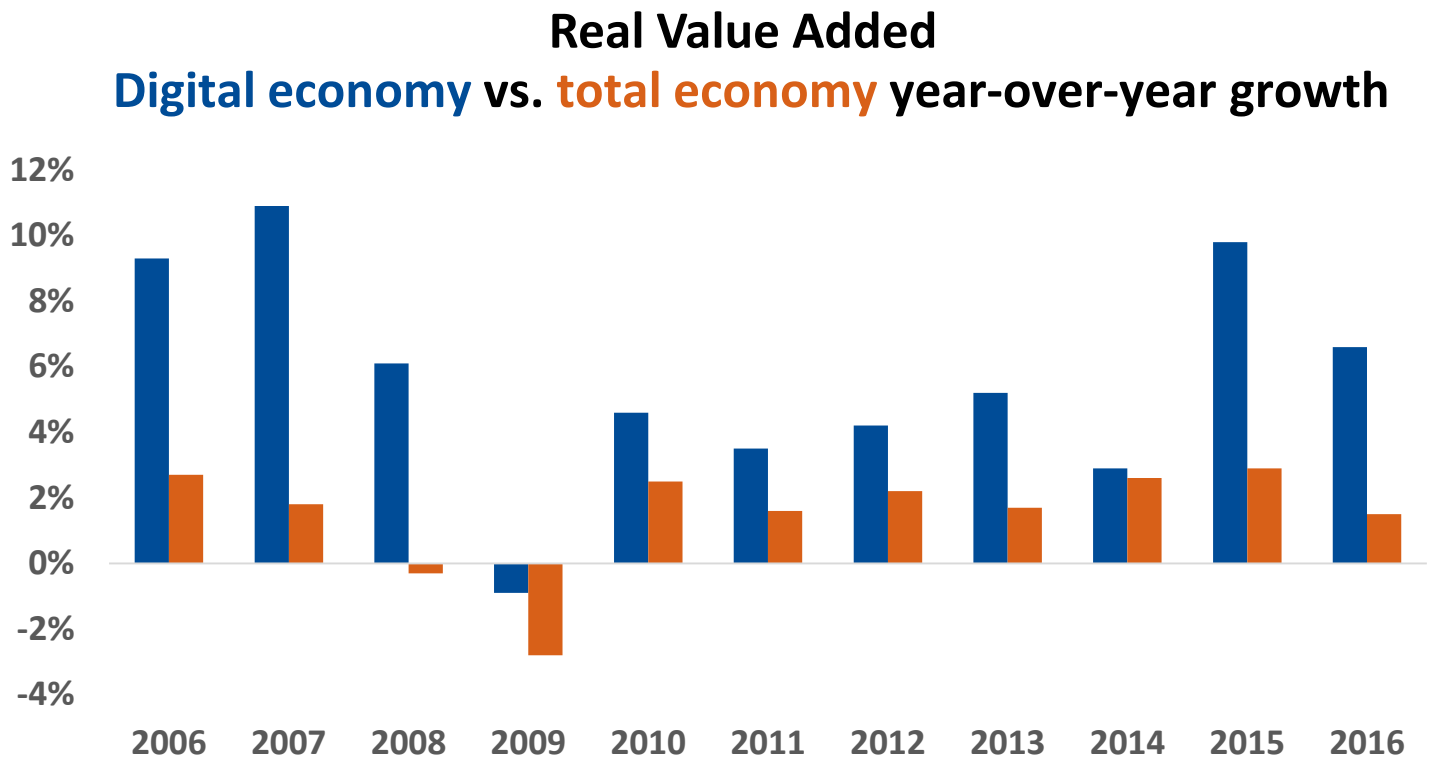
Digital Economy



U.S. Bureau of Economic Analysis

In 2016, **digital-enabling infrastructure** accounted for $1,072.6 billion (88.7 percent) of the total estimated $1,209.2 billion in digital economy current-dollar value added. **E-commerce and digital media** accounted for the remaining $136.5 billion (11.3 percent).

Digital Economy

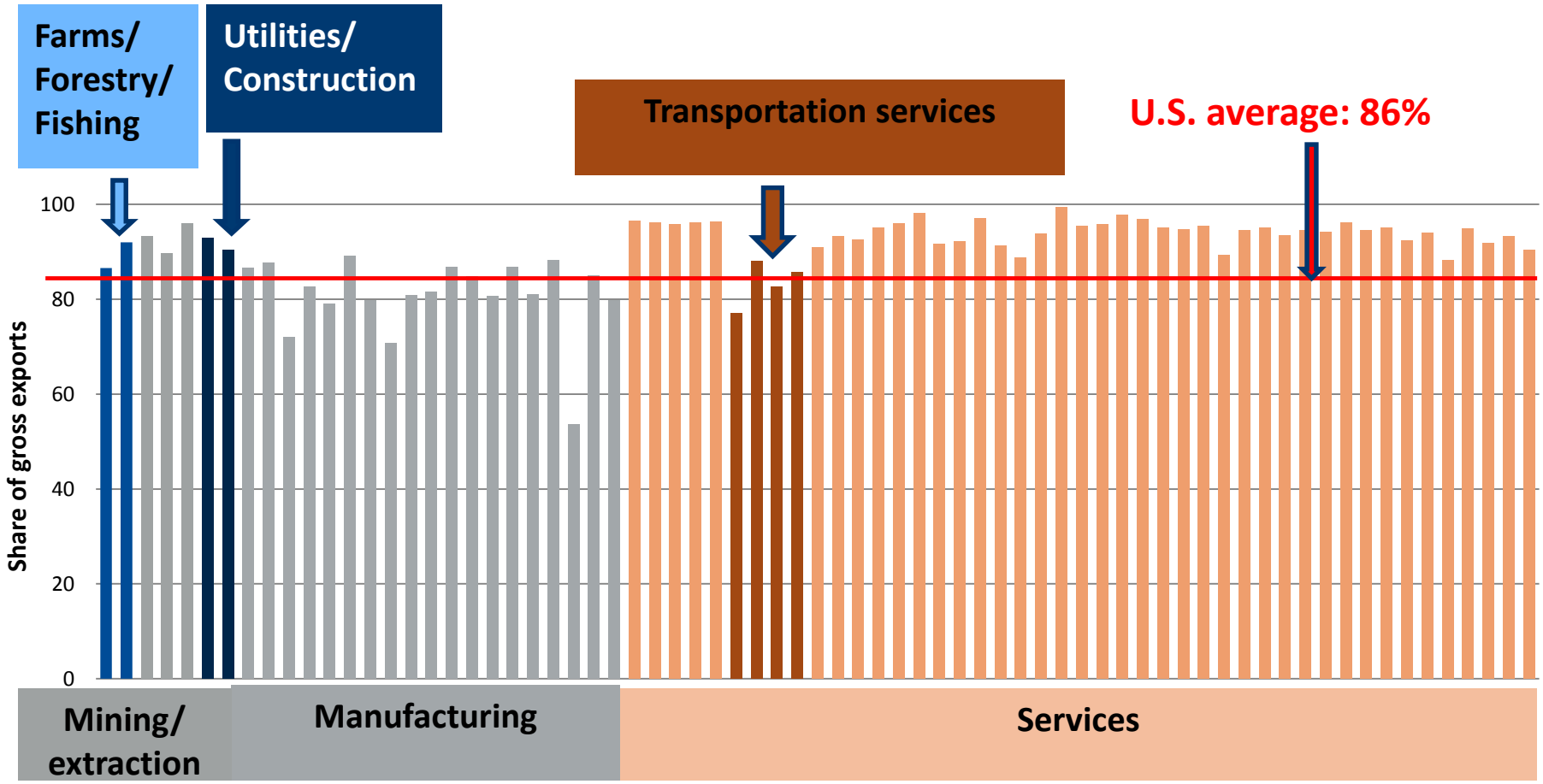


U.S. Bureau of Economic Analysis

From 2006 to 2016, real value added for the digital economy grew at an average annual rate of 5.6 percent, outpacing the average annual rate of growth for the overall economy of 1.5 percent

Global Value Chains

Trade in Value Added Domestic Value Added Share of U.S. Gross Exports by Sector, 2011



Extended SUTs for global value chain analysis

- Supply Use Tables (SUTs) by U.S.-owned Multinational Enterprises (MNEs), foreign-owned MNE, Non-MNEs
- Does accounting for firm heterogeneity matter?
- Domestic value added as a share of exports

Extended SUTs for global value chain analysis

Dimensions of Firm Heterogeneity

OECD proposal

BEA proof of concept

Table 2: ' Ideal' breakdown of columns and rows in SU tables

Foreign Owned												Domestically owned MNE												Domestic Owned											
With high Export orientation 'Exporters'						With low Export orientation 'Non-Exporters'						With high Export orientation 'Exporters'						With low Export orientation 'Non-Exporters'						With high Export orientation 'Exporters'						With low Export orientation 'Non-Exporters'					
Low import orientation			High import orientation			Low import orientation			High import orientation			Low import orientation			High import orientation			Low import orientation			High import orientation			Low import orientation			High import orientation			Low import orientation			High import orientation		
S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L

Extended SUTs for global value chain analysis

Use Table for the United States, 2011

Use ($ billions)	Primary	Manufacturing	Services	Final Demand	Exports	Total Use
Primary	121.5	852.5	97.2	197.3	84.0	1,352.4
Manufacturing	84.7	1,746.1	1,284.4	3,222.6	942.3	7,280.1
Services	193.5	1,159.9	6,395.3	12,077.7	846.3	20,672.7
Special	-4.9	26.6	61.3	-51.0	202.0	234.0
Total Intermediates	394.9	3,785.1	7,838.1			12,018.0
Value Added	587.5	2,070.5	12,379.3			
Industry Output	982.4	5,855.6	20,217.4	15,446.7	2,074.5	29,539.2

Extended SUTs for global value chain analysis

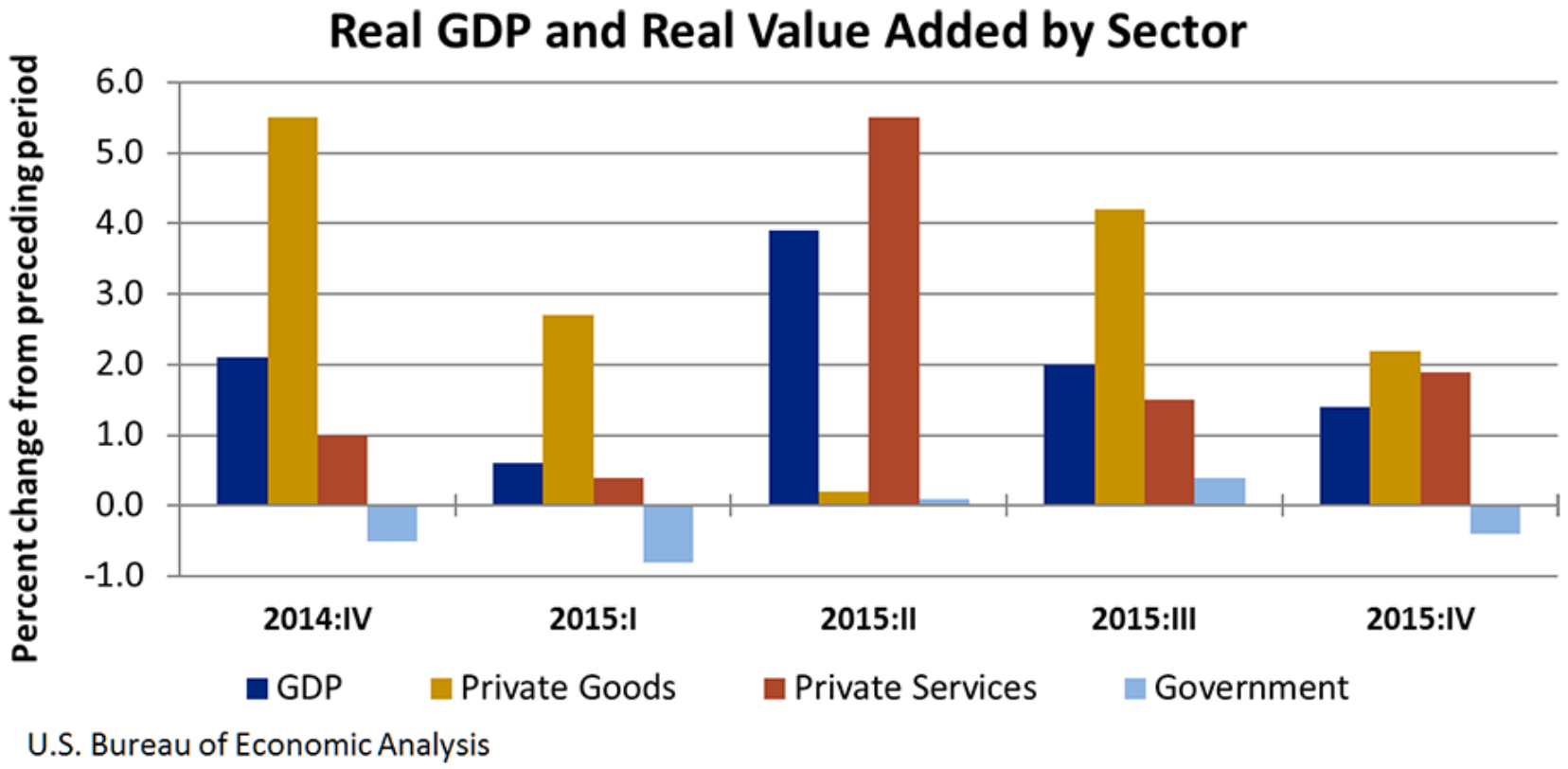
Use Table with Firm Heterogeneity, 2011

Use ($ billions)		Primary			Manufacturing			Services		
		Domestic MNE	Foreign MNE	Non-MNE	Domestic MNE	Foreign MNE	Non-MNE	Domestic MNE	Foreign MNE	Non-MNE
Primary	Dom MNE	0.5	0.3	6.8	21.2	8.5	26.3	1.2	0.7	8.8
	Foreign MNE	0.3	0.2	3.2	11.0	4.5	14.2	0.7	0.4	5.0
	Non-MNE	2.9	1.1	80.5	182.6	60.6	177.5	5.3	3.0	41.0
	Imports	2.4	0.9	22.4	90.3	34.1	221.8	5.0	2.1	24.0
Manuf	Dom MNE	0.6	0.3	18.9	203.4	95.2	146.1	30.9	11.0	263.0
	Foreign MNE	0.3	0.1	8.1	97.7	54.0	74.2	10.7	4.1	118.4
	Non-MNE	1.0	0.4	26.5	217.6	106.0	255.7	53.1	19.0	465.1
	Imports	9.8	6.5	12.2	190.2	165.2	140.8	100.8	80.8	127.3
Services	Dom MNE	2.6	1.3	43.7	97.3	40.5	116.8	404.8	136.7	1,050.3
	Foreign MNE	0.8	0.4	15.0	35.3	14.5	40.8	105.0	36.9	303.9
	Non-MNE	6.9	3.5	112.0	306.2	126.8	347.6	790.0	295.1	3,127.7
	Imports	0.4	0.1	6.8	3.1	0.8	30.2	7.2	2.5	135.3
Special	Dom MNE	-0.1	<0.05	-1.0	0.1	0.3	0.3	-1.2	-0.6	-4.8
	Foreign MNE	<0.05	<0.05	-0.5	0.1	0.1	0.1	-0.6	-0.3	-2.4
	Non-MNE	-0.4	-0.2	-5.2	2.9	2.1	4.1	7.1	0.4	-3.4
	Imports	0.1	<0.05	2.6	0.5	0.3	15.8	1.1	0.5	65.6

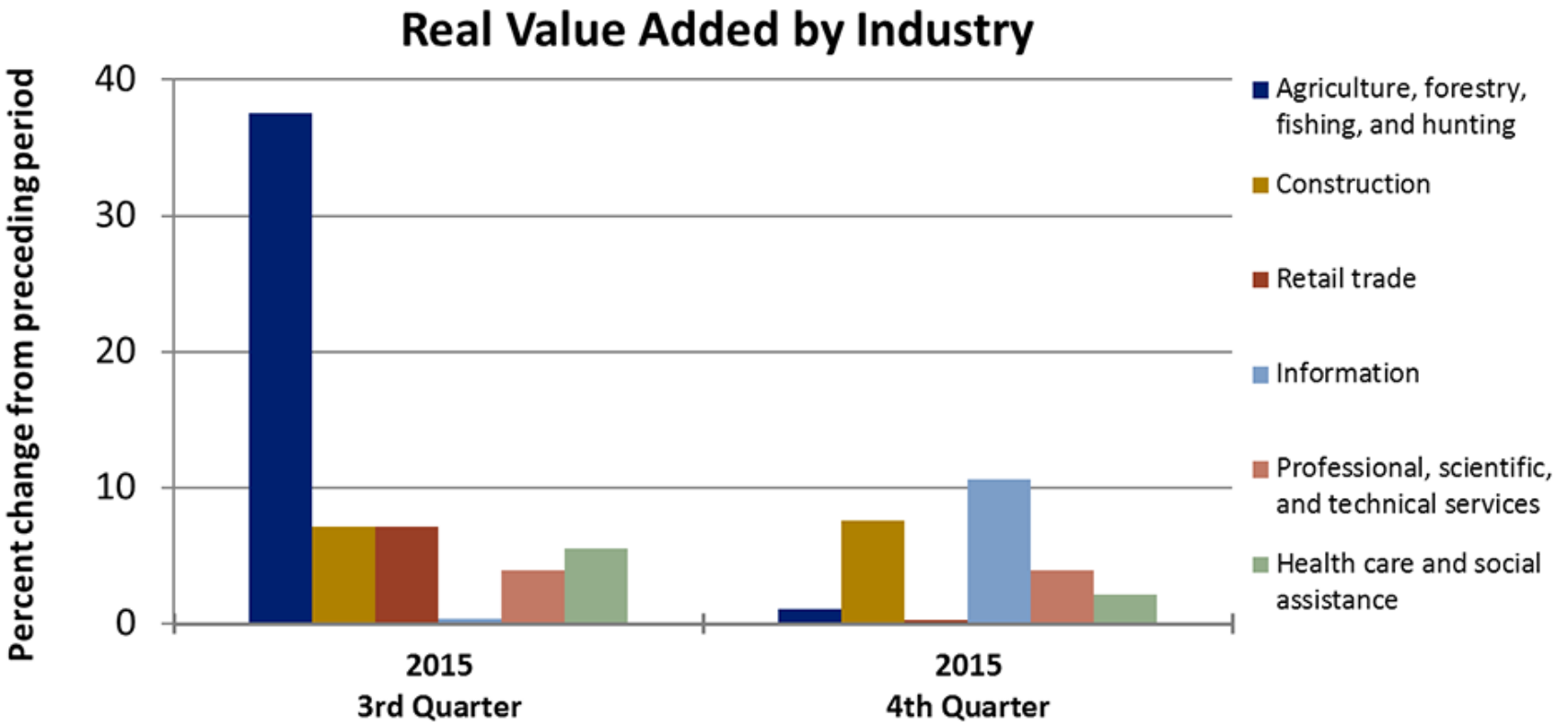
GDP by industry

- Time series SUTs provide the framework to produce inflation-adjusted statistics on gross output, intermediate inputs, and value added by industry
  - Production measure of GDP
  - Compliments featured GDP (E)
  - Lots of User interest in knowing relative performance of industries

Quarterly GDP by industry

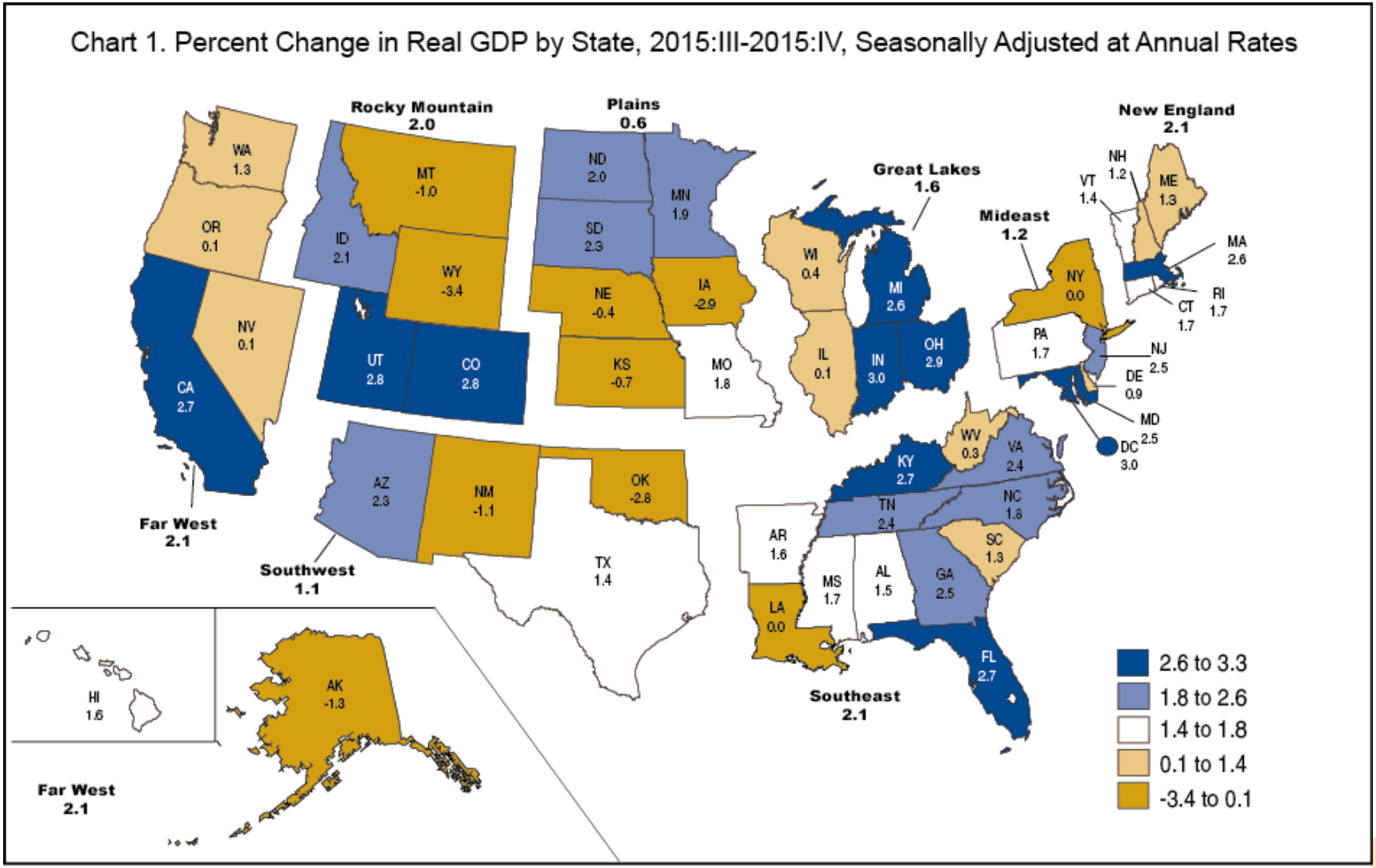


Quarterly GDP by industry



U.S. Bureau of Economic Analysis

GDP by state



U.S. Bureau of Economic Analysis

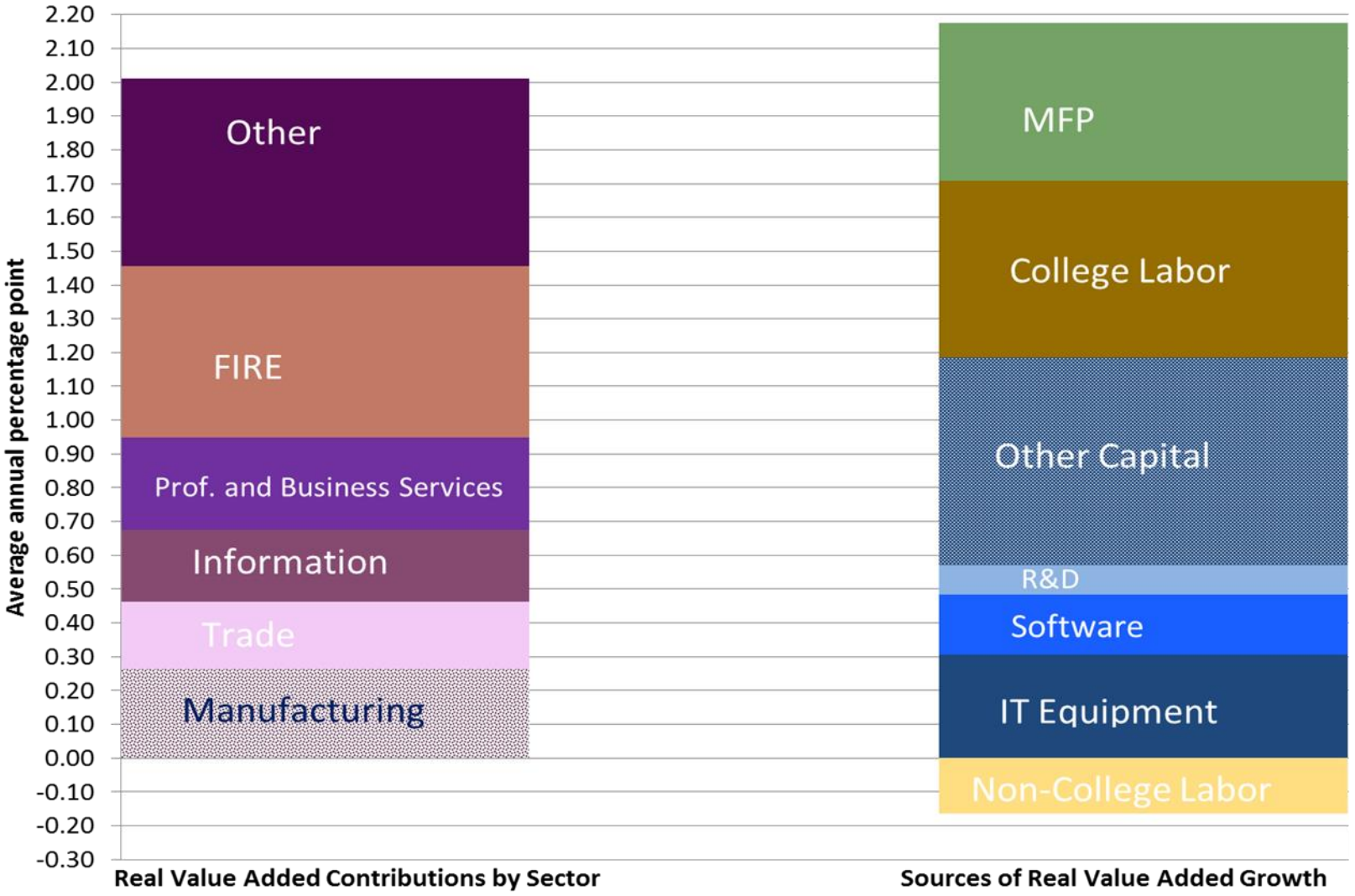
Integrated Production Account – KLEMS

- Long-standing call for statistics on the sources of growth
  - Solow (1957), Denison (1967), Griliches and Jorgenson (1967)
  - Postwar Recovery, Big Slump, IT Boom, the Great Recession
  - *"… differences between the BEA and BLS estimates have led many researchers to construct their own measures …"*

    -Jorgenson and Landefeld (2006) in *A New Architecture for the U.S. National Accounts*

- The Advisory Committee on Measuring Innovation in the 21st Century: A Report to the Secretary of Commerce (January 2008)
  - *"Develop annual, industry-level measures of total factor productivity ..."*

Integrated Production Account – Sources of U.S. economic growth, 1998-2012



Conclusion and Future Directions

- SUTs provide the framework for a number of widely used applications
  - Impact analysis, constant-price statistics, globalization analysis ,etc.
- Future directions
  - Globalization projects: North America Regional SUTs, APEC TiVA, OECD and firm heterogeneity