The National Academies of
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COMMITTEE ON NATIONAL STATISTICS

Consensus Panel Study on Measuring the Transformation of Retail Trade and Related Activities

Meeting 2: June 22-23, 2020

The National Academies of Sciences, Engineering, and Medicine
Sponsor: Bureau of Labor Statistics
Meeting conducted virtually

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Consensus Panel Study on Measuring the Transformation of Retail Trade and Related Activities

Meeting 2: June 22-23, 2020

Virtual workshop to discuss the transformation, data challenges, and potential solutions

Monday, June 22, 2020

10:00-10:25 Welcome and overview of the workshop.

- 10:00-10:05 Welcome, **Brian Harris-Kojetin**, director of CNSTAT
- 10:05-10:10 Welcome, **Lucy Eldridge**, BLS
- 10:10-10:25 Workshop overview, **Steve Landefeld**, panel chair

What is Retail and How is It Changing?

10:25-11:25 Research on retail changes. Moderator: **Greg Duncan**, panel member

- 10:25-10:45 **Emek Basker**, US Census Bureau; **Chad Syverson**, University of Chicago; and **Steve Noble**, McKinsey. Statements of participants.
- 10:45-11:05 Panel discussion
- 11:05-11:25 Discussion

11:25-11:40 Break

11:40-12:50 Industry Perspectives of Industry Changes: Past, Present, Future. Moderator: **Jack Kleinhenz**, Retail Trade Federation.

- 11:40-11:45 Overview**: Jack Kleinhenz**, Retail Trade Federation
- 11:45-12:05 Statements by panelists. **Drew Spata**, Macy's; **David Glick**, FLEXE (formerly Amazon); **Richard Phillips,** Yale Divinity School (former Chairman and former CEO of Pilot Freight Services); **Anne Goodchild**, University of Washington.
- 12:05-12:25 Panel discussion
- 12:25-12:50 Discussion

12:50-2:00 Lunch break

Key Measurement and Data Challenges:

2:00-4:00 Data: Availability, Needs, Discrepancies and Gaps. A panel discussion. Moderator: **Wesley Yung**, panel member.

- 2:00-2:35 Initial statement by panelists. Panelists: **Ken Robertson**, BLS; **Jon D. Samuels**, BEA; **Matthew Russell**, BLS; **Leland Crane**, Federal Reserve; **Ian Thomas**, Census Bureau; **Edward Watkins**, Census Bureau.

2:35-3:15 Panel discussion

3:15-3:30 Break

3:30-4:00 Discussion

4:00 Adjourn

Tuesday, June 23, 2020

Potential Improvements to Measuring Employment and Productivity in Retail-Related Sectors

10:00-11:30 Towards a BLS satellite account for retail: Moderator: **Carol Corrado,** panel member

10:00-11:00 Panel discussion. Panelists: **Brian Chansky**, BLS; **Tina Highfill**, BEA; **Philip Smith**, Statistics Canada (retired); **Marshall Reinsdorf**, International Monetary Fund.

11:00-11:10 Discussant: **Leonard Nakamura**, panel member
11:10-11:30 Discussion

11:30-11:45 Break

11:45-12:30 Quality-adjusted prices for retail. Moderator: **Dale Jorgensen,** panel member

11:45-12:00 **Ana Aizcorbe**, BEA
12:00-12:15 **Brendan Williams** and **Bonnie Murphy**, BLS
12:15-12:30 Discussion

12:30-2:00 Lunch

2:00-3:00 Uses of bottom-up in measuring employment and productivity. Moderator: **Kelly McConville,** panel member

2:00-2:30 **Teresa Fort** and **John Haltiwanger,** panel members
2:30-3:00 Discussion

3:00-3:20 Break

3:20-4:20 Global Value Chains. Moderator: **Michael Mandel**, panel member

3:20-3:40 **Dominic Smith**, BLS
3:40-4:00 **Robert Feenstra,** UC Davis
4:00-4:20 Discussion

4:20 Adjourn

Panel on Measuring the Transformation of Retail Trade and Related Activities

Statement of Task from the Contract with BLS

The Committee on National Statistics of the National Academies of Sciences, Engineering, and Medicine shall appoint an expert panel to review the issues related to measuring employment and productivity in retail-related industries for the Bureau of Labor Statistics (BLS) in the U.S. Department of Labor. The expert panel shall evaluate changes in the retail trade landscape and assess how they are impacting measures of employment and productivity in retail-related industries and determine if, and how, a satellite account can be designed to capture this retail transformation. The panel shall carefully review the existing measures as well as the methodological issues surrounding measurement of these concepts. As part of its information-gathering activities, the panel shall hold a public workshop to discuss the views of industry experts, academics doing work in related fields, and data users. The panel shall produce a consensus report, which shall include conclusions and recommendations for BLS on 1) the value and specifications for a satellite account for the retail-related sector, 2) ways to identify the proportion of output, employment and hours outside of retail trade that are directed toward supporting retail trade, and 3) ways to maintain a retail-related satellite account

Panel on Measuring the Transformation of Retail Trade and Related Activities, Panel Member Bios

CHAIR

J. STEVEN LANDEFELD is a consultant to the U.S. Bureau of Economic Analysis in Washington, DC. Prior to this, he served as advisor to the United Nations Statistical Division, visiting professor at the United States Naval Academy, and director of the U.S. Bureau of Economic Analysis. Dr. Landefeld is the recipient of numerous domestic and international awards, including: the Presidential Distinguished Executive Award; the Julius Shiskin Award from the American Statistical Association; the Harry Freeman Award from the Coalition of Services Industries; the Henri Willem Methorst Medal from the International Statistical Institute; and the David O. Cooke Award from the American Society for Public Administration. He currently serves as a fellow of the National Association for Business Economics, and he has testified before Congress on topics ranging from the economic recovery to the measurement of economic well-being. He has been regularly cited in national and international print media and has been a regular guest on radio and television, including appearances on C-SPAN, CBS, National Public Radio (NPR), Public Broadcasting Service (PBS), National Broadcasting Company (NBC), CNBC, and Cable News Network (CNN). Dr. Landefeld has B.A., M.A., and Ph.D. degrees in economics, all from the University of Maryland, College Park.

MEMBERS

CAROL A. CORRADO is research director at the Conference Board in Washington, DC. She also works with the Conference Board's China Center for Research on Economics and Business. Dr. Corrado is a member of the executive committee of the NBER's Conference on Research on Income and Wealth and is an organizer of a workshop on economic measurement at the NBER's annual Summer Institute. She has authored key papers on the macroeconomic analysis of intangible investment and capital, including the winner of the International Association of Research on Income and Wealth's 2010 Kendrick Prize and a paper in, Measuring Capital in the New Economy. Her research on intangibles and innovation has been cited in *Businessweek, The Economist,* and *New York Times*. Dr. Corrado received the American Statistical Association's prestigious Julius Shiskin Award for Economic Statistics in 2003 in recognition of her leadership in these areas and was a recipient of a Special Achievement Award from the Board of Governors of the Federal Reserve System in 1998. She has a B.S. degree in management science from Carnegie-Mellon University, and a Ph.D. in economics from the University of Pennsylvania.

GREGORY DUNCAN is senior principal economist, technologist and machine learning scientist at Amazon, and affiliate professor of economics at the University of Washington. At Amazon, he has worked on addressing numerous econometric and statistical issues throughout the company, including projects related to policy and competition, forecasting, the use of machine learning, and supply chain research. Prior to Amazon, Dr. Duncan held a variety of positions at universities and consulting firms, including: the University of California, Berkeley; Huron Consulting Group; Deloitte Financial Advisory Services; National Economic Research Associates; University of Southern California; GTE Laboratories; Washington State University; and Northwestern University. He is also a co-founder of the Amazon Machine Learning University. Dr. Duncan has a B.A. degree in economics from the University of Washington, and an M.A. degree in statistics and a Ph.D. in economics, both from the University of California, Berkeley.

Panel on Measuring the Transformation of Retail Trade and Related Activities, Panel Member Bios

TERESA C. FORT is an Associate Professor of Business Administration at the Tuck School of Business at Dartmouth College. She conducts research in international trade and industrial organization. Her current work analyzes how technology affects firm-level offshoring and production fragmentation decisions, and the impact of these decisions on domestic employment and innovation. Dr. Fort is a Faculty Research Fellow at the National Bureau of Economic Research and a Research Affiliate at the Centre for Economic Policy Research. She holds a Ph.D. in economics from the University of Maryland and a B.A. from the University of Virginia.

JOHN C. HALTIWANGER is distinguished university professor in the Department of Economics at the University of Maryland, College Park. He also serves as research associate at the National Bureau of Economic Research, senior research fellow at the Center for Economic Studies at the U.S. Census Bureau, and fellow of the Society of Labor Economics and the Econometric Society. Dr. Haltiwanger is the first recipient of the Dudley and Louisa Dillard Professorship, which was awarded in 2013, and his work with statistical agencies has been recently recognized with him being awarded the Julius Shiskin Award for economic statistics in 2013 and the Roger Herriott Award for innovation in federal statistics in 2014. His own research increasingly uses the data and measures on firm dynamics from a substantial number of advanced, emerging, and transition economies. Dr. Haltiwanger has published more than 100 academic articles and numerous books including Job Creation and Destruction. He has a Sc.B. in applied mathematics-economics from Brown University, and a Ph.D. in economics from the Johns Hopkins University.

DALE W. JORGENSON (NAS) is the Samuel W. Morris university professor in the Department of Economics at Harvard University. Dr. Jorgenson was awarded the John Bates Clark Medal by the American Economic Association and served as its president in 2000. He has been honored with numerous honorary doctorates and memberships in the American Philosophical Society, the Royal Swedish Academy of Sciences, the U.S. National Academy of Sciences, and the American Academy of Arts and Sciences. He was a founding member of the Board on Science, Technology, and Economic Policy of the National Research Council and served as its Chairman of the Board. Dr. Jorgenson has conducted groundbreaking research on information technology and economic growth, energy and the environment, tax policy and investment behavior, and applied econometrics. He is the author of more than 300 articles in economics and the author and editor of 37 books. He has a B.A. degree in economics from Reed College, and a Ph.D. in economics from Harvard.

MICHAEL MANDEL is chief economic strategist at the Progressive Policy Institute (PPI) in Washington, DC, where he supervises PPI's research and policy work across a wide range of topics. He is also senior fellow at Wharton's Mack Institute for Innovation Management at the University of Pennsylvania, and president and founder of South Mountain Economics LLC, which provides expertise on emerging occupations and emerging industries. Dr. Mandel has received multiple awards for his work, including the Gerald Loeb Award for Business and Financial Journalism, and is the author of numerous books, including, Rational Exuberance: Silencing the Enemies of Growth and Why the Future Is Better Than You Think. He is currently revising the third edition of his introductory economics textbook, Economics: The Basics. Previously, he served as co-principal investigator for a Sloan Foundation grant on Measuring the Impact of Globalization and has testified before Congress on the impact of regulation on innovation. Dr. Mandel has a Ph.D. in economics from Harvard University.

Panel on Measuring the Transformation of Retail Trade and Related Activities, Panel Member Bios

KELLY MCCONVILLE is assistant professor of statistics at Reed College, specializing in survey sampling. In her work, she develops survey estimation techniques that combine data collected under a complex sampling design with auxiliary data sources. Dr. McConville has collaborated with the U.S. Forest Service's Forest Inventory and Analysis Program and the U.S. Bureau of Labor Statistics. She enjoys teaching her students how to learn from data and introducing them to R (an open source statistical software program) and is a firm believer that undergraduate research enhances the educational experience. Dr. McConville also co-chairs two national programs: the Undergraduate Statistics Project Competition and the Electronic Undergraduate Statistics Research Conference. Dr. McConville has a background in establishment surveys and has previously worked as an American Statistical Association/National Science Foundation/Bureau of Labor Statistics research fellow. She has a B.A. degree in Mathematics from Saint Olaf College, and M.A. and Ph.D. degrees in statistics from Colorado State University.

LEONARD I. NAKAMURA is emeritus economist of the Federal Reserve Bank of Philadelphia, after having served as vice-president and economist for over 30 years. His research addresses financial economics and economic measurement issues, including intangibles, information flows, and free products. Previously, Dr. Nakamura led the research team responsible for producing the Business Outlook Survey, a regional manufacturing survey, and the State Coincident Indexes, as well as other economic indicators. He also served as economist at Citibank and as senior economic consultant for The Conference Board, a global, independent business membership and research association working in the public interest. Dr. Nakamura has taught courses at the Wharton School of the University of Pennsylvania, Swarthmore College, and Bryn Mawr College, and was previously a faculty member at Rutgers University. He has a B.A. degree in social sciences from Swarthmore College, and M.A. and a Ph.D. degrees in economics from Princeton University.

WESLEY YUNG is director of the Economic Statistics Methods Division of Statistics Canada. In this role, he manages a division of 110 methodologists who provide support to the Economic Statistics Field of Statistics Canada. Prior to this, he was assistant director of the division, where he managed 40 methodologists who provided support to annual and sub-annual business surveys and to Tax Data Division. Dr. Yung also served as section chief and senior methodologist at Statistics Canada. While currently in a management position, he continues to remain active in survey methods research touching variance estimation and, more recently, collection research. Dr. Yung has B.Sc. and M.Sc. degrees in statistics from Dalhousie University in Scotia, and a Ph.D. in statistics from Carleton University in Ontario.

Panel on Measuring the Transformation of Retail Trade and Related Activities, Workshop Presenter Bios

Ana Aizcorbe is a research economist at the Bureau of Economic Analysis (BEA), where she conducts research into price index and other measurement issues. Prior to this, she served as BEA's Chief Economist where she initiated a Health Satellite Account that allows one to identify the drivers underlying the cost of treating diseases. She also held positions as an ASA/NSF/BLS research fellow, staff economist at the Federal Reserve Board, visiting fellow at The Brookings Institution, and a research economist in the Bureau of Labor Statistics. She has published a book titled "A Practical Guide to Price Index and Hedonic Techniques" and numerous articles on the theoretical issues underlying price measurement, with empirical applications to the high-technology and service sectors. Dr. Aizcorbe has a B.A. degree in economics from Georgetown University, and a Ph.D. in economics from Boston College.

Emek Basker is a Principal Economist at the U.S. Census Bureau and an Adjunct Professor at the University of Missouri. Her primary area of research is the economics of retail markets and supply chains. Her current research concerns the impact of innovations and technological changes in the retail sector, including the introduction of barcode scanners and self-service technologies. Since obtaining her Ph.D. in economics from MIT in 2002, she has also held visiting positions at the Federal Reserve Banks of St. Louis and Philadelphia, the University of California-Berkeley, Boston College, Stanford University, and Dartmouth College.

Brian Chansky is an economist in the Bureau of Labor Statistics' (BLS) Division of Industry Productivity Studies, Office of Productivity and Technology. Since joining BLS in 2001, he has developed productivity measures for a variety of industries, including Used household and office goods moving, Private community hospitals, Gambling industries, and Urban transit systems. His co-authored article "Multifactor productivity slowdown in U.S. manufacturing" won the Lawrence R. Klein award for best MLR article of 2018.

Leland Crane is a Senior Economist in the Industrial Output section of the Federal Reserve Board of Governors. His interests include search and matching models of the labor market, machine learning and economic measurement using non-traditional data.

Lucy Eldridge has served as Associate Commissioner in the Office of Productivity and Technology at the U.S. Bureau of Labor Statistics (BLS) since 2016. Dr. Eldridge leads an organization of dedicated professionals responsible for producing timely, accurate, and relevant measures and analyses of productivity that help people assess the performance of the U.S. economy and make informed decisions. From 2014 to 2016, Dr. Eldridge served as the Chief of the Division of Major Sector Productivity, where she oversaw the Major Sector Labor Productivity and Multifactor Productivity programs. From 1998 to 2014, Dr. Eldridge was a senior economist at BLS, conducting research to improve productivity data and providing guidance on management and program development. She began her career at BLS in 1993 as a research economist in the Division of Productivity Research. Dr. Eldridge earned a Ph.D. and M.A. in Economics from The University of Arizona and a B.A. in Mathematics and Economics from Hood College. She is the author of numerous publications, including articles on productivity measurement, measuring hours of work, and off-shoring.

Robert C. Feenstra holds the C. Bryan Cameron Distinguished Chair in International Economics at the University of California, Davis. He served as the director of the International Trade and Investment Program at the National Bureau of Economic Research from 1992 to 2016. Dr. Feenstra's research is

focused on the theory and estimation of international trade models, including the measurement issues that arise in these topics. He is most known for his research on: measuring the gains from product variety; assessing the impact of offshoring; and the Penn World Table, a project jointly carried out with the University of Groningen on measuring real GDP across different countries in dollar values. He has written over 100 published articles and six books, including *Offshoring in the Global Economy and Product Variety and the Gains from Trade* (MIT Press, 2010).

David Glick is the Chief Technology Officer at FLEXE and is responsible for the design and development of the FLEXE technology platform. Before FLEXE, he spent nearly 20 years at Amazon, including five years as the VP of Fulfillment Technology, where he oversaw the development and functionality of the technology within Amazon's fulfillment centers, as well as the technology for Amazon's transportation systems for two of those years.

Anne Goodchild is the Founding Director of the Supply Chain Transportation and Logistics Center at the University of Washington and leads the University's academic and research efforts in the area of supply chain, logistics, and freight transportation. She is Professor of Civil and Environmental Engineering. She is an international leader in urban freight research and a border and port operations expert. She holds both a doctorate and a master's degree in civil and environmental engineering from the University of California, Berkeley, and a bachelor's degree in mathematics from University of California, Davis.

Tina Highfill is a research economist in the National Economic Accounts directorate at the Bureau of Economic Analysis (BEA). She has been at BEA for over 15 years, first producing regional economic statistics before moving into research. For the past 8 years, Tina has worked on and led development of many of BEA's satellite accounts. Tina has a bachelor's in economics from Virginia Tech, a master's in applied economics from The Johns Hopkins University, and a Ph.D. in health services organization and research from Virginia Commonwealth University.

Jack Kleinhenz is the chief economist for the National Retail Federation, the world's largest retail trade association. Dr. Kleinhenz is a Certified Business Economist (CBE) in business economics and data analytics. He serves as a board director to the National Bureau of Economic Research, the nation's leading nonprofit economics research organization. Appointed by the U.S. Secretary of Labor, Dr. Kleinhenz has served as a member of the Bureau of Labor Statistics Data Users Advisory Committee. He is a member of The Conference Board Consumer Dynamics Center Advisory Board, the University Hospitals of Cleveland Investment Management Committee and the Governor of Ohio's Council of Economic Advisors. He also serves as principal and chief economist of Kleinhenz & Associates, an economic, financial consulting and wealth management firm headquartered in Cleveland, as well as adjunct professor of economics at Case Western Reserve University's Weatherhead School of Management. A graduate of John Carroll University, he earned his M.A. and Ph.D. in Economics from the University of Notre Dame.

Bonnie Murphy is Chief of the Branch of Industry Pricing in the Producer Price Index (PPI) Program at the Bureau of Labor Statistics. Her career focus had been development and supervision of the expansion of the PPI to include over 150 service industries. She now oversees the certification of all micro-producer price data and price indexes each month. She also currently serves as the Co-chair of the Voorburg City Group, a United Nations' sponsored international group that establishes and maintains an

internationally comparable methodology for measuring output and producer price indexes for service industries.

Steve Noble co-leads the McKinsey global work in retail transformation and leads their efforts on retail strategy and transformation in the Americas. He helps retailers define and implement a wide range of growth, cost, and operational improvements and his experience spans a wide range of retail categories and formats. Beyond his client work, Mr. Noble has published on a range of retail transformation and strategy topics, including how to win within the changing consumer and retail landscape, how to prepare for and win through a downturn, and how retailers should think about mergers and acquisitions. He has played a variety of leadership roles within McKinsey Learning and spends several weeks per year leading its core training programs as faculty. He is a board member of Catholic Charities of Minneapolis and St. Paul and an advisory board member to the Consulting Enterprise at the University of Minnesota's Carlson School of Management. Prior to joining McKinsey, Mr. Noble was a private-equity associate in Washington, D.C., where he was responsible for executing leveraged buyout transactions and working with management teams to drive business performance.

Richard Phillips is currently a visiting fellow at the Yale Divinity School. Previously, he was Chairman (2017-2019) and CEO (2007-2017) of Pilot Freight Services, one of the largest privately held global logistics companies, that provided global transportation and logistics services to manufacturing, e-commerce, retail, and others. He led the turnaround of Pilot Freight Services, substantially increasing revenues and expanding the company's footprint to 190 countries. He holds a J.D. from Georgetown University, a Master of Philosophy from Cambridge University, and a Bachelor's degree from Yale.

Marshall Reinsdorf is a Senior Economist in the IMF Statistics Department and President of the International Association for Income and Wealth. Prior to joining the IMF he was head of the National Economic Accounts research group at the Bureau of Economic Analysis and a consultant to the IMF in the area of price statistics. He has also held research positions at the Bureau of Labor Statistics and at the FDIC. He has published more than 50 articles and papers on economic measurement questions and serves on technical advisory committees or panels for the US Bureau of Labor Statistics, Statistics Canada, and the Brookings Institute. He obtained his Ph.D. in Economics from the University of Maryland in 1985.

Ken Robertson joined the Bureau of Labor Statistics in 1990. He is the Assistant Commissioner for Industry Employment Statistics, where he manages the Current Employment Statistics (CES) survey, the Job Openings and Labor Turnover Survey (JOLTS), and the Quarterly Census of Employment and Wages (QCEW) program. Mr. Robertson's experience prior to this position includes developing software and designing surveys. Mr. Robertson has a B.S. in Computer Science and Mathematics, and a M.S. in Statistical Computing.

Matthew Russell is part of the Major Sector Program at Bureau of Labor Statistics overseeing the PFEI Quarterly Labor productivity and Costs as well as the multifactor productivity program. He was part of the Industry division at the Bureau of Economic Analysis for 5 years. He has a Master of Science from UT Austin.

Jon Samuels is a Senior Research Economist at the Bureau of Economic Analysis (BEA), and an Associate at the Institute of Quantitative Social Science (IQSS) at Harvard University. His research focuses on measuring technological change and the sources of economic growth. Previously, Samuels worked as a

Panel on Measuring the Transformation of Retail Trade and Related Activities, Workshop Presenter Bios

Researcher for the Program on Technology and Economic Policy directed by Dale Jorgenson at Harvard University and was a Junior Economist in economic forecasting with Primark Decision Economics. He received a BA in economics from the University of Chicago, and a MA and PhD in economics from Johns Hopkins University.

Dominic Smith is a Research Economist at the Bureau of Labor Statistics in the Division of Price and Index Number Research. His research focuses on the retail sector. He received a Ph.D. in economics from the University of Minnesota in 2019.

Philip Smith is semi-retired. During his career, he worked mostly at Statistics Canada. In the last decade of his career he was Assistant Chief Statistician responsible for the National Accounts and Analytical Studies Field and subsequently Assistant Chief Statistician for the Business and Trade Statistics Field, responsible for the Agency's statistical programs focusing on international trade, investment, industry output and sales, financial statistics, science and technology statistics, and price indexes (including the consumer price index). Currently he works on a part-time, post-retirement basis at Statistics Canada, doing some teaching, mentoring and research projects. He holds a PhD in economics from Queen's University.

Drew Spata is Vice president of Economics and Forecasting for Macy's. Mr. Spata develops sales forecasts, including store level forecasts for Macy's and Bloomingdale's three-year planning cycle; tracks and deciphers external economic variables; and creates economic models to support planning. Areas of expertise include macroeconomic forecasting, trend analysis, and data mining. He has a bachelors and master's degrees in economics from Miami University of Ohio.

Chad Syverson is the George C. Tiao Distinguished Service Professor of Economics at the University of Chicago Booth School of Business. His research spans several topics, with a particular focus on the interactions of firm structure, market structure, and productivity. He also coauthored (with Austan Goolsbee and Steve Levitt) an intermediate-level text, *Microeconomics*, now in its 3rd Edition. Dr. Syverson serves as an editor of the *Journal of Political Economy*, is a research associate of the National Bureau of Economic Research, and has recently served on National Academies committees. Prior to his appointment at the University of Chicago in 2001, Dr. Syverson was a mechanical engineer for Loral Defense Systems and Unisys Corporation. He earned two bachelor's degrees in 1996 from the University of North Dakota, one in economics and one in mechanical engineering. He earned his Ph.D. in economics from the University of Maryland.

Ian Thomas is the Assistant Division Chief, Retail and Wholesale Trade Sectors at the Census Bureau. He has 16 years of experience on retail including monthly, annual, and Economic Census. He currently oversees two annual programs: the Annual Retail Trade Survey (ARTS) and the Annual Wholesale Trade Survey (AWTS). These surveys produce national estimates of sales, inventories, e-commerce, purchases, and expenses. He also oversees the retail and wholesale sectors for the Economic Census that is conducted every five years. The Economic Census collects extensive statistics about businesses that are essential to understanding the American economy.

Edward Watkins is the Assistant Division Chief of Service Sectors at the Census Bureau. He has worked at the Census Bureau for almost 21 years, beginning in 1999. He manages the Service Annual Survey

(SAS), which provides annual estimates of revenue and other measures for most service industries. He also oversees service industries data for the Economic Census, which is conducted every five years and is the Census Bureau's most comprehensive measurement of U.S. business activity.

Brendan Williams is a Senior Economist in the Branch of Consumer Prices in the Consumer Price Index (CPI) Program at the Bureau of Labor Statistics. He has conducted research on hedonic quality adjustment and incorporating transaction data into the CPI. He received his M.A. in economics from American University.

What is Retail and How is it Changing

Session 1: Research on retail changes

1. Each of you has mentioned several points about the way the retail sector is transforming. To what extent are these changes limited to the sector leaders and to what extent are they common across the entire retail sector? When should we see these changes in the statistics for the sector as a whole?

2. How would you characterize the way labor productivity in retail has changed over the past decade?

3. What data would you use to understand how labor productivity has changed in the retail sector and how it compares to other sectors?

4. If you wanted to explain to a politician or the public how labor productivity has changed in retail, what key points would you make and what data would you use to make those points?

5. The transformation in retail challenges the definition of what's included in the sector. Large retailers have expanded into new areas – like cloud computing or health services – that are classified in other industries. At the same time, digital devices and the web have transformed some goods that used to be sold by retailers – like books and music – into digital services. Where is it useful to draw the line between what's included in retail and what's not?

6. How do you think the Covid 19 pandemic is likely to change the trends in the retail sector?

Questions for Retail Trade Industry Panel

"Over the past decade there have been significant changes in how goods and services are delivered to consumers. As the retail landscape evolves, many firms have developed their own e-commerce platforms, fulfillment operations, and distribution networks. These changes also affect other industries associated with retail trade, such as wholesale trade, transportation, and warehousing. To better understand the implications for employment and productivity measurement in retail trade and to capture gains in productivity associated with shifts across industries, the Bureau of Labor Statistics (BLS) is considering developing a satellite account for a broader combination of retail-related industries."[1]

Consumers see huge changes in terms of access to on-line shopping and home delivery options, though they may not know the transformations that make these consumer benefits possible. COVID-19 seems to have accelerated the provision of these enhancements to consumers. It is also clear that low-cost goods from China have been a benefit to consumers.

The purpose of this project is to evaluate changes in the retail trade landscape and assess how they are impacting government measures of employment and productivity in retail-related industries. Accordingly, we have assembled a group of industry experts to share their observations about the changes they have seen in the retail (and related) industries, and how they think the industry will continue to evolve over time. We are interested in your thoughts about whether you think these changes are reflected in government data, but understand that you may not be familiar enough with the data to comment.

What is Retail and How is it Changing?

1. The transformation in retail challenges the definition of what's included in the sector. Large retailers have expanded into new areas – like cloud computing or health services – that are classified in other industries. At the same time, digital devices and the web have transformed some goods that used to be sold by retailers – like books and music – into digital services. Where do you think it useful to draw the line between what's included in retail and what's not?

2. Can you comment on the adequacy of current government statistics about the retail trade industry? What statistics do you use? Are there gaps in the data, or different cuts of the data that would be more useful to you, such as data by size of establishment, or size of firm?

3. What are the major structural changes you have seen occurring in retail supply chains and how they might evolve in the future? What has been the impact of Covid 19 on retail supply chains? What changes do you think will continue in the future?

4. Are there changes in the industry beyond supply chains that we should be aware of? What do you think are the major inputs and outputs from retail trade industries?

[1] BLS. (2020). "CNSTAT Consensus Panel on Measuring the Transformation of Retail Trade and Related Activities: Summary Of Issues", Background paper prepared for the panel's first meeting in April.

QUESTIONS for Data Availability, Needs, Discrepancies and Gaps Panel Discussion

1. How can output be adjusted to capture output of "all retail establishments", including those that are auxiliaries of non-retail industries, to match BLS retail establishment employment and hours?
2. What is the feasibility of identifying the relevant and consistent input and output data for the *four alternative retail trade sector definitions outlined on pages 5 and 6*? Auxiliaries supporting retail should be included in these broader sectors. Is it possible to identify them, or impute or estimate for them using other sources? For each alternative comment on the necessary data, whether they are available, their relative quality, and if not whether there is enough information to make imputations. Among these alternatives which do you think has the greatest likelihood of demonstrating changes in productivity due to structural change in the retail trade industry?
3. For each of the four alternative retail trade sector definitions are errors introduced by differences in business registries and classification differences likely to cause significant biases? Are there specific analyses that should be carried out to estimate the likely size of such errors?
4. Are there other definitions of a broader retail sector that should be considered?
5. Of the first 3 issues/questions summarized on pages 6 and 7 can you comment on the difficulty of the data issues that might arise from each? Are there any that have been addressed in the new BEA/BLS integrated account?
6. What are the conceptual, classification/definitional, and methological issues that might be relevant for a retail trade satellite account designed to better capture the transformation of retail trade?
7. What is the feasibility of providing data on labor productivity that can be analyzed by firm size, by workforce composition, or by domestic vs. foreign ownership?
8. Are there other sources for retail sector output or data on auxiliaries that should be considered, or other ways of working with the existing data sources?

QUESTIONS FOR DISCUSSION in Satellite Account Session

1. Of the four potential candidates for defining a broader scope for the new broader retail trade sector described on page 3 which do you think has the greatest potential value and why? What do you see as the greatest challenges in creating a satellite account with this scope and why? Is there an alternative definition for a broader retail trade sector that should be considered and why?

2. Among the remaining issues, especially 2, 3, and 4 on page 4, that could be addressed by a satellite account which are the most critical for accomplishing project goals and why? What additional issues might be most useful to include? What are the potential challenges associated with addressing these issues?

3. What existing examples of satellite accounts would provide applicable guidance for implementing a satellite account for the retail-related sector?

   Most satellite account applications gather activities from numerous industries to view a subsector of the economy as a whole. Most rely on detailed underlying input-output tables. Are there any examples of satellite accounts that have an aim of calculating productivity for a subsector? This seems like a natural extension when working with existing industries, but perhaps not sub-industries, such as transportation for goods vs transportation for persons. The retail trade account would need to include labor requirements to capture all indirect effects of the super-sector on employment. Are there examples of satellite accounts that use non-standard ways of splitting industries, for example by size of firm, or using an enterprise-based definition of selected industries?

4. Are there conceptual and data problems that could not be addressed by a satellite account?

5. Are there any new conceptual or data problems that could be introduced by a satellite account?

CNSTAT Consensus Panel on Measuring the Transformation of Retail Trade and Related Activities: Summary Of Issues

Over the past decade there have been significant changes in how goods and services are delivered to consumers. As the retail landscape evolves, many firms have developed their own e-commerce platforms, fulfillment operations, and distribution networks. These changes also affect other industries associated with retail trade, such as wholesale trade, transportation, and warehousing. To better understand the implications for employment and productivity measurement in retail trade and to capture gains in productivity associated with shifts across industries, the Bureau of Labor Statistics (BLS) is considering developing a satellite account for a broader combination of retail-related industries.

This document contains a summary of the issues pertinent to the development of a retail-related satellite account in the BLS Office of Productivity and Technology (OPT). We start with an introduction of the industries impacting the retail trade sector and cover the questions that form the basis of our request to develop a satellite account. We next review the fundamentals of BLS's current labor productivity measures before moving on to provide a review of the data sources from which these measures are built. We close with an overview of trends and some potential obstacles identified by our primary data sources to the construction of a retail-related satellite account. You will also find an appendix that includes a list of relevant publications, glossary of terms, and an overview of concerns from outside data users.

This summary of issues is intended to facilitate our presentations and discussions with the CNStat Panel. The BLS looks forward to working with the panel.

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CNSTAT Consensus Panel on Measuring the Transformation of Retail Trade and Related Activities: Summary Of Issues

Introduction

The Bureau of Labor Statistics (BLS) produces employment and productivity statistics across a wide range of industries in the United States. These data capture trends in the type of work American workers are doing and the efficiency with which various industries convert inputs into outputs. These data are valuable to understanding labor dynamics and industry performance over time. Retail trade is particularly important to the U.S. economy as most people interact with this sector on a daily basis.

BLS measures are based on the North American Industrial Classification System (NAICS) which groups establishments into industries according to similarities in production processes. NAICS is particularly important for the BLS productivity measures because these measures combine output data from the Census Bureau and the Bureau of Economic Analysis with hours worked and price data from BLS surveys. BLS currently publishes data for: the retail trade sector (NAICS 44-45) and for all 3-digit and 4-digit NAICS industries within the retail sector; the wholesale trade sector (NAICS 42) and all 3-digit and 4-digit NAICS industries within the wholesale trade sector; trucking and courier services industries (NAICS 484 and 492); and the warehousing and storage industry (NAICS 493).

These NAICS-based industry data provide important understanding into what industries are driving employment and productivity trends at the aggregate level and show how the industries compare to one another and the overall economy. BLS is interested in determining if a satellite account that includes employment, hours, and productivity measures for a broader combination of industries related to retail trade activities would provide new insights into the sector's impact on economic growth.

Developing a satellite account

A satellite account is a supplementary statistical program that allows for particular study of some element of the economy. For example, the Bureau of Economic Analysis (BEA) uses satellite accounts to study topics such as travel and tourism, health care, and the digital economy. Although the satellite account is kept separate from the agency's core products, it is designed to be consistent with the mission and standards. A satellite account may incorporate innovative or experimental methodology and is subject to further review or refinement.

In order to provide the most relevant and useful data for its customers, BLS requests assistance with the following:

- In order to capture gains in employment and productivity that results from shifts across industries, would a satellite account for employment, hours, and productivity for a broader combination of retail-related industries be a worthwhile addition to the BLS data portfolio?

- If BLS creates this new retail-related satellite account, how should the retail-related sector be defined and what is the best approach to measure individual industry contributions to this newly defined sector?
- Within the scope of data that BLS can access, what is the best approach to identifying the proportion of output, employment and hours outside of retail trade that are directed toward supporting retail trade?
- If BLS creates this new retail-related satellite account, what should be done to maintain it to ensure future changes in the retail environment are reflected over time?

A proposed satellite account for retail-related activity could hypothetically take a number of different forms. Some potential examples might be:

- The "distributional sector" of the U.S. economy, consisting of all establishments primarily involved with the distribution of goods from manufacturers and importers to other firms or consumers. This would be a broadly-defined sector comprising much or all of the current transportation, warehousing, wholesale, and retail trade sectors.
- The "retail-supporting sector" of the U.S. economy, consisting of retail trade and the portion of other sectors (transportation, warehousing, and wholesale trade) which serve retail trade firms as their primary customer.
- The "retail-controlled sector" of the U.S. economy, which would be more narrowly-defined than the previous form by only including transportation, warehousing, and wholesale trade establishments owned or controlled directly by retail firms (a.k.a. "auxiliary" establishments).

For each form of satellite account, there would exist a balance of its potential usefulness to BLS customers with the difficulty of acquiring the necessary data. The CNStat panel shall determine what form (if any) the satellite account should take in order to best reconcile these issues.

Fundamentals of Labor Productivity

The BLS Office of Productivity and Technology produces labor productivity and cost data for industries and major sectors in the U.S. economy including industries within the retail trade, wholesale trade, manufacturing, transportation, and warehousing sectors. Productivity is calculated as an index of the amount of goods and services produced by an industry (its output) divided by the index of labor input assigned to the production of that output (its input). OPT also calculates measures of unit labor costs (compensation per unit of output) and hourly compensation.

$$Labor\ Productivity = \frac{Output}{Hours\ worked}$$

Two primary methods are used for calculating output: physical quantity and deflated value. Physical quantity measures use data for primary products produced in each industry (at the most detailed level possible) combined using Tornqvist aggregation. Deflated value measures

use the nominal value of industry output adjusted for price change. Where possible, deflated value output indexes are Tornqvist aggregations of the deflated values of individual products and services within the industry.

For industry productivity, labor input is measured as hours worked (rather than hours paid) in order to account for how intensively labor is used. Labor input includes productive hours, hours on ancillary activities, unproductive hours in the course of work, and short periods of rest, while excluding paid leave and holidays, longer-than-typical meal breaks, and time spent on commuter travel.

Why does productivity matter?

BLS productivity series are intended to be measures of efficiency within each industry. Measures of productivity reflect the generally accepted economic theory of production and costs developed since the mid-1950s. There is a consensus among prominent scholars of the subject that productivity should be measured and analyzed in the context of the neoclassical theory of production and costs. At the core of this theory is the concept of a production function which is a mathematical relationship between output and the inputs that generate it. A production function describes how firms optimally combine inputs (also known as factors of production) in order to produce output. Productivity statistics are then developed in order to describe the *change* in the production function over time. The BLS produces two types of productivity statistics: **labor productivity**, which compares the rate of output growth to that of labor hours, and **multifactor productivity** (MFP), which compares output growth to the combined growth rates of labor hours, capital services, and intermediate purchases. Productivity statistics describes the efficiency gains (or losses) associated with growth (or decline) in output that is not a result of changes in the measured inputs.

Multifactor productivity measures, which account for all measurable elements of an industrial production function, are the preferred measure of efficiency. However, an enormous amount of data is required to construct the necessary capital and intermediate purchases measures required as inputs into multifactor productivity. This has limited the number of industries for which multifactor productivity is published. Labor productivity statistics are regarded as the best measure of efficiency for those industries for which multifactor productivity statistics cannot be determined.

Labor productivity series show how efficiently labor hours are converted into output. As a result, the labor productivity series may reflect the joint influences of changes in capital and intermediate inputs as well as improvements in technology, improvements in managerial practices, reallocation of resources from sectors that are less productive to those which are more productive, and other unmeasured factors.

Whether we are measuring labor productivity or MFP, it is important to consider the scope of activity being examined. Productivity can be measured at many different levels. This can range

from an individual worker, to an establishment, a firm, an industry, a sector, or even an entire nation. In order to create valid and useful productivity measures, we must ensure that the activity being measured corresponds to a valid production function. In other words, a cogent labor productivity series is created only when all labor hours going into a specific type of production are measured and compared with the total output of that same activity. On the other hand, distorted or suboptimal labor productivity measures will be created when either

1. The labor pool being measured is mismatched with the output being measured, or
2. The level of activity being measured does not accurately correspond with a realistic production function.

To give an example of the first type of error, imagine if we determined the labor productivity of a full-service restaurant by measuring output as the total amount of food sold and measuring labor as the hours worked only of waiters. This is a mismatch between labor and output, because the restaurant employs both waiters and cooks, who work in concert in order to sell food. The labor productivity of the restaurant must take into account how its entire labor pool operates in the production of output. The same type of mismeasurement would occur if we fully measured labor hours of both waiters and cooks, but then measured output as only the amount of soup sold (assuming the restaurant serves more than just soup!).

The second type of productivity measurement error can occur when firms or industries are aggregated into a larger group or sector. Aggregation must be done in a way whereby the production process of the composing elements maintains some sort of sensible similarity. The resulting productivity series informs us about the efficiency of that shared type of production. This principle allows the creation of productivity series for different sectors of the economy, such as the manufacturing sector, the agricultural sector, the transportation sector, etc. When measuring productivity for large sectors, it is also important to remove transactions between producers in the sector. This precludes double-counting and provides better information on trends in sectoral efficiency.

We must measure the entire output of an examined activity and align it with all labor hours put into its production. It would be impractical to create labor productivity measures for either single occupations or single types of products; in most firms, multiple occupations work together to produce multiple products. This is the realistic production function that productivity series are designed to evaluate.

Although the establishments and industries within these sectors differ, we can define (and therefore measure) a shared commonality in their production process. This is the principle of industrial organization on which the NAICS system is founded. On the other hand, aggregation of firms or industries on a non-production-related basis would yield productivity series that lack validity. For example, we could hypothetically create a productivity series for a “good-smelling” sector that encompasses perfume manufacturers, bakeries, flower shops, and new car dealers. Even if we properly measure the labor hours and the output of these industries, the labor productivity measure derived for this sector would lack validity. This is because the

commonality of these industries is not based on a shared aspect of their production function but rather a superficial commonality of their products.

It is important to keep principles in mind as we evaluate the possibility of creating a new labor productivity measure for a retail-related sector more broadly defined than has been previously determined by NAICS.

BLS best practices for sectoral output measurement

The question of how best to measure output for use in productivity statistics has received a great deal of attention. Although much of the economic literature on this topic has focused on multifactor productivity, it is no less pertinent in relation to labor productivity. The distinction matters insomuch as how one interprets the productivity statistic, but this relates technological change to the measured inputs. The validity of the output measure is the same under either case.

Two of the most common ways output is measured in economics are as either **gross output** or **value-added**. Gross output is defined as the sum total output of all the establishments in the group being measured. It is the most direct measure, and gross revenues are typically captured in government surveys of industry. Value-added output is equal to gross output minus the value of all inputs which originate as output of other firms. These inputs include materials, energy, and purchased services. We frequently refer to these as “intermediate inputs”. Value-added output is useful in systems of national accounts to avoid double-counting in the determination of final demand.

BLS productivity measures at the industry or sector level make use of a third measurement of output: **sectoral output**. Sectoral output for an industry is equal to gross output minus all inputs which originate from firms within the industry being measured. These are referred to as “intra-sectoral transactions”. For the purposes of productivity measurement, these intra-sectoral transactions are not viewed as true output, since they are used as inputs in further production within the industry. Another way to perceive sectoral output is the total output produced by an industry for consumption outside of that industry (whether to other industries or to final consumers). Sectoral output is the preferred output concept for industry productivity measurement because it most accurately represents the output portion of the industrial production function without the drawback of double-counting.

Because sectoral output deducts only inputs originating from within the industry or subsector, it has a lower bound equal to the value-added output (when all inputs originate from within the sector) and an upper bound equal to gross output (when no inputs originate from within the sector). Sectoral output equals gross output at the establishment level and converges to value-added output at the total economy level. As a result, sectoral output provides a bridge between the gross output concept and the value-added concept allowing us to examine the economy at different levels of detail while preventing double-counting issues. The sectoral output measure

remains the only estimate that is useful at both the detailed industry level and the aggregate economy level.

Measuring output for productivity measures and why

Our task is to first define the activities which constitute the business of an industry and then determine how the volume of those activities should be measured. The principle function of retail trade industries is to transfer possession of merchandise from suppliers to consumers. Retail establishments assemble product lines, display them at a convenient place and time, and provides ancillary services. Generally, retailers take ownership of the products until they are sold to consumers.

In an ideal world, we would count the precise number of goods and services provided in order to determine the output for an industry. This indeed is possible for some industries, such as measuring coal mining via the total tons of coal extracted. So called “physical quantity” measurement is even possible for some services, e.g. output for air transportation and line-haul railroads are measured in terms of freight-ton miles and passenger miles carried. However, for most industries quantities of goods and services are not directly observable. Consequently, we must infer quantity by starting with revenue.

Picture a factory that produces widgets of some unknown quantity. If we have data on the total revenue (also known as nominal output) earned from the widgets and the price received per widget (which we may imagine as a deflator), we can calculate the constant-dollar output of widgets. This value of industry output, in which revenue is deflated in order to remove the effect of price change, serves as a direct proxy for the physical quantity.

For retail trade, wholesale trade, and many services, BLS pulls nominal output of employer firms as total revenue from a corresponding annual Census Bureau survey, benchmarked to the 5-year Economic Census. The annual surveys include Annual Wholesale Trade Survey, Annual Retail Trade Survey, and Services Annual Survey. We then add the revenues of sole proprietorships and partnerships from the Census Nonemployer Statistics distributed to detailed product lines based on the employer firm proportions.

To get real output we remove intra-sectoral transactions wherever possible. Next we deflate the detail revenues with corresponding price indexes from the BLS (Consumer Price Index and Producer Price Index) and the BEA (Merchant Wholesale Deflators). We then calculate an index of the real output for each of the detail revenue lines. To create the industry output index, we use a Törnqvist formula to aggregate the real output indexes of the product lines with weights based on nominal revenue shares.

Measuring hours worked

Labor hours reflect annual hours worked by all employed persons in an industry. Total annual hours worked for each industry are estimated separately for three categories: paid employees, self-employed, and unpaid family workers. Average weekly hours of paid employees are collected from establishments by the BLS Current Employment Statistics (CES) on an hours-paid basis. This includes time when employees are on leave. Therefore, ratios of hours worked to hours paid from the National Compensation Survey (NCS) are applied to the CES data. This results in the average weekly hours worked which are multiplied by employment to calculate total annual hours worked for paid employees. Hours worked are preferred over hours paid for the calculation of labor productivity. This is because hours worked exclude the category of paid leave (such as vacation or sick time), which are not devoted to the production process.

Employment and hours data for the self-employed and unpaid family workers are collected from the Current Population Survey (CPS), a household survey. Hours worked of all persons at the industry level are treated as homogeneous and directly aggregated with no distinction made between the quality of hours worked by employees with different skill levels and education.

At the major sector level, measures of hours worked are supplemented to account for changes in so-called “labor composition”. This is a measure of the overall level of skill of the labor force. To compute the change in labor composition, the labor force is sorted into types of workers, defined by combinations of age, education, and gender. For each of these worker types (a.k.a. “cells”) total hours worked and median hourly wage are calculated in each year. Wages are assumed to be a proxy for worker skill, with more skilled workers receiving greater compensation.

The hours and wage data are used to calculate each type of worker’s share of total wages. The labor composition adjustment is calculated as the difference between the percent change in total hours worked and the weighted sum of the percent changes of hours worked by each age/education/gender worker type.

Data Sources

Primary sources for employment and hours worked

BLS Office of Employment and Unemployment Statistics

The CES provides “all employee” and “nonsupervisory employees total weekly hours” to OPT. These data are benchmarked on an annual basis to the population counts of the Quarterly Census of Employment and Wages (QCEW).

Establishments are classified into industries on the basis of their primary activity. For an establishment engaging in more than one activity, the entire employment of the establishment is included under the industry indicated by the principal activity. Industry information is collected on a supplement to the quarterly unemployment insurance (UI) tax reports filed by employers. CES retrieves these codes from the QCEW microdata files.

CES Data Availability

CES data include nonfarm employment series for all employees and nonsupervisory employees as well as average weekly hours for both groups. Data are published monthly for nearly 900 industries at various levels of aggregation.[1]

CES Collection and Estimation Methodology

1. **CES Sample Design** – The CES sample frame is generated from another BLS program, the Quarterly Census of Employment and Wages (QCEW). The QCEW produces a quarterly file of all firms in the United States that are covered by Unemployment Insurance (UI). The CES sample design is a stratified, simple random sample of worksites, clustered by UI account number from this file. The sample strata are defined by state, industry, and employment size, yielding a state-based design.

    a. *Optimum Allocation* - CES sampling rates for each stratum are determined through optimum allocation, which distributes a fixed number of sample units across a set of strata to minimize the overall variance or sampling error on the primary estimate of interest, the statewide total nonfarm employment level.

    b. *Strata definitions* - The strata used to draw the CES sample are 13 industries by 8 size classes yielding 104 allocation cells per state. The allocation industries are: Mining and Logging; Construction; Manufacturing Durables; Manufacturing Non-Durables; Wholesale Trade; Retail Trade; Transportation; Warehousing and Utilities; Information; Financial Services; Professional and Business Services; Education and Health Services; and Leisure and Hospitality and Other Services. The allocation size classes are defined in terms of maximum employment for the previous 12 months, at the UI account level.

    c. *Timing and procedures for sample updates* – The entire CES sample is redrawn annually with the most recent first quarter UI-based universe data (QCEW) which incorporates new business births and deaths, and updates control information for existing firms. Frame maintenance includes updating information such as addresses, phone numbers, industry, size, and geographic codes. In addition to the annual full sample redraw, a sample of new business births is drawn midway through each year

[1] A complete list of data availability can be found at https://www.bls.gov/web/empsit/cesseriespub.htm#tab1

from the most recent third quarter QCEW data. The sampling frame for births includes only those firms born since the first quarter sample draw.

2. **CES Data Collection Overview** - The monthly survey collects the total number of employees and number of non-supervisory employees, along with payroll and hours data, for the pay period that includes the 12th of the month.

    a. *OMB approval* - The CES data collection operation and CES collection forms are subject every three years to an Office of Management and Budget (OMB) review and approval under the Federal Paperwork Reduction Act.

    b. *Mandatory and non-mandatory states* - The CES survey is voluntary under federal law and it is presented as such on the CES data collection forms. However, a few states make reporting to economic surveys mandatory. Response rates are not significantly different between mandatory and non-mandatory states.

    c. *Industry specific reporting forms* - The CES collection forms are categorized by broad industry group based on the North American Industry Classification System (NAICS) and number of pay groups. These industry groups are mining and logging, construction, manufacturing, service-providing industries (includes Trade, Finance, Transportation), educational services, and public administration. Additionally, there are six variations of CES ongoing collection forms and each is tailored for the data items, concepts, and definitions of major industry sectors.

3. **CES Registry Overview** - The CES registry is a master control file containing information on all CES sample members such as company name, address, contact names, location, industry codes, and sampling weights. The registry information is kept up to date at all times to facilitate sample enrollment, monthly collection, and estimation.

    a. *CES Industry Codes* – Establishments are classified into industries on the basis of their primary activity. Those that use comparable capital equipment, labor, and raw material inputs are classified together. For an establishment engaging in more than one activity, the entire employment of the establishment is included under the industry indicated by the principal activity. Industry information is collected on a supplement to the quarterly unemployment insurance (UI) tax reports filed by employers. CES retrieves these codes from the QCEW microdata files. Industry codes are updated annually by the BLS national office to incorporate any changes from the QCEW program's annual re-filing survey, which verifies these fields.

4. **CES Estimation** – For every basic estimating cell of the all employee series, an annual benchmark level is established for a single month. The following months of employment level estimates are derived in sequence by applying the ratio of current to previous month matched sample employment to the previous month's employment level, and then adding a

model-derived estimate of the net of business birth and death employment. Essentially CES estimation procedures are comprised of three basic components:

a. *Industry stratification scheme* - The CES sample is post-stratified into basic estimating cells for purposes of computing employment, hours, and earnings estimates. This is different from the stratification pattern used for sampling. An exhaustive set of industry cells are established for the purpose of producing publishable estimates. Basic estimation cells are defined primarily at the 3-, 4-, 5-, or 6-digit NAICS levels for the all employee estimates. Hours, earnings, and non-supervisory employee series are produced under a separate cell structure from that used for all employee estimation and are usually at a higher level of industry detail because of the lower response rates for these data types.

b. *Monthly estimation and the matched sample* - CES uses a matched sample concept to produce estimates. A matched sample is defined to be all sample members that have reported data for the reference month and the month prior. National all employee estimates uses the weighted-link-relative formula for monthly estimates, while the difference-link-and-taper formula is used to calculate all other data types. Both formulas use data reported that meets the matched sample criteria.

c. *Annual CES benchmark* - CES realigns the monthly sample-based employment totals with the UI-based population counts (QCEW) for March of each year.

Following the revision of basic employment estimates, estimates for nonsupervisory employees are recomputed using the revised all-employee estimates and the previously computed sample ratios of these workers to all employees. All basic series of employment and hours are re-aggregated to obtain estimates for each sector and higher level of detail.

QCEW Overview

The QCEW consists of a monthly count of employment, quarterly counts of wage levels and business establishments, and covers more than 95 percent of U.S. jobs available at the county, Metropolitan Statistical Area (MSA), state, and national level, by detailed industry. The primary source for the QCEW is administrative data from state unemployment insurance (UI) programs. These data are supplemented by data from two BLS surveys: the Annual Refiling Survey and the Multiple Worksite Report. Before publication, BLS and state workforce agencies review and enhance the QCEW data, converting errors to correct values and confirming and annotating unusual movements.

An establishment is commonly understood as a single economic unit, such as a farm, a mine, a factory, or a store, that produces goods or services. Establishments are typically at one physical location and engaged in one, or predominantly one, type of economic activity for which a single industrial classification may be applied. An establishment is in contrast to a firm, or a company,

which is a business and may consist of one or more establishments, where each establishment may participate in a different predominant economic activity. The QCEW program uses NAICS classification for industry detail, Federal Information Processing Standards for geographic area codes, and the OMB for size classes. Establishments are asked to provide physical addresses for their business activities. The addresses are then converted into geocodes by the BLS Office of Technology and Survey Processing and are provided to the states to add to the data. The geocodes are entered into Geographic Information Software to create detailed maps of the locations of establishments and their economic and administrative attributes.

Scope and exclusions

QCEW monthly employment data represent the number of covered private-industry employees who worked during, or received pay for, the pay period that included the 12th day of the month. Covered private-industry employees include most corporate officials, all executives, all supervisory personnel, all professionals, all clerical workers, many farmworkers, all wage earners, all piece workers, and all part-time workers. Workers on paid sick leave, paid holiday, paid vacation, and similar are also covered. Workers on the payroll of more than one firm during the period are counted by each employer that is subject to UI, as long as those workers satisfy the preceding definition of employment.

QCEW excludes proprietors, the unincorporated self-employed, unpaid family members, certain farm and domestic workers exempted from having to report employment data, and railroad workers covered by the railroad unemployment insurance system. Excluded as well are workers who earned no wages during the entire applicable pay period because of work stoppages, temporary layoffs, illness, or unpaid vacations.

Primary sources for output

Census Bureau Data

BLS uses detailed revenue data from the Economic Census along with total sales from monthly, quarterly, and annual surveys to build our output measures. Samples for the Census monthly and quarterly indicator surveys, annual economic surveys, and quinquennial economic censuses are developed on the basis of the information contained in the Business Register (BR). For the sectors and industries referenced as potentially in-scope for a retail-related satellite account, BLS uses data from the following surveys:

- Annual Retail Trade Survey (ARTS)
- Monthly Retail Trade Survey (MRTS)
- Annual Wholesale Trade Survey (AWTS)
- Monthly Wholesale Trade Survey (MWTS)
- Services Annual Survey (SAS)
- Quarterly Services Survey (QSS)

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Economic Census

Every five years, the U.S. Census Bureau collects extensive statistics about businesses that are essential to understanding the American economy. This official count, better known as the Economic Census, serves as the foundation for the measurement of U.S. businesses and their economic impact. As part of the Census Bureau's mission to provide timely information on the health of the U.S. economy, this "business" census serves as the most extensive collection of data related to business activity. Nearly 4 million businesses, large, medium, and small, covering most industries and all geographic areas of the United States will receive surveys tailored to their primary business activity.

The Economic Census collects information from individual business establishments on physical location, type of business activity (industry), employment, payroll, and revenue by type of service or product. Economic Census statistics about industries, their inputs and outputs, and how they relate to each other, are available nowhere else. Census totals also serve as benchmarks to keep Census surveys accurate.

The Economic Census is also used to update the Census Bureau's master list of businesses. Without the Economic Census, the Census Bureau would miss vital information about changes in the ownership and organizational structure of American businesses and industries.

Business Register: The Census Economic Surveys Sample Frame

The Business Register is a listing of all legal business entities—incorporated businesses, partnerships, and sole proprietorships—operating in the United States and its territories (island areas) as identified by the U.S. Internal Revenue Service (IRS). It lists businesses that have paid employees (i.e., employer businesses), of which about 5 million have only one location and 160,000 have more than one location. It also lists non-employer businesses, of which there are about 25 million. In somewhat different words, it is the Census Bureau's master list of businesses.

The universe for the economic censuses comprises all non-employer and employer businesses in the register. For some of the annual surveys, both kinds of businesses are included (ARTS and AWTS), while for other surveys only employer businesses are included (SAS), which are far fewer in number but account for the bulk of economic activity. Two basic types of statistical units are included on the Business Register, establishment and enterprise:

1. An establishment is an economic unit, generally at a single physical location, where business is conducted or where services or industrial operations are performed. The intersection of a physical location and an Employer Identification Number (EIN) is the smallest discrete unit for employer businesses on the Business Register.
2. An enterprise (which is also called a business or a company) is an economic unit comprising one or more establishments under common ownership or control. An enterprise on the Business Register may comprise a single establishment, a U.S. parent

and its U.S.-based establishments (but excluding any establishments abroad), or a U.S. subsidiary of a foreign-owned company, together with any associated establishments that are physically located in the United States.

The standard unit for the collection of data in the economic censuses is an establishment. In contrast, in the majority of the annual business surveys, the standard unit for data collection is an enterprise.

Business Register: Input Data Sources

The Business Register combines data from multiple sources with the goal of providing comprehensive, accurate, and timely coverage of business units. Administrative records are the foundation of the Business Register. The primary data for identifying businesses come from the IRS, which provides information from its Business Master File (BMF), income tax returns, and quarterly payroll tax returns. The IRS provides updates to the Census Bureau for each of these types of records on a weekly basis. The BMF records are a source of information on name, address, and legal form of organization for all of the EIN entities of which the IRS is aware. Tax records provide information on revenues, assets, inventories, payroll, employment, and industry. EIN applications filed with the IRS and processed by the Social Security Administration are shared with the Census Bureau on a monthly basis and provide North American Industry Classification System (NAICS) codes for new businesses.

The Bureau of Labor Statistics (BLS) is another important source of industry information. Each quarter, the Census Bureau prepares a listing of unclassified or partially classified EINs to refer to the BLS for comparison with its business register. The BLS provides approximately 30 percent of industry codes for EINs that appear on the Census Bureau's list, mostly for small employers. In addition to providing data that would otherwise be missing, this operation helps to make the Census Bureau's register more consistent with the separate register used by BLS for its business surveys.

Over time, businesses may experience changes in their structure and in the nature of their activities. The Census Bureau's Business Register is updated continuously to provide a set of statistical units that are as complete and accurate as possible for use in conducting the economic censuses and surveys. The sources for these updates include not only income and payroll tax records from the IRS, but also data from two annual surveys that are conducted by the Census Bureau specifically for the purpose of updating the register and data from the quinquennial economic censuses—the Company Organization Survey (COS, formally the Report of Organization Survey) and the Business and Professional Classification Survey (known as SQ-CLASS).

Business Register: Frame Maintenance

A long-standing issue for the federal statistical system has been the fact that the economic and business surveys conducted by the Census Bureau and those conducted by the Bureau of Labor

Statistics rely on samples drawn from separate Business Registers, with different strengths and weaknesses (Fairman et al., 2008; Fixler and Landefeld, 2006). Because these registers rely on different underlying source data, the two lists often assign the same establishment to different industries or record the establishment with a different employment level. Employment by geographic area also differs between the two registers, reflecting in part the fact that the BLS collects more comprehensive information about the location of individual establishments through its Multiple Worksite Report than is obtained through the COS (Bureau of Labor Statistics, 2010). In an ideal world, the two agencies would be able to share their register information freely and, together, construct a combined register that reflects the strengths of both agencies' source data. Legal barriers currently prevent that ideal world.

Census Annual Surveys: ARTS, AWTS, and SAS Overviews

ARTS

The Annual Retail Trade Survey (ARTS), conducted since 1952, produces national estimates of total annual sales, e-commerce sales, sales taxes, end-of-year inventories, purchases, total operating expenses, gross margins, and end-of-year accounts receivable for retail businesses located in the United States. Additionally, in years ending in "2" and "7," the survey also generates detailed operating expenses estimates.

Firms without paid employees, or nonemployers, are included in the estimates through imputation or administrative data provided by other federal agencies. Estimates are released approximately 15 months after the reference year has concluded and are published at an industry level.

AWTS

The Annual Wholesale Trade Survey (AWTS), conducted since 1978, produces national estimates of total annual sales, e-commerce sales, end-of-year inventories, purchases, total operating expenses, gross margins, and commissions (for electronic markets, agents, and brokers) for wholesale businesses located in the United States. Additionally, in years ending in "2" and "7," the survey also generates detailed operating expenses estimates. Sales and revenue information reporting requirements vary by type of wholesale: merchant wholesalers (MW), manufacturers' sales branches and offices (MSBO), and agents, brokers, and electronic markets (AGBR).

SAS

The U.S. Census Bureau conducts the Service Annual Survey (SAS) to provide national estimates of annual revenues and expenses of establishments classified in select service sectors. The estimates are developed using data from a probability sample of firms located in the United States that have paid employees (i.e., employer firms). Consequently, published estimates only include data for employer firms. For some industries, firms without paid employees (i.e., nonemployers) may comprise a relatively large part of an industry. Because of the potential contribution to the industry totals from nonemployer firms, a separate table that provides total

revenue estimates for employers plus nonemployers is available. The sample is regularly updated to reflect the universe of employer service businesses and covers both taxable and tax-exempt firms.

Census Annual Surveys: Sample Selection

Among the eleven annual surveys, only two use establishment as the sampling unit. The other nine annual surveys use enterprises, including the three covered in this summary. ARTS, AWTS, and SAS use stratified simple random sampling (STSRS) to extract survey samples. STSRS selects units within a stratum at random until the desired sample size is obtained. The strata are defined by industry, industry by size, or more specialized characteristics, such as tax status. Size is defined by amount of sales in a previous year or the number of employees at a previous time.

Survey	Sampling Unit	Frame Size	Sample Size	% of Sample in Certainty Units	% of Sales Accounted for by Certainty Units
ARTS	Enterprise (company EIN) (employer and nonemployer)	1,082,500	16,000	Enterprises: 18%	58%
AWTS	Enterprise (company EIN) (employer and nonemployer)	315,000	8,700	Enterprises: 24% MSBOs: 63% Agents & brokers: 28%	Distributors: 52% MSBOs: 93% Agents & brokers: Not available
SAS	Enterprise (company EIN) (employer)	2,942,000	78,000	Enterprises: 25%	65%

Sample units are reselected for these annual surveys every 5-6 years. During the period for which the samples are used, updates are made on a quarterly basis to reflect changes in the business universe. These updates are designed to account for new businesses (births) and businesses that discontinue operations (deaths). The samples are also updated to reflect mergers, acquisitions, divestitures, splits, and other changes to the business universe.

Census updates the sample on a quarterly basis to represent EINs issued since the initial sample selection. These new EINs, called births, are EINs recently assigned by the Internal Revenue Service (IRS) that have an active payroll filing requirement on the IRS Business Master File (BMF). An active payroll filing requirement indicates that the EIN is required to file payroll for the next quarterly period. The Social Security Administration attempts to assign industry classification to each new EIN.

EINs with an active payroll filing requirement on the IRS BMF are said to be "BMF active," and EINs with an inactive payroll filing requirement are said to be "BMF inactive."

They sample EIN births on a quarterly basis using a two-phase selection procedure. To be eligible for selection, a birth must either have no industry classification or be classified in an industry within the scope ARTS, AWTS, or SAS, and it must meet certain criteria regarding its quarterly payroll.

Census Annual Surveys: Data Collection

Participation in the annual surveys is mandatory. Data items requested vary by form type and sector, but include annual sales or revenue, e-commerce sales, number of establishments covered by the report, and total operating expenses. Questionnaires are mailed each year and request data for the previous year.

Survey	Response Rate	Burden
ARTS	91.7%	39 minutes
AWTS	87.8%	31 minutes
SAS	74.9% - 95.1%	1-3 hours

Census Annual Surveys: Estimation Methods

Total estimates are computed using the Horvitz-Thompson estimator, i.e. the sum of weighted reported or imputed data, for all selected sampling units that meet the sample canvass and tabulation criteria. The weight for a given sampling unit is the reciprocal of its probability of selection into the reference survey sample. Sample estimates are benchmarked to the most recent Economic Census.

Firms without paid employees (nonemployers) are included in the ARTS and SAS estimates through administrative data provided by other Federal agencies and through imputation.

Census Annual Surveys: Imputation for Missing Data

The three annual surveys follow the same approach for the imputation of missing data as indicated below:

- simple imputation—single item (free form) or total with detail (balance complex);
- general imputation—using subset of administrative data for current year;
- substitution of sum of subannual (monthly, quarterly) data for the current year;
- multiplication of unit's prior period value by a ratio of current-to-prior period data, where the data item used in the ratio is assumed to be highly correlated with the data item of interest (e.g., inventory to sales);
- imputation of annual revenue from a regression model;
- multiplication of a unit's prior period value by a "ratio of identicals"; and
- raking of detailed items (reported or imputed) to their total.

Administrative data from the Business Register is used to compare or validate reported annual data and sometimes used in place of items that are missing or imputed for the company. Analysts use annual reports when available for some items for nonresponding companies. The corresponding monthly and quarterly surveys are also used for some missing data items.

Monthly Retail Trade Survey Overview

The MRTS provides current estimates of sales at retail and food services stores, e-commerce sales made by retailers, and inventories held by retail stores. The United States Code, Title 13, authorizes this survey and provides for voluntary responses.

A mail-out/mail-back survey of about 13,000 retail businesses with paid employees; supplemented by estimates for nonemployers, new employers, and missed employers obtained from benchmarking to the Annual Retail Trade Survey. The sample of retail firms is drawn from the Business Register which contains all Employer Identification Numbers (EINs) and listed establishment locations. Sales and inventories data are collected using one combined survey form.

Firms selected for the survey are first stratified by major kind of business and estimated sales. All firms with sales above applicable size cutoffs are selected into the survey with certainty (i.e., probability equal to one) and report for all their retail establishments. Approximately 2,500 of the 13,000 are selected with certainty. EINs are stratified by major kind of business and sales, and randomly selected from each stratum.

The sample is updated quarterly to reflect employer business "births" and "deaths"; adding new employer businesses identified in the Business and Professional Classification Survey and dropping firms and EINs when it is determined they are no longer active. There is about a 9-month delay before new firms are represented in the sample.

Monthly Wholesale Trade Survey Overview

The Monthly Wholesale Trade Survey, since 1936, provides month-to-month trends for sales and inventories of U.S. merchant wholesalers, excluding manufacturers' sales branches and offices (MSBOs). Companies provide estimates on monthly sales and end-of-month inventories. The sample consists of approximately 1,700 certainty companies and 2,500 noncertainty companies.

Estimates are released 5-6 weeks after the close of the data month, containing preliminary current month estimates and final data for the previous month. Statistics include: sales, inventories, and inventories/sales ratios along with standard errors. Estimates are both seasonally adjusted and unadjusted.

An annual benchmark report is released each spring. This report presents the results of the benchmarking operation that revises monthly sales and inventories estimates based on the Annual Wholesale Trade Survey. Estimates are both seasonally adjusted and unadjusted.

Quarterly Services Survey Overview

The Quarterly Services Survey (QSS) is the only source of service industry indicator performance providing timely estimates of revenue and expenses for selected service industries. Questionnaires are mailed to a probability sample of firms selected from the larger Service Annual Survey (SAS) sample. The sample includes firms of all sizes; however, firms without paid employees (nonemployers) are not included in the estimates. The survey form is due 14 days after the end of the reference period. A new sample is selected about every five to seven years. The QSS is released online, approximately every 75 days, after each calendar quarter.

The sample is updated quarterly to reflect births and deaths, adding new employer businesses identified in the Business and Professional Classification Survey, and deleting firms and EINs that are no longer active. During interim periods, service non-employers and businesses are represented by administrative records data or imputed values.

The first publication was released on September 13, 2004 and included data for the fourth quarter of 2003 and the first two quarters of 2004. In addition, each year, benchmark reports are released using the results of the latest Service Annual Survey (SAS).

Title 13 of the United States Code authorizes the Census Bureau to conduct the MRTS, MWTS, and QSS and provides for voluntary responses. They each carry a lower burden for respondents.

Survey	Response Rate	Burden
MRTS	67% to 72%	7 minutes
MWTS	65 to 68%	7 minutes
QSS	69 to 73%	10-15 minutes

Nonemployer Statistics

Nonemployer Statistics (NES) is an annual series that provides subnational economic data for businesses that have no paid employees and are subject to federal income tax. The data consist of the number of businesses and total receipts by industry. Most nonemployers are self-employed individuals operating unincorporated businesses (known as sole proprietorships), which may or may not be the owner's principal source of income.

The majority of all business establishments in the United States are nonemployers, yet these firms average less than 4 percent of all sales and receipts nationally. Due to their small economic impact, these firms are excluded from most other Census Bureau business statistics (the primary exception being the Survey of Business Owners).

Statistics are available on businesses that have no paid employment or payroll, are subject to federal income taxes, and have receipts of $1,000 or more ($1 or more for the Construction sector). The data are available for approximately 450 NAICS industries at the national, state, county, metropolitan statistical area, and combined statistical area geography levels. Data are also presented by Legal Form of Organization (LFO) as filed with the Internal Revenue Service (IRS).

NES data originate from statistical information obtained through business income tax records that the Internal Revenue Service (IRS) provides to the Census Bureau. The data are processed through various automated and analytical review to eliminate employers from the tabulation, correct and complete data items, remove anomalies, and validate geography coding and industry classification.

Remaining relevant sources

Employment and hours

Current Population Survey

The CPS is a monthly survey of households conducted by the Bureau of Census for the BLS. It provides a comprehensive body of data on the labor force, employment, unemployment, persons not in the labor force, hours of work, earnings, and other demographic and labor force characteristics. OPT estimates the ratio of nonproduction worker to production worker average weekly hours worked based CPS data. This is then multiplied by the CES measure of production worker average weekly hours paid. Hours worked of self-employed (SE) and unpaid family workers (UFW) is obtained from CPS and add to paid worker hours.

National Compensation Survey

NCS is an establishment-based survey that provides comprehensive measures of (1) employer costs for employee compensation, including wages and salaries, and benefits, (2) compensation trends, and (3) the incidence of employer-sponsored benefits among workers. The NCS also collects data and produces estimates on the provisions of selected employer-sponsored benefit plans. OPT multiplies paid worker hours by an industry-specific “hours worked to hours paid ratio” derived from NCS.

Estimates

OPT employs a handful of sources to break out employment and hours estimates for detail industries. These include the QCEW, ARTS, IRS, Census Nonemployer data, and County Business Patterns.

Alternate source

The Annual Survey of Public Employment and Payroll (APES) from the Census Bureau is used to include government employees in liquor stores (NAICS 445310).

Output

Consumer Price Index

The Consumer Price Index (CPI) is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services. The CPI research series (CPI-U-RS) presents an estimate of the CPI for all Urban Consumers (CPI-U) from 1978 to present that incorporates most of the improvements made over that time span into the entire series. The CPI-U-RS is the primary deflator source for retail trade industries sales.

Producer Price Index

The Producer Price Index (PPI) program measures the average change over time in the selling prices received by domestic producers for their output. The prices included in the PPI are from the first commercial transaction for many products and some services. The PPI is the primary deflator source for manufacturers' sales and branch offices sales, truck transportation, couriers and messengers, and warehousing.

Bureau of Economic Analysis

Annual data from BEA National Income and Product Accounts on implicit price deflators for manufacturing and trade sales are used to deflate merchant wholesale sales.

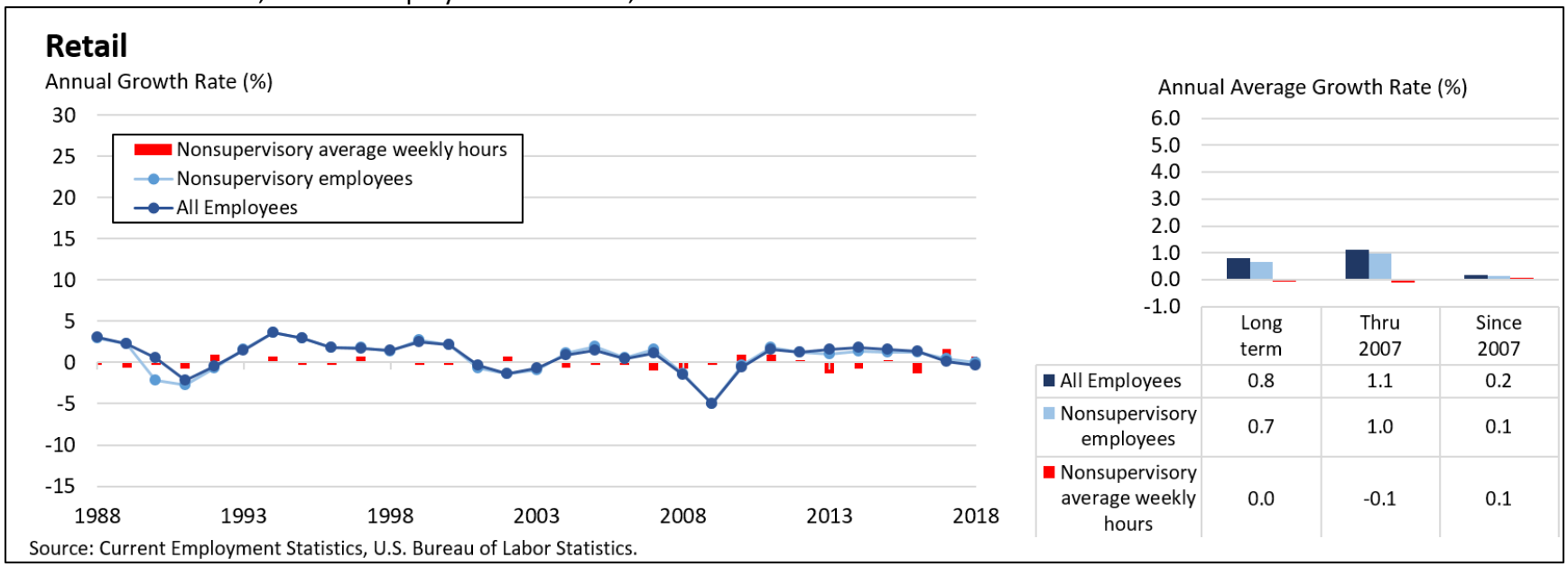
Issues for developing a satellite account for retail-related activities

Relevant trends in employment and productivity in retail-related industries

Employment

As the retail industry has shifted from traditional brick and mortar stores to online retailing, online retail enterprises can now be comprised of establishments where their primary business activity falls amongst supporting super-sectors, rather than solely retail. The below charts show trends of CES all employees, production and supervisory employees, and production and supervisory average weekly hours of retail, wholesale, and related auxiliary super-sectors.

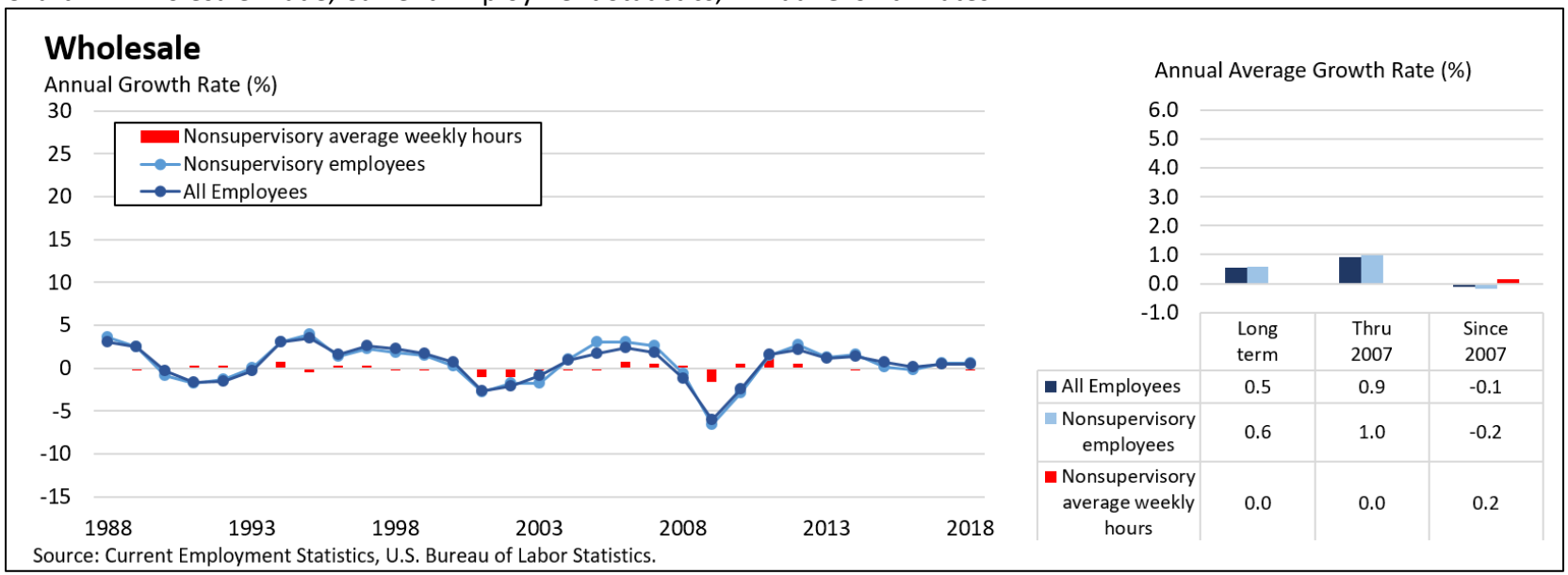
Chart 1 – Retail Trade, Current Employment Statistics, Annual Growth Rates



	Long term	Thru 2007	Since 2007
All Employees	0.8	1.1	0.2
Nonsupervisory employees	0.7	1.0	0.1
Nonsupervisory average weekly hours	0.0	-0.1	0.1

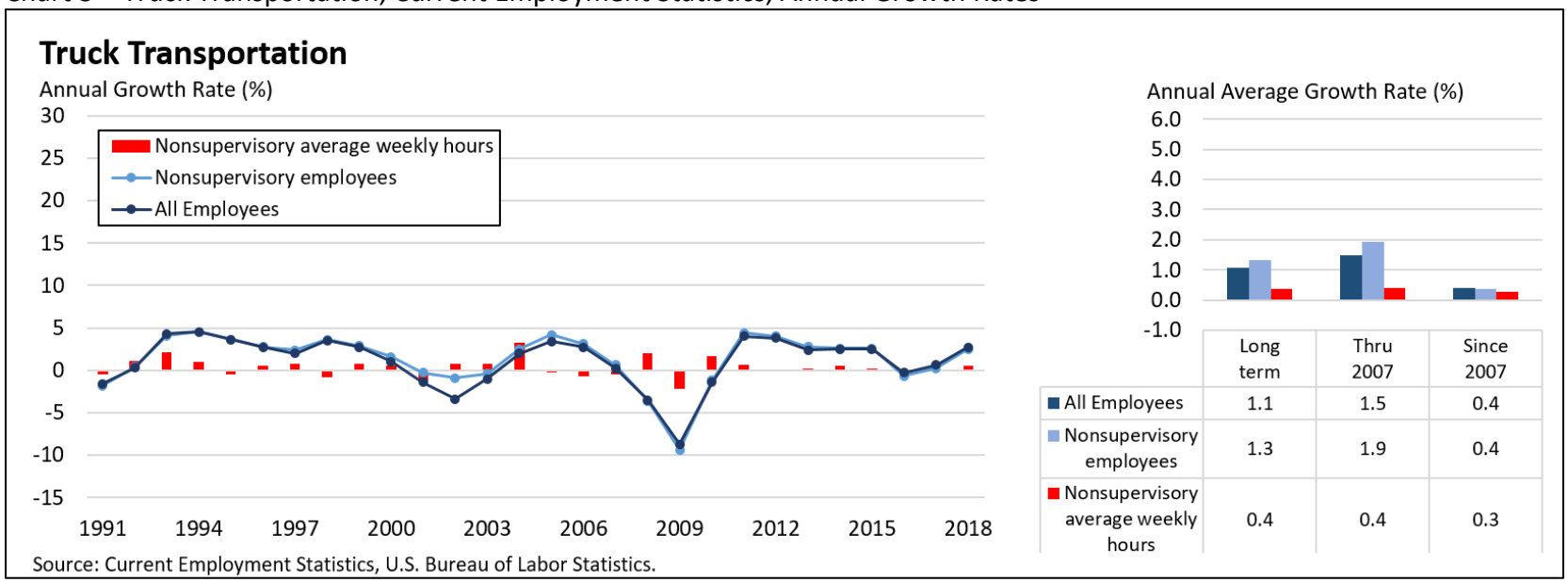
Source: Current Employment Statistics, U.S. Bureau of Labor Statistics.

Chart 2 – Wholesale Trade, Current Employment Statistics, Annual Growth Rates



Source: Current Employment Statistics, U.S. Bureau of Labor Statistics.

Chart 3 – Truck Transportation, Current Employment Statistics, Annual Growth Rates



Source: Current Employment Statistics, U.S. Bureau of Labor Statistics.

Chart 4 – Couriers and Messengers, Current Employment Statistics, Annual Growth Rates

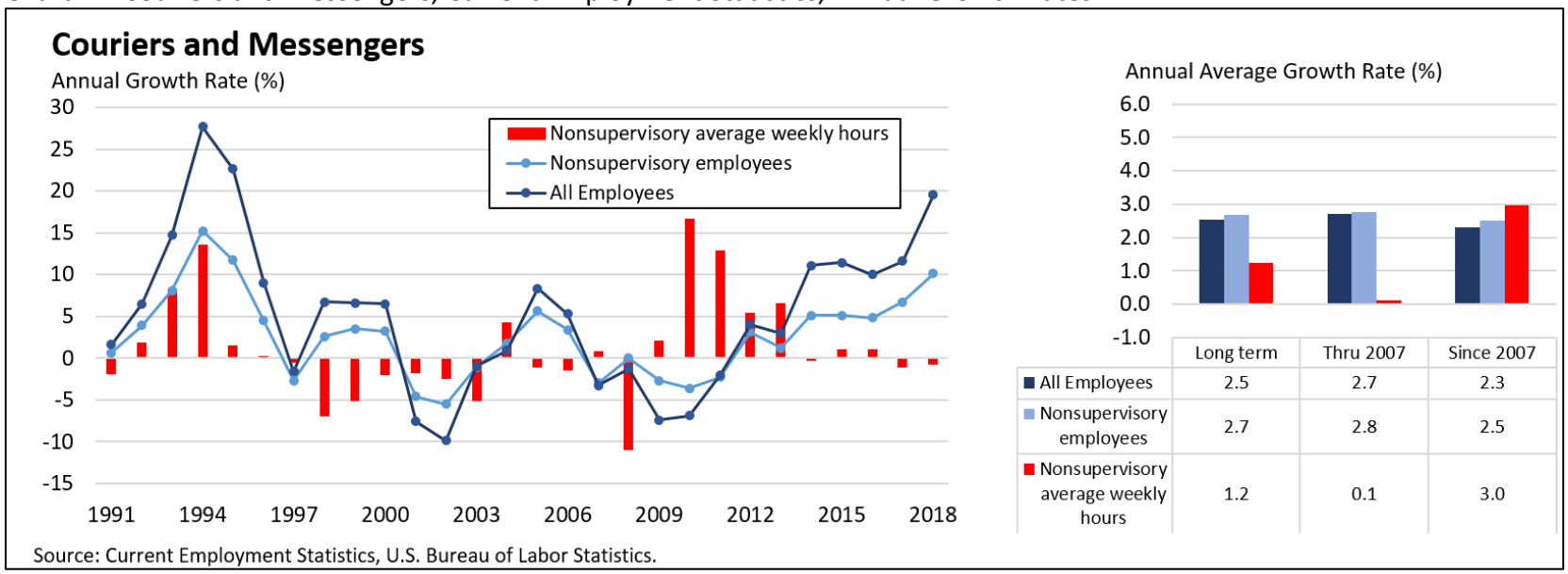
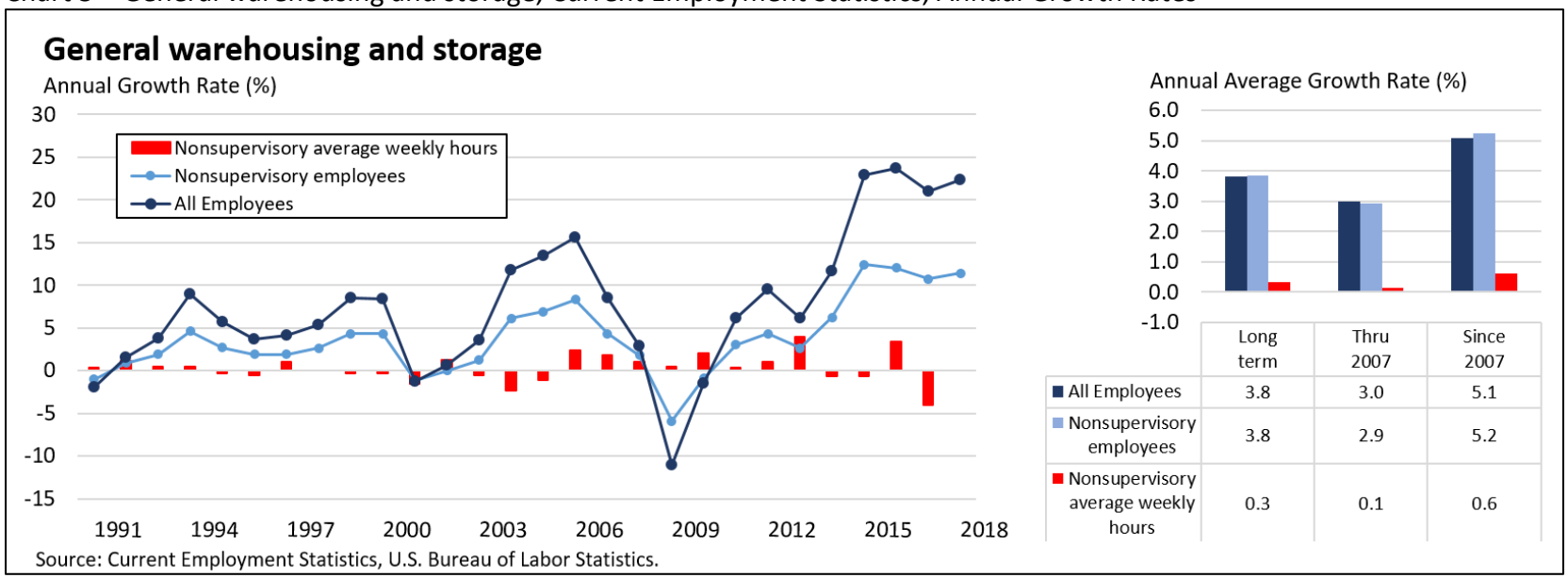


Chart 5 – General warehousing and storage, Current Employment Statistics, Annual Growth Rates



Productivity

Since 2007, the retail trade sector has experienced output growth but no increase in hours worked leading to 2.1% annual growth in labor productivity. Wholesale trade has similarly demonstrated 1.0% average annual growth in labor productivity as warehousing & storage and courier industries both show an annual average deceleration in labor productivity over this time period (-1.1% and -4.5%). The warehousing & storage industry has experienced a 4.2% growth in output combined with a 5.4% growth in hours worked over the 2007-2018 period. For couriers, the significant deceleration is coming from the combination of a 2.8% deceleration in output and a 1.8% increase in hours worked.

Chart 6 – Retail Trade, Output, Hours, and Productivity, Annual Growth Rates

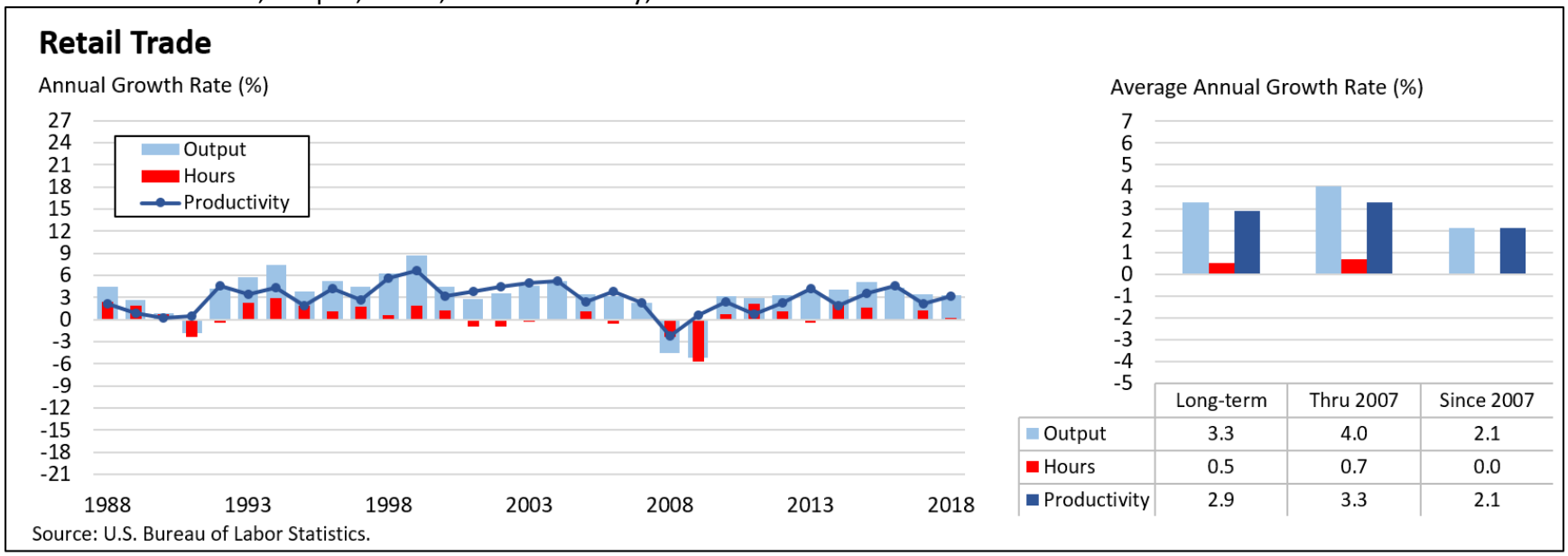


Chart 7 – Wholesale Trade, Output, Hours, and Productivity, Annual Growth Rates

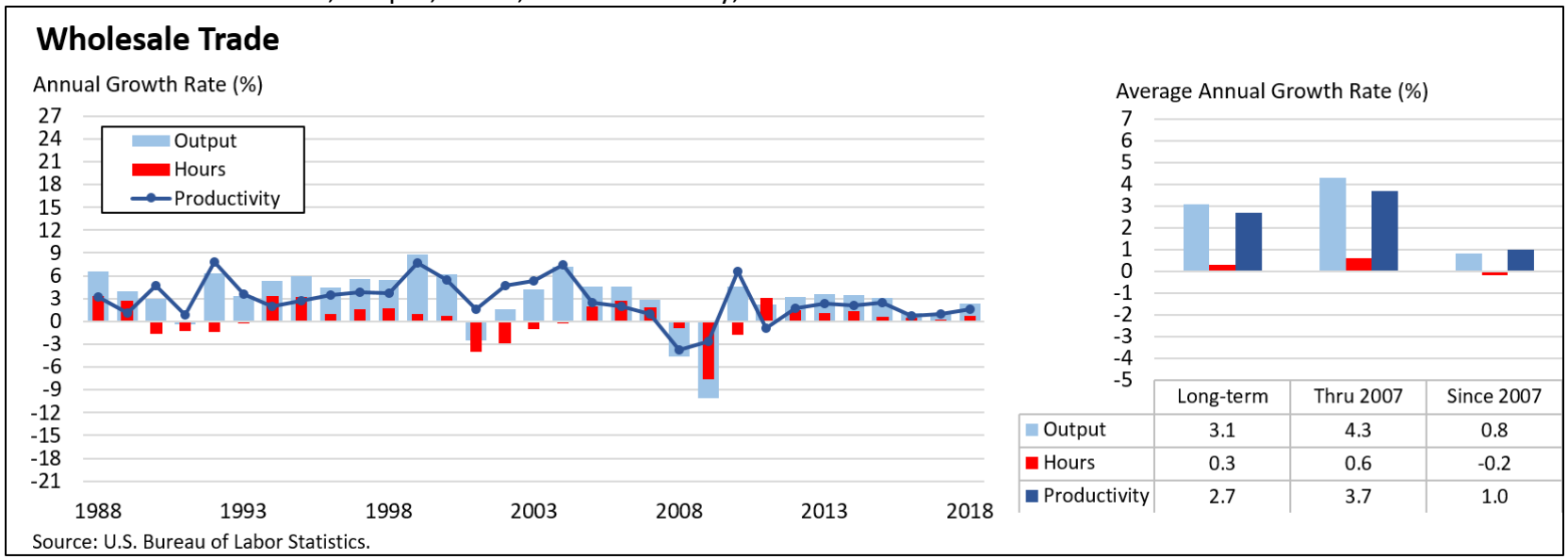


Chart 8 – Truck Transportation, Output, Hours, and Productivity, Annual Growth Rates

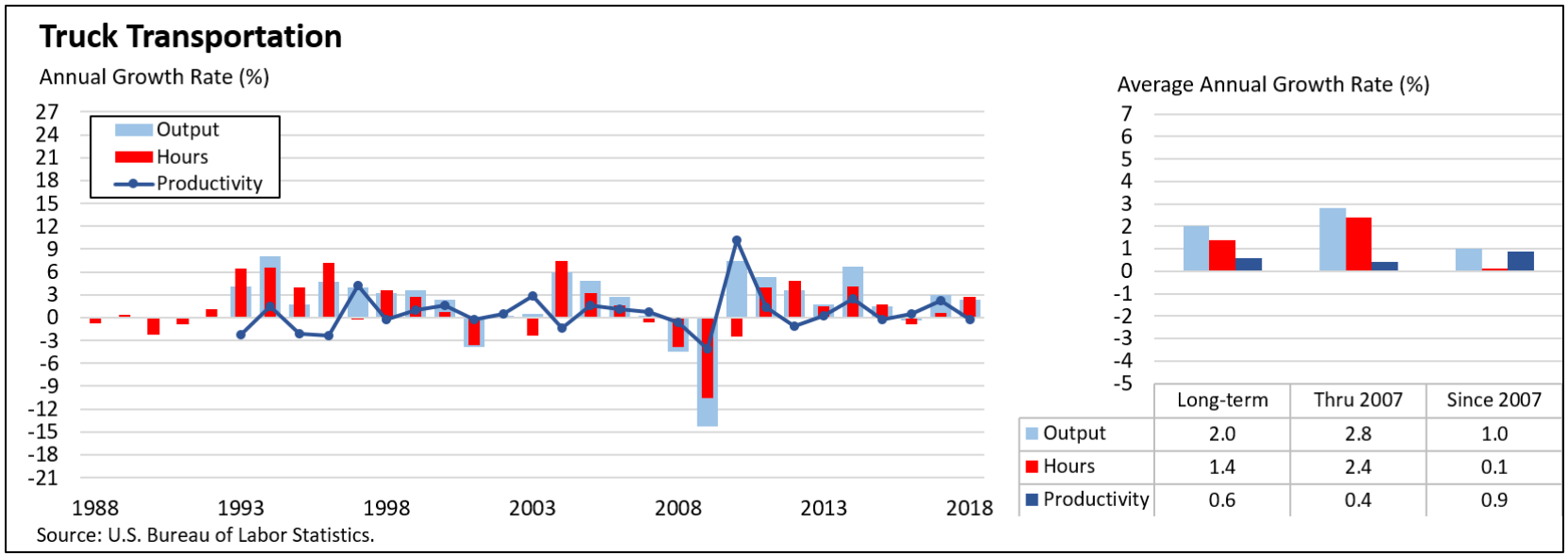


Chart 9 – Couriers and Messengers, Output, Hours, and Productivity, Annual Growth Rates

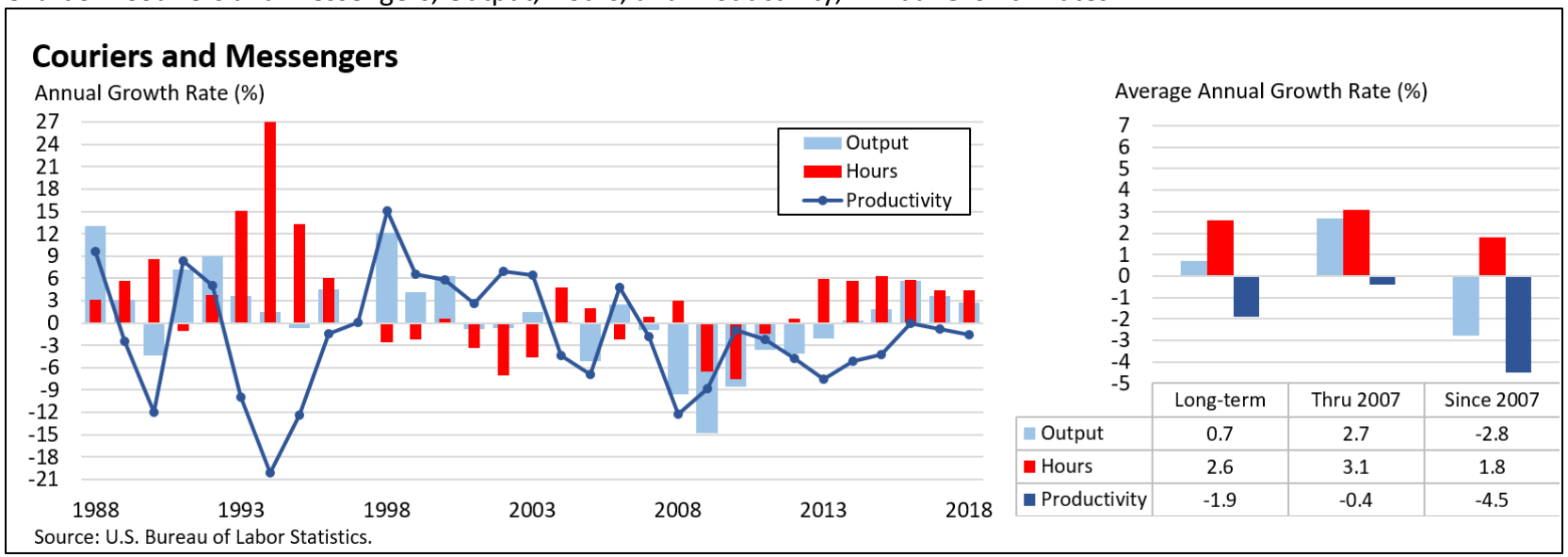
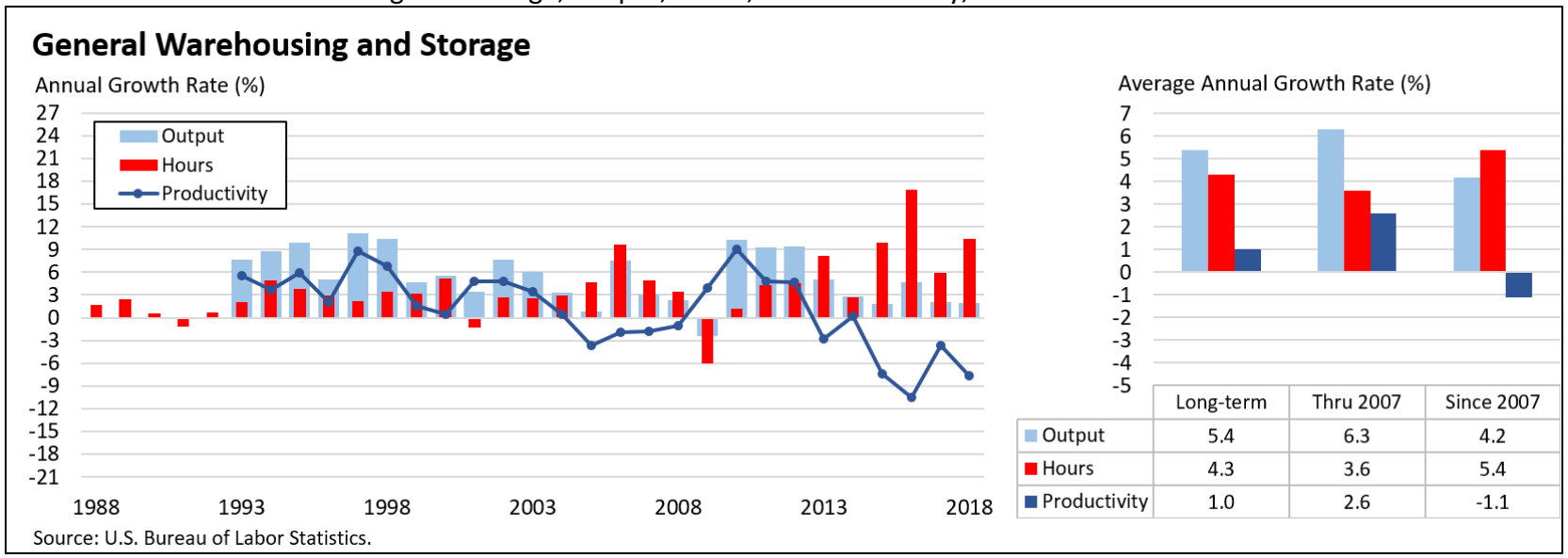


Chart 10 – General Warehousing and Storage, Output, Hours, and Productivity, Annual Growth Rates



As we look at the trends in employment, hours, and output across the sectors and industries depicted above, we notice relatively low annual rate changes for retail trade, wholesale trade, and truck transportation compared to the relatively high swings in warehousing and couriers. Trucking, warehousing, and couriers each play a role as auxiliaries in the distribution networks of retail trade and wholesale trade. An auxiliary is an establishment of an enterprise or company that exists solely to serve other establishments of the same enterprise.

We can see the influence of auxiliaries on the industries they serve by looking at the share of auxiliaries' establishments and employees serving other sectors. The following numbers from the 2012 Economic Census and Census of Auxiliaries provide a snapshot of this influence. Of the 529,489 employees working in warehousing, almost 98 percent worked in auxiliary establishments. And of that 98 percent, 74 percent are in support of retail trade.

Table 1 – Establishment and Employee counts in select industry groups, 2012

2012				
Industry	Establishments		Employees	
Wholesale	419,464		5,881,913	
Retail	1,062,083		14,703,529	
Auxiliary Industry	Establishments		Employees	
	Total	Aux	Total	Aux
Trucking and couriers	168,187	2,319	2,510,254	77,200
Industries Served				
Wholesale		575		D
Retail		369		D
Transportation and warehousing		265		4,812
Auxiliary Industry	Establishments		Employees	
	Total	Aux	Total	Aux
Warehousing	14,448	6,077	529,489	518,294
Industries Served				
Wholesale		1,080		50,051
Retail		2,927		383,618
Transportation and warehousing		95		6,673

What we don't know is how the share of work in the supporting industries to retail or wholesale has changed over time. It would be interesting to see the trends as that may aid the analysis for the creation of a retail-related satellite account.

Measuring retail-related activities

The Office of Productivity and Technology asked our primary data sources two questions:

1. Can OEUS and Census identify the portion of hours and output among auxiliary or wholesale companies that support retail trade firms or enterprises?

   OEUS
   No. BLS assigns industry to businesses according to the North American Industry Classification System (NAICS) at the worksite level, and does not have a list of units in other industries that support retail trade worksites.

   Census
   There is nothing on the monthly/quarterly surveys that we capture at enough detail to produce statistics on the sector they [auxiliary or wholesale companies] support. We would need an identifier (from the BR?) to indicate this information, and we would need to control the sample to ensure representation.

   There could be things from the Economic Census that might help. There is class of customer information that shows the buyers, but I don't believe that's exactly what BLS is asking for here. In the past, I believe auxiliaries used to capture the sector they supported, but I don't know if they still do.

2. If there are obstacles, what suggestions can OEUS and Census provide?

   OEUS
   BLS does have a firm identifier on its business register (the federal EIN). However, even using EIN to identify auxiliary support units does not answer this question. A firm may, for example, be predominately retail, and have a warehouse with the same EIN. However, the company may find tax advantages to having a separate EIN for the warehouse. This does not strike CES as the best way to identify “retail related” worksites or support outside the retail trade industry; it only captures a fraction of the retail related support.

   With sufficient funding, each of the 10 million establishments could be asked periodically, perhaps as part of the BLS’ Annual Refiling Survey, to indicate the share of their business activity that supports each of the major industry sectors plus direct support to the public.

   A model, and clearly defined model inputs (preferably that come from reliable federal sources), that identifies the share of each industry sector that supports retail trade seems to be one likely lower-cost solution for this measurement challenge.

Census

For the annual surveys, there is nothing we collect to capture these support activities. Part of the Economic Census we produce Class of Customer estimates but that may not be useful. In addition, we do have enterprise support statistics for select services industries (Sectors 48-49; 51, 54, 55, 56, 81) that have auxiliaries that may be of use. The most recent data is from the 2012 Economic Census, the 2017 data is not available as of yet.

Below is a link to the 2012 data for sector 81 as an example:
https://data.census.gov/cedsci/table?q=enterprise%20support&tid=ECNENTSUP2012.EC1281SXSB5&vintage=2012

Appendix A: Technical Documentation

Productivity	
Labor Productivity Overview	https://www.bls.gov/lpc/lpcover.htm
Industry Productivity Handbook of Methods	https://www.bls.gov/opub/hom/inp/home.htm

Current Employment Statistics	
Technical Note	https://www.bls.gov/web/empsit/cestn.htm
Handbook of Methods	https://www.bls.gov/opub/hom/pdf/ces-20110307.pdf
Industry Classification Overview	https://www.bls.gov/ces/naics/home.htm
Data Collection Forms	http://www.bls.gov/ces/idcfcesforms.htm

Quarterly Census of Employment and Wages	
Overview	https://www.bls.gov/cew/overview.htm
Handbook of Methods	https://www.bls.gov/opub/hom/cew/home.htm
Industry Classification Overview	https://www.bls.gov/cew/classifications/industry/home.htm

National Compensation Survey	
Handbook of Methods	https://www.bls.gov/opub/hom/ncs/home.htm

Consumer Price Index	
Overview	https://www.bls.gov/cpi/overview.htm
Handbook of Methods	https://www.bls.gov/opub/hom/pdf/cpihom.pdf
Research Series	https://www.bls.gov/cpi/research-series/home.htm

Producer Price Index	
Overview	https://www.bls.gov/ppi/ppiover.htm
Handbook of Methods	https://www.bls.gov/opub/hom/pdf/ppi-20111028.pdf

Office of Survey Methods Research	
BLS Survey Response Rates	https://www.bls.gov/osmr/response-rates/

Economic Census	
Methodology	https://www.census.gov/programs-surveys/economic-census/technical-documentation/methodology.html
Survey Forms	https://bhs.econ.census.gov/ombpdfs/

Annual Retail Trade Survey	
Methodology	https://www.census.gov/programs-surveys/arts/technical-documentation/methodology.html
Survey Forms	https://www.census.gov/programs-surveys/arts/technical-documentation/questionnaires.html

Monthly Retail Trade Survey	
Methodology	https://www.census.gov/retail/mrts/how_surveys_are_collected.html
Survey Forms	https://www.census.gov/retail/mrts/get_forms.html

Annual Wholesale Trade Survey	
Methodology	https://www.census.gov/programs-surveys/awts/technical-documentation/methodology.html
Survey Forms	https://www.census.gov/programs-surveys/awts/technical-documentation/questionnaires.html

Monthly Wholesale Trade Survey	
Methodology	https://www.census.gov/wholesale/www/how_surveys_are_collected/monthly_methodology.html
Survey Forms	https://www.census.gov/wholesale/www/get_forms/monthly_forms.html

Service Annual Survey	
Methodology	https://www.census.gov/programs-surveys/sas/technical-documentation/methodology.html
Survey Forms	https://www.census.gov/programs-surveys/sas/technical-documentation/questionnaire-app.html

Quarterly Services Survey	
Methodology	https://www.census.gov/services/qss/about_the_surveys.html
Survey Forms	https://www.census.gov/services/qss/get_forms.html

OECD	
Measuring Productivity	http://www.oecd.org/sdd/productivity-stats/2352458.pdf

Appendix B: Related Publications

US Government Agencies

BLS	
Labor productivity in retail trade, '87-'99	https://www.bls.gov/opub/mlr/2001/12/art1full.pdf
Alternative output measurement for the U.S. retail trade sector	https://www.bls.gov/opub/mlr/2005/07/art4full.pdf
Productivity measures for retail trade: data and issues	https://www.bls.gov/opub/mlr/2005/07/art3full.pdf
Federal Reserve	
Productivity Growth and Retail Trade (2004)	https://www.frbsf.org/economic-research/publications/economic-letter/2004/december/productivity-growth-and-the-retail-sector/
NBER	
Foster, L., Haltiwanger, J., and Krizan, C. J. (2006), Market Selection, Reallocation, and Restructuring in the U.S. Retail Trade Sector in the 1990s, The Review of Economics and Statistics, 88(4), 748-758	https://www.jstor.org/stable/40043032
BEA	
Distributed Services in the U.S. Economic Accounts by Robert E. Yuskavage (2006)	https://www.bea.gov/system/files/papers/P2006-5.pdf

Academic

Handbook on the Economics of Retailing and Distribution	*Part 1 Development* 1: The evolution of national retail chains 2: The evolution of technology in retail 3: Retail productivity 4: Distribution services

Industry Perspectives

National Retail Federation	
If you want to measure retail employment, don't look to monthly BLS employment figures (2019)	https://nrf.com/blog/if-you-want-measure-retail-employment-dont-look-monthly-bls-employment-figures
Data Dilemma: How Government Data Tells an Incomplete Story About Retail	https://cdn.nrf.com/sites/default/files/2019-05/BLS%20Data%20Dilemma.pdf

Newspapers

New York Times	
How the Growth of E-Commerce Is Shifting Retail Jobs	https://www.nytimes.com/interactive/2017/07/06/business/ecommerce-retail-jobs.html
E-Commerce as a Jobs Engine? One Economist's Unorthodox View	https://www.nytimes.com/2017/07/10/business/dealbook/e-commerce-jobs-retailing.html
As Amazon Moves In, Demand for Warehouse Space Climbs	https://www.nytimes.com/2017/10/24/business/amazon-ecommerce-warehouse-demand.html
Washington Post	
The retail apocalypse was worse than we thought, but there's a silver lining	https://www.washingtonpost.com/us-policy/2019/02/06/retail-apocalypse-was-worse-than-we-thought-theres-silver-lining/

Websites

Retail Trade Industry Spotlight | SelectUSA.gov	https://www.selectusa.gov/retail-services-industry-united-states
BLS Industries at a Glance	
Retail Trade	https://www.bls.gov/iag/tgs/iag44-45.htm
Wholesale Trade	https://www.bls.gov/iag/tgs/iag42.htm
Truck Transportation	https://www.bls.gov/iag/tgs/iag484.htm
Couriers and Messengers	https://www.bls.gov/iag/tgs/iag492.htm
Warehousing and Storage	https://www.bls.gov/iag/tgs/iag493.htm
Why Retail Productivity is Being Undermeasured, and Why Ecommerce Jobs are Rising	https://www.progressivepolicy.org/blog/retail-productivity-undermeasured-ecommerce-jobs-rising/
Indeed Retail Jobs Tracker: Retail's Steady Decline Continues	https://www.hiringlab.org/2019/07/18/retail-jobs-tracker-q2-2019/

Podcasts and Videos

Tech's Convenience Store (Amazon)	https://www.npr.org/2019/09/05/758088293/techs-convenience-store
Physical Stores are Back Again	https://www.npr.org/2019/09/17/761705581/physical-stores-are-back-again
Retail Sales Up, Retail Stores Down	https://www.marketplace.org/2019/07/16/retail-sales-up-retail-stores-down/
The Decade in Retail	https://www.marketplace.org/2019/12/24/the-decade-in-retail/
Business Insider: Redefining Retail	https://www.youtube.com/watch?v=Rqn5c3XrOto

Appendix C: Glossary of Terms

Annual Wholesale Trade Survey (AWTS) – Provides detailed industry measures of sales and inventories for wholesale trade activities.

Annual Retail Trade Survey (ARTS) – Provides detailed industry measures of sales and inventories for retail trade activities.

Auxiliary – An establishment of an enterprise or company that exists solely to serve other establishments of the same enterprise.

Census-period – The five-year period between census-years.

Census-year – Year in which the Census Bureau conducts their economic census; occurs every 5 years.

Current Employment Statistics (CES) – The Current Employment Statistics program conducts a monthly survey of about 150,000 businesses and government agencies, representing approximately 390,000 individual worksites, that provides detailed industry data on employment, hours, and earnings of workers on nonfarm payrolls.

Consumer Price Index (CPI) – Consumer Price Index is a monthly measure of changes in the prices paid by urban consumers for a representative basket of goods and services.

Current Population Survey (CPS) – The Current Population Survey is a monthly survey of about 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics.

Durable good – Durable goods are new or used items generally with a normal life expectancy of three years or more. Durable goods merchant wholesale trade establishments are engaged in wholesaling products, such as motor vehicles, furniture, construction materials, machinery and equipment (including household-type appliances), metals and minerals (except petroleum), sporting goods, toys and hobby goods, recyclable materials, and parts.

Establishment – The physical location of a certain economic activity—for example, a factory, mine, store, or office. A single establishment generally produces a single good or provides a single service. An enterprise (a private firm, government, or nonprofit organization) can consist of a single establishment or multiple establishments. All establishments in an enterprise may be classified in one industry (e.g., a chain), or they may be classified in different industries (e.g., a conglomerate).

Firm – A business organization or entity consisting of one domestic establishment (location) or more under common ownership or control. All establishments of subsidiary firms are included as part of the owning or controlling firm.

Industry – Producing units that use the same or similar production processes are grouped together in the North American Industry Classification System (NAICS). Industries are the most detailed groupings of economic activities in NAICS. For example, all establishments that manufacture automobiles are in the same industry. A given industry, or even a particular establishment in that industry, might have employees in dozens of occupations.

Labor Productivity – Labor productivity is a measure that represents the amount of goods and services that can be produced relative to the amount of labor service used. Labor productivity measures the rate at which labor is used to produce output of goods and services, typically expressed as output per hour of labor.

Merchandise Line Sales (MLS) – The sales totals collected in the Economic Census for major categories of merchandise sold for establishments. These would eventually be called Product Line Sales. For the 2017 Economic Census, produce line sales will be replaced by the North American Product Classification System (NAPCS).

Monthly Retail Trade Survey (MRTS) – The Monthly Retail Trade Survey provides current estimates of sales at retail and food services stores and inventories held by retail stores. This survey covers retail companies with one or more establishments that sell merchandise and related services to final consumers. Retail firms provide data on dollar value of retail sales and sales for selected establishments; some firms also provide data on value of end-of-month inventories.

Monthly Wholesale Trade Report (MWTR) – The Monthly Wholesale Trade Report tracks Month-to-month trends for sales and inventories of U.S. distributors, jobbers, drop shippers, and import/export merchants, excluding manufacturers' sales branches or offices (MSBOs).

Manufactures Sales and Branch Office (MSBO) – Also included as wholesale merchants are sales offices and sales branches (but not retail stores) maintained by manufacturing, refining, or mining enterprises apart from their plants or mines for the purpose of marketing their products and group purchasing organizations (e.g., purchasing and selling goods on their own account).

Multifactor productivity – Multifactor productivity is a measure that represents the amount of goods and services that can be produced relative to the amount of various measured inputs such as labor, capital, and intermediate purchases that are consumed or used to produce those goods and services.

North American Industry Classification System (NAICS) – The standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

North American Product Classification System (NAPCS) – A comprehensive, market- or demand-based, hierarchical classification system for products (goods and services) effective with the 2017 Economic Census.

Nondurable good – Nondurable goods are items generally with a normal life expectancy of less than three years. Nondurable goods merchant wholesale trade establishments are engaged in wholesaling products, such as paper and paper products, chemicals and chemical products, drugs, textiles and textile products, apparel, footwear, groceries, farm products, petroleum and petroleum products, alcoholic beverages, books, magazines, newspapers, flowers and nursery stock, and tobacco products.

Nonemployer – A nonemployer business is one that has no paid employees, has annual business receipts of $1,000 or more ($1 or more in the construction industries), and is subject to federal income taxes. Most nonemployers are self-employed individuals operating very small unincorporated businesses, which may or may not be the owner's principal source of income.

Producer Price Index (PPI) – The Producer Price Index measures the average change over time in the selling prices received by domestic producers for their output. The prices included in the PPI are from the first commercial transaction for many products and some services.

Quarterly Census of Employment and Wages (QCEW) – The Quarterly Census of Employment and Wages program publishes a quarterly count of employment and wages reported by employers covering 98 percent of U.S. jobs, available at the county, MSA, state and national levels by industry.

Research Series Consumer Price Index (RS-CPI) – The Consumer Price Index research series using current methods presents an estimate of the CPI for all Urban Consumers (CPI-U) from 1978 to present that incorporates most of the improvements made over that time span into the entire series.

Service Annual Survey (SAS) – Service Annual Survey is a survey conducted by the Census Bureau to provide national estimates of annual revenues and expenses of establishments classified in select service sectors.

Sector – NAICS divides the economy into 20 broad sectors. Industries within these sectors are grouped according to the production criterion.

Sectoral Output – The difference between the total of output that has been adjusted for changes in inventory (gross output) and the subtotal of goods and services shipped among related establishments, which are referred to as intra-industry and intra-sectoral shipments.

Tornqvist index – The Tornqvist index belongs to a class of "superlative" indexes and is calculated by using a weighted geometric mean of growth rates.

Appendix D: Outside Concerns

1. What types of questions or concerns have been expressed to Census and OEUS with respect to retail-related activities and industries? (e.g. NAICS, coverage)

   Census
   For NAICS, current industry classifications for retail stores (across all Sector 44-45 subsectors except 454) vs. e-commerce/electronic shopping (in Industry 45411, Electronic Shopping and Mail-Order Houses) are problematic, given the mix of in-store sales, e-commerce sales, and intermediation activities (orders placed online and picked up at a store location or locker, orders placed online at a store location, orders placed and/or fulfilled through intermediaries). Establishment-based surveys are able to apply appropriate industry classification rules to ensure that only establishments with 100% e-commerce are in Industry 45411, but, barring other data inquiries, data users have no means to determine broader e-commerce sales for the Retail Trade sector as a whole.

   OEUS
   The concern that current employment measures don't fully reflect the scale of retail employment, or the direction of its growth. This article highlights concerns of the National Retail Federation: https://nrf.com/blog/if-you-want-measure-retail-employment-dont-look-monthly-bls-employment-figures.

2. How have they been addressed? What answers do we have?

   Census
   This issue is a topic that the Economic Classification Policy Committee (ECPC) recommended to the Office of Management and Budget for public comment in the upcoming 2022 NAICS revision process through the Federal Register. It is also a topic under review internationally through the Technical Subgroup on the International Standard Industrial Classification (TSG-ISIC). Both of these reviews are just beginning and will play out over the next 6-12 months before final decisions are announced.

   Both the Annual and Monthly Retail Trade programs have worked extensively with retail trade groups and the retailers themselves to determine the type of data the industry desires. As a result, both programs introduced new data products to help provide insights for our data users. Specifically, we have produced an annual breakout within NAICS 4541 that provides an aggregated view of data in this industry based on the primary activity of the business and an experimental quarterly data product which provides aggregated e-commerce estimates from both the e-commerce fulfilled from the stores and from websites. Links to the two tables can be found below.

- Annual Table: https://www.census.gov/data/tables/2017/econ/arts/supplemental-ecommerce.html
- Experimental Quarterly Table: https://www.census.gov/retail/index.html#ecommerce

OEUS

- The main answer is that BLS classifies establishments based on primary function, following NAICS principles.
- Several years ago BLS participated in discussions with Retail Trade Federation and their contractor, as they worked to develop a measure of employment based on a broader SIC-like definition (i.e. primary function of firm with establishments supporting primary function) rather than a worksite definition of industry, using Dunn & Bradstreet data.
- Ken Robertson developed research data for an article [currently in editing with the MLR, slated for an April publication] which applies a firm-based SIC-like coding to the LDB, and then selects from those data interesting industries to highlight, one of which is retail trade. A PowerPoint slide deck highlighting the main points can be made available on request.