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**Article**

## Trends in factor shares: Facts and implications

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systematically benefit firstborns and help explain their generally better outcomes.

## Conclusion

In the past two decades, with the increased accessibility of administrative datasets on large swaths of the population, economists and other researchers have been better able to identify the role of birth order in the outcomes of children. There is strong evidence of substantial differences by birth order across a range of outcomes. While I have described several of my own papers on the topic, a number of other researchers have also taken advantage of newly available datasets in Florida and Denmark to examine the role of birth order on other important outcomes, specifically juvenile delinquency and later criminal behavior.<sup>13</sup> Consistent with the work discussed here, later-born children experience higher rates of delinquency and criminal behavior; this is at least partly attributable to time investments of parents.

<sup>1</sup> G. Becker, "An Economic Analysis of Fertility," in *Demographic and Economic Change in Developed Countries*, New York, Columbia University Press, 1960, pp. 209–40; G. Becker and H. Lewis, "Interaction Between Quantity and Quality of Children," in *Economics of the Family: Marriage, Children, and Human Capital*, 1974, pp. 81–90; G. Becker and N. Tomes, "Child Endowments, and the Quantity and Quality of Children," NBER Working Paper No. 123, February 1976.

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<sup>2</sup> S. Black, P. Devereux, and K. Salvanes, "The More the Merrier? The Effect of Family Composition on Children's Education" NBER Working Paper No. 10720, September 2004, and *Quarterly Journal of Economics*, 120(2), 2005, pp. 669–700.

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<sup>3</sup> S. Black, P. Devereux, and K. Salvanes, "Older and Wiser? Birth Order and the IQ of Young Men," NBER Working Paper No. 13237, July 2007, and *CESifo Economic Studies*, Oxford University Press, vol. 57(1), pages 103–20, March 2011.

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<sup>4</sup> J. Rodgers, H. Cleveland, E. van den Oord, and D. Rowe, "Resolving the Debate Over Birth Order, Family Size, and Intelligence," *American Psychologist*, 55(6), 2000, pp. 599–612.

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<sup>5</sup> S. Black, E. Gronqvist, and B. Ockert, "Born to Lead? The Effect of Birth Order on Non-Cognitive Abilities," NBER Working Paper No. 23393, May 2017.

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<sup>6</sup> L. Borghans, A. Duckworth, J. Heckman, and B. ter Weel, "The Economics and Psychology of Personality Traits," *Journal of Human Resources*, 43, 2008, pp. 972–1059.

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<sup>7</sup> S. Black, P. Devereux, K. Salvanes, "Healthy (?), Wealthy, and Wise: Birth Order and Adult Health," NBER Working Paper No. 21337, July 2015.

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<sup>8</sup> L. Argys, D. Rees, S. Averett, and B. Witoonchart, "Birth Order and Risky

Adolescent Behavior," *Economic Inquiry*, 44(2), 2006, pp. 215–33.

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<sup>9</sup> F. Cunha and J. Heckman, "The Technology of Skill Formation," NBER Working Paper No. 12840, January 2007.

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<sup>10</sup> R. Zajonc and G. Markus, "Birth Order and Intellectual Development," *Psychological Review*, 82(1), 1975, pp. 74–88; R. Zajonc, "Family Configuration and Intelligence," *Science*, 192(4236), 1976, pp. 227–36; J. Price, "Parent-Child Quality Time: Does Birth Order Matter?" in *Journal of Human Resources*, 43(1), 2008, pp. 240–65; J. Lehmann, A. Nuevo-Chiquero, and M. Vidal-Fernandez, "The Early Origins of Birth Order Differences in Children's Outcomes and Parental Behavior," forthcoming in *Journal of Human Resources*.

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<sup>11</sup> V. Hotz and J. Pantano, "Strategic Parenting, Birth Order, and School Performance," NBER Working Paper No. 19542, October 2013, and *Journal of Population Economics*, 28(4), 2015, pp. 911–936.

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<sup>12</sup> F. Sulloway, *Born to Rebel: Birth Order, Family Dynamics, and Creative Lives*, New York, Pantheon Books, 1996.

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<sup>13</sup> S. Breining, J. Doyle, D. Figlio, K. Karbownik, J. Roth, "Birth Order and Delinquency: Evidence from Denmark and Florida," NBER Working Paper No. 23038, January 2017.

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Loukas Karabarounis is an associate professor of economics at the University of Minnesota. He is also a research consultant at the Federal Reserve Bank of Minneapolis and a research associate in the NBER's Economic Fluctuations and Growth Program and International Finance and Macroeconomics Program. He serves as a member of the board of editors of the *American Economic Review* and as an associate editor of the *Journal of Monetary Economics*. Prior to joining the University of Minnesota, he was an associate professor of economics at the University of Chicago's Booth School of Business. He has served as a senior research economist at the Federal Reserve Bank of Minneapolis.

Karabarounis's research interests are in macroeconomics, labor economics, and international finance. His latest research focuses on topics such as the global decline in labor's share of income, productivity and capital flows in southern Europe, cyclical and dispersion in labor market outcomes, and the effects of unemployment insurance policy on macroeconomic outcomes. He is a recipient of the 2016 Sloan Research Fellowship, awarded by the Alfred P. Sloan Foundation. He received his Ph.D. in Economics from Harvard University and an undergraduate degree from the Athens University of Economics and Business.

## Trends in Factor Shares: Facts and Implications

Loukas Karabarounis and Brent Neiman

The distribution of national income between capital and labor and the determinants of that split are important for many reasons. The evolution of factor shares over time affects income inequality across households. Changes in factor shares inform economists' assumptions about aggregate production technologies and their understanding of the state of product and labor markets. The behavior of factor shares influences conclusions about the implications of progress in computing, robotics, and information technologies, the response and incidence of changes in tax policies, and the dynamics of markups and competition.

For many decades, the assumed stability of factor shares — one of the "stylized facts" about growth codified by Nicholas Kaldor in 1961 — meant that the modern macroeconomics literature paid little attention to trends in the functional distribution of income.<sup>1</sup> Measurement challenges and the absence of long time series for more than a small set of countries likely also played a role in dampening economists' interest in the evolution of factor shares over time.<sup>2</sup>

### The Global Decline of the Labor Share

Our work builds on a dataset that we collected from national income and product accounts for many countries and industries. We demonstrate that, at the global level, the labor share has been declining since the early 1980s.<sup>3</sup> The decline has been broad-based. As shown in Figure 1, it occurred in seven of the eight largest economies of the world. It occurred in all Scandinavian countries, where labor unions have traditionally been strong. It occurred in emerging markets such as China, India, and Mexico that have opened up to international trade and received outsourcing from developed countries such as the United States.

Where available, we use the labor share of income in the corporate sector as our preferred measure of the labor share, as it excludes many unincorporated enterprises and sole proprietors whose income is difficult to split between labor and capital. Further, our measure is not influenced by the government sector, which lacks market

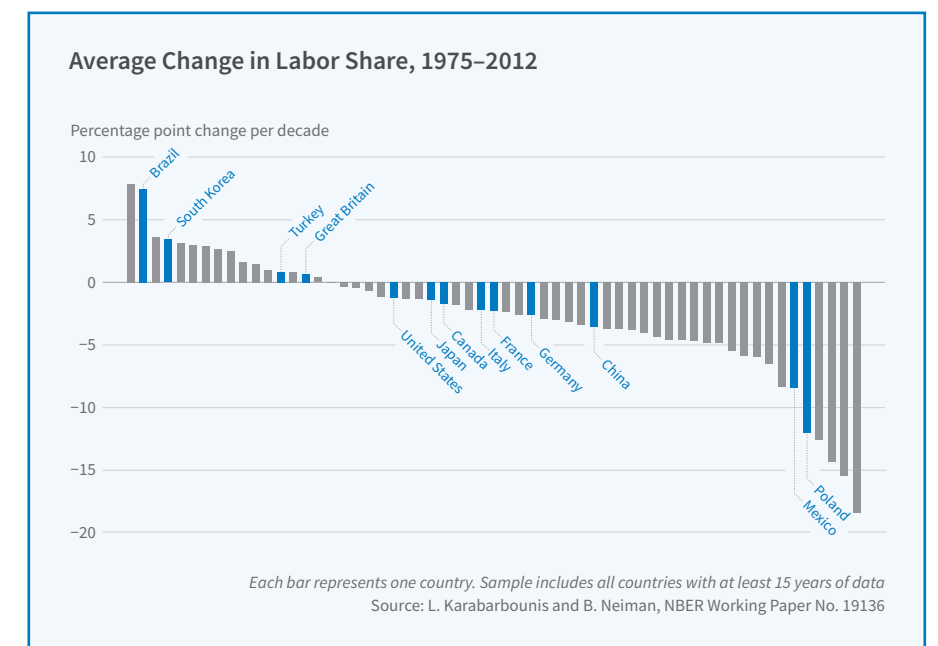


Figure 1



**Brent Neiman** is a research associate in the NBER's International Finance and Macroeconomics and International Trade and Investment programs. He is a professor of economics at the University of Chicago's Booth School of Business and served as an associate editor of the *American Economic Review*, the *Quarterly Journal of Economics*, and the *Journal of International Economics*.

Neiman conducts research on international macroeconomics, finance, and trade. He previously served on the White House Council of Economic Advisers as a staff economist for international finance and has worked at the Federal Reserve Bank of Chicago, McKinsey & Company, and the McKinsey Global Institute.

In 2014, Neiman was one of the eight economics professors in the United States and Canada to receive the Sloan Research Fellowship, an award given to early-career scientists. In 2009, he was named as one of 22 "Emerging Leaders" by the Chicago Council of Global Affairs.

Neiman earned a Bachelor of Science in Economics and a Bachelor of Applied Science, both *summa cum laude*, from the University of Pennsylvania in 1999. In 2000, he earned a master's degree in mathematical modeling from Oxford University, where he studied as a Thouron fellow, and he earned a Ph.D. in economics from Harvard University in 2008. He joined the Chicago Booth faculty in 2008.

Outside the classroom, Neiman is an enthusiastic golfer and was a bench warmer on the 1998 Ivy League Champion golf team as an undergraduate. He also enjoys travel and is always up for dim sum.

prices for its output, or by the residential sector (that has a labor share of zero), whose share of the total GDP fluctuates for reasons potentially unrelated to technology or product market structure.<sup>4</sup> We have posted our country-level data set online and it has been used in a number of studies.

The labor share declines occurred in most U.S. states and, globally, in most industries, including manufacturing, wholesale, and retail. Some have suggested that the share of compensation in domestic product net of depreciation, rather than in gross domestic product, is more informative about inequality between workers and capitalists. In fact, while some exceptions exist, most notably the United States, most countries experienced similar trend declines in their labor shares regardless of whether the share is measured as a fraction of net or gross domestic product.<sup>5</sup>

### Possible Explanations

The labor share decline likely has multiple drivers. A key benefit of our focus on the global decline is that it restricts the set of explanations to those that operate on a global scale. Country-specific changes in policies,

for instance, might be important for specific countries but are unlikely to account for much of the overall trend that the world has experienced.

Global trends in the value-added shares of various industries, referred to as structural change, contribute to the decline in the labor share if industries with lower labor share levels have grown relative to industries with higher labor share levels. Most of the labor share decline—and most of the cross-country variation in the labor share decline—is due to within-industry declines.

Another possible force contributing to the decline in the labor share is the substitution away from labor and toward capital in production. There was a decline in the price of investment relative to consumption that accelerated globally around the same time that the global labor share began its decline. A key hypothesis that we put forward is that the decline in the relative price of investment, often attributed to advances in information technology, automation, and the computer age, caused a decline in the cost of capital and induced firms to produce with greater capital intensity. If the elasticity of substitution between capital and labor—the percentage change in the

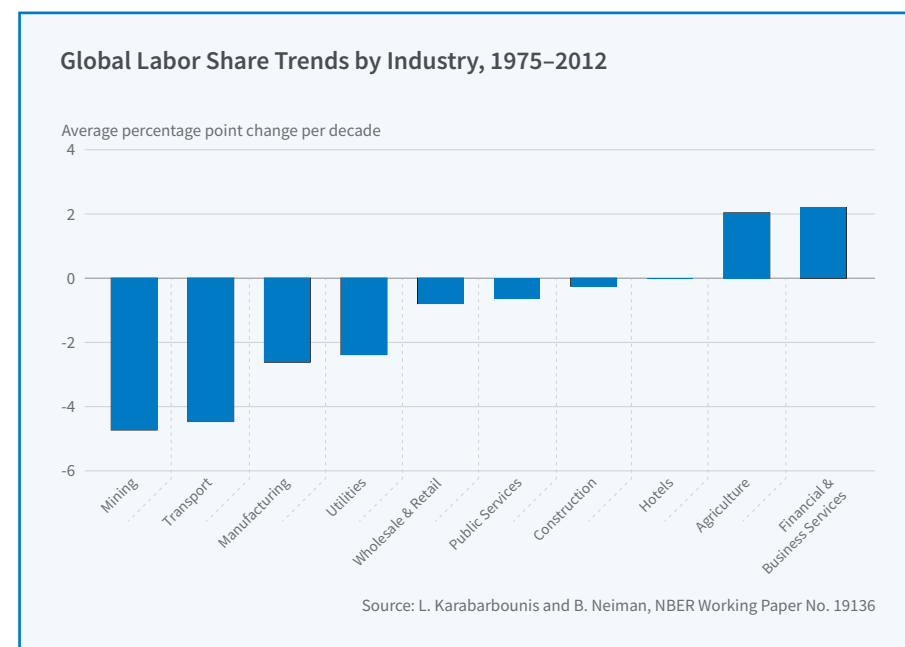


Figure 2

capital-labor ratio in response to a percentage change in the relative cost of labor and capital—is greater than one, the lowering of the cost of capital results in a decline in the labor share.

Most prior estimates of the elasticity of substitution between capital and labor are based on time series variation within a country in factor shares and factor prices. These estimates generally imply an elasticity of substitution below one. By contrast, our estimates of this elasticity are identified from cross-country and cross-industry variation in trends in labor shares and investment price declines. We find that countries and industries with larger declines in investment prices experienced larger declines in their labor shares, which leads to our estimate of an elasticity of substitution equal to 1.25. Taken together with the observed decline in the relative price of investment, our estimates imply that this form of technological change accounts for roughly half of the decline in the global labor share.<sup>6</sup>

This elasticity—and the implied relationship between capital-biased technical change and the labor share—applies at the industry or country level and is therefore inclusive of changes in economic activity across firms within industries or across firms and industries within countries. Our hypothesis that progress with IT-related technologies has contributed to the decline in the labor share is, therefore, not inconsistent with the possibility that most firms experience stable or even rising labor shares, while low labor share firms gained in market share.<sup>7</sup>

We also demonstrate how the inclusion of multiple types of capital with heterogeneous depreciation rates complicates the relationship between labor shares and the user cost of capital. Further, while a single elasticity suffices to relate trends in the labor share to trends in the user cost of capital when all capital can be bundled into a single type, this will not be the case for production functions with different nesting of capital types and labor, such as those posited in the literature on capital-skill complementarity.<sup>8</sup> Our continuing work aims to further explore these issues.

If technology explains half of the global labor share decline, what might

explain the other half? We use investment flows data to separate residual payments into payments to capital and economic profits, and find that the capital share did not rise as it should if capital-labor substitution entirely accounted for the decline in the labor share. Rather, we note that increases in markups and the share of economic profits also played an important role in the labor share decline.<sup>9</sup>

### Other Implications

Beyond the conclusions about technology and product market structure that emerge, why else does the labor share decline matter? The evolution of the labor share is a useful summary statistic for consumption or welfare-based inequality between a representative worker and capitalist. Some analyses focus on the labor share in gross domestic product

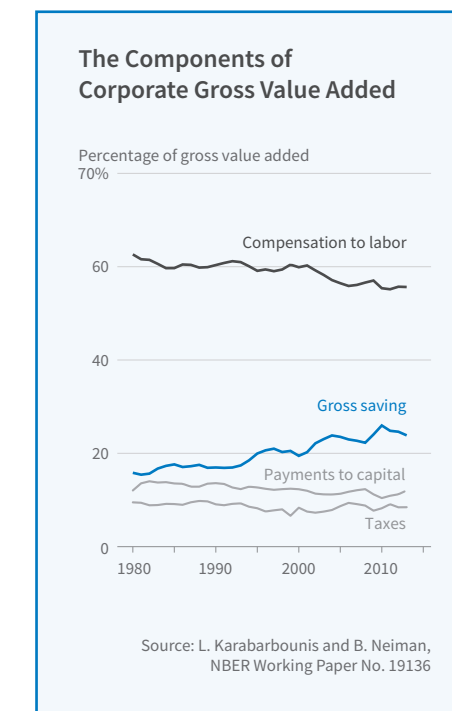


Figure 3

while others emphasize the labor share in net domestic product. Which of the two measures best approximates inequality depends on whether one studies transitional dynamics or the steady state, as well as which shocks are driving the labor share decline.

Our work also uncovers a closely

related trend influencing the financing of global investment.<sup>10</sup> Whereas in 1980 household saving funded most global investment, today corporate saving accounts for nearly two-thirds of every invested dollar. We measure corporate saving as undistributed corporate profits, which together with household and government saving equal national saving. We use a combination of aggregate and firm-level data to demonstrate that the decline in the global labor share resulted in an increase in accounting profits. Since dividends did not keep pace with profits, corporate saving increased.

The increase in corporate saving was also pervasive at the global level and observed in all ten of the largest economies. Further, given that global corporate investment has been relatively stable as a share of GDP since 1980, the corporate sector evolved from a net borrower to a net lender to the rest of the economy. The improvement in the net lending position of the corporate sector fell into various margins of adjustment, including reductions in debt, accumulation of cash, and equity buybacks.

### Next Steps

The stability of the labor share of income is a key assumption built into most modern macroeconomic models, but recent evidence shows downward trends in the labor share in the majority of countries and industries. Such trends are informative for the design of macroeconomic models, for evaluating changes in corporate financial practices, for assessing inequality, and for designing monetary and fiscal policies. A consensus remains elusive on the exact roles of factors such as technology, product market competition, globalization, and housing, and we are continuing our exploration of these issues in U.S. and international data.

<sup>1</sup> Some notable exceptions include O. Blanchard, "The Medium Run," *Brookings Papers on Economic Activity*, 2, 1997, pp. 89-158; O. Blanchard and F. Giavazzi, "Macroeconomic Effects of Regulation and Deregulation in Goods

and Labor Markets,” NBER Working Paper No. 8120, February 2001, and Quarterly Journal of Economics, 118(3), August 2003, pp. 879–907; and C. Jones, “Growth, Capital Shares, and a New Perspective on Production Functions,” Working Paper, 2003.

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<sup>2</sup> In thinking about the cross-section, for example, D. Gollin, “Getting Income Shares Right,” Journal of Political Economy, 110(2), 2002, pp. 458–74, stressed the pitfalls in studying labor shares without a careful accounting for the mixed income earned by proprietors and unincorporated businesses. By the late 1990s or early 2000s, few countries had long and consistent time series that allowed for our preferred treatment of this income.

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<sup>3</sup> L. Karabarbounis and B. Neiman, “The Global Decline of the Labor Share,” NBER Working Paper No. 19136, October 2013, and The Quarterly Journal of Economics, 129(1), February 2014, pp. 61–103.

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<sup>4</sup> While we view it as an improvement in this regard over the total labor share, see M. Smith, D. Yagan, O. Zidar, and E. Zwick, “Capitalists in the Twenty-First Century,” Working Paper, 2017, for

a discussion of why even the corporate sector’s labor share is not fully isolated from the behavior of sole proprietors.

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<sup>5</sup> See L. Karabarbounis and B. Neiman, “Capital Depreciation and Labor Shares Around the World: Measurement and Implications,” NBER Working Paper No. 20606, November 2014, and B. Bridgman, “Is Labor’s Loss Capital’s Gain? Gross Versus Net Labor Shares,” Macroeconomic Dynamics, July 2017.

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<sup>6</sup> Similar conclusions are reached in analyses of a different global data set in “International Monetary Fund, “Understanding the Downward Trend in Labor Income Shares,” World Economic Outlook, April 2017, pp. 121–72.

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<sup>7</sup> This pattern can be found in several firm or plant-level analyses of U.S. data, including D. Autor, D. Dorn, L. Katz, C. Patterson, and J. Van Reenen, “Concentrating on the Fall of the Labor Share,” NBER Working Paper No. 23108, January 2017, and American Economic Review Papers & Proceedings, 107(5), May 2017, pp. 180–5; B. Hartman-Glaser, H. Lustig, and M. Zhang, “Capital Share Dynamics When Firms Insure Workers,” NBER Working Paper No. 22651, October

2017; M. Kebrig and N. Vincent, “Growing Productivity Without Growing Wages: The Micro-Level Anatomy of the Aggregate Labor Share Decline,” Working Paper, 2017.

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<sup>8</sup> See P. Krusell, L. Ohanian, J.-V. Rios-Rull and G. Violante, “Capital-Skill Complementarity and Inequality: A Macroeconomic Analysis,” Econometrica, 68(5), September 2000, pp. 1029–53.

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<sup>9</sup> See M. Rognlie, “Deciphering the Fall and Rise in the Net Capital Share: Accumulation, or Scarcity?,” Brookings Papers on Economic Activity, 46(1), spring 2015, pp. 1–69; S. Barkai, “Declining Labor and Capital Shares,” Working Paper, 2017; and J. De Loecker and J. Eeckhout, “The Rise of Market Power and the Macroeconomic Implications,” NBER Working Paper No. 23687, August 2017, for work elaborating on this rise in economic profits as it relates to the labor share.

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<sup>10</sup> See P. Chen, L. Karabarbounis, and B. Neiman, “The Global Rise of Corporate Saving,” NBER Working Paper No. 23133, March 2017, and Journal of Monetary Economics, 89, August 2017, pp. 1–19.

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## NBER News

### Richard Thaler Awarded Nobel for Research on Behavioral Economics

Richard Thaler of the University of Chicago’s Booth School of Business, an NBER research associate for more than 25 years, was awarded the 2017 Nobel Prize in Economic Sciences for his research in behavioral economics. The award was announced in October, and Thaler delivered his prize lecture, “From Cashews to Nudges: The Evolution of Behavioral Economics,” on December 8 in Stockholm.

[\[Lecture slides\]](#)

The Royal Swedish Academy of Sciences’ announcement of the prize explains that Thaler “has incorporated psychologically realistic assumptions into analyses of economic decision-making. By exploring the consequences of limited rationality, social preferences, and lack of self-control, he has shown how these human traits systematically affect individual decisions as well as market outcomes.

“His empirical findings and theoretical insights have been instrumental in creating the new and rapidly expanding field of behavioral economics, which has had a profound impact on many areas of economic research and policy.”

The Academy cited many settings in which behavioral insights have enriched the research dialogue, includ-



ing the study of household saving, the formation of prices in financial markets, the role of fairness in setting wages and prices, and the potential for “nudges” to influence consumer behavior. The Academy’s description of the ways in which Thaler’s work has been applied may be found [here](#).

A longer summary of the scientific contributions that underlie this award may be found [here](#).

Thaler is the Charles R. Walgreen Distinguished Service Professor of Economics and Behavioral Science at the Booth School and a research

associate in the NBER’s Asset Pricing Program. In 1992, he and Robert Shiller launched the NBER Working Group on Behavioral Economics, which has served as an important forum for researchers in this field. He served as co-director of the group until 2016.

Thaler became the 27th current or past NBER research affiliate to receive the Nobel Prize:

Oliver Hart and Bengt Holmström, 2016; Angus Deaton, 2015; Lars Hansen and Robert Shiller, 2013; Alvin Roth, 2012; Thomas Sargent and Christopher Sims, 2011; Peter Diamond, 2010; Paul Krugman, 2008; Edward C. Prescott and Finn Kydland, 2004; Robert F. Engle, 2003; Joseph E. Stiglitz, 2001; James J. Heckman and Daniel L. McFadden, 2000; Robert C. Merton and Myron S. Scholes, 1997; Robert E. Lucas, Jr., 1995; and the late: Dale Mortensen, 2010; Robert W. Fogel, 1993; Gary S. Becker, 1992; George J. Stigler, 1982; Theodore W. Schultz, 1979; Milton Friedman, 1976; and Simon Kuznets, 1971.

In addition, six current or past members of the NBER Board of Directors have received the Nobel Prize: George Akerlof, 2001; Robert Solow, 1987; and the late: William Vickrey, 1996; Douglass North, 1993; James Tobin, 1981; and Paul Samuelson, 1970.