

Black, Sandra E.

Article

New evidence on the impacts of birth order

NBER Reporter

Provided in Cooperation with:

National Bureau of Economic Research (NBER), Cambridge, Mass.

Suggested Citation: Black, Sandra E. (2017) : New evidence on the impacts of birth order, NBER Reporter, National Bureau of Economic Research (NBER), Cambridge, MA, Iss. 4, pp. 15-18

This Version is available at:

<https://hdl.handle.net/10419/178759>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Andrei A. Levchenko 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 Michigan, and a member of the editorial boards of the *Journal of International Economics*, *Journal of Comparative Economics*, and *IMF Economic Review*. Previously, he was an economist at the International Monetary Fund, and he has held visiting positions at the University of Chicago's Booth School of Business and the University of Zurich. He earned his Ph.D. in economics from MIT in 2004 and a B.A. in economics, mathematics, and Italian from Indiana University in 1999.

Levchenko's research focuses on interactions among globalization, economic development, and macroeconomics. The main themes of his research have been the relationship between international trade and institutions, globalization and the business cycle, and quantitative assessments of the consequences of globalization.

Levchenko grew up in Moscow. He lives in Ann Arbor with his wife and three children.

is unrelated to productivity. We then estimate the international transmission of three identified shocks—surprise TFP, news of future TFP, and NTE—from the United States to Canada.

The U.S. non-technology shock produces a business cycle in the U.S., with output, hours, and consumption rising following a positive shock, and accounts for the bulk of U.S. short-run business cycle fluctuations. The non-technology shock also has a significant impact on Canadian macro aggregates. In the short run, it is more important than either the surprise TFP or the news of future TFP shocks in generating business cycle comovement between the U.S. and Canada, accounting for over 40 percent of the forecast error variance of Canadian GDP and over one-third of the variation in Canadian hours, imports, and exports.

Next, we extend the analysis to multiple countries and sectors.⁷ Using industry-level data on 30 countries over up to 28 years, we develop estimates of utilization-adjusted TFP shocks, and an approach to infer non-technology shocks. We then set up a quantitative model calibrated to the observed international input-output and final-goods trade data, and use it to assess the contribution of both technology and non-technology shocks to international comovement. We show that unlike the traditional Solow residual, the utilization-adjusted TFP shocks are virtually uncorrelated across countries. Transmission of TFP shocks across countries also cannot generate noticeable comovement in GDP in our sample of countries. By contrast, non-technology shocks are highly correlated across countries, and the model simulation with only non-technology shocks generates substantial GDP correlations.

Taking Stock

What have we learned from this research program? First, firm- and sector-level data are the right place to measure transmission of shocks across countries. In the micro data, evidence of transmission is pervasive. Whether transmission estimated at the micro level leads to substantial comovement in the macro aggregates is somewhat less certain, and depends on the details of how shocks are propagated and on the general equilibrium mechanisms.

Second, non-technology shocks are much more important for international comovement

than technology shocks, both because they are transmitted across countries to a greater extent, and because they are more correlated across countries than TFP shocks. Our main takeaway is that in order to understand international comovement, it is essential to both model and measure non-TFP shocks.

¹ J. di Giovanni and A. Levchenko, "Putting the Parts Together: Trade, Vertical Linkages, and Business Cycle Comovement," *American Economic Journal: Macroeconomics*, 2(2), April 2010, pp. 95–124.
[Return to Text](#)

² J. di Giovanni, A. Levchenko, and I. Méjean, "The Micro Origins of International Business Cycle Comovement," *NBER Working Paper No. 21885*, January 2016, and forthcoming in *American Economic Review*.
[Return to Text](#)

³ J. Cravino and A. Levchenko, "Multinational Firms and International Business Cycle Transmission," *NBER Working Paper No. 22498*, August 2016, and the *Quarterly Journal of Economics*, 132(2), May 2017, pp. 921–62.
[Return to Text](#)

⁴ R. Auer, A. Levchenko, and P. Sauré, "International Inflation Spillovers Through Input Linkages," *NBER Working Paper No. 23246*, March 2017.
[Return to Text](#)

⁵ J. Cravino and A. Levchenko, "The Distributional Consequences of Large Devaluations," *NBER Working Paper No. 23409*, May 2017, and *American Economic Review*, 107(11), November 2017, pp. 3477–509.
[Return to Text](#)

⁶ A. Levchenko and N. Pandalai-Nayar, "TFP, News, and 'Sentiments': The International Transmission of Business Cycles," *NBER Working Paper No. 21010*, March 2015.
[Return to Text](#)

⁷ A. Levchenko and N. Pandalai-Nayar, "Technology and Non-Technology Shocks: Measurement and Implications for International Comovement," *mimeo*, University of Michigan and University of Texas, November 2017.
[Return to Text](#)

New Evidence on the Impacts of Birth Order

Sandra E. Black

What determines a child's success? We know that family matters—children from higher socioeconomic status families do better in school, get more education, and earn more.

However, even beyond that, there is substantial variation in success across children within families. This has led researchers to study factors that relate to within-family differences in children's outcomes. One that has attracted much interest is the role played by birth order, which varies systematically within families and is exogenously determined.

While economists have been interested in understanding human capital development for many decades, compelling economic research on birth order is more recent and has largely resulted from improved availability of data. Early work on birth order was hindered by the stringent data requirements necessary to convincingly identify the effects of birth order. Most importantly, one needs information on both family size and birth order. As there is only a third-born child in a family with at least three children, comparing third-borns to firstborns across families of different sizes will conflate the birth order effect with a family size effect, so one needs to be able to control for family size. Additionally, it is beneficial to have information on multiple children from the same family so that birth order effects can be estimated from within-family differences in child outcomes; otherwise, birth order effects will be conflated with other effects that vary systematically with birth order, such as cohort effects. Large Scandinavian register datasets that became available to researchers beginning in the late 1990s have enabled birth order research, as they contain population data on both family structure and a variety of child outcomes. Here, I describe my research with a number of coauthors, using these data to explore the effects of birth order on outcomes including human capital accumulation, earnings, development of cognitive and non-cognitive skills, and health.

Birth Order and Economic Success

Almost a half-century ago, economists including Gary Becker, H. Gregg Lewis, and Nigel Tomes created models of quality-quantity trade-offs in child-rearing and used these models to explore the role of family in children's success. They sought to explain an observed negative correlation between family income and family size: if child quality is a normal good, as income rises the family demands higher-quality children at the cost of lower family size.¹

However, this was a difficult model to test, as characteristics other than family income and child quality vary with family size. The introduction of natural experiments, combined with newly available large administrative datasets from Scandinavia, made testing such a model possible.

In my earliest work on the topic, Paul Devereux, Kjell Salvanes, and I took advantage of the Norwegian administrative dataset and set out to better understand this theoretical quantity-quality tradeoff.² It became clear that child "quality" was not a constant within a family—children within families were quite different, despite the model assumptions to the contrary. Indeed, we found that birth order could explain a large fraction of the family size differential in children's educational outcomes. Average educational attainment was lower in larger families largely because later-born children had lower average education, rather than because firstborns had lower education in large families than in small families. We found that firstborns had higher educational attainment than second-borns who in turn did better than third-borns, and so on. These results were robust to a variety of specifications; most importantly, we could compare outcomes of children within the same families.

To give a sense of the magnitude of these effects: The difference in educational attainment between the first child and the fifth child in a five-child family is roughly equal to the difference between the educational



Sandra E. Black holds the Audre and Bernard Rapoport Centennial Chair in Economics and Public Affairs and is a professor of economics at the University of Texas, Austin. She is a research associate in the NBER's programs on Labor Studies, Education, and Children, an editor of the *Journal of Labor Economics*, and a non-resident scholar at the Brookings Institution.

Black served as a member of President Obama's Council of Economic Advisers, August 2015–January 2017. Prior to arriving at the University of Texas, she was an economist at the Federal Reserve Bank of New York and a professor in the Department of Economics at UCLA. She was a co-editor of *The Journal of Human Resources*, 2005–12, and editor-in-chief from 2012–15. She has been elected a fellow of the Society of Labor Economists, is an affiliated faculty member at the Norwegian School of Economics, and in January will become a member of the board of the Committee on the Status of Women in the Economics Profession.

Black's research focuses on the effects of early life experiences on the long-run outcomes of children, and on issues of gender and discrimination. She was born and raised in Los Angeles and received her B.A. from the University of California, Berkeley and her Ph.D. in economics from Harvard University. She lives in Austin with her husband.

attainment of blacks and whites calculated from the 2000 Census. We augmented the education results by examining earnings, whether full-time employed, and whether one had a child as a teenager as additional outcome variables, and found strong evidence for birth order effects, particularly for women. Later-born women have lower earnings (whether employed full-time or not), are less likely to work full-time, and are more likely to have their first child as teenagers. In contrast, while later-born men have lower full-time earnings, they are not less likely to work full-time [Figure 1].

Birth Order and Cognitive Skills

One possible explanation for these differences is that cognitive ability varies systematically by birth order. In subsequent work, Devereux, Salvanes, and I examined the effect of birth order on IQ scores.³

The psychology literature has long debated the role of birth order in determining children's IQs; this debate was seemingly resolved when, in 2000, J. L. Rodgers et al. published a paper in *American Psychologist* entitled "Resolving the Debate Over Birth Order, Family Size, and Intelligence" that referred to the apparent relationship between birth order and IQ as a "methodological illusion."⁴ However, this work was limited due to the absence of large representative datasets

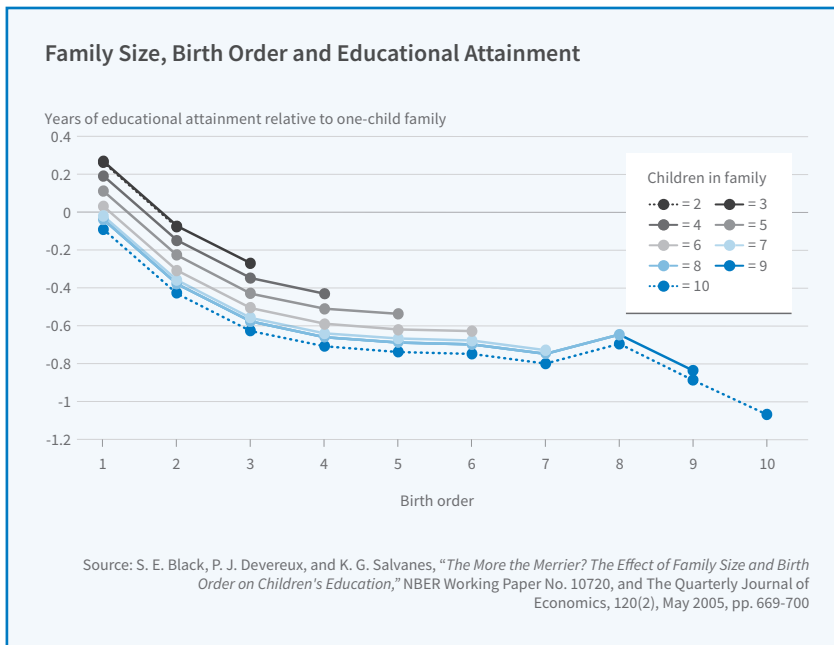


Figure 1

necessary to identify these effects. We again used population register data from Norway to estimate this relationship.

To measure IQ, we used the outcomes of standardized cognitive tests administered to Norwegian men between the age of 18 and 20 when they enlist in the military. Consistent with our earlier findings on educational attainment but in contrast to the previous work in the literature, we found strong birth order effects

Personality is another factor that is posited to vary by birth order, a proposition that has been particularly difficult to assess in a compelling way due to the paucity of large datasets containing information on individual personality. In recent work on the topic, Erik Gronqvist, Bjorn Ockert, and I use Swedish administrative datasets to examine this issue.⁵

In the economics literature, personality traits are often referred to as non-cognitive abilities and denote traits that can be distinguished from intelligence.⁶ To measure "personality" (or non-cognitive skills), we use the outcome of a standardized psychological evaluation, conducted by a certified psychologist, that is performed on all Swedish men between the ages of 18 and 20 when they enlist in the military, and which is strongly related to success in the labor market. An individual is given a higher score if he is considered to be emotionally stable,

on IQ that are present when we look within families. Later-born children have lower IQs, on average, and these differences are quite large. For example, the difference between firstborn and second-born average IQ is on the order of one-fifth of a standard deviation, or about three IQ points. This translates into approximately a 2 percent difference in annual earnings in adulthood.

The Effect of Birth Order on Non-Cognitive Skills

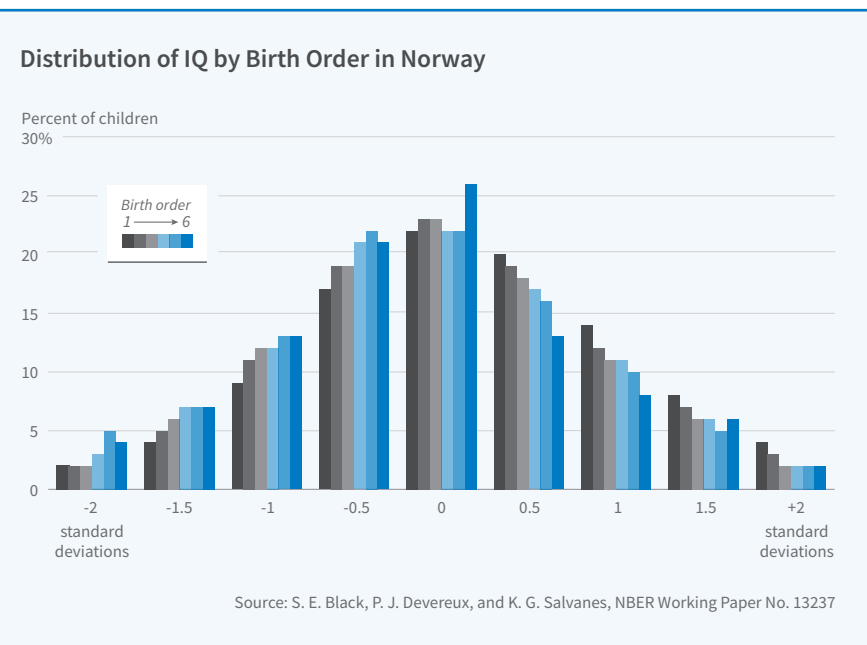


Figure 2

persistent, socially outgoing, willing to assume responsibility, and able to take initiative. Similar to the results for cognitive skills, we find evidence of consistently lower scores in this measure for later-born children. Third-born children have non-cognitive abilities that are 0.2 standard deviations below firstborn children. Interestingly, boys with older brothers suffer almost twice as much in terms of these personality characteristics as boys with older sisters.

Importantly, we also demonstrate that these personality differences translate into differences in occupation choice by birth order. Firstborn children are significantly more likely to be employed and to work as top managers, while later-born children are more likely to be self-employed. More generally, firstborn children are more likely to be in occupations requiring sociability, leadership ability, conscientiousness, agreeableness, emotional stability, extraversion, and openness.

The Effect of Birth Order on Health

Finally, how do these differences translate into later health? In more recent work, Devereux, Salvanes, and I analyze the effect of birth order on health.⁷ There is a sizable body of literature about the relationship between birth order and adult health; individual studies have typically examined only one or a small number of health outcomes and, in many cases, have used relatively small samples. Again, we use large nationally representative data from Norway to identify the relationship between birth order and health when individuals are in their 40s, where health is measured along a number of dimensions, including medical indicators, health behaviors, and overall life satisfaction.

The effects of birth order on health are less straightforward than other outcomes we have examined, as firstborns do better on some dimensions and worse on others. We find that the probability of having high blood pressure declines with birth order, and the largest gap is between first- and second-borns. Second-borns are about 3 percent less

likely to have high blood pressure than firstborns; fifth-borns are about 7 percent less likely to have high blood pressure than firstborns. Given that 24 percent of this population has high blood pressure, this is quite a large difference. Firstborns are also more likely to be overweight and obese. Compared with second-borns, firstborns are 4 percent more likely to be overweight and 2 percent more likely to be obese. The equivalent differences between fifth-borns and firstborns are 10 percent and 5 percent. For context, 47 percent of the population is overweight and 10 percent is obese. Once again, the magnitudes are quite large.

However, later-borns are less likely to consider themselves to be in good health, and measures of mental health generally decline with birth order. Later-born children also exhibit worse health behaviors. The number of cigarettes smoked daily increases monotonically with birth order, suggesting that the higher prevalence of smoking by later-borns found among U.S. adolescents by Laura M. Argys et al.⁸ may persist throughout adulthood and, hence, have important effects on health outcomes.

Possible Mechanisms

Why are adult outcomes likely to be affected by birth order? A host of potential explanations has been proposed across several academic disciplines.

A number of biological factors may explain birth order effects. These relate to changes in the womb environment or maternal immune system that occur over successive births. Beyond biology, parents could have other influences. Childhood inputs, especially in the first years of life, are considered crucial for skill formation.⁹ Firstborn children have the full attention of parents, but as families grow the family environment is diluted and parental resources become scarcer.¹⁰ In contrast, parents are more experienced and tend to have higher incomes when raising later-born children. In addition, for a given amount of resources, parents may treat firstborn children differently than second- or later-born children. Parents may

use more strict parenting practices toward the firstborn, so as to gain a reputation for "toughness" necessary to induce good behavior among later-borns.¹¹

There are also theories that suggest that interactions among siblings can shape birth order effects. For example, based on evolutionary psychology, Frank J. Sulloway suggests that firstborns have an advantage in following the status quo, while later-borns—by having incentives to engage in investments aimed at differentiating themselves—become more sociable and unconventional in order to attract parental resources.¹²

In each of these papers, we attempted to identify potential mechanisms for the patterns we observed. However, it is here we see the limitations of these large administrative datasets, as for the most part, we lack necessary detailed information on biological factors and on household dynamics when the children are young. However, we do have some evidence on the role of biological factors. Later-born children tend to have better birth outcomes as measured by factors such as birth weight. In our Swedish data, we took advantage of the fact that some children's biological birth order is different from their environmental birth order, due to the death of an older sibling or because their parent gave up a child for adoption. When we examine this subsample, we find that the birth order effect on occupational choice is entirely driven by the environmental birth order, again suggesting that biological factors may not be central.

Also in our Swedish study, we found that firstborn teenagers are more likely to read books, spend more time on homework, and spend less time watching TV or playing video games. Parents spend less time discussing school work with later-born children, suggesting there may be differences in parental time investments. Using Norwegian data, we found that smoking early in pregnancy is more prevalent for first pregnancies than for later ones. However, women are more likely to quit smoking during their first pregnancy than during later ones, and firstborns are more likely to be breastfed. These findings suggest that early investments may

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.¹³ 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.

¹ 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.

[Return to Text](#)

² 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.

[Return to Text](#)

³ 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.

[Return to Text](#)

⁴ 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.

[Return to Text](#)

⁵ 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.

[Return to Text](#)

⁶ 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.

[Return to Text](#)

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

[Return to Text](#)

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

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

[Return to Text](#)

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

[Return to Text](#)

¹⁰ 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*.

[Return to Text](#)

¹¹ 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.

[Return to Text](#)

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

[Return to Text](#)

¹³ 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.

[Return to Text](#)



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.¹ 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.²

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.³ 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

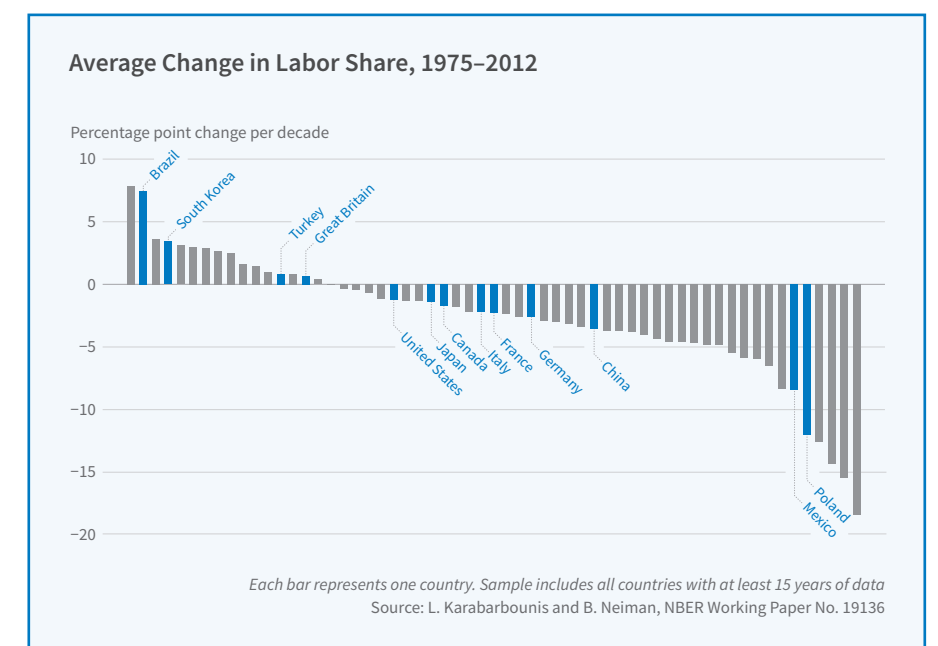


Figure 1