Program Report

Measuring the Economy of the 21st Century

Charles R. Hulten

The first meeting of the Conference on Research in Income and Wealth (CRIW) occurred in late January of 1936 in the midst of the Great Depression. The general objective of the conferences at this meeting and those that followed was to help fill the void created by the absence of a national statistical system. The CRIW provided conceptual support for the task of developing such a system, and a complex task it was indeed. A national economy is a system of interconnected flows of quantities and payments involving a vast number of goods and services. Fitting all this together into a national accounting framework has justifiably been called one of the “great inventions of the 20th Century.”

We are now well into the 21st century, and as with many other great inventions, there are constant challenges in updating the national statistical system to reflect the current technological environment. GDP is an aggregate measure of the flows of goods and services through product and factor markets, one that provides a statistical portrait of the economy as it evolves over time. However, the process of evolution itself has altered these flows in ways that undermine the accuracy or relevance of past concepts and data sources. The rapid transformation of the U.S. economy brought about by the revolution in information technology has introduced a profusion of new products and processes, new market channels, and greater organizational complexity. Parts of the statistical system are struggling to keep up.

The problem is nowhere more evident than in the difficulties associated with the Internet’s contribution to GDP. Valuing the ‘net and the wide range of applications offered with little or no direct charge is challenging because there is no reliable monetary yardstick to guide measurement, and their omission or undervaluation surely affects GDP.

This is important for the recent debate over future living standards and employment. The two percent growth rate of real U.S. GDP since the end of the Great Recession has lagged the long-term historical rate of three percent, inviting speculation about the emergence of a New...
Normal. [See Figure 1.] This view is reinforced by Robert Gordon’s recent suggestion that the growth of the information revolution is not of the same order of importance as those of previous tech-

nological revolutions and are, in any event, playing out.5 The future may look very different if recent GDP growth is significantly understated because of the mismeasurement of new goods and services.

Sorting out the many issues involved in "mea-
suring" the economy of the 21st century has domi-
nated the CRIW agenda since the early stages of the information revolution; it is a large job, and will occupy the CRIW for years to come. Past and current efforts are reviewed in this summary, starting with the importance of accurately accounting for new goods and improvements in the quality of existing ones, and the related problem of measuring the output of the service-pro-
doms of the economy. The following sections take a closer look at three of the most important service sectors: health care, education, and finance. Subsequent sections focus on capital and labor in the new economy, the role of entrepreneurship and com-
pany formation, and the problem of national income accounting in an increasingly globalized world. A final section sums up.

New Goods and Quality Change

In his discussion of "Effects of the Progress of Improvement upon the Real Price of Manufactures" in The Wealth of Nations, Adam Smith dodged the problem of changing product quality by say-
ing that "Quality, holographic, is so very disputable a mat-
ter, that I look upon all information of this kind as somewhat uncertain." He was referring to price trends in the production of cloth, but fast-forward more than two centuries to 20th century and William Nordhaus writ-
ing on the history of lighting, when he argues that official price indexes may "miss the important

revolutions in economic history" because of the way they are constructed.3 The quality problem endures and, if anything, has gotten more difficult with the profusion of new and improved goods.

The quality change problem arises when a new version of a good is introduced that embodies characteristics that make it more desirable. The new model may not cost much more than the old, but represents a greater

amount of output from the user's standpoint. If the price per unit transacted in the market does not change, the introduction of a new unit for an older model will not affect either nominal or apparent real GDP because the apparent market price of the good is not changed. However, effective real output has increased, and the benefits of the inno-
vation are lost in the official data. Personal computers are an important example, and in the mid-1980s, the Bureau of Economic Analysis began adjusting computer prices to better reflect the technological gains in com-
puting power. The new goods variant of the product innovation problem is even more challeng-
ing because, unlike the quality change problem, there are no prior versions of the good on which to base price comparisons. Current procedures for incorporating new goods into existing price indexes are complicated, but may miss much of the value of these innova-
tions. At the same CRIW meeting at which Nordhaus examined the history of light-
ing, Jerry Hausman examined the introduc-
tion of a new brand of breakfast cereal and found that the treatment (or non-treatment)

of new goods in official statistics resulted in a 20 percent upward bias in that component of the Consumer Price Index.4 He arrived at this conclusion by substituting the prices of mobile cellular telephones, though the magni-

date of the bias is larger.5 By implication, the impact of implementing new digital technology goods, like the Internet and the many applications it enables, may be subject to significant undervaluation.

Papers on various aspects of price mea-
surement have appeared frequently in other CRIW proceedings, and in 2009 the CRIW held a conference on Price Index Concepts and Measurement devoted to the subject.6 Papers in the resulting volume, published in 2009, ranged over theoretical issues in price measurement, from the reassessment of qual-
ity change in computer prices and the issue of outlet substitution bias to measurement problems in specific applications in finance, health, and education.7 An earlier volume, Hard-to-Measure Goods and Services: Essays in Honor of Zvi Griliches, published in 2007, included six papers devoted to price mea-
surement. One, by Jaison Abel, Emile Berndt, and Alan White, moves beyond the rapid increase in the power of computer hardware to show that improvements in software are also important.8

The question of how much product innovation has been omitted from estimates of US output is discussed by Charles R. Hulten. If the upward bias in price indexes is of the magnitude suggested by Nordhaus, Hausman, and others, then the growth in real GDP may be considerably greater than the official estimates suggest.9 Whether the bias has increased in recent years and is large enough to offset the apparent slowdown in recent growth is another matter. It is a sub-
ject that will undoubtedly be on the agendas of future CRIW conferences.

The Services Sector Problem

The private services-producing sectors of the US economy account for about 60 percent of recent private business value added. Not only do they account for a large fraction of GDP, these sectors are essential for under-

standing the trends in aggregate economic growth. In his introduction to the CRIW volume Output Measurement in the Service

Figure 1 Source: Bureau of Economic Analysis, National Income and Product Accounts

Charles R. Hulten is a research associate of the National Bureau of Economic Research and professor of economics at the University of Maryland, where he has taught since 1985. He has served for 30 years as chairmen of the NBER’s Conference on Research in Income and Wealth, a forum in which academicians, members of the policy community, and representatives of the statistical agencies meet regularly to discuss problems with the statistical system. The CRIW has produced 24 conference volumes during its tenure. He also is a member of the advisory committee of the federal Bureau of Economic Analysis.

Hulten’s recent research includes work on measurement of intangible capital and effects of intangibles on innovation, eco-
nomic growth, and corporate wealth. His research interests also include the measurement of eco-
nomic depreciation, public and private capital formation, and produc-
tivity theory and analysis.

Before joining the University of Maryland, Hulten was a senior research associate at the Urban Institute and an assistant profes-
sor of economics at Johns Hopkins University. His undergraduate and Ph.D. degrees are from the University of California, Berkeley.

Sectors, Zvi Griliches wrote that the much-discussed productivity slowdown of the 1970s and 1980s might be due to
The subject purchases expert services, or financial position, knowledge, etc. intervention state, where “state” refers vari-
ably large in many of these sectors, and is made more difficult because the out-
resistant to productivity change.

Looking at a longer period, they report a percent of the increase in overall labor pro-
these units are, they are not necessarily the main objective of schooling is to move a

Rising health care costs and the aging of the baby boomers have focused much attention on the health services sector. Not surprisingly, the measurement of health care cost and output has been the subject of two recent CRIW meet-
ings: the 2001 Medical Care Output and Productivity conference and the 2013 Productivity conference and the 2013 Cost conference. The 31 papers in the two conference volumes range over a vast array of issues, many of which are related to the condition of wellness, legal or financial position, knowledge, etc. The subject purchases expert services, X, in the expectation or hope that they will have a positive outcome. However, the outcome also depends on the subject’s own efforts and initial state of being. Measured GDP records the payment for X, and perhaps ancillary expenses as well. What matters here is not necessarily the value of the outcome to the recipient, which may be different and in part an amorphous good. A fundamental problem arises when trying to separate X into price and quan-
tity components in order to measure real GDP, if what units do you measure? Doctors and lawyers may provide infor-
mation but bill by the visit, or the hour, or the procedure. This is their “output,” and it is not measured in bits or bytes of expert information. The service providers usually do not sell guaranteed outcomes, since the advice they provide may not be heed-
ed and outcomes are often uncertain. There is a parallel problem in the units in which outcomes are measured: Whatever these units are, they are not necessarily the same for buyers and sellers. But if there are no clear units of measurement, how is it possible to determine the level of out-
put if it is performed by the provision of a service? Outcomes have a subjective component, like improved quality of life, and depend on the pre-treatment risk and diagnosis. Expenditures are price-denominated, whereas outcomes are not, at least not in their pure state. However, progress can be made by adjusting the price estimates used to deflate nominal-price expenditure data for those outcomes that can be measured (e.g., cures, survival rates), and by the use of disease-based price indexes to better reflect the bundle of services received by the consumer. This is an important step for measuring the growth in real GDP, given the growing size of the health sector and the manifest importance of advances in medical technology. The medical care cost and output framework is one formal line of analysis applies to the education sector. The over-
all objective of schooling is to move a student from one state of knowledge or another, some students are particularly advanced in val-

ting state, where “state” refers vari-

The input side of the economy has also been affected by the digital revolu-
tion. This is apparent in the 2005 volume Measuring Capital in the New Economy, which is largely devoted to the grow-
ing importance of intangible capital for-

Tangible and Intangible Investment Rates

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Source: C.A. Corrado and C.R. Holton

In our summary, we go on to take a closer look at the input side of the economy. The 1960s and 1970s saw the rise of two major industries: the semiconductor industry and the computer industry. The semiconductor industry produced microchips, which are the building blocks of modern computers. The computer industry produced computers, which are used to process information. These industries were significant because they were the first to make use of a new technology called “integrated circuits.” Integrated circuits are small chips that can perform many different tasks, and they are the foundation of the modern computer. As a result, the computer industry has become one of the most important industries in the world. The semiconductor industry has also been important because it has led to the development of new technologies, such as the Internet and mobile devices. These industries have been significant because they have driven economic growth and have created new jobs. As a result, they have been a major focus of economic policy. The computer industry has also been important because it has been a major source of innovation. The computer industry has been a leader in the development of new technologies, such as artificial intelligence and machine learning. These technologies have the potential to change the way we work and live. In addition, the computer industry has been a major source of economic growth. The industry has created a large number of jobs, and it has been a major source of tax revenue for governments. As a result, the computer industry has been a major focus of economic policy. The semiconductor industry has also been important because it has been a major source of innovation. The semiconductor industry has been a leader in the development of new technologies, such as wireless communication and high-speed Internet. These technologies have the potential to change the way we work and live. In addition, the semiconductor industry has been a major source of economic growth. The industry has created a large number of jobs, and it has been a major source of tax revenue for governments. As a result, the semiconductor industry has been a major focus of economic policy.
Globalization and International Trade

The globalization of the world economy has also received attention in the conference on International Trade in Services and Intangibles in the Era of Globalization. 26 The delivery of many services has traditionally involved physical proximity, but this is changing with the revolution in information and communication technology. The new technologies have enhanced the capacity for global trade in legal, financial, medical, and communication services as well as in software. The editors of the conference volume note that world trade has grown more rapidly than the world production, and that trade in services has grown faster than trade in goods. These flows have added an international dimension to the pricing and quantity measurement problem already noted for services in general, and have added problems associated with currencies and taxes.

Summing Up

Since 2000, 15 CRW conferences have been held, and the proceedings, published or in process, contain well over 200 papers. The great diversity of topics covered is impossible to summarize in a short review, and many important ideas have been omitted. 27 Some measurement issues, in areas such as medical services, banking, price measurement, and education, have been considered in many conferences.

A full list of conferences, and links to the papers they contain, can be found at: http://www.nber.org/CRW/.


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Research Summaries

Fiscal Policy in Emerging Markets: Procyclicality and Graduation
Carlos A. Vegh

Five key questions have guided my research on fiscal policy in emerging markets:
1. How is fiscal policy conducted in emerging markets compared to industrial countries?
2. Why has fiscal policy often been procyclical in emerging markets?
3. Are there developing countries that have “graduated” — that is, switched from being procyclical to countercyclical?
4. Has fiscal policy been an effective countercyclical tool?
5. Is the experience of some eurozone countries reminiscent of past fiscal behavior in emerging markets?

This summary describes the main findings that have resulted from this research agenda. In pursuing these issues, I have been very fortunate to work with many talented co-authors whose many contributions will hopefully become clear below.

Fiscal Policy in Emerging Countries: When It Rains, It Pours

Figure 1, on the next page, shows the correlation between the cyclical components of real GDP and government spending for 96 countries (21 industrial and 75 developing) for the period 1960–2014. Industrial countries are denoted by gray bars while blue bars represent emerging countries.

The visual impression is striking. With only two exceptions, Greece and Portugal, all gray bars lie to the left of the graph, indicating a positive correlation and hence procyclical government spending in developing countries. In fact, the average correlation for industrial countries is 0.23, compared to 0.21 for developing countries. Both estimates are significantly different from zero at the one percent level.

Although much less documented — mainly because data on tax rates are much harder to come by — the same is true of tax policy. Based on a novel annual dataset that comprises value-added, corporate, and personal income taxes for 62 countries (20 industrial and 42 developing) for the period 1960–2013, Guillermo Vuletin and I have concluded that tax policy has been acyclical in industrial countries and mostly procyclical in developing economies. By procyclical tax policy, we mean that the correlation between the cyclical components of tax rates and GDP is negative; that is, it reinforces the business cycle.

The evidence thus strongly suggests that, unlike industrial countries, developing countries have historically pursued procyclical fiscal policy both on the spending and the revenue side. During bad times, with capital flowing out and the economy mired in recession, policymakers have often compounded the problem by contracting fiscal policy.

Why has Fiscal Policy been Procyclical in Emerging Markets?

A natural question is why policymakers in developing countries exacerbate already pronounced boom-bust cycles by pursuing procyclical fiscal policy. This has been a puzzle in search of an explanation. The two most convincing explanations are arguably that they have limited access to international credit markets in bad times, and that political incentives and institutional weaknesses tend to encourage “excessive” public spending in good times.

These two channels have in fact reinforced one another in bringing about procyclical fiscal policy. Emerging countries’ inability to borrow in bad times — often in conjunction with calls for “fiscal consolidation” from international creditors and organizations — has typically left them with little choice but to cut spending and raise taxes in the midst of severe recessions.

This situation has only been made worse by the tendency to save little, if any, during temporary booms fueled by surges in commod- ity prices and capital inflows.

Time and again, policymakers have insisted that good times were here to stay and spent accordingly. Spending proceeds that are temporary in nature as though they were permanent naturally forces governments to contract spending and raise taxes in bad times to satisfy the intertemporal budget constraint (or, alternatively, default). Put differently, the textbook recommendation of saving on sunny days for rainy days has been seldom, if ever, followed in emerging markets.

Graduation

Fortunately, fiscal policy is not an immutable phenomenon and changes in market access and domestic financial institutions have enabled many developing countries over the last 15 years to switch from being procyclical to acyclical or even countercyclical, a phenomenon dubbed “graduation.” In my work with Jeffrey Frankel and Vuletin, we have in fact reinforced one another in bringing about procyclical fiscal policy. Emerging countries’ inability to borrow in bad times — often in conjunction with calls for “fiscal consolidation” from international creditors and organizations — has typically left them with little choice but to cut spending and raise taxes in the midst of severe recessions.

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How Effective is Counter-Cyclical Fiscal Policy?

We have established that about a third of developing countries have graduated. This has brought the number of developing countries that have pursued countercyclical fiscal policies over the last 15 years to 35 percent from just 19 percent in the period 1960–1999. The next question, then, is: How effective has countercyclical fiscal policy been?

The size of the fiscal multipliers has, of course, been a perennial question for the United States and, to a lesser extent, other industrial countries. Until quite recently, however, the evidence for emerging countries had, at best, been scant, due to lack of reliable quarterly data. Estimates based on annual data are dubious simply because the main identification mechanism—the Blanchard-Perotti assumption that government spending can react to GDP with only one period lag—strains credibility when applied to annual data.

Even more important perhaps is the overall improvement in the quality of fiscal institutions, including transparent budgetary procedures, fiscal accountability, and broad agreement on fiscal policy.

countries that used to be procyclical but have become countercyclical over the last 15 years. Twenty one out of the 24 countries in our (8% peer) are developing countries. The overall graduation rate for developing countries is 34 percent. As a share of the proportion of developing countries that are procyclical has fallen from 81 percent to 65 percent.

The poster-boy of the graduation from procyclicality has been Chile. Between the two periods, Chile’s correlation switched from 0.25 to -0.68. In fact, Chile’s fiscal stimulus package of close to three percent of GDP in response to the global financial crisis of 2008–2009 was among the largest in the world.

The key to Chile’s graduation was the adoption in the year 2001 of a fiscal rule that requires the government to run a structural balanced budget. The structural balance is computed by adjusting the actual balance for the effects on tax revenues of deviations of actual output from trend output and of deviations of copper prices from their long-run value. These trends are based on forecasts produced by an independent group of experts. By constructing, a zero structural balance forces the fiscal authority to save in good times and allow it to spend in bad times.

Needless to say, fiscal rules are not a panacea and even Chile broke its own rule in 2008 when, as a result of the stimulus package in response to the global financial crisis, it ran a structural deficit of 1.2 percent. But clearly fiscal rules cannot bring about a change in established fiscal policy and, when based on the structural fiscal balance, in drawing the marker’s attention to the need to adjust to changes in the economy when evaluating current fiscal policy.

Even more important perhaps is the overall improvement in the quality of fiscal institutions, including transparent budgetary procedures, fiscal accountability, and broad agreement on fiscal policy rules. A structural fiscal rule à la Chile should be viewed as an improvement in fiscal institutions. In fact, the empirical evidence clearly suggests that improvements in the quality of institutions lead to more countercyclical fiscal policy.\(^1\)

1 We use the terms “emerging markets” and “developing countries” interchangeably, since the prototypical developing country that I have in mind has fairly standard fiscal institutions and is reasonably integrated into world capital markets.

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Eurozone: The New Latin America?

Vuletin and I further show that the fiscal policy response in recent recessions in the eurozone (when, of course, for countries such as Greece) has been eerily reminiscent of the pervasive response in Latin America several decades ago. Figure 4 shows the correlation of components of government spending and GDP from the beginning of the recession to the first quarter of 2013 for 10 eurozone countries. We see that four countries (Greece, Ireland, Italy, and Portugal) have been procyclical, with Greece, not surprisingly, the most procyclical of all.\(^2\) We further show that transactional fiscal policy during bad times extended the despair of the recession, intensified the fall in GDP, and worsened social indicators.

Final Remarks

We should note, in closing, that monetary policy has not escaped the procyclical trap. In fact, over the period 1960–2009, about 40 percent of developing countries pursued procyclical monetary policy.\(^3\) When the sample is divided before and after the year 2000, about 35 percent of developing countries are found to have graduated to countercyclical monetary policy.

The source of procyclicality in monetary policy is the need, in the minds of many policymakers in emerging markets, to defend the domestic currency in bad times by raising interest rates. Policymakers often fear, with some justification, that sudden currency depreciation will increase inflation, exacerbate capital flight, and render dollar-denominated debt of both public and private agents more onerous.

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Developing new and improved clean-energy technologies is an important part of any strategy to combat global climate change. For example, generation of electricity and heat is the largest source of carbon emissions, accounting for 42 percent of carbon emissions worldwide in 2012.1 Meeting the climate policy goals currently under consideration, such as European Union discussions to reduce emissions by 40 percent below 1990 levels by 2030 or the U.S. Clean Power Plan goal of reducing emissions from the electricity sector by 32 percent by 2030, will not be possible without replacing much of the current fossil fuels-based electric generating capacity with alternative, carbon-free energy sources.

My research focuses on the role of technology for both reducing energy consumption and providing clean energy. This work includes three main themes: empirical studies of the relationship between environmental policy and innovation, policy simulations and empirical work on ways environmental and science policies may promote energy innovation, and empirical studies of environmental technology transfer. Much of my research uses patent data to track energy innovation, thereby building on the pioneering efforts of NBER researchers such as Adam Jaffe and Bronwyn Hall, whose early forays into patent data to track energy innovation, and other work considers the potential of technology for climate adaptation by studying how innovation responds to natural disasters.

Popp studies the links between environmental policy and innovation, with a particular focus on how environmental and energy policies shape the development of new technologies for combating climate change. His research often makes use of patent data to trace development of green technologies, exploring how policy and prices shape innovation. Other recent work considers the potential of technology for climate adaptation by studying how innovation responds to natural disasters.

Popp is a co-editor for two journals, the Journal of the Association for Environmental and Resource Economics and Environmental and Resource Economics. He currently serves on the advisory committee of the Green Growth Knowledge Platform. Popp received a B.A. in political economy from Williams College in 1992, and a Ph.D. in economics from Yale University in 1997. He lives in Manlius, NY, with his wife, Deirdre, and two teenage children. He enjoys baseball, hiking, snowshoeing, and attending his children’s many musical and theater performances.
broad-based policies, such as a carbon tax or tradable permits, to address externalities, policy makers often use more narrowly focused policies to encourage renewable energy. For example, feed-in tariffs for energy generated from renewable sources, and renewable portfolio standards that require a minimum percentage of electricity be generated from renewable energy sources. While renewable portfo-

lo standar
d states leave it to market forces to decide which renewable sources are used to meet the tar-
fic, feed-in tariffs promote specific energy sources. For example, at their peak, feed-in tariffs for solar energy in Germany were over seven times higher than the feed-in tariffs for wind energy.4 In a 2010 publication, Nick Johnstone, Ivan Haščič, and I collect data on renewable energy policies and patents across coun-
tries to assess the effect of vari-
ous renewable energy policies on innovation.5 Figure 1 shows that parenting activity has increased rapidly over the past decade as these policies have become more prevalent. Moreover, different instruments end up promoting innovation on different types of renewable energy technologies. Quantity-based policies, such as renewable portfolio stand-
ards, favor development of wind energy. Of the various alternative energy technolo-
gies, wind has the lowest cost and is closest to being competitive with traditional energy sources. As such, when faced with a mandate to provide alternative energy, firms focus their innovative efforts on the technology that is closest to market. In contrast, direct investment incentives are effective in promoting clean energy R&D in solar and waste-to-energy technologies, which are further from being competitive with traditional energy technologies and thus need incentive policies to make them competitive.

These results suggest particular chal-

[larger text]

ALTERNATIVE ENERGY PATENTS OVER TIME

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of patents</th>
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<tbody>
<tr>
<td>2000</td>
<td>100</td>
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<tr>
<td>2005</td>
<td>200</td>
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<tr>
<td>2010</td>
<td>400</td>
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<td>2015</td>
<td>600</td>
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Source: G. Rajan, R&D Funding Chart (2013).

Figure 1

The Roles of Environmental and Science Policy

Understanding the role of environ-
ment policy on technological change involves the study of two market failures. Because pollution is not priced by the mar-
etic, firms and consumers have no incentive to reduce emissions without policy inter-
tervention. Thus, the market for technologies that mitigate pollution is not self-sustain-
ing without policy interventions that alter these incentives. At the same time, the public goods nature of knowledge leads to spill-
overs that benefit the public as a whole, but not the innovator. As a result, poten-
tially innovative private firms and individu-
als may not have incentives to provide the socially optimal level of research activity. The evidence suggests that science policy plays a supporting role, but that environmental policies are more important for promoting new green technolo-
gies. Policies must be in place not only to encourage renewable energy R&D, but also to encourage the adoption of existing clean technologies. In 2006, I ran a model of the global economy that links eco-
nomic activity to carbon emissions and allows research in the energy sector to respond to policy changes.6 I compare long-
run welfare gains from both an optimally-designed carbon tax (one equating the mar-
ginal benefits of carbon reduc-
tions with the marginal costs of such reductions) and optim-
ally designed R&D subsi-
dies.7 While combining both policies yields the largest wel-
fare gain, a policy using only the carbon tax achieves 95 per-
cent of the welfare gains of the combined policy. In contrast, a policy using only the opti-
mal R&D subsidy attains just 11 percent of the welfare gains of the combined policy. This finding is con-
firmed by other researchers simulating U.S. and global energy policies, show-
ing that policies directly targeting envi-
ronmental damages from (GDP) energy gen-
eration better promote both emissions reductions and innovation.8 However, carbon prices and R&D subsidies can complement each other if clean technolo-
gies are less developed than existing dirty technologies. In such a case, initial R&D subsidies can close the gap between clean and dirty technologies, reducing the level of carbon taxes needed in future years to reduce greenhouse gas emissions.9

To use R&D subsidies most effec-
tively, we need to understand their impact. Figure 2 shows that patenting activity increases rapidly within five years of funding, but the lag from new R&D funding to patent grants is longer. In my recent work, I use scientific publications to explore how public R&D spending affects patenting and publication, there is little increase in the cumulative probability of a citation resulting from new R&D funding until approximately two years after funding, with the effect not lev-
eling out until almost 18 years afterwards. Allowing for a five year window for processing paten-
tents, this suggests that new patent appli-
cations citing these publications begin appearing about one year after funding and continue for 13 years.

International Technology Transfer

A third stream of my research focuses on the international dimensions of envi-
ronmental innovation. Combining data on scientific publications for alternative energy technologies with data on govern-
ment R&D support helps isolate the effect of public R&D and sheds light on the pro-
cess through which public R&D helps develop scientific knowledge. Interestingly, unlike work on private sector innovation, other factors such as energy prices and pol-
icy have little effect on alternative energy publication rates. Current government energy R&D efforts appear to support novel research, rather than crowding out work previously done. I find little evidence for diminishing returns to energy R&D at current funding levels. However, patience is important for evalu-
ating the effect of energy R&D. The ultimate goal of government energy R&D funding is not a publication, but rather a new technology. Thus I use cita-
tions these articles receive from future paten-
ts to assess the impact of basic science on new technologies. Figure 2 traces the time path of the impact in energy probability for publications generated from an additional $1 million in R&D funding being cited by a pat-
et. It may take up to a decade to realize the full effect of public energy R&D funding on pub-
lication, and even longer until the effect on new energy patents. Because of the lags between initial fund-
ing and publication, there is little increase in the cumulative probability of a citation resulting from new R&D funding until approximately two years after funding, with the effect not lev-
eling out until almost 18 years afterwards. Allowing for a five year window for processing paten-
tents, this suggests that new patent appli-
cations citing these publications begin appearing about one year after funding and continue for 13 years.

Figure 2

EVALUATING PUBLIC ENERGY R&D

How much additional $2 million in funding affects patent citations

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of citations</th>
</tr>
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<tbody>
<tr>
<td>2000</td>
<td>100</td>
</tr>
<tr>
<td>2005</td>
<td>200</td>
</tr>
<tr>
<td>2010</td>
<td>400</td>
</tr>
<tr>
<td>2015</td>
<td>600</td>
</tr>
</tbody>
</table>

Source: G. Rajan, R&D Funding Chart (2013).

The ultimate goal of government energy R&D funding is not a publication, but rather a new technology. Thus I use cita-
tions these articles receive from future paten-
ts to assess the impact of basic science on new technologies. Figure 2 traces the time path of the impact in energy probability for publications generated from an additional $1 million in R&D funding being cited by a paten-
et. It may take up to a decade to realize the full effect of public energy R&D funding on publication, and even longer until the effect on new energy patents. Because of the lags between initial fund-
ing and publication, there is little increase in the cumulative probability of a citation resulting from new R&D funding until approximately two years after funding, with the effect not lev-
eling out until almost 18 years afterwards. Allowing for a five year window for processing paten-
tents, this suggests that new patent appli-
cations citing these publications begin appearing about one year after funding and continue for 13 years.
decrease and project efficiency (measured by the capacity factor, which compares a wind farm’s actual annual electricity generation to its potential annual output if the wind farm operates at its full capacity) increases with the previous experience of local project developers and foreign wind turbine manufacturers. That these improvements occur for the capacity factor as well as for cost reductions suggest that technology transfer occurs, and that the results are more than reduced transaction costs and lower contract prices forrepeat customers.

Conclusion

While the papers cited here highlight the important connections between environmental policy and technological change, much work remains to fully understand the potential for technology to aid in both the mitigation of and adaptation to climate change. In addition to the research questions addressed here, the role of technology in climate change adaptation10 and the behavioral influences of clean technology adoption,11 are important areas for future work.


Recessions and Retirement: How Stock Market and Labor Market Fluctuations Affect Older Workers

Courtney Coile and Phillip B. Levine

The sharp drop in equity values at the beginning of the recent financial crisis led to widespread concern about the effect of the crisis on retirement security. With defined contribution pension plans largely having replaced defined benefit plans for U.S. workers,7 millions of individuals experienced steep declines in the value of their retirement savings. It was widely predicted that workers would delay retirement to make up for these losses, as newspaper headlines proclaimed “Economic Crisis Scrambles Retirement Math” and “Will You Retire? New Economic Realities Keep More Americans Working.”8

The effect of the sharp rise in the unemployment rate on retirement was a less-publicized element of the crisis. Relative to earlier periods, workers who lost jobs experienced longer spells of unemployment and had a lower probability of finding new jobs.9 Older workers who experienced job loss and difficulty finding work may have retired earlier than planned. Indeed, the Social Security Administration reported in 2009 that new retired worker benefit claims rose by 10 percent more than expected during 2008 and officials surmised that the weak economy was the cause.10

The potential effects of the crisis on retirement are more complex than suggested by the headlines. In a series of studies, we have investigated the effect of stock and labor market fluctuations on retirement decisions and retiree well-being in the United States.11 This summary reviews our exploration of whether retirement rates are higher when stock markets or labor markets are weak. We also describe our analyses of whether recessions have long-term impacts on retiree income and health.

Does the Stock Market Affect Retirement?

In order for stock market fluctuations to affect retirement decisions, several conditions must be met. First, since equity investors presumably expect a positive rate of return on their investments and understand that daily prices are volatile, there must be asset price movements representing larger- or smaller-than-expected returns. Second, workers must have enough stock assets that these price changes constitute meaningful wealth shocks. Third, retirement rates must be sensitive to fluctuations in wealth. The stock market has experienced unusual equity returns over the past two decades, with two boom-bust cycles, culminating in the dot-com crash of 2000–2002 and the more recent financial crisis. Whether workers have substantial equity investments is a different matter. In one analysis, we report that 58 percent of U.S. households with a head aged 55 to 64 held stock assets in 2007, just before the recent crisis.12 The most common form of ownership is through retirement accounts (50 percent of households), though some households own stocks directly (21 percent) or in mutual funds outside of retirement accounts (14 percent). Median stock assets are $78,000 among stockholders. As wealth and stock values are strongly correlated with education, some 78 percent of households headed by a college graduate own stock, and the median holding is $123,000, while just 21 percent of households headed by high school dropouts hold stock, with a median holding of $10,000. Overall, nearly six in ten of near-retirement-age households have less than $25,000 in stock assets and only one in eight have assets over $250,000.

Courtney Coile is a research associate in the NBER’s Aging Program and editor of the NBER Bulletin on Aging and Health. She is a professor of economics at Wellesley College, where she directs the Knapp Social Science Center and has taught since 2000. Much of Coile’s research focuses on the economics of retirement. She is a long-time participant in the NBER’s Social Security and Retirement around the World project and is the co-author of Reconsidering Retirement: How Losses and Layoffs Affect Older Workers. She recently served on the National Academy of Sciences Committee on the Long-Run Macro-Economic Effects of the Aging U.S. Population (Phase II) and is an editor for the Journal of Pension Economics and Finance.

Coile studied economics as an undergraduate at Harvard University and first worked at the NBER as a research assistant in those years. She earned her Ph.D. in economics from MIT in 1999.

Coile lives in the Boston suburbs with her husband and two school-age children. In her free time, she shares her love of running and hiking. Getting her children to share her love of running and hiking.
If workers respond to financial wealth shocks, the stark differences in stock ownership by education suggest that the impact of stock market returns on retirement will vary by education. We asked whether college graduates between the ages of 55 and 70 are more sensitive to short-term (single year) stock market fluctuations when making retirement decisions than less educated individuals. When we analyzed data from the Current Population Survey, 1980–2002, and the Health and Retirement Study, 1992–2002, we found no evidence of this. This could be due to the small number of individuals who experienced large, unexpected wealth gains or losses during this period, or to the wealth effect being relatively small. We subsequently revisited this question with more data and were able to identify circumstances in which retirement behavior is responsive to stock market fluctuations.6 Specifically, we found that long-term market fluctuations, as measured by the percent change in the S&P 500 Index over a five- or 10-year period, affect the retirement decisions of college-educated workers aged 62 to 69. [See Figure 1] We found no statistically significant effect of short-term fluctuations on retirement behavior, nor any effect of market fluctuations on younger workers or workers with less education. The magnitude of the retirement effect is economically meaningful—a one-standard-deviation (77 percentage point) increase in the 10-year return increases the retirement rate of college-educated workers by about one percentage point, or 12 percent relative to the mean. Overall, the empirical findings suggest that while there are workers whose retirements are slowed or accelerated when they experience unexpected changes in stock market returns, the number of workers who experience substantial wealth shocks is relatively small and the magnitude of the aggregate retirement response is likely modest.

We found that experiencing a recession, but also are likely to retire at early ages regardless of market conditions due to poor health and the inability to continue working at physically demanding jobs, while more skilled workers may have a relatively low risk of unemployment during a recession. We think that ‘high school graduates may have the right combination of desire to continue working along with a higher risk of unemployment and difficulty in finding new work, so a recession may lead many of them to retire involuntarily.’

In short, the results suggest that retirement is cyclically sensitive, particularly for less-educated workers over the age of 61.

Do Stock and Labor Markets Affect Retiree Well-Being?

Finally, we turn to the question of whether market fluctuations have long-term effects on retiree well-being. Here, our focus is on labor market conditions, as the stock market has rebounded from its 2009 low to values near or above pre-crisis levels, while the weakness in the labor market has been more transient and persistent. A spell of late-career unemployment can have long-term consequences for an individual even after the labor market rebounds. If an individual fails to find new employment, he or she may claim Social Security benefits when first available at age 62, potentially delaying the years leading up to retirement lowers retiree income. The finding is stronger for Social Security income but is also notable for labor market conditions and for labor market conditions experienced at or after age 62.

Our central finding is that retirement is cyclically sensitive—a five-point increase in the unemployment rate raises the probability of retirement by about one percentage point, or eight percent relative to the mean annual retirement rate of 13.5 percent. Moreover, the labor supply response to unemployment emerges at age 61, as workers approach the Social Security early retirement age of 62; retirement is not cyclical for workers aged 55 to 60. In subsequent work, we explore how the cyclicality of retirement varies with education. We find that workers with a high school degree experience the largest effect—a five-point increase in the unemployment rate raises their probability of retirement by 1.8 percentage points, or nearly 20 percent relative to the mean. [See Figure 1] The effects for other education groups are positive but not statistically significant. In explaining these results, we surmise that high school dropouts may be most likely to lose a job during a recession, but also are likely to retire at early ages regardless of market conditions due to poor health and the inability to continue working at physically demanding jobs, while more skilled workers may have a relatively low risk of unemployment during a recession. We think that ‘high school graduates may have the right combination of desire to continue working along with a higher risk of unemployment and difficulty in finding new work, so a recession may lead many of them to retire involuntarily.’

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these individuals. While the recent crisis focused public attention on retirement security in an age of defined contribution pension plans, it seems clear that the difficulties facing individuals who approach retirement at a time when the labor market is weak merit greater public attention.


Menu Choices in Defined Contribution Pension Plans

Clemens Sialm

Significant changes in the structure of retirement saving programs have occurred in recent decades in the United States and across the world. Defined Contribution (DC) pension plans, such as 401(k) and 403(b) plans, have become an important source of retirement funding, while the relative significance of Social Security and Defined Benefit (DB) pension plans has declined. As a result, more savings and investment decisions need to be taken by individuals, who might not have the time and knowledge to take optimal investment decisions. In addition, there are potential conflicts of interest between providers of the newer plans and retirement savers. Investment choices that maximize the profits of plan providers are not necessarily the optimal choices for retirement savers. It is therefore crucial to scrutinize the impact of DC plan design on savings and investment decisions.

I discuss here some key findings of two recent research projects that analyze the mutual fund investment options offered in DC pension plans. The structure of the retirement savings system affects the investment strategies, the money flows, and the performance of retirement savers. DC plan design needs to take into account behavioral biases and bounded rationality by retirement savers as well as conflicts of interests by service providers.

Mutual Fund Menu Options

Mutual fund holdings in employer-sponsored DC plans are an important and growing segment of today’s financial markets. Figure 1 depicts the total value of mutual fund assets in the United States. Between 1992 and 2014, total mutual fund assets grew from $1.6 trillion to $15.9 trillion. Mutual funds can be held in DC pension plans, in Individual Retirement Accounts (IRAs), and in non-retirement environments. The growth of mutual fund assets has been particularly strong in DC plans. Currently, around 23.5 percent of mutual fund assets are held in DC plans, 22.4 percent in IRAs, and the remaining 54.1 percent in non-retirement accounts.

Thus, mutual funds have mixed clientele that differ according to their distribution channels, their time horizons, and their tax implications. Whereas investors who own mutual funds in IRAs or in non-retirement accounts can choose from the universe of mutual funds, participants in employer-sponsored DC plans typically have limited choices. These choices arise through a two-stage process. In the first stage, the plan sponsor, typically the employer, together with the service provider, selects the DC plan menu, which defines the set of investment options for participants. In the second stage, plan participants—often the employees—allocate their individual account balances among the choices made available to them by the plan sponsor. Thus, final allocations in DC plans reflect decisions of the sponsor, the service providers, and the participants.

Figure 1
Sticky vs. Discerning Money

Despite the importance of DC mutual fund flows, it is known about the properties of money flows in DC pension plans. Conventional wisdom suggests money flows in DC plans are “sticky” and not discerning. Previous studies indicate that DC plan participants exhibit significant inertia in their flow decisions and are reluctant to rebalance and realign their portfolios. In addition, DC plan participants make periodic retirement account contributions or withdrawals, which lead to persistence in money flows.

To test whether DC money flows are sticky, we follow the definition of Hanjiang Zhang, and I compare the flows of DC and non-DC mutual fund investors from 1997 to 2010. In contrast to the conventional wisdom, we find that money flows into mutual funds by DC plan participants are more volatile and exhibit a lower serial correlation than the flows into mutual funds by other investors. Furthermore, we show that DC flows are more sensitive to prior fund performance than non-DC flows. In fact, the flow-performance sensitivity of DC flows is particularly pronounced for funds with extreme prior performance records.

Figure 2 depicts the sensitivity of money flows to prior performance for DC and non-DC assets. We group all U.S. domestic equity funds into percentiles according to the fund performance over the prior year. Funds in the highest percentile correspond to the one percent of mutual funds that exhibit the worst performance over the previous year, whereas funds in the lowest percentile correspond to the one percentile of funds that exhibit the best performance.

The dots in the figure show the average money flows for the performance percentiles after controlling for other fund characteristics. The blue diamonds correspond to DC flows and the gray circles correspond to non-DC flows. The solid curves show the least-squares cubic relation for DC and non-DC flows. On average, DC assets experience larger fund flows than non-DC assets due to the significantly greater number of qualified retirement accounts over our sample period. Whereas the flow-performance relation is close to linear for non-DC assets, the relation is clearly nonlinear for DC assets. The flow-performance relation is particularly steep for DC assets corresponding to funds in the top and bottom performance groups. For example, funds in the bottom decile of performance experience an average outflow of 8.3 percent of their assets, whereas funds in the top decile experience an average inflow of 53.6 percent of their assets.

Figure 3

We examine whether mutual fund families act strategically as providers, using their choice of menu items to influence the investment behavior of their clients. We hypothesize that service providers can have an incentive to promote their own funds. A systematic analysis of the advantages and disadvantages of different structures of retirement savings is crucial in an environment where retirement savers are subject to behavioral biases and bounded rationality where financial intermediaries are subject to agency conflicts.

Conclusions

As individuals take more responsibility for managing their retirement savings, it becomes important to consider the two-stage process of asset allocation in retirement plans. This process, in which the sponsor selects the menu and the participants decide how much to invest in the separate options, has the advantage of mitigating the inertia of plan participants.

To investigate this favoritism hypothesis, we collect data from annual filings of Form 11-K with the SEC information they possess about these funds. To examine this possibility, we consider the performance of affiliated and nonaffiliated funds. We find that the performance of affiliated funds is lower than the performance of nonaffiliated funds for several reasons. First, DC plans have a probability of deletion of 25.5 percent for affiliated funds and a probability of deletion of only 13.7 percent for unaffiliated funds. Second, the average outflow of affiliated funds is lower than the average inflow of unaffiliated funds. Third, the deletion rates for affiliated funds are consistent with conflicts of interest, more so than for unaffiliated funds.

The evidence on favoritism is consistent with conflicts of interest, 401(k) plan sponsor biases, and superior information about their own proprietary funds. Therefore, it is possible that they show a preference for these funds. Whereas mutual fund options are biased toward them, but rather due to positive information they possess about these funds. To investigate this possibility, we examine the performance of affiliated and nonaffiliated funds. For example, the decision to keep poorly performing affiliated funds on the menu is information-driven, then these funds should perform better in the future. This is not the case. Affiliated funds that rank poorly based on past performance but are not deleted from the menu do not perform well in the subsequent year. On average, they underperform by approximately four percent annually on a risk-adjusted basis. Our results suggest that the favoritism we document could have important implications for the retirement income of employees.


In his more recent research, the prize committee said, Deaton has highlighted "how reliable measures of individual household consumption levels can be used to discern mechanisms behind economic development. His research has uncovered important pitfalls when comparing the extent of poverty across time and place. It has also exemplified how the clever use of household data may shed light on such issues as the relationships between income and calorie intake, and the extent of gender discrimination within the family. Deaton is the Dwight D. Eisenhower Professor of International Affairs and a professor of economics and international affairs at Princeton's Woodrow Wilson School of Public and International Affairs. A native of Scotland, he earned his bachelor's degree and Ph.D. from the University of Cambridge, and holds both British and American citizenship.

Deaton has authored or co-authored dozens of working papers. His recent papers include Suicide, Age, and Wellbeing: an Empirical Investigation, with Anne Case, and Creative Destruction and Subjective Wellbeing, with Philippe Aghion, Ufuk Akcigit, and Alexandra Roulet. He is affiliated with seven NBER research programs: Aging, Children, Development, Economic Fluctuations and Growth, Education, Health Care, and Public Economics.
Education, Skills, and Technical Change: Implications for Future U.S. GDP Growth

The NBER hosted a Conference on Research in Income and Wealth (CRIW) meeting, “Education, Skills, and Technical Change: Implications for Future U.S. GDP Growth,” in Bethesda, MD, on October 16–17. Research Associates Charles Hulten of University of Maryland and Valerie Ramey of University of California, San Diego, organized the meeting. These papers were discussed:

- Canyon L. Bosler, Mary Daly, and John Fernald, Federal Reserve Bank of San Francisco, and Bart Hobijn, Arizona State University, “The Outlook for U.S. Labor Quality Growth”
- Dale Jorgenson, Harvard University; Mum Ho, Resources for the Future; and Jon Samuels, Bureau of Economic Analysis, “Education, Participation, and the Revival of U.S. Economic Growth”
- Shelly Lundberg, University of California, Santa Barbara, “Non-Cognitive Skills as Human Capital”
- Robert G. Valletta, Federal Reserve Bank of San Francisco, “Recent Hardening in the Higher Education Wage Premium: Polarization, Deskilling, or Both?”
- Gordon Hanson, University of California, San Diego, and NBER, and Matthew J. Slaughter, Dartmouth College and NBER, “High-Skilled Immigration and the Rise of STEM Occupations in U.S. Employment”
- Caroline Hoxy, Stanford University and NBER, “Online Education, Labor Productivity, and Technological Innovation”
- Grey Gordon, Indiana University, and Aaron Hedlund, University of Missouri, “Accounting for the Rise in College Tuition”

Summaries of these papers are at: http://www.nber.org/confer/2015/CRIWf15/summary.html

Firms and the Distribution of Income: The Roles of Productivity and Luck

An NBER conference, “How do Firms Affect the Distribution of Income? The Roles of Productivity and Luck,” took place in Palo Alto on November 13–14. Labor Studies Program Director David Card of University of California, Berkeley, and Research Associates Edward Lazear and Kathryn Shaw of Stanford University, organized the meeting. These papers were discussed:

- Erling Barth, Institute for Social Research and NBER, James Davis, Bureau of the Census; and Richard B. Freeman, Harvard University and NBER, “Augmenting the Human Capital Earnings Equation with Measures of Where People Work”

Summaries of these papers are at: http://www.nber.org/confer/2015/LCMf15/summary.html

Lessons from the Crisis for Macroeconomics

An NBER conference, “Lessons from the Crisis for Macroeconomics,” took place in New York on December 4. Research Associates Virgilirg Midrigan and Thomas Philippon of New York University organized the meeting. These papers were discussed:

- David Berger and Guido Lorenzoni, Northwestern University and NBER, and Veronica Guerrieri and Joseph Yavza, University of Chicago and NBER, “House Prices and Consumer Spending” (NBER Working Paper No. 21467)
- Christopher House and Linda Tesar, University of Michigan and NBER, and Christian Pröbsting, University of Michigan, “Austerity in the Aftermath of the Great Recession”
- Atif Mian, Princeton University and NBER; Amir Sui, University of Chicago and NBER; and Emil Verner, Princeton University, “Household Debt and Business Cycles Worldwide” (NBER Working Paper No. 21581)
- Oscar Jordi, Federal Reserve Bank of San Francisco; Moritz Schularick, University of Bonn; and Alan Taylor, University of California, Davis, and NBER, “Leveraged Bubbles” (NBER Working Paper No. 21486)
- Danny Yagan, University of California, Berkeley, and NBER, “Moving to Opportunity? Migratory Insurance over the Great Recession”
- Robert Hall, Stanford University and NBER, “Macroeconomics of Persistent Slumps”

Summaries of these papers are at: http://www.nber.org/confer/2015/LCMf15/summary.html

• Chinhui Juhn, University of Houston and NBER; Kristin McGuie and Holly Monti, Bureau of the Census; and Brooks Pierce, Bureau of Labor Statistics, “Firm Performance and the Volatility of Worker Earnings”
• Edward Lazear and Kathryn Shaw, Stanford University and NBER, and Christopher Stanton, Harvard University and NBER, “Who Gets Hired? The Importance of Finding an Open Slot”
• David Card and Patrick Kline, University of California, Berkeley, and NBER; Ana Rute Cardoso, Institute for Economic Analysis (Barcelona); and Jörg Heinig, Institute for Employment Research (Nuremberg), “Firms and Labor Market Inequality: A Review”
• John M. Abowd, Cornell University and NBER; Kevin L. McKinney, Bureau of the Census; and Nellie Zhao, Cornell University, “Earnings Inequality Trends in the United States: Nationally Representative Estimates from Longitudinally Linked Employer-Employee Data”
• Erik Brynjolfsson, MIT and NBER, and Heekyung Kim and Guillaume Saint-Jacques, MIT, “CEO Pay and Information Technology”
• Jae Song, Social Security Administration; David Price and Nicholas Bloom, Stanford University and NBER; Fatih Guvenen, University of Minnesota and NBER; and Till von Wachter, University of California, Los Angeles, and NBER, “Firing Up Inequality” (NBER Working Paper No. 21199)
• Stefan Bender, Deutsche Bundesbank; Nicholas Bloom; David Card; John Van Reenen, London School of Economics and NBER; and Stefanie Wolter, Institute for Employment Research (Nuremberg), ‘Of Managers and Management: Evidence from Matched Employer-Employee Data”
• David Deming, Harvard University and NBER, and Lisa Kahn, Yale University and NBER, “Firm Heterogeneity in Skill Demands”

Summaries of these papers are at: http://www.nber.org/confer/2015/PERf15/summary.html
Program and Working Group Meetings

Development Economics

The NBER’s Program on Development Economics and The Bureau for Research and Economic Analysis of Development held a joint meeting in Cambridge on September 25–26. Program Director Duncan Thomas of Duke University, Research Associates Abhijit Banerjee of MIT and Mushfiq Mobarak of Yale University, and Eliana Li Ferrara of Bocconi University, organized the meeting. These papers were discussed:

• Jing Cai, University of Michigan, and Adam Steidl, Central European University, “Interfirm Relationships and Business Performance”
• Francesco Amorino, McGill University, and Miguel A. Martinez-Carrasco, University of Piuara, “Input Allocation, Workforce Management and Productivity Spillovers: Evidence from Personnel Data”
• Koichiro Ito, University of Chicago and NBER, and Shuang Zhang, University of Colorado, Boulder, “Willingness to Pay for Clean Air: Evidence from Air Purifier Markets in China”
• Juan Carlos Suárez Serrato and Xiao Yu Wang, Duke University and NBER, and Shuang Zhang, “The One Child Policy and Promotion of Mayors in China”
• Joram Mayshar, Hebrew University of Jerusalem; Omer Moav, University of Warwick; Zvika Neeman, Tel Aviv University, and Luigi Pascali, Pompeu Fabra University, “Cereals, Appropriability, and Hierarchy”
• Christian Dippel, University of California, Los Angeles, and NBER; Avner Greif, Stanford University; and Daniel Treffer, University of Toronto and NBER, “The Rents from Trade and Coercive Institutions: Removing the Sugar Coating” (NBER Working Paper No. 20958)

Summaries of these papers are at: http://www.nber.org/confer/2015/DEVf15/summary.html

Chinese Economy

The NBER’s Working Group on the Chinese Economy met in Cambridge on October 9–10. Working Group Director Hamming Fang of the University of Pennsylvania and Research Associate Shang-Jin Wei of Columbia University organized the conference. These papers were discussed:

• Cynthia Kinnan, Northwestern University and NBER; Shing-Yi Wang, University of Pennsylvania and NBER; and Yongxiang Wang, University of Southern California, “Relaxing Migration Constraints for Rural Households” (NBER Working Paper No. 21349)
• Koichiro Ito, University of Chicago and NBER, and Shuang Zhang, University of Colorado, Boulder, “Willingness to Pay for Clean Air: Evidence from Air Purifier Markets in China”

• Chen Lin and Xiaofeng Zhao, Chinese University of Hong Kong; Randall Morck, University of Alberta and NBER; and Bernard Yeung, National University of Singapore, “Anti-Corruption Reforms and Shareholder Valuations: Evidence from China”
• Bei Qin, University of Hong Kong; David Stromberg, Stockholm University; and Yanhui Wu, University of Southern California, “The Political Economy of Social Media in China”
• Yi Che, Shanghai Jiao Tong University; Yi Lu, National University of Singapore; Justin Pierce, Federal Reserve Board; Peter Schott, Yale University and NBER; and Zhigang Tao, University of Hong Kong, “Do Chinese Imports Influence U.S. Elections?”
• Andrew Ang, Columbia University and NBER; Jennie Bai, Georgetown University; and Hao Zhou, Tsinghua University, “The Great Wall of Debt: Corruption, Real Estate, and Chinese Local Government Credit Spreads”
• James Choi, Yale University and NBER; Li Jin, Peking University; and Hongjun Yan, Yale University, “Informed Trading and the Cost of Capital”
• Tasso Adamopoulos, York University; Loren Brandt and Diego Restuccia, University of Toronto; and Jessica Leight, Williams College, “Misallocation, Selection and Productivity: A Quantitative Analysis with Panel Data from China”

Summaries of these papers are at: http://www.nber.org/confer/2015/CEf15/summary.html

Political Economy

The NBER’s Political Economy Program, directed by Alberto Alesina of Harvard University, met in Cambridge on October 23. These papers were discussed:

• Oded Galor, Brown University and NBER, and Marc Klemp, Brown University, "Roots of Autocracy"
• Filip Matějka, Center for Economic Research and Graduate Education - Economics Institute, and Guido Tabellini, Bocconi University, "Electoral Competition with Rationally Inattentive Voters"
• Marianne Bertrand, University of Chicago and NBER; Robin Burgess and Guo Xu, London School of Economics; and Arunish Chawla, Indian Administrative Service, “Determinants and Consequences of Bureaucratic Effectiveness: Evidence from the Indian Administrative Service”
• Alberto Bisin, New York University and NBER, and Thierry Verdier, Paris School of Economics, “On the Joint Evolution of Culture and Institutions”
• Gabriele Gratto, University of New South Wales; Luigi Guiso and Claudio Michelacci, Einaudi Institute for Economics and Finance; and Massimo Morelli, Columbia University and NBER, “From Weber to Kafka: Political Activism and the Emergence of an Inefficient Bureaucracy”
• Sharun Mukand, University of Warwick, and Dani Rodrik, Harvard University and NBER, “The Political Economy of Liberal Democracy” (NBER Working Paper No. 21540)

Summaries of these papers are at: http://www.nber.org/confer/2015/POlF15/summary.html
Market Design

The NBER's Working Group on Market Design, co-directed by Michael Ostrovsky of Stanford University and Parag Pathak of MIT, met in Cambridge on October 23–24. These papers were discussed:

- Tarfun Sönmez and Utku Ünver, Boston College, and Öğür Yılmaz, Koç University, "How (not) to Integrate Blood Subtyping Technology to Kidney Exchange"
- Mehmet Ekmecki, Boston College, and M. Bumin Yennez, Carnegie Mellon University, "Integrating Schools for Centralized Admissions"
- Shuchi Chawla, University of Wisconsin-Madison; Jason Hartline, Northwestern University; and Denis Nekipelov, University of Virginia, "Mechanism Design for Data Science"
- John Hatfield, University of Texas at Austin; Scott Duke Kominers, Harvard University; Alexandru Nichifor, University of St Andrews; Michael Ostrovsky; and Alexander Westkamp, Maastricht University, "Full Substitutability"
- Thinh Nguyen, Purdue University, and Rakesh Vohra, University of Pennsylvania, "Near Feasible Stable Matchings with Complementarities"
- Ali Hortaçoğlu, University of Chicago and NBER, Jakub Kastl, Princeton University and NBER; and Allen Zhang, Department of the Treasury, "Bid Shading and Bidder Surplus in the U.S. Treasury Auction System"
- Nick Arnosti, Marissa Beck, and Paul Milgrom, Stanford University, "Adverse Selection and Auction Design for Internet Display Advertising"
- Daniela Saban, Stanford University, and Gabriel Weintraub, Columbia University, "Procurement Mechanisms for Differentiated Products"
- Steven Lalley, University of Chicago, and Glen Weyl, Microsoft Corporation, "Quadratic Voting"
- Canice Prendergast, University of Chicago, "The Allocation of Food to Food Banks"

Summaries of these papers are at: http://www.nber.org/confer/2015/MDf15/summary.html

Economic Fluctuations and Growth

The NBER's Program on Economic Fluctuations and Growth met in New York on October 30. Faculty Research Fellow Greg Kaplan of Princeton University and Research Associate Ricardo Reis of Columbia University organized the meeting. These papers were discussed:

- Xavier Gabaix, New York University and NBER; Jean-Michel Lasry, Paris Dauphine University; Pierre-Louis Lions, Collège de France; and Benjamin Moll, Princeton University and NBER, "The Dynamics of Inequality" (NBER Working Paper No. 21363)
- Woiter den Haan, London School of Economics; Pontus Rendahl, University of Cambridge; and Markus Riegler, University of Bonn, "Unemployment (Fears) and Deflationary Spirals"
- Cosmin Ilut, Duke University and NBER; Rosen Valchev, Boston College; and Nicolas Vincent, HEC Montréal, "Paralyzed by Fear: Rigid and Discrete Pricing under Demand Uncertainty"
- Marco Del Negro and Marc Giannoni, Federal Reserve Bank of New York, and Christina Patterson, MIT, "The Forward Guidance Puzzle"
- Iván Werning, MIT and NBER, "Incomplete Markets and Aggregate Demand" (NBER Working Paper No. 21448)

Summaries of these papers are at: http://www.nber.org/confer/2015/EFGf15/summary.html

International Finance and Macroeconomics

The NBER's Program on International Finance and Macroeconomics met in Cambridge on October 30. Research Associates Ariel Burstein of University of California, Los Angeles, and Charles Engel of University of Wisconsin-Madison organized the meeting. These papers were discussed:

- Javier Cravino and Andrei Levchenko, University of Michigan and NBER, "The Distributional Consequences of Large Devaluations"
- Gita Gopinath, Harvard University and NBER; Sebnem Kalemli-Özcan, University of Maryland and NBER; Loukas Karabarbounis, University of Chicago and NBER; and Carolina Villegas-Sanchez, ESADE, "Capital Allocation and Productivity in South Europe" (NBER Working Paper No. 21453)
- Doireann Fitzgerald, Federal Reserve Bank of Minneapolis and NBER; Stefanie Haller, University College Dublin; and Yaniv Yedid-Levi, University of British Columbia, "How Exporters Grow"
- Philippe Bacchetta and Elena Perazzi, University of Lausanne, and Eric van Wincoop, University of Virginia and NBER, "Self-Fulfilling Debt Crises: Can Monetary Policy Really Help?" (NBER Working Paper No. 21158)
- George A. Alessandria, University of Rochester and NBER, and Horag Choi, Monash University, "The Dynamics of the U.S. Trade Balance and the Real Exchange Rate: The J Curve and Trade Costs?"
- Hanno Lustig, Stanford University and NBER, and Adrien Verdeltak, MIT and NBER, "Does Incomplete Spanning in International Financial Markets Help to Explain Exchange Rates?"

Summaries of these papers are at: http://www.nber.org/confer/2015/IFMF15/summary.html
Public Economics

The NBER’s Program on Public Economics met in Palo Alto on November 5–6. Research Associates Raj Chetty and Mark Duggan of Stanford University organized the meeting. These papers were discussed:

- Florian Scheuer, Stanford University and NBER, and Iván Werning, MIT and NBER, “The Taxation of Superstars” (NBER Working Paper No. 21323)
- Benjamin B. Lockwood, Harvard University; Charles G. Nathanson, Northwestern University; and Glen Weyl, Microsoft Corporation, “Taxation and the Allocation of Talent”
- Alexander M. Gelber, University of California, Berkeley, and NBER; Timothy J. Moore, George Washington University and NBER; and Alexander Strand, Social Security Administration, “The Effect of Disability Insurance Payments on Beneficiaries’ Earnings”
- Hugh Macartney, Duke University and NBER; Robert McMillan, University of Toronto and NBER; and Uros Petroniævic, University of Toronto, “Education Production and Incentives”
- Ufuk Akcigit, University of Chicago and NBER; Salomé Baslandze, Einaudi Institute for Economics and Finance; and Stefanie Stantcheva, Harvard University and NBER, “Taxation and the International Mobility of Inventors” (NBER Working Paper No. 21024)
- Pablo Fajgelbaum, University of California, Los Angeles, and NBER; Eduardo Morales, Princeton University and NBER; Juan Carlos Suárez Serrato, Duke University and NBER; and Owen M. Zidar, University of Chicago and NBER, “State Taxes and Spatial Misallocation” (NBER Working Paper No. 21760)
- Lorenz Kueng, Northwestern University and NBER, “Explaining Consumption Excess Sensitivity with Near-Rationality: Evidence from Large Predetermined Payments”
- Marco Di Maggio, Columbia University, and Amir Kermani, University of California, Berkeley, “The Importance of Unemployment Insurance as an Automatic Stabilizer”

Summaries of these papers are at: http://www.nber.org/confer/2015/PEf15/summary.html

Monetary Economics

The NBER’s Program on Monetary Economics met in Cambridge on November 6. Research Associates Ganti Eggertsson of Brown University and James Stock of Harvard University organized the meeting. These papers were discussed:

- Francesco D’Acunto, University of Maryland; Daniel Hoang, Karlsruhe Institute of Technology; and Michael Weber, University of Chicago, “Inflation Expectations and Consumption Expenditure”
- Valerie Ramey, University of California, San Diego, and NBER, “Macroeconomic Shocks and Their Propagation: Monetary Policy Shocks”
- Diego Anzoategui and Joseba Martinez, New York University; Diego A. Comin, Dartmouth College and NBER; and Mark Gertler, New York University and NBER, “Endogenous Technology Adoption and R&D as Sources of Business Cycle Persistence”

Summaries of these papers are at: http://www.nber.org/confer/2015/MEf15/summary.html

Asset Pricing

The NBER’s Program on Asset Pricing met in Palo Alto on November 6. Research Associates Kent D. Daniel and Robert Hodrick of Stanford University organized the meeting. These papers were discussed:

- David Backus, New York University and NBER; Nina Boyarchenko, Federal Reserve Bank of New York; and Mikhail Chernov, University of California, Los Angeles, “Term Structures of Asset Prices and Returns”
- Michael Weber, University of Chicago, “The Term Structure of Equity Returns: Risk or Mispricing?”
- Dong Lou and Christopher Polk, London School of Economics, and Spyros Skouros, Athens University of Economics and Business, “A Tug of War: Overnight Versus Intraday Expected Returns”
- Zhiguo He and Bryan T. Kelly, University of Chicago and NBER, and Asaf Manela, Washington University in St. Louis, “Intermediary Asset Pricing: New Evidence from Many Asset Classes”
- Ian Dew-Becker, Northwestern University; Stefano Giglio, University of Chicago and NBER; Anh T. Le, Pennsylvania State University; and Marius Rodriguez, Federal Reserve Board, “The Price of Variance Risk” (NBER Working Paper No. 21182)

Summaries of these papers are at: http://www.nber.org/confer/2015/APf15/summary.html
Corporate Finance
The NBER’s Program on Corporate Finance met in Palo Alto on November 6. Research Associates Peter Demarzo of Stanford University and Bruce Carlin of University of California, Los Angeles, organized the meeting. These papers were discussed:

- Andrew Hertzberg, Columbia University; Andres Liberman, New York University; and Daniel Paravisini, London School of Economics, “Adverse Selection on Maturity: Evidence from On-line Consumer Credit”
- Ulf Axelsson and Igor Makarov, London School of Economics, “Informational Black Holes in Financial Markets”
- Brad Barber and Ayako Yasuda, University of California, Davis, “Interim Fund Performance and Fundraising in Private Equity”
- Shai Bernstein, Stanford University and NBER; Emanuele Colonnelli, Stanford University; and Benjamin Iverson, Northwestern University, “Asset Reallocation in Bankruptcy”
- Casey Dougal, Drexel University; Pengjie Gao, University of Notre Dame; William J. Mayew, Duke University; and Christopher A. Parsons, University of California, San Diego, “What’s in a (School) Name? Racial Discrimination in Higher Education Bond Markets”

Summaries of these papers are at: http://www.nber.org/confere/2015/CFf15/summary.html

Labor Studies
The NBER’s Program on Labor Studies met in Palo Alto on November 13. Program Director David Card of the University of California, Berkeley, organized the meeting. These papers were discussed:

- Thomas Lemieux, University of British Columbia and NBER, and W. Craig Riddell, University of British Columbia, “Top Incomes in Canada: Evidence from the Census” (NBER Working Paper No. 21347)

Summaries of these papers are at: http://www.nber.org/confere/2015/LSf15/summary.html

Economics of Education
The NBER’s Program on the Economics of Education met in Cambridge on November 19–20. Program Director Caroline M. Hoxby of Stanford University organized the meeting. These papers were discussed:

- Chris e E. Carroll, University of California, Davis, and NBER; Mark Hoekstra, Texas A&M University and NBER; and Elira Kuka, Southern Methodist University, “The Long-Run Effects of Disruptive Peers”
- Gregorio S. Caetano and Hao Teng, University of Rochester, and Joshua Kinsler, University of Georgia, “Towards Consistent Estimates of Children’s Time Allocation on Skill Development”
- Eric Nielsen, Federal Reserve Board, “Achievement Gap Estimates and Deviations from Cardinal Comparability”
- George Bulman, University of California, Santa Cruz, and Caroline M. Hoxby, “The Returns to the Federal Tax Credits for Higher Education” (NBER Working Paper No. 20833)
- Douglas N. Harris, Tulane University, and Matthew Larsen, Lafayette College, “The Effects of the New Orleans Post-Katrina School Reforms on Student Academic Outcomes”
- Michael Dinerstein, University of Chicago, and Troy D. Smith, RAND Corporation, “Quantifying the Supply Response of Private Schools to Public Policies”
- Esteban M. Aucejo, London School of Economics, and Jonathan James, California Polytechnic State University, “The Path to College Education: Are Verbal Skills More Important than Math Skills?”
- Andrew C. Barr, Texas A&M University, and Sarah Turner, University of Virginia and NBER, “Aid and Encouragement: Does a Letter Increase Enrollment among UI Recipients?”
- Michael D. Bates, University of California, Riverside, “Public and Private Learning in the Market for Teachers: Evidence from the Adoption of Value-Added Measures”
- Luc Behaghel and Marc Gurgand, Paris School of Economics, and Clément de Chaisemartin, University of Warwick, “Ready for Boarding? The Effects of a Boarding School for Disadvantaged Students”
- Massimo Anelli, Bocconi University, “Returns to Elite College Education: a Quasi-Experimental Analysis”
- Richard Murphy, University of Texas at Austin, and Gill Wyness, University College London, “Testing Means-Tested Aid”
- Rodney Andrews, University of Texas at Dallas and NBER; Scott A. Imberman, Michigan State University and NBER; and Michael Lovenheim, Cornell University and NBER, “The Effects of Targeted Recruitment and Comprehensive Supports for Low-Income High Achievers at Elite Universities: Evidence from Texas Flagships”

Summaries of these papers are at: http://www.nber.org/confere/2015/EDf15/summary.html
Behavioral Finance

The NBER's Working Group on Behavioral Finance met in Cambridge on November 20. Working Group Director Nicholas Barberis of Yale University organized the meeting. These papers were discussed:

- Samuel Hartzmark, University of Chicago, and Kelly Shue, University of Chicago and NBER, "A Tough Act to Follow: Contrast Effects in Financial Markets"
- Sergey Chernenko, Ohio State University, and Samuel Hanson and Adi Sunderam, Harvard University and NBER, "Who Neglects Risk? Investor Experience and the Credit Boom"
- Nicholas Barberis, Robin Greenwood, and Andrei Shleifer, Harvard University and NBER; and Lawrence Jin, California Institute of Technology, "Extrapolation and Bubbles"
- Ian Gow, Harvard University; Steven Kaplan, University of Chicago and NBER; David Loker, Stanford University; and Anastasia Zakyolyukina, University of Chicago, "CEO Personality and Firm Policies"
- Umit Gurun, University of Texas at Dallas; Noah Stoffman, Indiana University; and Scott Yunker, Cornell University, "Trust Busting: The Effect of Fraud on Investor Behavior"
- Sandra Black, University of Texas at Austin; Paul Deveereux, University College Dublin; and Peter Lindberg, and Kaveh Majlesi, Lund University, "On the Origins of Risk-Taking in Financial Markets" (NBER Working Paper No. 21332)

Summaries of these papers are at: http://www.nber.org/confere/2015/BFf15/summary.html

Organizational Economics

The NBER's Working Group on Organizational Economics met in Cambridge on December 4–5. Group Director Robert S. Gibbons of MIT organized the meeting. These papers were discussed:

- Sylvain Chassang, Princeton University, and Juan M. Ortnre, Boston University, "Collusion in Auctions with Constrained Bids: Theory and Evidence from Public Procurement"
- Daron Acemoglu, MIT and NBER, and Alex Wolitzky, MIT, "Sustaining Cooperation: Community Enforcement vs. Specialized Enforcement" (NBER Working Paper No. 21457)
- John Antonakis, University of Lausanne; Giovanni Adda, Polytechnic University of Milan; and Roberto Weber, University of Zurich, "Just Words: Just Speeches? On The Economic Value of Charismatic Leadership"
- Alexander Schmitt and Giovanna d'Adda, University of Lausanne; and Christian Zehnder, University of Lausanne; "CEO Personality and Firm Policies"
- Laura Alfaro and Pol Antria, Harvard University and NBER; Davin Chor, National University of Singapore; and Paola Conconi, Université libre de Bruxelles, "Internalizing Global Value Chains: A Firm-Level Analysis" (NBER Working Paper No. 21582)
- Francine Lafontaine, University of Michigan, "Organizations and Policy"
- Alexandre Mas, Princeton University and NBER, "Does Disclosure affect CEO Pay Setting? Evidence from the Passage of the 1934 Securities and Exchange Act"
- Emily L. Breza and Yogita Shamdasani, Columbia University, and Supeet Kaur, Columbia University and NBER, "The Morale Effects of Pay Inequality"
- Orie Shalek, Stanford University, and Amy Nguyen-Chyung, University of Michigan, "Competing for Labor through Contracts: Selection, Matching, Firm Organization and Investments"
- Gadi Barlevy, Federal Reserve Bank of Chicago, and Derek Neal, University of Chicago and NBER, "Allocating Effort and Talent in Professional Labor Markets"

Summaries of these papers are at: http://www.nber.org/confere/2015/OEf15/summary.html

International Trade and Investment

The NBER's Program on International Trade and Investment met in Palo Alto on December 4–5. Program Director Robert Feenstra of the University of California, Davis, organized the meeting. These papers were discussed:

- Ana Fernandes and Martha Pierola, World Bank; Peter Klenow, Stanford University and NBER; Sergii Meleshchuk, University of California, Berkeley, and Andres Rodriguez-Clare, University of California, Berkeley, and NBER, "The Intensive Margin in Trade: Moving Beyond Pareto"
- Paolo Bertolotti, University of Pavia; Federico Etro, Ca‘ Foscari University of Venice; and Ina Simonovska, University of California, Davis, and NBER, "International Trade with Indirect Additivity"
- Treb Allen, Northwestern University and NBER, and David Atkin, MIT and NBER, "Volatile, Insurance, and the Gains from Trade"
- Jose Asturias, Georgetown University; Manuel Garcia-Santana, Université Libre de Bruxelles; and Roberto Ramos, Bank of Spain, "Competition and the Welfare Gains from Transportation Infrastructure: Evidence from the Golden Quadrilateral of India"
- Ralph Ossa, University of Chicago and NBER, "A Quantitative Analysis of Subsidy Competition in the U.S." (NBER Working Paper No. 20975)
- James Harrigan, University of Virginia and NBER; Ariell Reshef, University of Virginia; and Farid Toobal, Paris School of Economics, "The March of the Techies: Technology, Trade, and Job Polarization in France, 1994–2007"
- Wolfgang Keller, University of Colorado Boulder and NBER, and Hille Utar, Bielefeld University, "International Trade and Job Polarization: Evidence at the Worker Level"

Summaries of these papers are at: http://www.nber.org/confere/2015/ITIf15/summary.html
Entrepreneurship

The NBER’s Working Group on Entrepreneurship met in Cambridge on December 4. Group Director Antoinette Schoar of MIT and Research Associate Josh Lerner of Harvard University organized the meeting. These papers were discussed:


• Tania Babina and Paige Ouimet, University of North Carolina at Chapel Hill, and Rebecca Zarutskie, Federal Reserve Board, “Going Entrepreneurial? IPOs and New Firm Creation”

• Ulf Axelson and Igor Makarov, London School of Economics, “Informational Black Holes in Financial Markets”

• Thomas J. Chemmanur, Boston College; Gang Hu, Hong Kong Polytechnic University; and Chaopeng Wu, Xin Men University, “High Differentiation and Low Standardization: The Role of Venture Capitalists in Transforming the Management and Governance of Private Family Firms”


Summaries of these papers are at: http://www.nber.org/confer/2015/ENTf15/summary.html

NBER Books

Social Security Programs and Retirement around the World: Disability Insurance Programs and Retirement

Edited by David A. Wise
National Bureau of Economic Research Conference Report
Cloth: $130, e-book $104

Even as life expectancy in many countries continues to increase, social security and similar government programs can prompt workers to leave the labor force when they reach the age of eligibility for benefits. Disability insurance programs can also play a significant role in the departure of older workers from the labor force, with many individuals in some countries relying on disability insurance until they are able to enter into full retirement.

The sixth stage of an ongoing research project studying the relationship between social security programs and labor force participation, this volume draws on the work of an eminent group of international economists to consider the extent to which differences in labor force participation across countries are determined by the provisions of disability insurance programs. Presented in an easily comparable way, their research covers 12 countries, including Canada, Japan, and the United States, and considers the requirements of disability insurance programs, as well as other pathways to retirement.

Tax Policy and the Economy, Volume 29

Edited by Jeffrey R. Brown
Cloth $80, e-book $48

The papers in Volume 29 of Tax Policy and the Economy illustrate the depth and breadth of taxation-related research by NBER research associates, both in terms of methodological approach and in terms of topics. In the first paper, former NBER President Martin Feldstein estimates how much revenue the federal government could raise by limiting tax expenditures in various ways, such as capping deductions and exclusions. The second paper, by George Bulman and Caroline Hoxby, makes use of a substantial expansion in the availability of education tax credits in 2009 to study whether tax credits have a significant causal effect on college attendance and related outcomes. In the third paper, Casey Mulligan discusses how the Affordable Care Act (ACA) introduces or expands taxes on income and on full-time employment. In the fourth paper, Bradley Heim, Ithai Lurie, and Kosali Simon focus on the “young adult” provision of the ACA that allows young adults to be covered by their parents’ insurance policies. They find no meaningful effects of this provision on labor market outcomes. The fifth paper, by Louis Kaplow, identifies some of the key conceptual challenges to analyzing social insurance policies, such as Social Security, in a context in which shortsighted individuals fail to save adequately for retirement.

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