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## **William C Dudley: The monetary policy outlook and the importance of higher education for economic mobility**

Remarks by Mr William C Dudley, President and Chief Executive Officer of the Federal Reserve Bank of New York, at the Council for Economic Education's 56th Annual Financial Literacy & Economic Education Conference, New York City, 6 October 2017

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Good afternoon. It is a pleasure to have the opportunity to speak at this Council for Economic Education (CEE) event, marking the CEE's 56th Annual Financial Literacy and Economic Education Conference. Given the hard lessons of the financial crisis—and the economic challenges still facing many Americans—there are few goals more worthy than promoting greater financial and economic literacy. As always, what I have to say reflects my own views and not necessarily those of the Federal Open Market Committee (FOMC) or the Federal Reserve System. [1]

### **Personal educational experience**

Before discussing the economic outlook and the role of education in income mobility, I will offer a few remarks on my own educational experience. While it may not be surprising that I have a Ph.D. in economics, the path that led me to the University of California, Berkeley, is a bit unusual.

I started college in the 1970s at Columbia University. On the positive side, the professors were engaging, and I had the opportunity to read the great books of the university's core contemporary civilization curriculum. But, I was troubled by the emphasis on grades and test taking. I wanted something that was more free-form. The idea was to find an environment that fostered learning for learning's sake. So, in a small act of rebellion—after all, it was the early 1970s and I was a teenager—I decided to transfer to New College in Sarasota, Florida. New College provided a strong liberal arts, cross-disciplinary, and flexible education program that relied—as it does today —on an unstructured format of evaluations, study programs with individual professors, and contracts rather than grades. I like to call it “graduate school for undergraduates,” because it really is a place that encourages students to engage intellectually, read and think critically, and communicate effectively.

This experience made me a strong advocate of a liberal arts education, which I believe is now more valuable than ever, given the greater importance of synthesizing and evaluating the vast array of information we have at our fingertips. The cross-disciplinary approach of a liberal arts program is also vital to understanding and solving complex problems. I believe that training—combined with the excellent education in economics I got at Berkeley—helped me to better diagnose what was going wrong in 2007 and 2008, and how the Federal Reserve could be most effective in our response to the crisis.

### **Economic and monetary policy outlook**

Turning to the economic outlook, the damage wrought by Hurricanes Harvey, Irma, and Maria has imposed immeasurable hardship on many. And, the damage will undoubtedly disrupt commerce for some time. However, these effects are likely to be relatively modest in the context of the national economy. Natural disasters tend to depress economic activity initially, but once the recovery and reconstruction efforts get underway in earnest, such disasters actually serve to lift economic activity.

Looking beyond the storm effects—which will make interpreting near-term economic data releases more difficult—the economy remains on a trajectory of slightly above-trend growth at about 2 percent, and the fundamentals supporting continued expansion are generally quite favorable. Low unemployment, sturdy job gains (recognizing the near-term negative impact of the storms), and rising wages (even at a pace below previous expansions) are lifting personal income. Household wealth has been boosted by rising home and equity prices, and household debt has been growing relatively slowly, contributing to a healthy household balance sheet. Thus, consumer spending should continue to advance in coming quarters.

Business fixed investment outlays are also likely to continue to rise. With the supply of labor tightening, there are greater incentives for businesses to invest in labor-saving technologies. Investment spending should also benefit from a better international outlook and the improvement in U.S. trade competitiveness caused by the dollar's recent weakness. The softer dollar and solid growth abroad also suggest that the trade sector will no longer be a significant drag on economic growth.

Turning to the outlook for inflation, I have been surprised by the persistence of the shortfall from the FOMC's 2 percent long-run objective. While some of this year's shortfall can be explained by one-off factors—such as the sharp fall in prices for cellular phone service—its persistence suggests that more fundamental structural changes may also be playing a role. These include the increased ability of prospective buyers to compare prices across different sellers quickly and easily, the shift in retail sales to online channels of distribution from traditional brick-and-mortar stores, and the consequences of these changes on brand loyalty and business pricing power.

Over the coming months, I hope that we will be better able to differentiate between these competing explanations. If it turns out that structural changes have played a significant role, I would generally view this as a positive, rather than negative, development. It would imply that the U.S. economy could operate at a higher level of labor resource utilization without generating a troublesome large rise in inflation. More people could be put to work on a sustainable basis, enabling them to gain opportunities not just to earn greater income, but also to develop their skills and grow their human capital.

Slightly above-trend growth is gradually tightening the U.S. labor market, which should support a rise in wage growth over time. When combined with a firmer import price trend—partly reflecting recent depreciation of the dollar—and the fading of effects from a number of temporary, idiosyncratic factors, I expect inflation will rise and stabilize around the FOMC's 2

percent objective over the medium term. Thus, even though inflation is currently somewhat below our longer-run objective, I judge that it is still appropriate to continue to remove monetary policy accommodation gradually. This judgment is supported by the fact that financial conditions have eased, rather than tightened, even as the FOMC has raised its short-term interest rate target range by 75 basis points since last December.

But, the upward trajectory of the policy rate path should continue to be shallow, in part because the level of short-term interest rates consistent with keeping the economy on a sustainable long-run growth path is likely to be considerably lower than it was in prior business cycles.

The FOMC recently launched the process of balance sheet normalization—in which an increasing proportion of maturing Treasuries and agency mortgage-backed securities (MBS) repayments are allowed to run off the Federal Reserve’s balance sheet. While this process also should exert some monetary policy restraint over time, I believe the impact will be quite modest. Not only was this shift in policy widely anticipated, but we also have seen that the impact on the level of long-term interest rates has been small as expectations have adjusted.

The economy has made great strides in recovering from the Great Recession, as the unemployment rate has fallen from 10 percent to 4.2 percent, aided by accommodative monetary policy. Measures of underemployment have also improved considerably and are near pre-crisis levels. Stronger labor market conditions are perhaps the best means to improve the economic well-being of most Americans, particularly those who have been struggling and are most vulnerable to economic downturns.

And, as discussed in the Federal Reserve’s July Monetary Policy Report and in Chair Yellen’s accompanying testimony before Congress, it is encouraging that unemployment rates continue to fall for most demographic groups, including African-Americans and Hispanics. [2] At the same time, we should remain concerned that the jobless rates for those groups remain above the unemployment rate for the nation.

Recent U.S. Census Bureau estimates of household income growth also provide some reason for optimism. Median real household income rose 3.2 percent in 2016, after strong gains the prior year. Gains were particularly notable among African-American and Hispanic households, and the poverty rate fell to near pre-crisis levels. While this is good news, I think we can all agree that we have a long way to go to improve income inequality and mobility in the United States. As I see it, these are among the most important issues we face as a nation.

### **Income mobility and education**

Now, it is clearly the case that, given differences in individuals’ abilities, a free-market society will generate some level of inequality. However, there are persistent trends toward growing inequality and diminished economic mobility—and in my view, these are problematic. [3] First, income inequality has widened notably since about 1980. [4] Second, and more

distressing, is a relatively low rate of economic mobility, or the degree to which individuals or families can move up or down in the income distribution over time. For example, the fraction of children who earn more than their parents has fallen from 90 percent to 50 percent over the past half century, and only 37 percent of parents believe that their children will be better off financially than they are, according to a recent Pew Research Center survey.<sup>5</sup>

High inequality combined with a low rate of mobility is particularly problematic in a democratic society. In short, it means that being born into a low-income family is likely to severely limit an individual's opportunities and well-being over his or her lifetime. The United States fares notably weaker on both dimensions relative to its OECD peers. [6] That is concerning, and some thing we should be working to address.

One significant initiative we have taken within the Federal Reserve System is the establishment of the Opportunity and Inclusive Growth Institute at the Minneapolis Fed, which conducts research and makes recommendations on the structural barriers to economic advancement in the nation. The New York Fed has been, and will continue to be, an active participant and supporter of this initiative.

Let me now turn to the primary routes of economic mobility and the impediments that too often block them. The primary avenue to higher incomes for most people is investment in their human capital, namely through education. Indeed, the income returns on education are very high, and they continue to rise in spite of very significant increases in the supply of highly educated workers during much of the 20th century. Since the 1980s, however, increases in the supply of well- educated workers in the United States have slowed, while demand for these workers has accelerated due to technological change. These forces have been a major contributor to the increase in the college wage premium. [7] While college graduation rates in the U.S. have stagnated, those in many other OECD countries have continued to rise. As a result, only one- quarter of those in the 25-to-34 age bracket in the United States have more education than their parents, compared with an OECD average of one-third. [8] This represents a dramatic decline in college education's influence as an engine of upward mobility. So, part of a solution to the increase in inequality and the reduction in social mobility is to increase the level of educational attainment in the population.

There are many barriers to expanding post-secondary education, however. From the potential student's perspective, a lack of information, low college preparedness, and high costs are all substantial barriers to college attendance and completion, and these barriers restrict social mobility. Let me discuss each of these in turn.

By lack of information, I mean the recognition that in spite of its high price tag, a college degree typically offers an even larger payoff in terms of future earnings. Many aspects of the college attendance decision are complex and hard to predict, especially for students from families without much experience with higher education. For example, research indicates that decisions about college attendance are highly correlated with an understanding of the future payoffs from attendance and particular majors. [9] New York Fed research shows

evidence of systematic underestimation of the average benefits—and overestimation of the costs—of a college education, with larger biases among lower-income and non-college households. [10] Families may not realize that listed tuition prices may not be what a particular student actually pays. Moreover, misperceptions about the net return from a college degree can be consequential, influencing parents' expectations and intentions for their children's college attendance.

Importantly, however, these expectations are not hardwired. Evidence from an information experiment indicates that students do respond to new information by revising their expectations and their education choices. [11] This suggests that making information about higher education decisions more available to families—particularly those with less experience with higher education—is a promising way to expand economic mobility. I was fortunate as a child that I didn't face this problem. Both my parents went to college and there was no doubt among us about the payoff from higher education.

Another concern is the lack of college preparedness among new college entrants. Nearly seven out of 10 students entering public two-year institutions and four out of 10 students entering four-year public institutions take remedial courses in college. [12] Generally, these are courses they should have taken in high school. The costs of taking these courses in college are high, especially because they do not count for college credit. Low readiness contributes to persistently low college completion rates, with only 55 percent of first-time undergraduates completing a degree within six years. [13] College dropout rates are especially high among lower-income, part-time, and nontraditional students, with high costs, low perceived ability to pay, and a lack of information about the returns to degree completion also contributing to the high dropout rate.

The importance of college readiness underscores the value of high-quality K-12 schooling. But, research indicates that fewer than half of five-year-olds from low-income families possess the math and reading skills, behaviors, and overall health required for learning success, compared to 75 percent of children from middle- and high-income families. [14] These differences are important because they have long-lasting effects on academic achievement and future careers. A substantial body of evidence, including research by economists at the Minneapolis Fed, points to very large economic returns to high-quality preschool and early-childhood development programs. [15] Clearly, such programs can play an important role in improving economic mobility.

I benefited from nursery school and kindergarten and a mother who taught me to read before I entered elementary school. And, when my junior high school tried to move me out of an accelerated math program, my mom intervened and got me back in.

Paying for college is another major impediment to college attendance and completion. While college is generally a good investment, it has become increasingly expensive over the last several decades to attend a four-year program, as costs have risen considerably faster than wages—especially wages for all but the very top of the income distribution. This means that college has become increasingly unaffordable for those families who need it most, if we are

to increase social and economic mobility. Of course, one result of the increasing unaffordability of college education is that fewer people get a college degree, which could help account for the slowdown in the growth rate of the college-educated workforce that I discussed earlier. However, recent research by my colleagues at the New York Fed shows that young Americans have mostly adjusted to rising tuition and fees not by foregoing college education, but rather by amassing more debt.

Over the past few decades, funding for higher education has shifted from state and local sources to students and their families. While the federal student loan program has helped ease that transition, the result has been that more students are leaving college with significantly higher amounts of debt. In fact, student loan debt has grown 170 percent over the last decade and now totals over \$1.3 trillion. [16]

To be clear, I don't want to downplay the importance of student loans. When accompanied by college completion, they allow students to make what generally turns out to be a very worthwhile investment. I personally benefited from student loans while at Berkeley. But, compared to alternative ways of financing higher education—such as greater government support for public universities and increased federal education grants—student loans can have adverse consequences. This is especially true when loans are taken on by those who don't complete their education. For borrowers with large student loan balances, such consequences include slow or late repayment, serious delinquency, and default. [17] New York Fed researchers have shown that such unfavorable outcomes are related to family background. Thus, at times, student loans can have the perverse effect of limiting social mobility.

In addition, our research indicates that, for any given level of educational attainment, workers who have student debts are less likely to own homes than those who got their education without incurring debts. Certainly, for those who have difficulty repaying their student loans, the resulting damage to credit scores will make obtaining a mortgage very difficult, especially under today's lending standards. A student loan default, which is unhappily common, means that borrowing to buy a home is essentially impossible. And, we know that these factors—slow repayment, delinquency, and default—are most prevalent among those from modest family circumstances.

This connection between rising college costs, increased student borrowing, and reduced homeownership is important for inequality and social mobility because, for the great majority of American families, increasing home equity is the major form of wealth accumulation. [18] Thus, changes over the last few decades in the way that college is financed mean higher education is less able to lift people from poverty into the middle class.

I should note here that economic education has an important role to play in mitigating these challenges, which increasingly arise as debt becomes a more common part of the college experience. For example, financial literacy and the skills taught by educators have been demonstrated to better prepare young people for the management of their finances, enhancing their well-being. Financial literacy allows people to better understand the terms of

student loans and the consequences of missed payments, and how to accumulate wealth. [19] I strongly support the CEE's efforts to bring economic knowledge to young people, as I believe that it is increasingly vital for everyone, and has an especially important role in fostering social and economic mobility.

Other factors that can foster or inhibit social mobility are the practices of universities themselves. In some very recent work, Raj Chetty and his co-authors have documented the role that different universities play in fostering economic mobility. [20] From my perspective, the most important findings are that access to the best universities is very closely related to parent income—children from wealthier families are more likely to go to Ivy League schools, for example. Yet, those students from poorer families who actually are admitted to the best universities do just as well in their future earnings as those from more advantaged backgrounds.

Part of the problem, aside from cost, is the legacy admission policies of elite schools—where children of alumni receive preferential access. This is patently unfair, and scrapping such policies would help increase economic mobility. [21] I really don't see how our best universities can continue to justify this practice. Yes, fund-raising might suffer slightly over time—but I suspect the impact would be very small. More importantly, do we really want to encourage what is essentially a “donate to admit” policy at our major universities? Such an approach only preserves the status quo and constrains economic mobility.

The research shows that upward mobility differs substantially across colleges. Ivy League schools are good at producing top earners, but, as I noted, they accept very few lower-income students, so their impact on income mobility is small. Meanwhile, other schools with economically diverse student bodies produce few high earners, and their impact is likewise small. Then there are certain schools—some of which can be found in the CUNY and California state systems—that manage to produce a large number of high earners from economically diverse student bodies. Learning exactly how they do it and how it can be replicated strikes me as a first-order question for further study.

While I am distressed by the high and increasing levels of inequality and diminished mobility that our economy has delivered over the last several decades, I remain optimistic about the future. There is more attention now to inequality and low intergenerational mobility than I can recall at any time during my professional life. Organizations like the CEE and the National Association of Economic Educators exist to improve awareness of economic concepts. This enhances the ability of young people to make better financial decisions and helps to close the gaps in knowledge that contribute to inequality. Top-tier researchers in both academia and the Federal Reserve System are focusing their attention on the causes, consequences, and solutions of this social problem, using better data, methods, and means of communicating their results. Even more importantly, policymakers are also paying close attention. Ultimately, I believe we will identify and implement policies that can make the dream of a better life a reality for more of our fellow citizens.

Thank you again for your kind attention. I would be happy to take your questions.

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[1] Gerard Dages, Jack Gutt, Andrew Haughwout, Anand Marri, and Wilbert van der Klaauw assisted in preparing these remarks.

[2] Board of Governors of the Federal Reserve System, Monetary Policy Report – July 2017, July 7, 2017.

[3] See William C. Dudley, Remarks at the Economic Press Briefing on the Regional Economy, August 10, 2017.

[4] See the New York Fed’s Economic Press Briefing on Wage Inequality in the Region, August 10, 2017.

[5] Pew Research Center, Global Publics More Upbeat About the Economy, June 5, 2017.

[6] Corak, 2013. “Income Inequality, Equality of Opportunity, and Intergenerational Mobility.” *The Journal of Economic Perspectives*, vol. 27, no. 3 (Summer). 79–102.

[7] Goldin and Katz, 2007. Long-Run Changes in the U.S. Wage Structure: Narrowing, Widening, Polarizing. NBER Working Paper No. 13568 (November, revised December).

[8] OECD, 2015. *Education at a Glance 2015: OECD Indicators*, OECD Publishing. p. 78.

[9] Wiswall and Zafar, 2011. Determinants of College Major Choice: Identification using an Information Experiment. Federal Reserve Bank of New York Staff Reports, no. 500 (June; revised August 2014).

[10] Bleemer and Zafar, 2015. Intended College Attendance: Evidence from an Experiment on College Returns and Costs. Federal Reserve Bank of New York Staff Reports, no. 739 (September).

[11] Wiswall and Zafar, 2015. “How Do College Students Respond to Public Information about Earnings?” *Journal of Human Capital*, vol. 9, no. 2 (Summer). 117–169.

[12] Chen, 2016. Remedial Coursetaking at U.S. Public 2- and 4-Year Institutions: Scope, Experiences, and Outcomes (NCES 2016–405). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

[13] Shapiro, Dundar, Khasiala, Yuan, Nathan, and Hwang, 2015. *Completing College: A National View of Student Attainment Rates – Fall 2009 Cohort* (Signature Report No. 10). Herndon, VA: National Student Clearinghouse Research Center (November).

[14] Isaacs, 2012. Starting School at a Disadvantage: The School Readiness of Poor Children. Brookings Institution Center on Children and Families (March).

[15] Wat, 2010. The Case for Pre-K in Education Reform. A Summary of Program Evaluation Findings . The Pew Center on the States (April). Grunewald and Rolnick, 2010. An Early Childhood Investment with a High Public Return. The Regional Economist, Federal Reserve Bank of St. Louis (July).

[16] See the New York Fed's Economic Press Briefing on Household Borrowing, Student Debt Trends and Homeownership, April 3, 2017.

[17] For example, the default rate for students from relatively modest backgrounds is around 35 percent, 2-3 times that of those from wealthier backgrounds. See Press Briefing on Household Debt, with Focus on Student Debt, p.26.

[18] Bleemer, Brown, Lee, Strair, and van der Klaauw, 2017. Echoes of Rising Tuition in Students' Borrowing, Educational Attainment, and Homeownership in Post-Recession America . Federal Reserve Bank of New York Staff Reports, no. 820 (July). Tracy, Schneider, and Chan, 1999. Are Stocks Overtaking Real Estate in Household Portfolios? Current Issues in Economics and Finance, vol. 5, no. 5 (April).

[19] Zafar, Bleemer, Brown, and van der Klaauw, 2014. What Americans (Don't) Know about Student Loan Collections. Federal Reserve Bank of New York Liberty Street Economics (June 5).

[20] Chetty, Friedman, Saez, Turner, and Yagan, 2017. Mobility Report Cards: The Role of Colleges in Intergenerational Mobility. NBER Working Paper No. 23618 (July).

[21] See Richard Reeves, Dream Hoarders (Washington, D.C.: Brookings Institution Press, 2017).

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## Fonte

Bank For International Settlements (BIS)

<http://www.bis.org/review/r171009c.pdf>

## **Yves Mersch: Economic policy and the need for humility**

Speech by Mr Yves Mersch, Member of the Executive Board of the European Central Bank, at the Conference "Banking and Financial Regulation", Bocconi University, Milan, 9 October 2017

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"[...] five years from now the dynamic stochastic general equilibrium model that central bankers worship like Baal will still be there. There will be a few changes to the parameters, and maybe a constraint or two added like temple lamps, but apparently they never learn." [1]

John Dizard

The policy maker's environment is a multi-faceted one. She or he faces a continually changing economic landscape. Let me give you some specific examples. Economic data — upon which we base our policy decisions — appear at different times and with different qualities: for instance, some economic series (such as trade and investment data) are subject to considerable revision over time. Moreover, the transmission lags of monetary policy changes are often long, uncertain, and perhaps even contingent on the state of economy (for example whether it is an expansionary or contractionary phase). Last, but certainly not least, policy making itself does not operate in a vacuum or in a laboratory. There is the practical backdrop of legal, constitutional, cultural, and political economy constraints etc.

Experience, judgement and the acknowledgement of uncertainty are key parts of that environment, and key parts of the policy maker's outlook. To help assess economic developments and to facilitate policy discussion, though, central banks use a variety of macroeconomic models and econometric tools.

Despite the sophisticated tools and analysis at our disposal, the uncertainty underlining the policy environment is pervasive. Accordingly, I believe policy makers must show humility in their understanding of how the economy works, and how policy works.

Before the financial crisis many distinguished policy makers and academics treated economics and finance as if it had attained something of a natural science – replete with regularities upon which most economists could, and seemingly did, agree. Indeed, some even declared the business cycle dead. The doubters meanwhile (among them Robert Gordon, Raghuram Rajan, Robert Shiller) were either neglected or – what is worse – labelled luddites.

The global financial crisis challenged such complacency. In effect, it shone a light on our over confidence and, exposed our very lack of humility. More philosophically, the crisis also suggested that we, as a profession, had perhaps lost touch with an older tradition of economics that had precisely sought to emphasise uncertainty, the limits of information, and

the wider social context underlining economic interactions — as for instance, highlighted by von Mises and Hayek “economic calculation problem” and Hayek’s “fatal conceit” which submits that knowledge is dispersed across society and can never truly be known by any one agent or entity [2] - a fact that the former chief economist of the ECB, Otmar Issing, never failed to remind us of.

Notwithstanding, the inescapable fact is that policy makers must make decisions under uncertainty. Such uncertainty is not, in addition, a temporary phenomenon that we can wait out. As former Fed Chairman Alan Greenspan (2003) wrote:

“... uncertainty is not just a pervasive feature of the monetary policy landscape; it is the defining characteristic of that landscape”. [3]

Given this complexity and the need to stabilize market expectations, policy makers have traditionally relied on a variety of macro-econometric and statistical models. These tools come with many caveats. Indeed, many were the first to point an accusatory finger at such modelling frameworks in the aftermath of the financial crisis.

The main criticisms were that models were missing key features of the economy (e.g. financial interactions) and/or were based on unrealistic assumptions. [4] Examples of the latter include the assumption of “complete” and “efficient” markets as well as of “rational” expectations. These features make it difficult for models to speak to real-world phenomena such as herd behaviour in markets, asset price misalignments, sudden stops etc. The overreliance on mathematics and models leads to a failure of acknowledging the crucial role of social behaviour.

Of course, all models make simplifying assumptions, otherwise they wouldn’t be models. Or, as the statistician George Box famously noted, “All models are wrong; some models are useful.” Indeed, there is an active research agenda to incrementally but carefully improve our existing models: examples include integrating “financial frictions” and so-called heterogeneous agents which inject more realistic dynamics. Moreover, many have also sought out insights from machine learning and big data techniques, and from behavioural and evolutionary economics. The latter try to explain departures from optimality in agents’ decisions, and integrate the social fabric and consumer heuristics underlying economic behaviour. As the economy advances and grows yet more complex, innovation in our modelling and statistical frameworks will undoubtedly continue, but fail in its pretention to encapsulate human complexity in an equation.

The fact that all models are wrong does not preclude their combination from being useful. We know that combining models – even often using simple pairing rules – regularly outperform the best individual model in forecasting exercises. Likewise, the robust policy literature has combined macroeconomic models to ask which types of policies are likely to work well across many different models and scenarios. [5] This seems a reasonable research agenda, although it is unclear if the models are close to being useful for analysis of macro-prudential and financial stability issues. [6] Macro-prudential policy is a good example

of this pretence lacking even a capacity to define its own objective otherwise than by its negative.

In the remainder of my remarks I will elaborate on the challenges faced by central banks related to uncertainty. I highlight merits and limitations of models, and I comment on different area that researchers are currently working on.

### **Monetary policy and financial regulation under uncertainty**

Uncertainty is the defining characteristic of monetary policy landscape. The literature distinguishes several types, so it is worth starting by describing it to continue later on how economists have thought about it and how they have tried to tackle it.

First, there is Knightian uncertainty. This is the type of uncertainty that is immeasurable and thus not possible to calculate. Typically it relates to the inability of agents or decision makers to reasonably contemplate all the possible states of nature or characterize their probability distributions. If, on the other hand, the realization of the states of nature is not known in advance but agents can reasonably contemplate all such states and their likelihood, this situation is commonly known as risk (the second type of uncertainty).

Others tend to distinguish between aleatory (or objective) uncertainty and epistemic (or subjective). [7] Ultimately, all uncertainty relevant for decision making is subjective, but for practical purposes it is worth making the distinction because there are cumulative effects of the two uncertainties that can explain events such as the financial crisis. As Oliver Blanchard commented:

“... what is at work is not only objective, but also subjective uncertainty ... Subjective uncertainty is about “unknown unknowns”. When, as today, the unknown unknowns dominate, and the economic environment is so complex as to appear nearly incomprehensible, the result is extreme prudence, if not outright paralysis, on the part of investors, consumers and firms. And this behaviour, in turn, feeds the crisis”. [8]

Uncertainty can be related to many dimensions relevant to policy making, including (i) uncertainty about the current state of the economy, (ii) uncertainty about its structure; and (iii) uncertainty over the way economic agents form expectations about future developments and future policy actions.

Let me give you some concrete examples of such dimensions relying on unobservables.

First, consider the famous Taylor rule. This relates changes in monetary policy rates to changes in inflation and the output gap, anchored around some notion of the equilibrium real interest rate. By and large, the rule assumes fixed coefficients for these feedbacks. Even though policy makers never mechanically follow such a rule, over a long horizon, it can ex post provide a good description of monetary-policy setting. Policy-making, however, as opposed to academia is forward looking – unless one believes with Karl Marx that history repeats itself as a farce.

Consider now the effect of monetary policy when interest rates are around their effective lower bound. Given the limited experience policy makers have of such episodes, there is deep uncertainty as to whether the normal rules of the game (i.e., the coefficients of the Taylor rule) will continue to provide a broad guide for monetary decisions. Moreover, estimates of potential output and thus the output gap have inevitably been blurred by the scarring of the financial crisis, as well as by rapid technological changes throughout the last decades. [9] In line with this, at the Bank for International Settlements, Borio has argued that we must supplement traditional measures of output gaps with measures of financial imbalances and credit cycles. [10] There is however no unambiguous way to do this given the many different methods of filtering data and extracting trend and cycle. Moreover, macroeconomic data samples are limited relative to the infrequent nature of crises to make these discriminations. Likewise, forecasts of inflation are increasingly difficult to make in a globalized world: there are many common trends in inflation determinants, and common shocks such as in commodity prices. Accordingly, domestic factors – such as wage setting – may matter far less than before.

Finally, estimates of the so-called natural real rate of interest, always understood to be difficult to pin down, are in an interdependent world beset by many “headwinds” (e.g., population aging, potentially technical deceleration), as argued by Gordon. [11] It is very difficult to be able to say how such headwinds will evolve. In the same context other scholars even identify tailwinds: Brynjolfsson and McAfee find that technological advance has caused a drastic shift in the means of production, simultaneously boosting the productivity of firms which are however difficult to measure with traditional gauges. [12]

All of these examples relate to stabilization policy over the cycles – but it goes well beyond that. Consider regulatory policy, given the expansion in recent decades of the financial sector and its changing nature (e.g., the rise of shadow banking, FinTech), the optimal design of regulatory policy in such a changing landscape is profoundly complex.

Uncertainty though does not (and cannot) prevent the central bank from taking informed decisions. How do we ensure that we avoid paralysis? Given the complexity and the need to stabilize market expectations, academics and researchers have traditionally relied on a variety of econometric models. Policy makers supplement these models, with expert judgement to shed light on economic developments.

The use of models inevitably introduces other dimensions of uncertainty which all go under the name of model uncertainty. It is possible to classify risk within a model, where the uncertainty is about the outcomes that emerge in accordance with a model that specifies fully the outcome set of probabilities; and ambiguity among models, where the uncertainty is about which alternative model should be used. If the true model is not assumed to be among the original set of models under consideration, a third source of uncertainty emerges, i.e. model misspecification.

Uncertainty has been one very important aspect of the policy environment and of the models used that the economic professions has been forced to think more deeply about with the

financial crisis. But many other features of the models have been at the centre of the discussion.

### **Reflections on the models**

Let me now elaborate more fully on policy models. Many prominent economists (from different perspectives) concluded that today's mainstream macroeconomic models somehow had led the profession down the wrong path (Buiter, Krugman, Mankiw, Akerlof and Shiller). [13] In other words that these models suffer from misspecification. There are also examples in finance: mainstream financial economists possessed an incomplete understanding of the correlation of different assets, perhaps excessive faith in the risk-reducing potential of the securitization and a blinkered Gaussian mind-set. [14] In short they used models – often of great sophistication – but poorly combined them with judgement and experience.

As we noted, many have reached a relatively positive assessment of policy models, and of the re-constructive abilities of the profession. Indeed, some others argued that the mistake was actually in not following models' prescriptions closely enough. For instance John Taylor maintained that during the early 2000s, monetary policy in the US was set looser than that implied by the Taylor Rule. This, he claimed, caused the build-up of debt and risk-taking, which ultimately led to the onset of the Great Recession. Likewise, Michael Wicken concluded that

“... the financial crisis was brought about more by a failure to employ modern macroeconomics than by its failings. If used sensibly, it will lead us out of the crisis.” [15]

On the other side, those who criticize the types of macroeconomic models popular at central banks have argued that they mistook beauty for truth and were too complex and opaque to be used quickly. More recently Stiglitz posed another question highlighting one important flaw of models: why does the economy not quickly return to full employment, as one would have expected in an equilibrium model? Why do we persist in using models with such strongly counterfactual dynamics? More specifically the list of model troubles could include: linearity, rational expectations, complete markets, limited agent heterogeneity and financial imperfections. [16]

On a more general perspective, some set the discussion in terms of the fact that some models give the impression of the possibility to fine tune or socially “engineer” the economy whereas less standard approaches – also inspired by other disciplines – see the economy rather as an ever- evolving social system for which one can merely set the broad framework conditions and institutions. This goes back to an old debate started indeed with Ludwig von Mises, who first discussed the concept of catalaxy, and made popular later on by Friedrich Hayek who elaborated on that concept and defined it as follows: “... the order brought about by the mutual adjustment of many individual economies in a market”. Hayek particularly stressed his view in that respect in his lecture to the memory of Alfred Nobel, *The Pretence of Knowledge* in which he forcefully challenged all those who believed that government had the wisdom or ability to successfully plan the economic affairs of society. His primary targets

were the Keynesian economists at that time who were confident that they could manage the economy to assure full employment, economic growth, and market stability. Hayek's more general antagonists were social engineers who wished to redesign and regulate society. The terms of the current debate are similarly along those lines.

### **Way forward/implications for research and policy**

One possible reaction by fine-tuners to this uncertainty is to rely on Machine learning and Big Data techniques to deliver forecasts and enhance policy analysis. As the name implies, such techniques rely on large complex datasets to extract and manipulate correlations and regularities in the data that would otherwise be opaque. They have proved popular and valuable in many fields such as advertising, prediction, developing trading strategies, and so on. Indeed, as the economic historian Joel Mokyr provocatively wrote "... who needs causation as long as we have correlation?" [17]

Big Data, however intriguing, is no panacea. Such methods rely on often multi-dimensional correlations fitted (perhaps over-fitted!) on past data that may bear little relation to future events. Moreover, the relations uncovered by algorithms trawling vast datasets may identify false positives (in other words, relationships that essentially do not exist in the data and have no real- world justification). But more fundamentally, many problems in social sciences entail a combination of prediction but also causal inference. We need to know for example, if the central bank lowers interest rates below zero or engages in asset purchases, will that stimulate aggregate demand? Central banks have for the most part not engaged in these types of policy before so there is no (or very limited) historical correlation upon which we can fall back.

To address such questions, we inevitably rely on our macro-econometric models to give us structure. During the crisis some believe to have seen many examples of policy insights from models (for example how the policy transmission changes in periods of low activity, high uncertainty and rates near their effective lower bound). Moreover, many interesting extensions were fashioned onto existing models in the wake of the crisis.

However successful such extensions prove to be, there are still clearly (fairly tight) limits on how big policy models can be. The bigger models are, the more difficult it is to estimate and solve them; the more difficult it is to build a coherent narrative around them. Such narratives are an important ingredient in building consensus around where the economy is and how policy should advance. To lose the big picture in the details is not ideal.

The bottom line is that whilst we should acknowledge the contribution our statistical and macroeconomic models make, we must also acknowledge their limitations and make improvements. We must recognize the presence of pervasive uncertainty. We must show humility.

There is hope, and an active research agenda. Useful insights on how to improve models come from behavioural and evolutionary economics (expectations, multiple equilibria, the

effects of news, and asset market bubbles) — as well as from the enhancement of models to include commercial banks, credit frictions, and uncertainty. Also, central banks have always been concerned with uncertainty and they always tried to take robust decisions. [18] They have also been confronted with the challenge to distinguish between short-term versus long-term, cyclical versus structural developments or deviations of various degrees versus dead ends. The main problem is the difficulty the policy maker faces in distinguishing between objective and subjective uncertainty, and how to cope with the latter.

Possible solutions to uncertainty are on the one hand to relax the assumption that a single probability number quantifies beliefs and assume that they can account on a set of them. The policy makers then act according to the belief that minimizes the expected loss. On the other hand the risk aversion of policy makers towards the two types of uncertainties is not the same. Allowing for the distinction in the attitude towards uncertainty allows us to evaluate their role and quantify their importance. As already stressed, the crises increased the concern for uncertainty. The research agenda is also high on this topic. [19]

## **Conclusions**

If it did nothing else, the financial crisis served to remind us all of a few home truths. The economy is a profoundly complex setting. It is bound and shaped by history as well as by cultural and legal norms. If it can at all be conceived of as a model, such a model would have many moving parts and shifting parameters and volatilities. But even then, deep uncertainty inevitably remains – uncertainty about the underlying mechanisms and parameters and the lines of causality between those mechanisms. Many economists had in recent years perhaps forgotten that, but as I have argued the study of economics and many practitioners had not.

Let me be clear, an acknowledgement of uncertainty is not a recipe for nihilism. On the contrary, the ECB has shown great flexibility and ingenuity in dealing with the financial crisis. For instance, all the available evidence suggests that the range of asset purchases programme has led to material improvements in financial conditions and credit supply conditions in the euro area. The ECB has marshalled its many models and staff expertise to great effect in these last few admittedly difficult years.

Moreover, economists have made a sober assessment of the gaps in their modelling frameworks and made a serious, diligent, and ongoing attempt to fill them whilst retaining model tractability. In this cause we have and will be guided by the proliferation of large and detailed datasets in our macroeconomic and macro-prudential settings. And yet the benefit of experience, judgement, and – perhaps above all — humility remains always to the fore.

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## Fonte

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