The twenty-seventh edition of the NBER Macroeconomics Annual continues with its tradition of featuring theoretical and empirical contributions that shed light on central issues in contemporary macroeconomics. As in previous years, this year’s papers push the frontiers of macroeconomic research on topics related to both the business cycle and economic growth. Also as in previous years, the contributions address important policy-relevant questions and open new debates that we expect to continue in the years to come. This year’s volume follows recent volumes in featuring two papers that aim to illuminate the causes of the recent financial crisis: the first studies how firms accessed credit during the financial crisis, and the second seeks to measure the changing price and treatment of risk in mortgage lending in the UK mortgage market during the decades before the crisis. In addition, this year’s volume contains two contributions on the labor market: one on the implications of microeconomic estimates of labor supply for the determination of employment rates across countries and time, and the other showing whether industry-level employment and output change disproportionately in response to different changes in product demand, as in Keynesian models with sticky price adjustment. Related to this second paper, the volume also contains a contribution that studies individual prices over time and draws out the implications of observed price adjustment for macroeconomic models of price stickiness. Finally, the volume contains an innovative paper that measures the effect of federal highway spending on output across US states and uses a model to interpret the implications of these findings for the efficacy of aggregate fiscal policy of this type.

Each of these six contributions tackles a central area in macro-
economics and advances the literature in several directions. The papers and the detailed discussions published with each not only contribute significantly to our knowledge but open avenues for further study and debate. We also continue the tradition begun with the 2010 volume of publishing a more policy-related speech, which this year deals with the interactions of fiscal imbalances, financial sector insolvency, and lack of economic growth in the common currency area of the euro.

Turning to the specific contributions in order, “Does Indivisible Labor Explain the Difference between Micro and Macro Elasticities? A Meta-Analysis of Extensive Margin Elasticities” by Raj Chetty, Adam Guren, Day Manoli, and Andrea Weber addresses a classic problem in equilibrium models of the business cycle: the appropriate elasticity of labor supply to assume in evaluating the implications of changes in labor demand on equilibrium labor supply. It has long been recognized that quantitative macroeconomic models require much large labor supply elasticities than those estimated in microeconomic studies, especially studies of the labor supply of prime-age males. This discrepancy between the micro and the macro has typically been bridged by considering models that distinguish between the extensive and the intensive margin, such as those incorporating indivisible labor supply. The idea is that most microeconomic studies focus on labor supply changes by already employed (high attachment) workers while business cycle fluctuations might be associated with new workers coming into the labor market or marginal workers reducing their labor supply by leaving their jobs. Chetty et al. systematically evaluate this class of explanations by confronting implications of quantitative macroeconomic models of the business cycle with microeconomic estimates of extensive margin elasticities. They first draw an important distinction between Hicksian elasticities, which make steady state comparisons, and are thus relevant for cross-country comparisons presuming that countries are along their balanced growth paths, and Frisch elasticities, which exploit intertemporal substitution, and are thus more relevant for business cycle studies. Their systematic review of quasi-experimental estimates from the literature and their comparison of the impact of various tax policy changes on labor supply indicate Hicksian elasticities on the extensive margin of about 0.25 and Frisch elasticities also on the extensive margin of 0.25. These Hicksian elasticities are of similar magnitudes to those that would be necessary to rationalize cross-country differences using an equilibrium model, while the Frisch elasticities are an order of magni-
tude smaller than what would be necessary to explain business cycle fluctuations with an equilibrium model (without labor market rigidities or frictions). This paper is a significant and provocative contribution to the debate as to whether, even with the important distinction between intensive and extensive margin, equilibrium business cycle models without significant labor market frictions can generate quantitatively important labor market fluctuations at cyclical frequencies.

In crafting their response to the Great Recession, policymakers turned to economists for advice on the use of fiscal policy to stabilize the economy. However, the field had little hard evidence on whether to conduct fiscal stabilization policy, let alone how to conduct it. The majority of existing evidence derives from the careful analysis of military spending data. While it is difficult to measure the effects of most types of government spending on the economy because the economy and most government spending are both driven largely by past economic performance, in the case of military spending there are large changes in spending driven not by past economic performance but instead by considerations of national security and geopolitical goals, changes that can then be used to trace out the effects of military spending on the economy over time. Not only was this type of research helpful in our debate over policy responses to the Great Recession, but also, in dealing with many issues of identification and inference, it has laid the foundation for work that continues to expand our knowledge on the effects of fiscal stabilization policy. “Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on the Impact of Public Infrastructure Investment” by Sylvain Leduc and Daniel Wilson builds on this literature by addressing two important issues. First, existing work focuses on the effects of military spending, spending that has little direct benefit for private production or welfare. In contrast, spending on public infrastructure, tax incentives to spend on health, or spending on “green” products might provide greater stimulus than military spending through its impact on the incentives to produce or expectations of lower required spending and taxes. Second, existing evidence on many questions related to fiscal stimulus is statistically weak, mainly because there are few innovations to military spending that happen in (deep) recessions. The literature typically does not estimate the effect that military spending has in a recession, but rather the effect that military spending has on average. The policy question concerns the former effect, which may or may not be the same as the latter effect.

Leduc and Wilson address these issues by looking at the economic
impact of changes in spending on public highways across US states. By looking at infrastructure spending, the paper measures the economic response to the major type of spending that the Federal government undertook in its response to the Great Recession. By looking across states, the paper brings more information to measurement that, when combined with a model, increases what we know about the efficacy of fiscal stimulus. The authors use the institutional detail of the legislative process to construct state-specific innovations to the future path of federal grants, obligations, state outlays, and state spending. The research finds that an innovation in one year leads to an increase in highway spending the next year that persists and then roughly doubles in years six through nine before declining back to zero. This pattern of spending is associated with an increase in GDP in the first year that goes away in the second, and then higher GDP for several years beginning when the level of spending again increases. The scale of these changes implies impact and cumulative government spending multipliers well above unity. And the authors find that the effect of this type of spending on output is, if anything, larger in booms than recessions. That said, the multiplier is a reduced-form statistic, and, with limited state-specific tax implications, this estimated multiplier is not comparable to an aggregate multiplier. The paper shows that the measured responses are consistent with those implied by a calibrated new Keynesian model of open economies in which government capital is productive. While far from the last word on the topic, the paper represents a significant step forward for the literature measuring the response of the economy to government spending. Not all spending is created equal, and spending on productive capital like roads seems to provide more stimulus-type bang for the buck, though at a potentially large cost of significant delays.

In “Which Financial Frictions? Parsing the Evidence from the Financial Crisis of 2007 to 2009,” Tobias Adrian, Paolo Colla, and Hyun Song Shin argue for the incorporation of financial contracting into macroeconomic models as an additional propagation mechanism, particularly if such models are to be useful in analyzing events like those of the recent financial crisis. The authors propose more specifically that recent events point to the importance of incorporating financial frictions of a particular type that are not always present, even in models that allow for “financial accelerator” effects. Many of the best-known examples of such models assume that variations in the volume and terms of financial intermediation play an important role in the propagation of disturbances, but attribute this to interference with the demand for
credit, owing, for example, to impairment of the balance sheets of final borrowers (households or entrepreneurs); the authors argue instead that the contraction of intermediated credit in the recent crisis must be understood as resulting primarily from a reduction in the supply of such credit. Moreover, they show that while bank lending to firms declined during the crisis, bond financing actually increased, so that the total supply of credit to firms did not decline nearly as sharply as bank lending. They argue, as a consequence, that models in which a financial crisis corresponds to a contraction in the supply of credit as such are inaccurate, and that it is important instead to represent such episodes as mainly involving shifts in the composition of credit, away from bank loans and toward bond issuance. They propose a model with both direct and intermediated credit, and show how it can explain a number of key facts about the recent crisis. In their model, a financial crisis can have a substantial negative effect on aggregate output, but this results from the spike in risk premia that necessarily accompanies the shift toward increased bond financing, rather than from a reduction in the volume of borrowing. Finally, the authors show that variations in the assets held by financial firms are largely associated with procyclical variation in the degree to which the firms leverage their book equity, rather than with variations in the firms’ net worth of the kind stressed in common “financial accelerator” models, even when the key friction is assumed to relate to the ability of intermediaries (rather than ultimate borrowers) to finance themselves. Hence they argue for the importance of models incorporating a constraint on the ability of banks to finance themselves by issuance of new equity, together with mechanisms that result in procyclical variation in the degree of leverage that is considered acceptable by financial firms and/or those funding them. The task of incorporating these insights into a complete macroeconomic model remains largely for future work, but the paper makes an important contribution to the vital task of developing models of business fluctuations that take account of the kind of potential disruptions of financial intermediation so evident in the recent crisis.

“Individual Price Adjustment along the Extensive Margin,” by Etienne Gagnon, David López-Salido, and Nicolas Vincent, contributes to the active recent literature that seeks to discriminate among alternative possible models of price adjustment using micro-level data sets, rather than studying the dynamics of price indices alone. The authors argue that a difference among alternative models of price-setting that is of critical importance for their macroeconomic implications has to do
with the degree to which changes in broad price indices reflect variation in the size of the changes in individual prices that would in any event be reconsidered (the “intensive margin” of price adjustment), or variation in the number of prices that are reconsidered over a given period of time (the “extensive margin”). The authors propose to identify (or at least to bound) the importance of adjustment on the extensive margin by looking at the distributions of individual price changes immediately following certain large shocks, with the desirable features that (a) the timing of the shock is clear apart from any measurement of its effect on prices, and (b) the shock should increase the profit-maximizing price of all goods in the same proportion, and in a proportion that can be known other than from the observed effect on prices. In such a cases, under the hypothesis that prices that do change always adjust to the currently profit-maximizing price, it is possible to predict what the distribution of individual (logarithmic) price changes should be under the hypothesis that the shock affects only the intensive margin: it should be the same as the distribution of log price changes in the absence of the shock (that may be inferred from the observed distribution over a period prior to the shock), translated horizontally by the amount of the change in each firm’s optimal log price due to the shock. Any discrepancy between this prediction and the distribution of individual price changes that is actually observed is then taken as evidence of adjustment on the extensive margin. The authors propose three examples of shocks that arguably satisfy their criteria—a sudden large devaluation of the Mexican peso in 1994, and increases in the Mexican value-added tax rate in 1995 and 2010—and argue that the distributions of changes in the prices of individual Mexican goods around these events indicate a considerable degree of adjustment on the extensive margin, implying a greater degree of aggregate price flexibility than in the case of a model with exogenous timing of price adjustments calibrated to match the observed average frequency of price changes. Debate will doubtless continue about the degree to which flexibility of prices in response to large shocks of this kind should be taken as suggesting that prices should be equally flexible in response to smaller changes in macroeconomic conditions; but the authors’ evidence makes an important contribution to our understanding of one of the most critical (but also most controversial) issues in quantitative macroeconomic modeling.

“Testing for Keynesian Labor Demand,” by Mark Bils, Peter J. Kle-now, and Benjamin A. Malin, develops an original approach to testing the empirical validity of the Keynesian view that declines in employ-
ment during recessions are due to a tendency of firms to reduce the quantity that they produce (and hence the inputs that they must hire) in response to reduced demand for their products at existing prices. The aspect of the Keynesian labor demand hypothesis that the authors focus on is the idea that low demand leads to layoff of workers rather than lowering prices, either because of nominal price stickiness or because the desired markup of monopolistic firms is countercyclical for some reason. The original approach of the authors exploits relative demand changes for seventy different industries exploiting the insight that, absent stickiness, industries with more durable products should experience a greater amplitude of fluctuations because the adjustment of the desired stock requires a bigger proportional adjustment of expenditure. For similar reasons, demand for products that are luxuries should be more cyclical than necessities. Using a variety of different data sources, and consistent with Keynesian labor demand, the authors find that industries producing products that are more durable exhibit significantly more cyclical employment and output, but also show countercyclical relative markups. This provides support for the Keynesian labor demand hypothesis and also pinpoints a specific mechanism. This new and original approach will undoubtedly lead to further research on understanding the cyclical behavior of labor demand in different industries, and will be a reference for future research in this area.

In “Risk Heterogeneity and Credit Supply: Evidence from the Mortgage Market,” Timothy Besley, Neil Meads, and Paolo Surico brings new information to the measurement of changes in lending standards in the mortgage market in the United Kingdom during the period prior to and during the large increase in house prices that preceded the house price collapse and financial crisis. Along with the general macroeconomic situation, the house price boom and bust in the United Kingdom mirrored that in the United States, with the exception that in the United Kingdom a borrower is de facto liable for the value of the mortgage regardless of the value of the house used as collateral. The question addressed in the paper is whether, as interest rates fell and house prices increased, there was also a decrease in the positive relationship between the interest rate on a mortgage and the risk of default. The paper uses the size of a mortgage as a measure of the risk of default, in that larger mortgages, other things equal, are more likely to default. To separate the effect of changing borrower characteristics from the effect of changing credit supply, the paper constructs instruments using changes over time and amounts in the tax rate on housing transactions.
The assumption of the estimation is that the changes in the tax instruments shift loan demand and not supply. Finally, the paper employs a quantile regression methodology to estimate the marginal effect of default risk on interest rates at different points in the size distribution. The authors show that there is indeed a positive relationship between the interest rate and the amount borrowed in their sample of 600,000 mortgages from 1975 to 2005, and, more interestingly, that this relationship flattened over time. That is, the price or quantity of perceived default risk declined as interest rates fell and house prices increased. By bringing large amounts of data and careful econometric work to the analysis of the terms of credit in the precrisis period, this paper should influence the ongoing debate on the causes and, to some extent, consequences of the housing price bubble.

The final chapter is a speech by Paul Krugman, longtime NBER member and renowned columnist and political and economic commentator (as well as professor at Princeton University and Nobel Prize winner). Krugman provides an overview of the early thinking on optimal currency areas as Europe transitioned into a single currency area, how this thinking has proved largely correct, and what we have learned about the relative importance of the different prerequisites for an optimal currency area. He concludes with some ideas for improving the workability of the Euro area going forward.

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Abstracts

Raj Chetty, Adam Guren, Day Manoli, and Andrea Weber

Macroeconomic calibrations imply much larger labor supply elasticities than microeconometric studies. One prominent explanation for this divergence is that indivisible labor generates extensive margin responses that are not captured in micro studies of hours choices. We evaluate whether existing calibrations of macro models are consistent with micro evidence on extensive margin responses using two approaches. First, we use a standard calibrated macro model to simulate the impacts of tax policy changes on labor supply. Second, we present a meta-analysis of quasi-experimental estimates of extensive margin elasticities. We find that micro estimates are consistent with macro evidence on the steady-state (Hicksian) elasticities relevant for cross-country comparisons. However, micro estimates of extensive-margin elasticities are an order of magnitude smaller than the values needed to explain business cycle fluctuations in aggregate hours. Hence, indivisible labor supply does not explain the large gap between micro and macro estimates of inter-temporal substitution (Frisch) elasticities. Our synthesis of the micro evidence points to Hicksian elasticities of 0.3 on the intensive and 0.25 on the extensive margin and Frisch elasticities of 0.5 on the intensive and 0.25 on the extensive margin.
2. Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on the Impact of Public Infrastructure Investment
Sylvain Leduc and Daniel Wilson

We examine the dynamic macroeconomic effects of public infrastructure investment both theoretically and empirically, using a novel data set we compiled on various highway spending measures. Relying on the institutional design of federal grant distributions among states, we construct a measure of government highway spending shocks that captures revisions in expectations about future government investment. We find that shocks to federal highway funding positively affect local GDP both on impact and after six to eight years. However, we find no permanent effect (as of ten years after the shock). Similar impulse responses are found in a number of other macroeconomic variables. Our results suggest that the transmission channel for these responses operates through initial funding leading to building, over several years, of public highway capital, which then temporarily boosts private sector productivity and local demand. To help interpret these findings, we develop an open economy new Keynesian model with productive public capital in which regions are part of a monetary and fiscal union. We show that our empirical responses are qualitatively consistent with an initial effect due to nominal rigidities and a subsequent medium-term productivity effect that arises once the public capital is put in place and available for production.

Tobias Adrian, Paolo Colla, and Hyun Song Shin

The financial crisis of 2007 to 2009 has sparked keen interest in models of financial frictions and their impact on macro activity. Most models share the feature that borrowers suffer a contraction in the quantity of credit. However, the evidence suggests that although bank lending to firms declines during the crisis, bond financing actually increases to make up much of the gap. This paper reviews both aggregate and micro-level data and highlights the shift in the composition of credit between loans and bonds. Motivated by the evidence, we formulate a model of direct and intermediated credit that captures the key stylized facts. In our model, the impact on real activity comes from the
spike in risk premiums, rather than contraction in the total quantity of credit.

4. Individual Price Adjustment along the Extensive Margin
   Etienne Gagnon, David López-Salido, and Nicolas Vincent

Firms employ a rich variety of pricing strategies whose implications for aggregate price dynamics often diverge. This situation poses a challenge for macroeconomists interested in bridging micro and macro price stickiness. In responding to this challenge, we note that differences in macro price stickiness across pricing mechanisms can often be traced back to price changes that are either triggered or canceled by shocks. We exploit observed micro price behavior to quantify the importance of this margin of adjustment for the response of inflation to shocks. Across a range of empirical exercises, we find strong evidence that changes in the timing of price adjustments contribute significantly to the flexibility of the aggregate price level.

5. Testing for Keynesian Labor Demand
   Mark Bils, Peter J. Klenow, and Benjamin A. Malin

According to the textbook Keynesian model, short-run demand for labor is sensitive to the demand for goods. In this view, sellers deviate from setting the marginal product of labor proportional to the real wage, instead enduring or choosing lower price markups when demand for goods is high. We test this prediction across US industries in the two decades up through the Great Recession. To identify movements in goods demand, we exploit how durability varies across seventy categories of consumption and investment. We also take into account the flexibility of prices and capital-intensity of production across goods. We find evidence in support of Keynesian labor demand.

6. Risk Heterogeneity and Credit Supply: Evidence from the Mortgage Market
   Timothy Besley, Neil Meads, and Paolo Surico

This paper uses data on about 600,000 mortgage contracts to estimate a credit supply function that allows for heterogeneity in risk pricing. The results for the period 1975 to 2005 are suggestive of significant price
heterogeneity, with riskier borrowers increasingly penalized for borrowing more. A sub-sample analysis, however, reveals that the period before the financial crisis was characterized by a sharp fall in risk pricing and little evidence of heterogeneity, consistent with a relaxation of credit conditions.