FROM THE LAB

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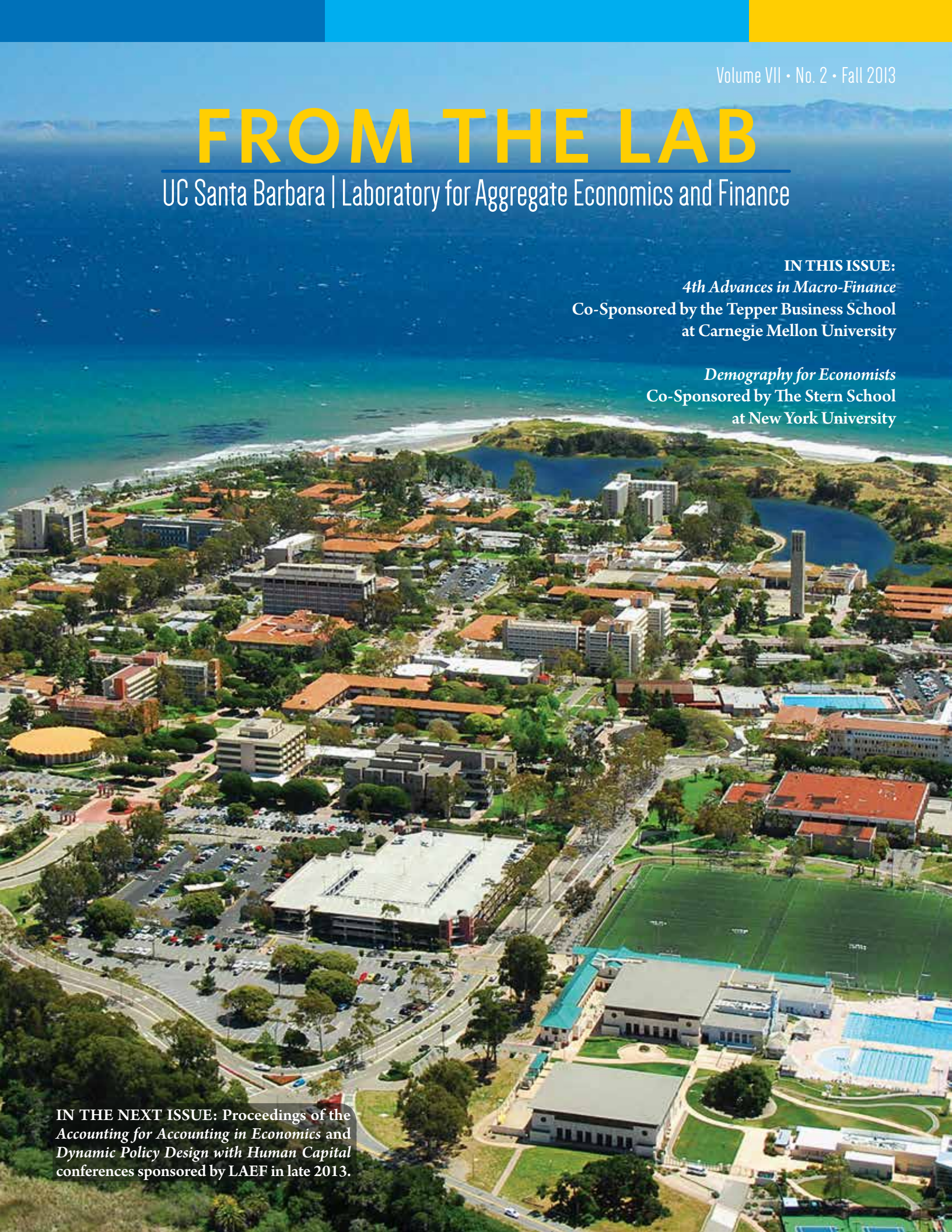
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4th Advances in Macro-Finance
**Co-Sponsored by the Tepper Business School
at Carnegie Mellon University**

Demography for Economists
**Co-Sponsored by The Stern School
at New York University**

IN THE NEXT ISSUE: Proceedings of the
Accounting for Accounting in Economics **and**
Dynamic Policy Design with Human Capital
conferences sponsored by LAEF in late 2013.

4th Advances in Macro-Finance
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University

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Director's Message
Finn Kydland

In this issue of *From the Lab*, we feature summaries of two conferences LAEF co-sponsored in the fall of 2013. *Demography for Economists* was organized by *David Backus* and *Thomas Cooley*, both of New York University. The conference was co-sponsored with the Center for Business and Global Economy at NYU and was held on the NYU campus. It focused on issues at the intersection of demography and economics. Demographic changes are persistent and slow moving and over the past decades there have been dramatic changes in demography – decreased mortality and morbidity, lower birth rates and changing age structure of the population. The conference explored the current state of demographic research and the implications of demographic change for important economic issues – the structure of the family, capital flows, savings behavior and the fiscal condition of economies.

The fourth annual *Advances in Macro-Finance* conference was co-sponsored with the Tepper School of Business at Carnegie Mellon University, and was held at CMU. The organizers of the conference were CMU assistant professors *Brent Glover* and *Ariel Zetlin-Jones*. As in the past years, the conference focused on research on the relationship between asset prices and macroeconomic fundamentals. Topics included, but were not limited to: production economies; exotic preferences; time variation in expected returns; learning; and pricing of currencies, commodities and sovereign debt. Preference was given to recent papers that had not previously been presented at major conferences. To the extent possible, the organizers paired authors to discussant with different backgrounds (macroeconomics and finance), with senior academics discussing the work of junior colleagues.

4th Advances in Macro-Finance

**Co-Sponsored with the Tepper Business School
at Carnegie Mellon University**

SEPTEMBER 20-21, 2013

CONFERENCE PARTICIPANTS

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Max Croce — University of North Carolina, Chapel Hill – Kenan-Flagler

Alessandro Dovis — Pennsylvania State University

Simon Gilchrist — Boston University

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Oliver Levine — University of Wisconsin, Madison

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Juan Pablo Nicolini — Federal Reserve Bank of Minneapolis

Stefano Sacchetto — Carnegie Mellon University - Tepper

Lukas Schmid — Duke University – Fuqua/UCLA – Anderson

Gill Segal — University of Pennsylvania – Wharton

Ivan Shaliastovich — University of Pennsylvania – Wharton

Yongseok Shin — Washington University, St. Louis

Hrishikesh Singhania — University of California, Santa Barbara

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Alexei Tchistyi — University of California, Berkeley – Haas

Brian Thomas — University of California, Santa Barbara

Venky Venkateswaran — New York University – Stern

Vivian Yue — Federal Reserve Board of Governors

Stanley Zin — New York University – Stern

Efficient Sovereign Default
Alessandro Dovis

Data on sovereign default feature severe output losses, consumption losses, and trade disruptions for the debtor country. The data also show that interest rate spreads on debt increase as sovereigns approach default, and that creditors are repaid partially after default. The literature on sovereign borrowing attributes default either to market incompleteness, implying that default is inefficient, or to excessive reliance on short-term debt, which leaves countries vulnerable to roll-over risk. Dovis takes a different approach to studying sovereign borrowing. He asks: What are the features of an efficient risk-sharing arrangement between a sovereign borrower and foreign lenders when there are informational and commitment frictions? He shows that the ex-post inefficiency of default is necessary to implement the ex-ante efficient arrangement when the borrowing government is privately informed about the state of the domestic economy and cannot credibly commit to repaying its debt. He implements the efficient arrangement using non-contingent defaultable bonds and finds that the equilibrium path features a shift towards short-term debt as a country approaches default. Therefore, both the ex-post inefficiency of default and the increased reliance on short-term debt emerge as ways to support the ex-ante efficient risk-sharing arrangement. Dovis also finds that default episodes in the model are consistent with the features of the data.

The infinite-horizon production economy features a final consumption good and an intermediate good. In each period, patient, risk-neutral foreign agents are endowed with large quantities of the intermediate good. Impatient, risk-averse domestic agents are endowed with one unit of labor and a constant returns to scale production technology that transforms labor and intermediate goods into the final good. Domestic agents are also subject to taste shocks that affect their marginal utility of consumption. A benevolent domestic government borrows the intermediate good from foreign lenders on behalf of the domestic agents. The efficient borrowing arrangement features partial insurance only. When borrowers report the high taste shock, they are penalized with lower future consumption and lower imports of intermediate goods. The latter penalty makes deviations into autarky unprofitable for the borrower. The implementation using non-contingent defaultable bonds replicates efficient partial insurance by decreasing (increasing) the price of outstanding long-term debt after a high (low) taste shock, thus decreasing (increasing) the borrower's debt burden.

The discussant, Vivian Yue, suggested some possible extensions. She commented that the adopted timing of the sovereign debt game ruled out the possibility of signaling, and of spillovers from the government's default to the creditworthiness of private borrowers. These two effects are important in the data. She noted that the model may be decentralized in other ways. The capital constraints faced by domestic firms could depend on government indebtedness. Foreigners could invest in domestic firms and production inefficiencies could arise due to changes in capital flows. She also suggested that Dovis consider a framework with endogenous debt limits. Yue added that the model could be used to quantify the importance of each friction in the optimal contracting literature. For example, the author could compare how the efficient allocation and the utility frontier changes because of private information. These exercises will help quantify the welfare cost of different market structures and guide policy interventions in the sovereign debt markets. She also suggested generalizing the model to incorporate persistent shocks and shock-distributions with a larger support. These generalizations will improve the connection between the model and the data.

Dovis responded that there was some spillover in the model: the indebtedness of the sovereign affected private sector imports. Private firms cannot get access to intermediates because exporters realize that highly indebted governments may tax imports. He added that contracts with endogenous debt limits cannot be implemented in environments with private information. Moreover, these implementations require access to a full set of Arrow-securities. The proposed implementation applies as long as the outcome of the optimal contract is dynamic.

A conference participant noted that the value of financial autarky to the sovereign borrower was exogenously imposed. Since the inefficient region is not an outcome of the model, why don't the agents negotiate? Isn't the lack of renegotiation a consequence of this assumption? Dovis agreed that renegotiation-proofness is important. The participant followed up by noting that we see renegotiation in the data. Dovis responded that the partial repayment can be thought of as an outcome of the renegotiation process. He added that he was studying renegotiation-proof contracts in a different paper, and that his implementation works in such an environment. Another participant asked if the findings survive when the cardinality of the set of shocks is larger than that of the set of assets. Dovis responded that an approximate version of the findings should survive. He added that one would have to solve the game differently. Another participant asked whether the model featured free-entry of lenders. Dovis responded that there was free-entry and lenders were making zero profits. This participant followed up: how can lenders have different valuations of debt along the utility frontier? Dovis responded that the frontier showed the total market-value of debt.

BKK the EZ Way
Ric Colacito, Max Croce, Steven Ho, and Philip Howard

What is the role of long-term risk and uncertainty in international macroeconomics? Does capital always flow to the most productive country? Do international capital markets distinguish between short-lived and long-lived productivity improvements? Colacito, Croce, Ho, and Howard answer these questions using a framework that features short- and long-term productivity risk, along with recursive preferences. They find that the allocation of resources across countries depends on two channels – the productivity channel and the risk-sharing channel. The productivity channel induces resource allocation towards the most productive countries, whereas the risk-sharing channel induces resource allocation towards the least productive countries. The productivity channel dominates in the short-run and the risk-sharing channel dominates in the long-run. Therefore, capital flows into (out of) a country that gets a positive short-run (long-run) productivity shock. The authors also present novel empirical evidence from the G7 countries to show that the findings are consistent with international quantity and price movements.

The model economy features two countries that specialize in the production of one good each. Both countries combine capital and effective labor into output using a Cobb-Douglas production technology. The growth rate of productivity in each country is subject to a country-specific short-run shock that lasts one period, and a country-specific long-run shock that lasts many periods. The output produced by each country can be consumed or invested in either the home or the foreign country. The total investment in each country is a CES aggregate of domestic and foreign investments; the aggregator features investment home bias. Each country also has heterogeneous vintages of capital, with new vintages of capital facing aggregate productivity risk with a delay. A representative agent in each country has Epstein-Zin preferences over consumption and leisure. The consumption of each agent is a CES aggregate of his consumption of the domestic and the foreign good; the aggregator builds consumption home bias into preferences. Under Epstein-Zin preferences, each representative agent is very sensitive to news about long-run productivity. Therefore, each agent responds to good news about long-run productivity in his country by increasing his current consumption, and by shifting resources to the foreign country in order to lower the conditional variance of his wealth. The proportion in which resources, in the form of consumption and investment goods, are shifted to the foreign country depends on the relative home bias for consumption and investment goods.

The discussant, Stan Zin, re-formulated the authors' question: Is imperfect risk-sharing among countries evidence of non-expected utility rather than incomplete markets? He added that this paper considers the complete markets case

with non-expected utility to reconcile the model with the facts. The dynamics in the paper are driven by shocks to total factor productivity, not by preferences. Therefore, the social planner reallocates consumption across countries too much relative to the data. The authors address this inconsistency with the data by introducing home bias in consumption and investment. Zin added that the model had many parameters and suggested that the authors try to pare down the model. He encouraged the authors to consider several directions for future work. What about wedges? How do the wedges in the data change over time? What happens if the higher order moments of the utility fluctuate? Preference heterogeneity? Do small frictions get amplified by recursive preferences?

Colacito agreed that the model does have a lot of parameters. He noted that the main channel at work was the long-run risk channel, along with the heterogeneity in home bias in consumption and investment. He added that the authors were working on introducing frictions into the model in the form of trading costs. Adding frictions will reduce the agents' ability to smooth their continuation utilities, and help generate time-varying risk premia which will bring the model closer to the data.

Zin followed up with two facts about international trade. First, he noted that Canada and the United States are leading exporters of wheat. At the same time, they import wheat from each other. Second, north-south trade is cheaper than east-west trade. How do we think about these facts? He added that geo-political boundaries are important for trade and that they dictate the appropriate state-space for these models. A conference participant asked the authors how they constructed separate series for foreign consumption and investment. Colacito responded that the data come from four different NIPA tables. The participant noted that those data may not be reliable. The authors agreed. Another participant asked: Do you treat intermediate goods in the data as investment? Colacito responded yes. A different participant asked if a model containing the presented features, but without Epstein-Zin preferences, had appeared in the literature. Colacito answered no. He added that such an economy would not respond to long-run risk.

Good and Bad Uncertainty: Macroeconomic and Financial Market Implications
Gill Segal, Ivan Shaliastovich and Amir Yaron

Segal, Shaliastovich and Yaron take a fresh look at how macroeconomic uncertainty affects aggregate growth and asset prices. They decompose aggregate uncertainty of macroeconomic data into "good" and "bad" components. "Bad" uncertainty is the volatility that is associated with negative innovations to quantities (e.g., output, returns), and with lower prices and investment. "Good" uncertainty is

the volatility that is associated with positive shocks to these quantities, and with higher asset prices and investment.

An example of "good" uncertainty is the high-tech revolution of the early-mid 1990s. A common view at the time was that the introduction of the worldwide web would provide many positive growth opportunities that would enhance the economy, yet it was unknown by how much. Conversely, an example of "bad" uncertainty is the collapse of Lehman Brothers in 2008 that marked the beginning of the global financial crisis. With many of the ensuing bankruptcy cases, one knew that the state of economy was deteriorating – however, again, it was not clear by how much.

The authors propose a model to show theoretically that variations in "good" and "bad" uncertainty have separate and significant opposing impacts on the real economy and asset-prices. The key model implications include: (i) "good" uncertainty significantly and positively predicts future measures of economic activity, while "bad" uncertainty negatively forecasts future economic growth; (ii) "good" uncertainty fluctuations are positively related to asset valuations and to the real risk-free rate, while an increase in "bad" uncertainty depresses asset prices and the riskless yield; and (iii) the shocks to "good" and "bad" uncertainty carry respectively positive and negative market prices of risk, yet both contribute positively to the risk premium.

To take the model to the data, the authors use the ex-ante (predictable) components of the positive and negative realized semi-variances of industrial production growth as the respective proxies for "good" and "bad" uncertainty. Their analysis shows that these two types of uncertainty do indeed have a different impact on the macroeconomy and asset prices as predicted by their theoretical framework.

The discussant, Lukas Schmid, called the paper "nice and provocative" and sees it opening up an "interesting new debate." He pointed to existing models that have contradicting implications for the effects of volatility. On the one hand, some models with endogenous growth would predict that volatility increases growth. The reason for this is that risk averse agents save, leading to increased investment and stronger output. On the other hand, in a model with investment frictions, the opposite might happen. For example, if agents are exposed to credit frictions, their default rates increase with volatility, making it harder to borrow for investment, and leading to a slowdown in growth.

Schmid was somewhat critical of the definition of "good" and "bad" volatility in the paper. He pointed out that the authors' empirical strategy identifies "good" uncertainty as one that is associated with good ex-post outcomes and "bad" uncertainty as one that is associated with bad ex-post outcomes. In this sense, some of the empirical results in the paper appear to be true by construction. Similarly, agents in the model know

that "good" and "bad" volatility are followed by good and bad growth realizations and behave accordingly. Furthermore, he criticizes that "good" and "bad" volatility are not primitive shocks. Rather, the features of an economy should determine the nature of more primitive volatility innovations.

Schmid also pointed out that "good" volatility might not necessarily be welfare-improving despite being associated with higher growth, since risk-averse agents value volatile consumption less. Furthermore, he suggested thinking about different frequencies of volatility. He pointed to recent empirical evidence from derivative markets where investors pay sizeable risk premia to hedge against short-run consumption risk but seem much more willing to accept long-run uncertainty.

In the open discussion, a conference participant suggested that the authors calibrate their model to use their theory's restrictions to back out estimates of good and bad volatility from asset prices. Furthermore, the discussant was curious about whether "good" and "bad" volatility had different persistence in the data. Finally, another participant brought up a scenario under which it would be difficult to distinguish between the two types of volatility. If, after the 2008/09 crisis, agents expected a future increase in corporate income taxes, then the contemporaneous impact of this anticipated policy change would likely be a sharp drop in investment together with an increase in consumption. This shock would be "bad" for investment and "good" for consumption at the same time.

Implications of Heterogeneity in Preferences, Beliefs and Asset Trading Technologies for the Macroeconomy
YiLi Chien, Harold Cole and Hanno Lustig

Chien, Cole and Lustig present a methodology to analyze and compute the equilibria of economies with large numbers of agents who have different asset trading technologies. Trading technologies fall into two classes: (1) active traders who manage the composition of their portfolios among a given set of assets along with choosing how much to save; and (2) passive traders who take their portfolio composition as given and choose only how much to save. Within each class there can be a wide variety of different cases. For active traders, the trading technology varies depending upon the set of assets they can use, while for passive traders it varies with the specific portfolio composition rule.

In the authors' earlier work, all agents in the economy had to have the same flow utility functions, discount rates and beliefs. In this extension, the authors relax this restriction, greatly extending the set of economies to which their method applies.

The authors' methodology aims to explore the implications of a rapidly growing literature on household finance

which studies the portfolio decisions of households for the macroeconomy. This literature finds that many households do not use asset markets as standard theory would predict: both the extent of the assets they use and how they utilize the ones they do use differs in important ways. First, many households do not utilize all of the available assets. Second, even households who hold equities make very few adjustments in their financial positions. Third, many households who do adjust their portfolios seem to do so in a backward-looking manner that leads them systematically to mistime the market. These empirical findings suggest that many households are either completely unresponsive to variations in the pricing of risk or respond in the wrong direction. This pattern of asset usage by households is potentially important as it creates a form of market segmentation which can have wide ranging implications for household consumption behavior, the distribution of wealth, and, most directly, asset prices.

The discussant, Tony Smith, called the paper an "important contribution" to a line of research that tries to incorporate the "messy reality" of heterogeneous agents into asset pricing. He complimented the authors on their clever new approach to solving this class of models with many agents and assets. Unlike traditional methods, theirs does not rely on directly finding the prices that clear all asset markets, which can be computationally very expensive. To leverage this advantage in an even broader class of economies, he thought it would be useful if the authors extended their approach to be able to handle economies with capital as well.

Smith was critical of the fact that the frictions in the model are imposed exogenously. Specifically, the model is silent on why agents only trade certain assets and choose certain portfolios. He suggested that these margins of adjustment are an important dimension to explore in future research. Furthermore, he pointed out that agents empirically often do not interact directly in financial markets, using intermediaries such as mutual funds instead. He advocated that his would be an important avenue to explore in connection with heterogeneous agent models.

In the open discussion, a conference participant suggested that the authors evaluate the accuracy of their solution method by comparing it to traditional methods that are computationally more intensive but known to yield precise results. He thought this would be important to get a sense of the type of models for which their method was most reliable. Another participant further pointed out that the asset pricing implications of the model could differ vastly in response to only small changes in the frictions governing stock market participation. Finally, Chien was asked whether in the model one group of agents would eventually grow to dominate the economy, as is the case in most heterogeneous beliefs models. To this question, he responded that all agents are borrowing constrained in the model, preventing this common problem from occurring.

From Information Frictions and Financial Markets to Missallocation and Aggregate Productivity
Joel David, Hugo Hopenhayn and Venky Venkateswaran

Economists have been interested in understanding cross-country differences in per capita income for a long time. This has produced a large literature that identifies differences in total factor productivity (TFP) as being the main source of cross-country differences rather than differences in levels of capital and labor. A more recent publication, in particular Hsieh and Klenow (2009), has explained a large amount of TFP differences as resulting from misallocation. In this publication, firms within countries know their firm-specific TFP and optimally choose capital and labor inputs to maximize profits. When firms chose levels of capital different from this optimal level, this is considered to be a misallocation resulting from an exogenous wedge (either a distortion on just capital or a distortion that affects both inputs). Hsieh and Klenow (2009) modeled the wedge as exogenous so they could focus on measuring the size of the wedge.

A set of papers following Hsieh and Klenow (2009) has tried to understand what generates these distortions. David, Hopenhayn and Venkateswaran belong to this set and use an information friction to endogenize the wedge. The model they propose is a variant of Hopenhayn (1992), and includes a noisy rational expectations model to incorporate their idea of limited information. In the model, firms choose their level of capital with limited information about their firm-specific productivity (they also choose their level of labor with limited information in a separate case). Firms receive some information about their firm-specific productivity through three sources, and the quality of this these sources varies by country. Each firm's productivity follows a first-order autoregressive process and firms observe their previous period's productivity, a noisy private signal of their current productivity, and the current price of their stock. This stock price resembles an aggregation of information from investors who individually receive noisy signals about the firm's true productivity. There is a unit measure of these investors who each observe a noisy signal and then choose whether or not to purchase a single unit of equity at the market price. With these investors alone, the stock price would perfectly reflect the underlying productivity of each firm, and the firms could back this out. However, David, Hopenhayn and Venkateswaran also include noise traders in their stock market who purchase a random quantity of the stock each period. Because of these noise traders, the stock price does not perfectly reflect the underlying productivity of each firm.

The authors derive an expression for the uncertainty in idiosyncratic productivity at the firm level which can be equated to the dispersion of marginal products from Hsieh and Klenow (2009). The size of this uncertainty depends on the variance of the firm's private information, the variance

of the investors' private information, the size of the shock to productivity in the AR(1) process, and the volatility in noise trader purchases. The authors then use this uncertainty to derive a simple expression which relates aggregate TFP as a decreasing function of this uncertainty. This relationship essentially creates a link between microeconomic uncertainty and macroeconomic aggregates, and can be used for an easy comparison between a full information benchmark (where the uncertainty variable would be equal to zero) and the calibrated levels of uncertainty.

The quality of the information received by firms, both through stock markets and through private signals, varies from country to country, and leads to the differences in cross country misallocation. David, Hopenhayn and Venkateswaran use a calibration strategy that takes moments of both firm production and stock market data to calibrate their informational parameters for the United States, China and India. Their findings suggest that in China and India these informational frictions can account for 8-16% of TFP and 12-24% of GDP. For the U.S., they find that these frictions can account for 4-11% of TFP and 5-17% for GDP. These effects are greater for GDP because informational frictions discourage capital accumulation. Their results also suggest that the informational contribution of stock markets is very small. If they were to eliminate stock markets as a source of information, the increase in uncertainty would be negligible, 0.4% in the U.S. They also find that cross-country differences do not come from differences in the quality of financial markets, but instead from differences in: (a) the quality of the information from private sources; and (b) the size of shocks to fundamentals.

There were several questions from the audience during the presentation. A conference participant wanted to know how many firms are publicaly traded in China and India. This is an important consideration to make because not nearly as many firms are publicaly traded in these countries as in the U.S. Venkateswaran replied that you could interpret the results of their paper as only applying to the sector of publicaly-traded firms in each country, which would be small for China and India. Alternatively, you could think about how much information publicaly-traded firms have as an upper bound for the information that private firms have. You could then extend the model to include private firms who have the same stochastic structure as publicaly traded firms without the benefit of the market signal.

The discussant, Yongseok Shin, had several ideas that could be fruitful for future work. One of his suggestions is to model an extensive margin distortion under this same type of informational friction. This paper only examines the intensive margin, but a number of recent papers have found that extensive margin distortions have larger effects than intensive margin distortions. This extension would fit naturally into this framework since newborn and potential entrants face

the greatest amount of uncertainty, and they often obtain information from venture capitalists or IPOs. Shin pointed out that developed financial markets, like those in the U.S., facilitate trial and error among young firms through limited liability laws and bankruptcy protection. These institutions vary a lot even among wealthy and developed nations like the U.S. and Japan. Venkateswaran replied that he and his co-authors are currently working on this extension.

Hopenhayn, Hugo A. "Entry, exit, and firm dynamics in long run equilibrium." *Econometrica: Journal of the Econometric Society* (1992): 1127-1150.

Hsieh, Chang-Tai, and Peter J. Klenow. "Misallocation and manufacturing TFP in China and India." *The Quarterly Journal of Economics* 124, no. 4 (2009): 1403-1448.

Merger Activity in Industry Equilibrium
Theodosios Dimopoulos and Stefano Sacchetto

Mergers and acquisitions (M&As) represent a large share of firm turnover. Between 1981 and 2010, 4.5% of active public firms in a given year merged, while only 3.7% exited due to poor performance. While firm dynamics of entry and exit have been well studied through variants of the workhorse model developed by Hopenhayn (1992), the aggregate effects of M&As have not yet been explored in this framework. The goal of this paper is to include M&As in a standard industry equilibrium model with aggregate shocks to examine the joint dynamics of exit, entry and mergers over the business cycle, and to understand the effect of M&As on the cross-sectional distribution of firms.

Dimopoulos and Sacchetto start with a fairly standard Hopenhayn (1992) model. The new feature they embed into this framework is an M&A market. Incumbent firms have a probability of receiving a merger opportunity each period. When firms receive this opportunity, they negotiate the merger terms using symmetric Nash bargaining. There are two reasons for firms to merge. First, merging reduces the combined fixed costs of production since the merged firm can eliminate duplicative fixed costs. Second, the merged firm can have a higher productivity level than either of the individual firms if the merger creates sufficient merger synergies. This new productivity is determined by an assumed functional form that combines the productivities of the two individual firms. This functional form contains two parameters, theta and lambda, which are set through calibration and which allow the model to incorporate different theories in the Industrial Organization literature about merger gains. One of these theories, the Q-theory of mergers, suggests merger gains are more significant when firms have very different productivities. This is consistent with setting lambda equal to one. As lambda declines, gains are largest for mergers with similar productivity levels, which could be interpreted as merger synergies based on complementary assets.

The merger market in Dimopoulos and Sacchetto adds a term to each firm's expected continuation value that represents the value of future merger opportunities. This term depends on the cross-sectional firm distribution because merger synergies depend on the productivity of the merger partner which is chosen at random from the distribution. This distribution is time-varying because of the aggregate shocks, and the authors use the Krusell and Smith (1998) algorithm to solve the forecasting function used to predict the movements in the first and second moments of this distribution.

Dimopoulos and Sacchetto calibrate their model to match a number of empirical moments and to be consistent with parameter values from the previous literature. Under this calibration, the model is successful in replicating a number of empirical regularities. One of these empirical regularities is pro-cyclical entry and M&A activity with counter-cyclical exit. Dimopoulos and Sacchetto are able to replicate the entry and exit dynamics because threshold productivities for both entry and exit decline following a positive aggregate shock. In their framework, M&A activity could be either pro- or counter-cyclical depending on whether the cost reductions from merging or the increased marginal productivity from merging dominates. Cost reductions, by reducing the fixed costs of operating, are more relevant during bad aggregate states, pushing firms to merge in bad times in order to reduce costs and avoid exit. The increase in marginal productivity is more relevant in good aggregate states because aggregate shocks and idiosyncratic shocks are multiplicative in the profit function. With the calibrated parameter values they choose, the second effect dominates, and M&A activity becomes pro-cyclical as in the data.

The discussant, Oliver Levine, suggested adding some asymmetry between merging firms. In Dimopoulos and Sacchetto, merging firms are perfectly symmetric, meaning each gets the same share of the surplus from the bargain and the merged firm's resulting productivity depends equally on both of the merging firms. This may be an important model feature to change since some literature, particularly David (2012), has shown that it is important to make a distinction between the acquirer and the target of the acquisition. Specifically, David (2012) shows it is the acquirer's idiosyncratic productivity that is more influential in determining merger synergies than the target firm's productivity. Sacchetto replied that he and his co-author are working on adding this asymmetry. To do this, they plan to model the bargaining process with more detail where, after matching, one of the firms decides to be the acquirer and the other the target, depending on their future merger opportunities.

A conference participant also suggested some other changes to the authors' model. The participant pointed out that the authors consider the productive efficiency rationale for mergers, but do not consider the strategic motive where a firm might want to acquire another firm to increase market power so that it can charge monopoly prices and increase its rents. Stefano responded that this motive for mergers is indeed absent in his model and that every proposed merger in his model would be approved by a regulator since there are only positive effects in his environment. David (2012) discusses the strategic motive for mergers and dismisses it since most mergers are very small and have insignificant market power implications. Only a few big mergers, like US Airways trying to merge with American Airlines or AT&T trying to merge with T-Mobile, seem to have important implications for market power. Nevertheless, including this additional motive could be a fruitful extension since it would allow a researcher to think about the cyclicality and time-consistency of antitrust regulation.

David, Joel. "The aggregate implications of mergers and acquisitions." Working Paper (2012).

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Krusell, Per, and Anthony A. Smith, Jr. "Income and wealth heterogeneity in the macroeconomy." *Journal of Political Economy* 106.5 (1998): 867-896.

Screening as a Unified Theory of Delinquency, Renegotiation and Bankruptcy
Natalia Kovrijnykh and Igor Livshits

A default event in consumer credit markets typically goes through three "stages." First, borrowers enter delinquency by becoming overdue on loan payments for a certain period of time. Some delinquent borrowers end up in bankruptcy, while others enter a renegotiation stage through which they achieve a debt settlement. So far, the theoretical literature on default has largely focused on modeling bankruptcy, but abstracted from delinquency and renegotiation. In this paper, Kovrijnykh and Livshits provide a parsimonious model with adverse selection where the three stages of default occur in equilibrium. The model generates reasonable predictions about how bankruptcy rates vary with debt and income, and it is applied to analyze the effects of government intervention in the mortgage market.

The benchmark model is static and assumes one borrower and one lender. The borrower is risk-averse while the lender is risk-neutral. The key assumption is that the borrower has private information about her cost of bankruptcy, so that an adverse selection problem naturally arises. Bankruptcy costs can only take two values, high and low. A contract specifies how much the borrower should repay the lender, who, in turn, designs the optimal contract by maximizing expected repayment. Depending on parametric conditions, three types of optimal contracts can emerge in equilibrium. In the first case, the lender demands a low level of repayment which is accepted by both types of borrowers. In this case no bankruptcy occurs. The second alternative arises when the lender demands a high enough level of repayment which is only accepted by high-cost borrowers. Low-cost borrowers, on the other hand, declare

bankruptcy. The first situation is referred to as "pooling" and the second one as "exclusion." The third possibility appears when the lender uses random contracts, a scenario which the authors call "screening." In this case, the lender optimally offers a pair of contracts to the borrowers. The first contract demands a deterministic repayment and only attracts the high types. The second contract is a lottery over repayments which is accepted by low-cost borrowers. A central point of the paper is that this simple screening mechanism generates the three stages of default, namely, delinquency, renegotiation and bankruptcy. Specifically, the authors provide the following sequential interpretation of the optimal screening contract. First, the lender offers the deterministic repayment, which low-cost borrowers reject and thus are declared delinquent. Next, some of those borrowers renegotiate a lower repayment with the lender. Those who do not renegotiate declare bankruptcy. Crucially, this sequential interpretation of the optimal contract relies on the assumption that there is full commitment on the lender's side.

The authors then extend the benchmark model by incorporating competition among lenders. More precisely, in the framework with competition, the borrower owes a given amount of debt to an incumbent lender, and both the incumbent and outsiders simultaneously offer contracts to the borrower. It is shown that outside competitors never renegotiate with the borrower (i.e., they never offer screening contracts), but competition induces the incumbent to renegotiate even if she didn't do so in the monopolistic setting. This model generates sensible comparative statics predictions on the equilibrium bankruptcy rate. Particularly, the bankruptcy rate increases with the level of debt and decreases with borrower's income.

Finally, Kovrijnykh and Livshits apply their model to study the effects of government intervention in debt restructuring. They focus on the consequences of a mortgage modification program aimed at limiting foreclosures, such as the Home Affordable Mortgage Program (HAMP) introduced in the U.S. in 2009. It is shown that if the government program ignores the impact on private debt restructuring, it may actually increase the number of foreclosures and, hence, have the opposite effect from the one intended.

The paper was discussed by Alexei Tchistyi. He first pointed out that the paper was very well motivated, given that the HAMP program implemented during the last foreclosure crisis was a big failure. Tchistyi's main suggestion was that the debt contract in the model should be defined properly. In this sense, he pointed out that payments from the borrower to the lender should be capped by the face value of debt. The reason is that, in practice, lenders are not paid more than the face value of debt, which is forbidden by bankruptcy laws. Livshits replied that the same results are obtained if one imposes an additional restriction requiring that lenders are not paid more than the face value of debt. Furthermore, he pointed out that

although the body of the paper treats debt exogenously, such value is endogenized in the appendix. Tchistyi's second suggestion was to better justify the benchmark framework, or think of other applications of it, as it doesn't really fit the way debt renegotiation takes place in reality. For example, while in practice lenders make offers to borrowers only if they are delinquent, in the model lenders make offers to borrowers before they enter delinquency. Finally, Tchistyi suggested a number of extensions to the paper. First, he proposed incorporating multiple types to determine whether the screening equilibrium survives and can be implemented with sequential offers. Second, he proposed assuming unknown wealth and risk aversion and studying how these affect the willingness to pay of borrowers. The final extension suggested was to introduce real collateral in the model. Tchistyi said that this might give rise to a new source of inefficiency, due to the loss in the borrowers' value of collateral whenever they end up in bankruptcy. Livshits replied that assuming more types would increase the number of rounds of renegotiation. He also agreed that the authors should carefully think about the other extensions proposed by the discussant.

Liquidity Traps and Monetary Policy: Managing a Credit Crunch
Francisco Buera and Juan Pablo Nicolini

The global financial crisis of 2008 led to unprecedented policy responses by developed economies. In the United States, for example, the Federal Reserve increased its balance sheet from 800 billion dollars in September of 2008 to around three trillion dollars by the end of 2012. Evaluating the effects of such unorthodox policies is still a challenge now in the aftermath of the crisis. Ironically, most macroeconomic models used by Central Banks around the world are unsuitable for this task for two main reasons. First, those models abstract from financial markets, which is where the global crisis originated. Second, they ignore monetary aggregates which were dramatically increased in response to the economic downturn.

In this paper, Buera and Nicolini build a model to assess the consequences of the unconventional policies that followed the credit crunch of 2008, hence contributing to fill in the aforementioned gap in the literature. Their model extends the real economy of Buera and Moll (2012) by introducing a role for money. More precisely, the economy is populated by entrepreneurs who are heterogeneous in productivity and wealth. Entrepreneurs face both collateral and cash-in-advance constraints, which naturally give rise to a credit and a money market, respectively. The economy is also populated by homogeneous workers who supply labor inelastically. Workers eventually become hand-to-mouth consumers, so in the long run equilibrium of the credit-market-active entrepreneurs (those with high productivity) borrow from

inactive entrepreneurs (those with low productivity). Prices and wages are assumed to be flexible, unlike the frameworks in the New Keynesian tradition. In this environment, the authors simulate a credit crunch by exogenously tightening the collateral constraints faced by entrepreneurs, and analyze the effects of alternative policies following the shock. Specifically, Buera and Nicolini focus on the consequences of conducting inflation targeting at the zero lower bound on nominal interest rates (henceforth ZLB).

The main result of the paper is that, compared to a passive policy, a low inflation target might lead to a less pronounced recession, but also to a slower recovery. The intuition behind this novel trade-off between size and duration of the recovery can be summarized as follows. Suppose that the economy is at the ZLB and policy is passive. The credit crunch reduces the number of bonds that active entrepreneurs can issue. But since capital is given, some capital will necessarily be reallocated to previously inactive and less productive entrepreneurs. Such reallocation is achieved through a reduction in the equilibrium real interest rate, and translates into a fall in total factor productivity (TFP) and output. Things are different when the monetary authority sets an inflation target, though. At the ZLB, the inflation target translates into a lower bound on real interest rates, which means that those rates cannot decrease as much as in the previous scenario. Hence, the reallocation of capital is not that large and this maps into milder falls in TFP and output. However, the inflation target can only be implemented by large increases in public liquidity which crowd out capital accumulation. As a consequence, the recovery from the recession will be slower than in the case of a passive policy. It is worth noting that if entrepreneurs used nominal debt, the effects associated with a decrease in the real interest rate are exacerbated when policy is passive. The reason is that at the ZLB, real interest rates can only go down by having inflation. So if money supply is constant (as in the case of a passive policy), there must be a deflation on impact which creates a debt deflation problem.

The paper was discussed by Simon Gilchrist. He first suggested changing the title of the paper to reflect that, in the model, a given inflation target is implemented through fiscal rather than monetary policy. This is because the government achieves a given inflation target by selling bonds and redistributing proceeds immediately to entrepreneurs. Nicolini agreed that, in the paper, the government is mainly conducting fiscal policy. Gilchrist also inquired whether the model could be simplified to illustrate the main mechanism in a clearer way. In this sense, he suggested eliminating the workers from the model as they don't seem to be playing a crucial role. He also pointed out that in Buera and Moll's (2012) baseline model, real interest rates do not necessarily fall in response to a credit crunch. He added that this depends on assumptions about the distribution of entrepreneurial productivities. He

suggested that the authors should explore the sensitivity of their findings to these assumptions. Nicolini agreed, but pointed out that the authors purposely restricted themselves to cases where real interest rates drop to negative values in order to analyze policies at the ZLB. Gilchrist also suggested looking at other policies besides the fixed inflation rate policy. As another extension, he said that the framework might be suitable to study credibility issues of public policies. Finally, he inquired whether a TFP-driven credit crunch was the "right model" for developed economies. Accordingly, he mentioned that while it is a stylized fact that developing economies experience large and long-lasting falls in output and TFP after financial crises, it is not clear whether this also holds for the U.S. In turn, he suggested that the model could potentially be recast as a capital utilization model. Nicolini replied that the main purpose of the authors' (admittedly stylized) model is to provide an example showing that the common view on how monetary policy should be conducted at the ZLB might be misguided. He also mentioned that the authors plan to work on an environment with capital utilization.

A conference participant asked why it was optimal for the government to intervene after the credit crunch. Nicolini replied that the purpose of the paper was not to design the optimal policy. Since collateral constraints are exogenous, the optimal policy would trivially require that the government take over the credit market. Another conference participant asked why the authors did not add a cash-in-advance constraint on the firm side, as in previous works of Jermann and Quadrini studying the macroeconomic effects of financial shocks. Nicolini replied that their economy operates in the cashless limit, so ignoring the cash-in-advance constraint on the firm side is without loss of generality.

Buera, F. and B. Moll (2013): "Aggregate Implications of a Credit Crunch," Working Paper.

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Population Trends and Development
John Bongaarts

Demographic change within countries and around the world has wide-spread implications for both economic stability and growth. The world is expected to continue a very fast pace of population growth, while simultaneously countries will face changes in the composition of their populations. These changes will have large consequences for the world. There are a number of countries with very high fertility rates and as a result, will face high rates of growth and environmental destruction. Countries that have recently faced these high fertility rates will transition into an intermediate phase, and countries that have low fertility will encounter additional challenges with low economic growth and rapidly aging populations. Bongaarts examines these groups and discusses policies to alleviate some of the problems associated with these stages.

Each of these groups will face economic, environmental, health, governmental, and political outcomes associated with their states of population growth and composition. Because they will have a high proportion of youth in their countries, the high-fertility countries are likely to face low wages, unemployment and poverty. In order to sustain such high levels of population growth, they will likely suffer depletion of their natural resources, pollution and high child mortality rates. Bongaarts also notes that because such countries will have low levels of production per capita, the government will be unable to invest in vital services, leading to political unrest and crime. In the intermediate group, population growth will slow down and the population will transition into a mass in working age. They will likely experience a "demographic dividend," which will cause the economy to experience boosts in GDP per capita as the youth in the country begin working and the participation of women increases. Like the high -fertility countries, the intermediate group faces depletion of their natural resources; unlike the prior group, child mortality will decline and the government will begin to institute social programs to improve education, health and infrastructure. Lastly, some countries will transition into the low-fertility state, characterized by zero or negative population growth rates and a rapidly aging population. In this state, countries will face slowing GDP and GDP per capita growth, while facing more environmental concerns. The governments in these states will likely encounter unsustainable social service costs and rising deficits.

Bongaarts posits several policy options to combat the negative consequences of each stage of demographic change. For high-fertility countries, Bongaarts suggests family planning programs to slow the rate of population increase and investments in human capital to increase the productivity of workers. In these developing countries, nearly half of pregnancies are unplanned; studies have shown that high

quality family planning programs can substantially cut down on these numbers. For aging societies, Bongaarts suggests a different policy prescription. First, countries can reform their pension systems and encourage private savings, which will help keep governments out of debt. Second, countries can attempt to raise retirement age while encouraging a high participation rate in the workforce. Finally, countries can attempt to increase the population growth rate by encouraging childbearing and increasing immigration. Additionally, Bongaarts notes that the world is increasingly dominated by "demographic burdens" instead of by "demographic dividends."

Many members of the conference audience took issue with the level of abstraction described in the presentation. One noted that getting young people to work is not easy: in Italy, the youth have long been encouraged to work, but the system is also set up in such a way that it causes people to retire very early and thus diminishes the demographic dividend. Another conference participant noted that while this demographic dividend may be present, it's much more important to focus on changes in productivity and, in particular, productivity per hour. Furthermore, one participant noted it's very likely that during some transition period between states a nation will have to retrain its workforce. Bongaarts noted that these were general prescriptions, not explicit programs to be installed in these countries.

One Child Policy and the Rise of Man-Made Twins
Wei Huang, Xiaoyan Lei and Yaohui Zhao

There was a 0.40 percentage point increase in the birth rate of Chinese twins from 1960 to 2000. It is suspected that the increase in the twinning rate is a result of an increased use of fertility drugs in response to the one child policy. It is also conjectured that the one child policy induced families to report siblings as twins. Both responses to the one child policy have undesirable long-run outcomes. When siblings are falsely reported as twins, the older sibling must delay his or her education by a year, which will adversely impact future labor market outcomes. Fertility-induced twinning is undesirable because biological twins have lower birth weights, which leads to future medical problems. Huang, Lei and Zhao use census data to ask whether a change in the one child policy fines led to an increase in the rate of twinning in China after the 1970s. The authors find the one child policy accounts for at least one-third of the increase in twins over this time period.

Huang, Lei, and Zhao regress the reported twin birth rate on the one child policy fine in a given province during a given year. The policy fine is the average monetary penalty rate for one unauthorized birth in the province-year panel from 1979-2000. The results indicate that an increase in the policy fine by one year's worth of income results in a 0.06 percentage point increase in the reported twin birth rate. A conference participant pointed

out that the total number of twins is small, so the coefficient does not imply a large effect. Huang agreed, but added that the coefficient does not capture the medical and socioeconomic effects. Huang, Lei, and Zhao observe that the policy fine is different across provinces and over time. A participant noted that the differences in the policy fine may be because the fine is endogenous to the reported number of twins. Huang responded that the number of reported twins does not predict the policy fine; therefore, the authors assume the fine is exogenous.

The authors divide the sample into those of Han ethnicity and minorities. The coefficient on the policy fine variable is positive and significant for the Han sample, but not significant for the minority sample. Huang explained that the policy may differ by ethnicity. Sometimes there is no restriction on the number of children born into minority households. Instead, the government specifies the number of years a family must wait before having another child. A conference participant asked whether there has been an increase in Han-minority marriage rates in response to the one child policy. Huang said that this is a topic on his current research agenda.

The authors also ask whether the increase in twins is a result of an increased use of fertility drugs, or an increase in false reporting. They create a twin sub-sample from the China Health and Nutrition Survey (CHNS) and regress the height difference of the twins on the policy fine, an indicator for same- or different-gender twins, an interaction term between policy and gender, and other control variables. They find that height differences are positively correlated with the policy fine. The result is only significant for same-gender twins. Huang, Lei, and Zhao conclude that the increase in the twin birth rate is due to an increase in the use of fertility drugs. An increase in false reporting would increase height differences for both same-gender and different-gender twins. A conference attendee pointed out that the sample size is small, with only 72 observations, and should be taken into consideration when interpreting the results.

Female Feticide: Some Results on Parental Choices of Conceptions and Abortions
Javier A. Birchenall and Raaj K. Sah

In the past few decades, parents have had some ability to choose the gender of their children. Because some parents prefer male children, they may choose to abort female children in hopes of having a male child. With the advent of these technologies, there has been evidence of a contemporaneous decline in the number of girls in Asian countries. In the past, the sex ratio at birth has been between 103 and 107 (103 males for every 100 females), but recently this number has become much larger, indicating that gender-biased abortions may be occurring. Birchenall and his co-author seek to scrutinize the choices over conception and abortion by constructing a dynamic model. They suggest that parents' decisions depend on their own preferences and the number as well as gender composition of the children they already have.

Birchenall and Sah propose two relatively parsimonious models for this question. In both models, the paper assumes that sons and daughters are weak substitutes, but that families value male children more and will only abort a child if it will be female. Their first model has two stages of choice: in the first stage, parents choose how many children to conceive and are told of the children's genders; in the second stage, they choose how many abortions to undertake conditional upon the gender composition. They solve the model by backwards induction: the agents first maximize their utility by choosing the number of abortions for a given composition of children and number of conceptions. Then, the agents optimally choose the number of conceptions using the optimal policy rule for abortions.

In the second model, each child's situation is considered by parents sequentially instead of collectively. At each time t, parents decide whether or not to conceive; then, having seen what the gender of the child will be, they choose whether or not to abort. In both models each set of parents face a cost of abortion as well as a propensity for sons.

The authors do not calibrate the model to any particular data, but rather use it to explain the phenomena since the advent of gender-biased abortions. In both models, the authors conclude that parents with a higher propensity for sons will undertake a larger or the same number of conceptions; additionally, the model suggests that decreasing the cost of abortions will cause at least as many conceptions. They find that for any group of parents, a single number (or two neighboring numbers) of abortions for each number of conceptions will maximize their utility (in the first model). In the sequential model, the authors find that decisions are based upon the preference parameter for sons: those with low preference will not conceive; those with a slightly higher preference will conceive, but choose not to abort. For those with an even higher preference for sons, they will choose to conceive and have an abortion if they do not receive a son.

One conference participant commented that there should be some concern for biological preferences within the paper, but Birchenall noted that it has been shown that such choices have little correlation with biology. Another participant noted that there should be concern for the relative costs of raising children of each gender, which isn't addressed by the paper. One participant in particular took issue with the use of indirect utility functions, stating that they miss out on a lot of nuance. In the same vein, another participant noted that without preferences, the audience didn't get any deeper insight into outcomes. The conference audience took less issue with the time-sequenced model, which they believed better modeled the behavior intended by the paper.

Achieving Fiscal Balance in Japan
Selahattin İmrohoroğlu, Sagiri Kitao and Tomoaki Yamada

Japan's net debt to GDP ratio is close to 150%. Even though Japan is highly indebted, its government wants to increase fiscal spending further. Japan also has one of the fastest aging populations among the more advanced economies. As a consequence, the country will soon have only one worker for every retiree. The Japanese government has tried to address these fiscal issues by cutting retirement benefits, raising the retirement age to 65, and raising pension premiums. Additionally, the government increased the consumption tax from five percent to eight percent; the tax will likely be increased again to 10% in 2018. İmrohoroğlu, Kitao, and Yamada ask: How will the aforementioned policies affect Japan's net debt to GDP ratio? What alternative policies could mitigate Japan's fiscal problems?

The authors use an overlapping generations model with heterogeneous agents. Individuals differ in gender, employment state, and age. An individual can have a regular job, a contingent job, or be unemployed. Contingent jobs pay less than regular jobs conditional on hours of work. The authors use individual level data to estimate age-earnings and consumption profiles across employment types. They use the estimated profiles to back out asset holdings and to calculate tax revenues under current fiscal policies. The authors find that current policies are ineffective in decreasing the future debt to GDP ratio. Rather, the ratio increases because of larger interest payments that follow the growth in government debt. They also find that pension payments become a larger share of government debt. The adopted fiscal policies are effective in that they slow down the rate at which the pension fund is depleted.

İmrohoroğlu, Kitao and Yamada consider what would happen under other exogenous changes. An increase in fertility, an increase in the return on the pension fund, and an increase in the consumption tax do not affect the outlook. Government debt accumulates at a lower rate if pension benefits are cut by 10 percent and the retirement age is raised from 65 to 70. An increase in female labor supply also slows down debt accumulation. Higher female labor force participation and an increase in the share of female workers with regular jobs both drive the non-pension deficit to zero. İmrohoroğlu suggested that allowing more immigrant workers into Japan might also help. He added that the paper does not analyze the consequences of this change in policy.

A conference participant asked why household level data was not used for the analysis. İmrohoroğlu replied that there were multiple reasons, the most important being that gender labor force participation plays a large role in the analysis. It would be difficult to tease out the role of women using household level data. Another participant asked if there were bequests in the model, since people who die tend to leave assets like houses to their children. İmrohoroğlu said that the next revision of the paper will address this question by comparing the asset profile generated by the model to the data.

Health Heterogeneity and Preferences
Jay Hong, Josep Pijoan-Mas and José-Victor Ríos-Rull

The U.S. population is aging rapidly. Usually in macroeconomic models, old people differ from young people only in that they have shorter time horizons and no labor decision. The data tell us that old people differ from young people in two additional ways: i) health declines as older people age further; and ii) the health of older people, conditional on age, depends on economic status. Hong, Pijoan-Mas and Ríos-Rull ask: How do changes in age and health shape preferences for consumption and change consumption decisions themselves? What is the impact of health on the marginal utility of consumption for people over fifty?

The authors employ a model of human capital investment in which agents differ in education and age. An agent's rate of time preference, health status, and asset holdings depend on his education. In each period, the survival probability of an agent depends on his age and current health status, but not on education. Conditional on survival, an agent's health status in the next period depends upon his current health status and his investment in health. Agents use their income each period towards expenditures on consumption goods, investments in health, and savings.

The analysis employs data on survival probabilities and evolution of health from the Health and Retirement Survey (HRS), along with consumption data from the Panel Study of Income Dynamics (PSID). The health multipliers and time discount factors are then estimated using GMM. The authors find that college-educated individuals have lower discount factors than other education groups. Also, for ages near fifty, good health produces a higher marginal utility of consumption. At older ages, however, poor health generates a higher marginal utility of consumption because consumption and health are substitutes. For example, old unhealthy individuals take a taxi to go places whereas healthy individuals walk. A conference participant suggested that all of these results hinge on the fact that the Euler equation holds with equality. Pijoan-Mas agreed. He added that the concern was quantitatively insignificant because most 50-year-olds in the data have positive asset holdings. Another participant asked if the authors were concerned about the fact that the analysis only captured market consumption. Pijoan-Mas agreed, and added that including home consumption in the model would be important for studying welfare implications.

He noted that this paper focuses on the relationship between health and expenditure, so there is no need for a home sector. Pijoan-Mas was asked if the health of young people depended on economic status. He replied that health varies little between the ages of 20 and 25, regardless of economic status.

Mortality Decline, Impatience and Aggregate Wealth Accumulation with Risk-Sensitive Preferences
Antoine Bommier

In recent history, humans have encountered rapidly decreasing mortality rates. This may have very large economic implications for growth and capital accumulation. In this paper, Bommier seeks to address the effect of mortality decline on aggregate wealth, using risk-sensitive preferences. When compared with standard models, risk-sensitive preferences that have not been applied to this literature may imply a larger accumulation of wealth than previously explained. Risk-sensitive preferences may do a better job approximating observable behavior, and thus should be considered in modeling decisions, particularly those involving mortality. This paper contributes both to the discussion on time discounting in the presence of mortality risks and by highlighting the impatience effect of temporal risk aversion.

In his model, Bommier assumes that agents consume one good and face only exogenous mortality risks. He sets the rate of time discounting such that it depends upon, and is increasing in, mortality risks. Using a life-cycle specification with risk-sensitive preferences, Bommier follows the historic pattern of mortality risk to better approximate the accumulation of wealth in the past half century. Bommier uses a heterogeneous agent set-up to calculate aggregate wealth in the economy, by first finding optimal asset and consumption choices and then summing over the proportion of agents with the same age. He decomposes the change over time into three effects. The first, the demographic aggregation effect, shows how much the ratio of aggregate wealth would change if the age structure were changed. Second is the income dilution effect, or the consequence of living longer and having to save more. Third is an impatience effect, which is the consequence of some probability of death in each period. Combined, he finds that concern over temporal risk may radically alter saving behaviors.

Bommier calibrates this model using data from the Human Mortality Database during the years 1950 to 2008 with data for 24 countries. This makes it easy to track the changes in mortality profile over time. He calibrates pure time preference to be such that consumers want constant consumption in the standard model. He also sets the parameter that changes the risk-sensitivity such that agents are indifferent between living either 70 or 80 years and 74 years with certainty. For each country in this sample, Bommier calculates what change in the

aggregate wealth ratio can be attributed to each of the three effects listed above. In each country, it is found that the ratio of aggregate wealth to aggregate income has increased between 1950 and 2008, suggesting the important effect of mortality to saving decisions. He further notes that in almost all cases, the impatience effect outweighs the aggregation effect in changing the aggregate wealth ratio.

There were some issues with the assumptions of the model. One conference participant noted: "Most people don't want to know when they will die. Does that make them risk-loving?" This became a point of contention for the audience members, one of whom asked what Bommier could change to make this consistent in the model. Another participant suggested that the model should not be using complete markets and that incomplete markets would be more appropriate.

Dynamic Squeezing: Marriage and Fertility in France After World War One
John Knowles and Guillaume Vandenbroucke

Marriage and fertility rates in France were greatly affected by World War I. Both marriage and fertility rates plummeted during the war, peaked shortly after, and then went through a long transition period. This paper uses data from post-World War I France to ask whether demographic shocks can account for the patterns observed in marriage and fertility rates. In particular, Knowles and Vandenbroucke ask: Why did the marriage rate peak even though there were fewer men? Why was the marriage rate the same before and after the war?

A directed search model is used to address these questions. Agents are heterogeneous in gender and age, and women additionally differ in fertility. The two fertility types represent the permanent ability or desire to have children that is unrelated to age. Marital surplus depends on both age and fertility type of the woman. The model is calibrated to target the age and sex distributions of pre-war France, as well as the pre-war marriage and fertility rates. Agents are exposed to four years of war represented by a decline in marriage and fertility rates by 50 percent. Additionally, four percent of men die each year to match the 16 percent casualty rate during the war.

The model is able to match the post-war marriage rates for 30-39 year-old men and 20-29 year-old women. Men ages 20-29 marry too quickly after the war and return to their pre-war trend after five years. A conference participant suggested that the addition of a younger age group might solve this problem. The youngest men would not be attractive to women looking to marry. Additionally, the model predicts a transition that is too slow for women ages 30-39, relative to the data. Vandenbroucke and Knowles conduct additional experiments to understand which shocks drive the trend in the data. They find that decreasing the pool of men alone does not contribute to the

increase in women's marriage rates in post-war time periods. The inability to marry during the war induces the increased post-war marriage rate we see in the data. In addition, the heterogeneity in female fertility rates amplifies the post-war marriage rates.

Analyzing the Effect of Insuring Health Risks
Harold L. Cole, Sonjin Kim and Dirk Krueger

Health and healthcare have been at the forefront of policy debates for many years: since the 1990s, the United States has had protections in place for those whose health impacts their ability to work (the Americans with Disabilities Act, ADA), and has had continued discussion about implementing policies that allow insurance to all Americans at attainable premiums, which was put into action in 2010 (the Affordable Care Act, ACA). Much has been conjectured about the impact of these policies, but few studies have analyzed the dynamic effects of these policies upon an individual's decision. If people's productivity and by extension, their wages, are tied to their health, policies that insure them against negative health shocks may cause them to do a poor job taking care of themselves. Furthermore, as Krueger, Cole and Kim note, policies that restrict insurance companies from charging premiums based upon health status may have a similar effect upon an individual's choices. Starting with a goal of full consumption insurance, the authors discuss the implications of each policy on both individual choices and the health of the population as a whole.

Krueger, Cole and Kim first construct a "static" model, which describes the contemporaneous benefits of instituting each of these policies. They show that the competitive equilibrium with both of these policies achieves the social planner's outcome. This model, however, ignores the effects of these policies on an individual's exercise choices over time. By adapting the model to a dynamic framework, they are able to track these policies effects on both individual's decisions to exercise and the distribution of health in the economy. They use a discrete, finite-time, life-cycle model in which households have production technology that depends upon health, among other factors. In this economy, firms are able to offer both wage and health insurance benefits to these households. In each period, agents maximize their utility by deciding their own consumption and "exercise," which impacts their health in the next period. The authors compare a social planner's solution to competitive equilibrium variants with different governmental policies. With the goal of offering complete consumption insurance against health shocks, the authors compare the effects on exercise and the distribution of health in the economy by restricting firms from offering wages as a function of health, from offering insurance premiums as a function of health, and both of these simultaneously. By imposing these restrictions, the authors wish to mirror the environment created by the ADA and the ACA, and other similar policies that enforce non-discrimination.

The authors use the static model to calibrate the parameters of the production function and the distribution of health shocks. They then use the dynamic model to estimate the preference parameters for the disutility of exercise and the terminal value of health. With each additional restriction, the variability of consumption between agents decreases until they are perfectly insured with both an ADA-and ACA-style set of protections in place. As might be expected, in the competitive equilibrium with both policies, the agents with good health compensate those who fall into bad health. Additionally, a competitive equilibrium with stronger consumption insurance leads to the least incentives to a healthy life. In fact, when both policies are in place in the dynamic setting, households only have incentive to maintain health so that they are able to live long enough to enjoy retirement. In order to compare the benefits of consumption insurance with the costs associated from changing incentives, the authors calculate a measure of comparison between aggregate welfare under each policy and combination. Under each specification, they find that the consumption equivalence to make households indifferent between the policies in place and the competitive equilibrium. The authors find that in the static setting, households require a reduction of 5.4 percent consumption under both the social planner and the competitive equilibrium, with both policies to make them ex-ante indifferent. However, in the dynamic setting, the authors find that with both policies in place, the outcome is not as good as the social planner's outcome. In fact, when only a no wage discrimination law is in place, households enjoy higher welfare than they do in the economy with both policies in place. Under both the static and dynamic specification, the no prior conditions law is worse than either the no wage discrimination law or both policies, but better than the outcome from a strictly competitive equilibrium.

A conference participant asked whether omitting the benefits of health would directly cause moral hazard problems, implying that there were other benefits of health that should be accounted for in the paper. Krueger noted that the model does include other benefits for health, so this isn't necessarily a large problem. Another participant questioned the results of the model by stating that many northern European countries have excellent healthcare and no obesity problems, which would run counter to the conclusions. Krueger argued that not the absolute level of health, but the time trend of health after these policies have been implemented should be considered. One audience member would have preferred if Krueger had looked at two year transitions of health in the PSID, as looking at only one year may imply the wrong causality.

Medicaid Insurance in Old Age
Mariacristina De Nardi, Eric French and John Bailey Jones

In the United States, health insurance is provided to those in old age through a number of different avenues. Of particular interest to De Nardi, French and Jones is Medicaid, a means-tested way of providing insurance to those in old age. Previous papers have only considered Medicaid recipients, but have not considered the composition of the recipients. Medicaid intends to provide insurance for both the "categorically" needy, who have spent much of their lives in poverty, and the "medically" needy, who have been impacted by very high health care costs. In the past, papers have failed to separate these two groups, instead focusing on the cost and value provided by Medicaid. The authors address this shortcoming in the previous literature by designing a model with heterogeneous agents over income and health to incorporate the distribution of lifetime Medicaid transfers. In addition to constructing the model, they use it to address the question of value provided to Medicaid recipients and find that the old-age cohort values their benefits roughly equal to the current size of the program.

The authors construct a dynamic model of the value provided by consumption and medical goods. Their current period utility includes both consumption and medical expenditures, where the medical expenditures utility is augmented by a number of factors, including health, age and the likelihood of medical shocks. In this economy, the government previously announced that it will guarantee a certain level of utility by providing for medical expenses once agents fall below a certain income and asset level, as the government of the United States has done by implementing Medicaid. This serves to insure agents against negative consumption shocks over time. Individuals solve a maximization problem by choosing consumption, medical expenses and assets, and then apply for Medicaid if they can. They get value from their contemporaneous utility, discounted expected utility during the next period, and the discounted utility that they would get from any bequests that they may leave if they die.

The authors calibrate the model using the Assets and Health Dynamics of the Old (AHEAD) and the Medicare Current Beneficiary Survey (MCBS) by generalized method of moments. Some of their estimated parameters are inconsistent with estimates from other papers, but the authors conclude that these differences can be explained by phenomena in the data. Furthermore, they note that the model uses only the distribution of out-of-pocket medical expenses for calibration, but does a good job fitting the data on Medicaid and total medical expenses. The authors find that while the poor benefit from Medicaid, the rich also derive benefit from Medicaid after they exhaust their own private resources. That is, because the rich live longer on average, they eventually face very high medical expenses and place a very high value on the services provided by Medicaid. The authors test the value of the program by simulating a cut in the values of both the categorically needy and medically needy floors. They find that while the lowest income quintiles value these cuts at roughly the same as the cost, the higher income groups value them several times higher than the cost at which they are instituted. They run an alternative simulation where they increase both of the monetary floors they had previously decreased; they find that for all income levels, people value the Medicaid transfers at less than their cost. The authors interpret these findings to mean that the Medicaid program is roughly the right "size," in that it provides the appropriate value for the cost.

One of the criticisms of the paper was that the authors focused only on the single retirees in the sample. While this is the majority of the retirees, it could introduce results that aren't consistent with the entire population. In particular, retirees who became single during the course of the study face much higher risks of dying during the next year than they otherwise would. Jones responded that he and his co-authors had considered this problem, but felt that some of the bias would be washed out by including a diverse group of data. One conference participant noted that there may be transfers to children prior to death; that is, retirees might give away some of their money outside of bequests. Likewise, the participant was concerned about the bequest motive if retirees were parents of wealthy children. Furthermore, the conference audience felt that a bequest floor of around $3,600.00 was far too low, and that low-income people would never have a bequest motive at that level of assets. Jones acknowledged that this was a concern, but that the floor needed to be low to induce all income levels to save in a consistent pattern with the data.

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