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Executive Summaries in This Issue

Public Policy Discussion Papers

Person-to-Person Electronic Funds Transfers: Recent Developments and Policy Issues
by Oz Shy

Motivation for the Research

Person-to-person (P2P) electronic funds transfers dominate in some European countries where paper checks are not used by households. For example, it is very common for a schoolteacher in Germany to collect money for a certain school activity (such as an end-of-year class trip) via this system. The teacher simply provides parents with her own bank account information, and parents use their Internet access to their bank account to transfer any amount of money free of charge, adding a note stating the student's name and the purpose of the transfer. In Germany most household bills (such as payments made to dentists, daycare centers, and landlords) are also paid via account-to-account electronic transfers because most people do not use paper checks. Thus, in Germany, merchants and consumers view electronic transfers of this sort as the most practical and least costly alternative to cash and plastic card transactions (see Litan and Baily 2009). However, in the United States P2P transfers hardly exist: P2P transfers are either cash based or accomplished by writing paper checks drawn against a personal checking account.

**Use of Payment Instruments by Nonbanks:
Number of Transactions per Inhabitant**
(2003 and 2007)
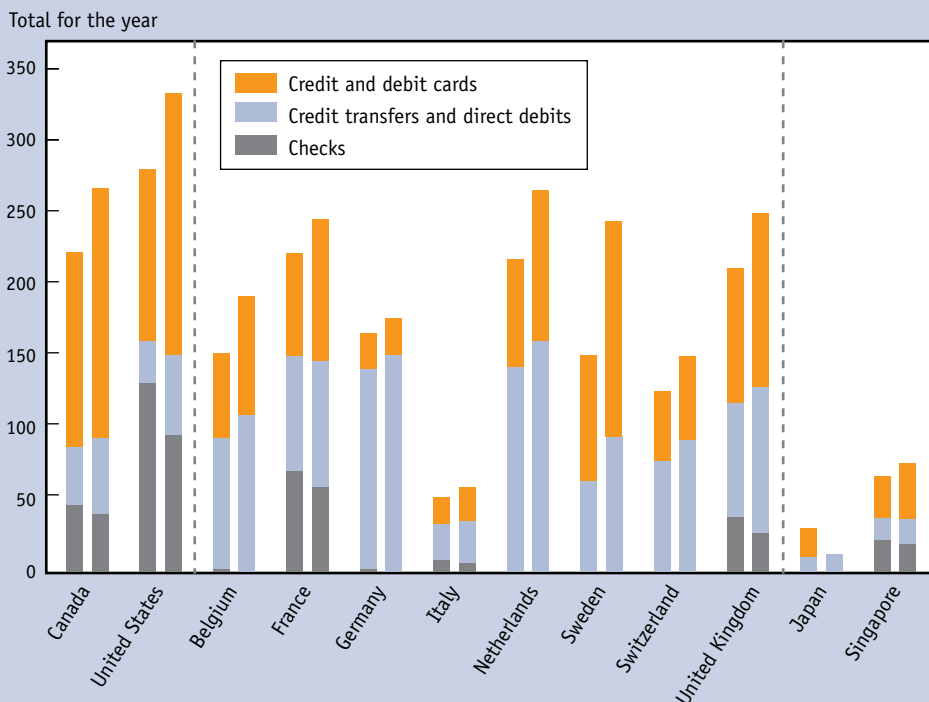
Source: Bank of International Settlements.
Note: Credit transfers and direct debits are classified as ACH operations.

This paper investigates the reasons why P2P electronic funds transfers are still relatively uncommon in the United States compared with practices in many other countries. It also describes recent enhancements to online and mobile banking that provide account holders with low-cost interfaces to manage P2P electronic funds transfers via automated clearing house (ACH). On the theoretical side, the paper characterizes the critical mass levels needed for payment instruments to become widely adopted. Finally, given the Federal Reserve's long-term heavy involvement in check clearing, the paper considers whether policy intervention is needed to encourage the development of P2P transfers in this country and, if so, what the possible means of intervention (if any) might be.

Research Approach

The author briefly discusses key information-sharing requirements of various types of P2P funds transfers, compares them with the requirements of paper check and credit or debit card transactions, and notes an important difference in the direction of information sharing: P2P transfers are "push" transactions, in which the payee must reveal personal information (email address, phone number, or bank account details) to the payer, whereas paper check and debit and credit card transactions are "pull" transactions, in which the payee does not need to reveal any information to the payer. The author describes some recent developments that have been introduced in the United States to address U.S. households' fear of disclosing information to transaction counterparties.

The author next discusses some theoretical frameworks frequently used to analyze the adoption of new payment instruments and explains why it is too early to predict whether online and mobile P2P transfers will become the key payment instruments in the United States. A section on international comparisons summarizes the use of checks, debit and credit cards, and credit transfers and direct debits in a number of industrialized countries in 2003 and 2007. This summary is followed by a brief analysis of the costs involved in making electronic payments versus using paper checks, a brief recent history of online banking and online bill payment in the United States, and a discussion of the adoption of online banking in the United States and selected European countries. The paper then turns to analyzing why most commercial banks in the United States have lacked sufficient incentives to offer low-cost P2P transfers via online banking at an earlier stage.

Finally, using the concept of a critical mass of users, wherein network (snowball) effects enhance the adoption of a new technology, the author addresses two main policy questions: (1) Given the Fed's long-standing heavy involvement in check clearing, should it take any action to facilitate the development and adoption of P2P transfer technologies? (2) If so, what are the possible means of intervention (if any)?

Key Findings

• Compared with the pace of adoption in the United States, the earlier heavy use of electronic P2P and P2B (personal-to-business) funds transfers in Europe cannot be explained by Europe's earlier adoption of online banking or online bill payment. In fact, adoption patterns were very similar on the two continents. Instead, the European lead in electronic P2P was a natural extension of the "old" Giro payment networks, which were accessible to all consumers via many European post offices and financial institutions. More recently, heavy involvement by the European Central Bank and national central banks have also played a major role in transforming national electronic payment networks into international networks.

• Given the Fed's heavy involvement in check clearing during the past 90 years and the U.S. government's continued involvement via the Check 21 Act of 2003, which may have signaled to banks and households that checks (paper and electronic) will continue to serve as the main payment instrument for P2P transfers, it may be necessary to widen the gap between the fees the Fed charges for check clearing and the fees it charges for ACH transfers. This would signal that paper check activities will eventually be replaced by online and mobile electronic payments. The Fed

could also adopt other means of intervention, such as public education and promotion campaigns.

- There are three ways by which the Fed could introduce differential pricing without creating a significant short-run deficit in fee collections: (1) initially giving overall ACH discounts to institutions that adopt online P2P funds transfer, with the hope that the increase in volume will offset the reduction in fees; (2) raising the fees on other Fed services (such as check clearing), while reducing the fee for ACH transactions; (3) raising the fees on other Fed services (such as check clearing), while leaving the fee for ACH transactions unchanged. The first two methods are somewhat problematic because these may end up diverting transactions from the competing, privately owned EPN network to the Fed ACH network. In this respect, the third method is less problematic because it would maintain competition in the ACH market and in addition it would increase the size of the ACH market by reducing the volume of check clearing.

Implications

In order to determine whether the Federal Reserve should intervene to promote a greater use of P2P in the United States, we need reliable data on cost and demand. Unlike cost variables, which can be estimated, demand data (consumers' willingness to pay as a function of the number of users) are still not available and cannot be estimated until P2P transfers become widely used. At this point, the only available demand data come from a few surveys in which individuals are asked, "How much are you willing to pay to transfer funds from your bank account to another account via online banking or your mobile phone?" This scattered information does not provide a sufficient number of data points to make a meaningful estimate of the demand.

This paper does not address a more fundamental question: why should ACH services be provided by central banks rather than by the private sector or other governmental agencies? Some answers to this question have already been given in Weiner (2008) and Schreft (2007). The arguments they raise for the Fed's involvement include economies of scale and scope, reducing the risk of identity theft and providing safety mechanisms, and correcting market failures that generate underprovision of payment services.

p-10-2

Mobile Payments in the United States at Retail Point of Sale: Current Market and Future Prospects
by Marianne Crowe, Marc Rysman, and Joanna Stavins

complete text: http://www.bos.frb.org/economic/ppdp/2010/ppdp1002.htm
e-mail: marianne.crowe@bos.frb.org, mrysman@bu.edu, joanna.stavins@bos.frb.org

Motivation for the Research

Throughout the U.S. banking and mobile carriers industries strong interest exists in the potential for mobile payments, which for this paper the authors define narrowly as the use of a mobile phone to make a contactless payment at a physical retail location, whether or not the phone actually accesses the mobile network to make the payment. This definition excludes person-to-person (P2P) transfers, use of a mobile phone to make an Internet purchase, and mobile banking transactions, which involve accessing bank services through a mobile device—activities that some participants in these industries would include in the definition.

The scope for bundling mobile payments with value-added services is great, and consumers are already conditioned to expect, and have shown a willingness to pay for, an ever-expanding array of innovative applications on their smart phones. Not only could a consumer simply wave a mobile phone

in front of a reader and have his bank or payment card account debited automatically, but using the computing and communication power of a smart phone, the customer could also perform many other activities at the same time. (For instance, in the course of using the mobile phone to make a payment, a consumer could compare prices with prices offered by other local merchants, store the payment record with his financial management software, download a warranty or instructional video on how to use a product, and more.) Merchants could benefit by having the phones interact with reward or other promotional programs. And this technology could greatly increase the efficiency of the U.S. payment system by encouraging the transition to electronic payments for low-value transactions—the one area where cash is still a widely used form of payment in the United States.

A number of countries have already integrated mobile phones, in some form, into their payment systems. While substantial business and consumer interest exists in the United States, adoption has been slower here than in three other countries. This paper examines the experience with mobile payments in three other countries, summarizes the status of mobile payments in the United States, and discusses the prospects for future adoption.

Research Approach
The authors review the technologies involved, discuss adoption patterns and experiences in Japan, South Korea, and Spain, and draw lessons for the U.S. mobile payments business. With respect to technologies, the paper focuses on contactless and near-field communication (NFC) technologies, as these appear to be the most likely candidates to be adopted for retail payments because of their convenience and sophistication.

The authors identify supply-side and demand-side obstacles to the adoption of mobile payments and consider why the barriers have been difficult to overcome in the United States. They discuss the expected benefits from mobile payments for consumers and merchants, their respective costs, and whether any market failures exist that would warrant policy intervention. On the supply side, the authors discuss issues of coordination, public goods, networks, and standards. In addition, they emphasize the need to be proactive in ensuring that these emerging technologies improve or at least maintain, rather than impair, the security and robustness of the nation's payment system

Based on this analysis, the authors consider U.S. prospects for adoption of mobile payments, raise issues concerning standards and oversight, and make policy recommendations for the Federal Reserve. The analysis is based on the existing literature and on discussions with representatives of several mobile carriers, financial institutions, and payments industry consultancies. The authors present their conclusions and recommendations with the caveat that forecasting the adoption of innovations is particularly difficult in any case—and especially so in the case of mobile payments because the market is evolving rapidly and because some developments are hidden behind proprietary veils; therefore, the authors caution that their analysis, conclusions, and recommendations should be understood in this context and may change as more information becomes available.

Key Findings
• Retail mobile payments have been most successful in cash-intensive, technologically advanced countries with highly concentrated banking markets (for example, Japan). In contrast, even though almost everyone in the United States carries a mobile phone, mobile payments have not been widely adopted by U.S. consumers.

• The adoption of mobile payments in the United States is inhibited by constraints on both the demand side and the supply side. On the demand side, in the absence of a compelling value proposition, the expected benefits of mobile payments in the short term are low in this country, since credit and debit cards already provide much of the convenience that mobile payments offer in countries where consumers rely heavily on cash to make payments. Furthermore, the benefits are subject to

Share of Transactions at the Checkout in Selected Countries
(Based on number of transactions)

Percent
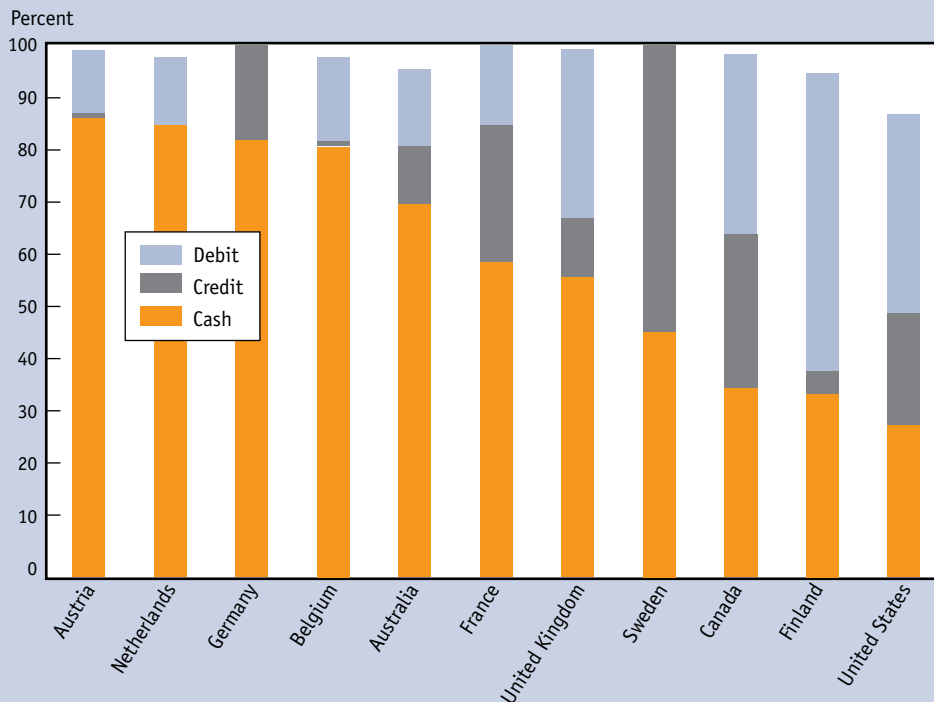
Source: Adapted from Eugenie Foster, LLC "What Do We Know about Cash Payments?" (presented at the Central Bank Forum on Payment Surveys, Chicago, March 2009). Data source varies by country.

network effects, in that even if consumers saw value in mobile payments, the extent of such value would depend on how many merchants would accept them, which in turn would depend on how many consumers would adopt this payment method. Moreover, the costs of adoption are high. Consumers would have to replace their mobile phones with phones equipped with a designated NFC chip, at a cost estimated to be in the range of $10–$15 per phone. For their part, merchants would have to install NFC readers capable of processing mobile payments at each terminal, at an estimated cost of about $200 per reader, and would have to pay interchange fees for each mobile payment accepted. Network effects come into play here too: mobile carriers are reluctant to invest in the technology until they have confidence that consumers will pay the extra cost, and consumers are unlikely to pay the adoption cost unless mobile payments are widely accepted at retail locations.

• On the supply side, there is a coordination problem. The U.S. banking and mobile carrier industries have very low market concentration compared with other advanced or developing economies, so industry-wide agreements on technology standards and business policies are very difficult to negotiate, whereas bilateral negotiations between a single bank and a single carrier are not very useful for promoting nationwide adoption of mobile payments technology. The coordination issue is exacerbated by the number of parties involved in each transaction: a mobile carrier, a handset manufacturer, a card association (for example, VISA, MasterCard), a mobile software vendor, a bank, a merchant, and a consumer. In addition to the coordination problem, there is a public good issue: because all market participants expect an eventual public standard will be established, any private party investing in the development of the mobile payments standards would help other potential adopters, so the short-term private benefits gained by each party would be much smaller than the private costs each party would have to incur. Furthermore, the uncertainty created by the lack of a clear regulatory oversight authority and by a lack of clarity about the rules and regulations that will govern mobile payments inhibits potential market participants. Provision of mobile payments involves several industries currently supervised by different agencies, and a consumer's use of a mobile device to make payments and purchases falls outside the regulatory boundaries

defied by each agency. Finally, in an issue that spans both the demand side and the supply side, consistent responses from the authors' interviewees indicate that lack of a viable business model that provides incentives to all relevant parties to invest in mobile payments technology and adopt the shared standards is a key barrier to the adoption of mobile payments in the United States.

• Low-value transactions would benefit most from mobile payments, especially in high-volume markets where completion speed is essential. A good example is the public transportation industry, a market that avoids some of the obstacles faced by merchants in other sectors: commuter demand is highly inelastic, and consumer benefits from faster service can be high. Furthermore public transit agencies experience real operational cost savings from replacing cash with electronic payments. In the United States, public transit is where the most successful implementation of contactless technology (albeit with NFC-enabled contactless cards, not mobile phones) has taken place (for example, the MBTA in Boston). In parts of Asia (Hong Kong, Japan, South Korea) contactless mobile transit payments have been implemented successfully.

• Despite the lack of adoption so far, the U.S. payments industry is convinced that mobile payments will inevitably be introduced in this country. The technology to process mobile payments already exists and the number of mobile phones (especially smart phones) has been rising. In addition, the adoption rate of mobile banking has grown, so American consumers seem to be becoming more comfortable with the mobile technology. However, because of the obstacles mentioned above, especially the lack of coordination and absence of a feasible business model, it is not clear when mobile payments will become widely adopted in the United States.

• The authors do not find compelling evidence that mobile payments will experience widespread success in the United States in the near term (defined as 1–3 years), although industry participants are continuing to experiment with pilot programs. Widespread deployment of NFC-enabled mobile phones, along with the requisite merchant readers, is costly, and the immediate benefits to each party appear to be small, given the broad adoption and use of credit and debit cards in the United States. Over the next 3–5 years, as old mobile phones and merchant terminals require replacement or upgrading, they may be replaced by phones and terminals that can process NFC contactless mobile payments, thereby removing some of the merchant barriers that currently exist.

Implications

Based on the findings listed above, the authors believe it is premature to advance any public policy intervention to promote mobile payments. Indeed, their findings indicate that the major reason for the lack of progress in the United States toward broad adoption of mobile payments is the limited prospect for realizing sufficient social net benefits from this technology in the short run (1–3 years), rather than market failure. Nevertheless, they suggest a few areas where the Federal Reserve could get involved to increase social welfare. The Fed could:

1. Conduct quantitative research, including survey and market research, to estimate the potential value of mobile payments in the United States.

2. Help to establish regulatory guidelines for security, privacy, and consumer protection, and to clarify oversight responsibilities. By convening a group of regulatory agencies to start planning potential regulatory changes in anticipation of the eventual widespread adoption of mobile payments and by raising the issue with legislators and the administration (or perhaps forming a council to establish the boundaries of agency oversight), the Federal Reserve could address the ambiguity regarding which agencies would be responsible for regulating mobile payments

3. Facilitate coordination of industry-wide standards that ensure the continued safety, soundness, and efficiency of the payments system by establishing a neutral setting where all the stakeholders can exchange ideas without concerns about collusion.

Working Papers

Insuring Consumption Using Income-Linked Assets
by Andreas Fuster and Paul S. Willen

Motivation for the Research

Smoothing household consumption fluctuations due to unanticipated income shocks (unemployment, illness, divorce, or death) is a perennial problem that many public policy programs seek to solve—some examples are unemployment compensation, Temporary Assistance for Needy Families, disability insurance, Social Security, and central bank policies. Yet despite concerted government intervention, mitigating household consumption volatility remains a significant challenge. Over the years, researchers have argued that we should try market-based solutions—traded financial assets that track household income—as an alternative. Income-linked assets could follow two basic designs, both tied to a group-specific factor like one's occupation, industry, or educational attainment. An *income-hedging instrument* would act as a basic insurance contract in which the future payoff is negatively correlated with future income streams—a household that experienced a negative income shock would receive a higher return than one receiving a positive income shock. An *income-linked loan* would tie the group's required repayment to positive correlations with group income shocks—for instance, if the demand for petroleum declined, workers in this industry would pay less to insure their incomes than employees in a field that experienced positive income gains, such as renewable energy.

Research Approach

The authors quantitatively explore how the market for such proposed income-linked assets might function and the potential gains in household welfare that might result. They project demand for these assets within the context of a calibrated life-cycle model of consumption and optimal portfolio choice, in which households can invest in different assets and can borrow funds, albeit at a substantial premium to the riskless rate of return. (In a nutshell, optimal portfolio choice depends on an investor's current wealth position, future risk-adjusted income prospects, and alternative investment opportunities. Households adjust their asset holdings if the risk-adjusted return exceeds the shadow rate of return—the minimum rate of return that induces them to decrease consumption and increase saving in a given period. Since individual households have different characteristics, shadow rates differ across investors). To determine whether a household will demand an income-linked asset, one needs to compute the risk-adjusted return and compare it with the shadow rate of return, which reflects the household's desire to smooth consumption across its life cycle. Welfare is measured as the gain in certainty-equivalent consumption, defined as the constant consumption stream that would provide the same lifetime utility as the risk-adjusted stream the investor actually expects.

To create a realistic portfolio choice problem, the authors use a finite horizon, partial equilibrium model that roughly matches basic facts about households' risky asset holdings. Households receive stochastic (randomly determined) labor income that is subject to transitory and permanent income shocks. Households enter the labor market at 20 years of age, exit immediately after turning 65, and die with certainty when 80 years old. In terms of the life cycle, households borrow substantially between ages 20 and 30, start to make substantial equity investments after age 35, do not borrow after age 40, and retire with average equity holdings equal to three times annual income. The authors' benchmark case allows individual households to trade only three financial assets—they can invest in stocks and bonds and borrow unsecured funds, albeit at an 8 percent interest rate that exceeds the 2 percent annual return on the riskless bond. The mean equity premium is 4 percent with a standard deviation set at 16 percent. One at a time, the new income-linked assets are introduced into this

benchmark framework to model how these alternative assets may affect total investment demand and welfare considerations. To overcome the challenge of modeling returns on hypothetical assets, the authors make a baseline assumption that the risk-return profile is cross-sectional, such that the assets can be priced fairly—the mean return on the income-hedging instrument equals the mean return on the riskless bond, and the mean interest rate paid on the income-linked loan equals the interest rate charged on other unsecured household debt. Other return characteristics are modeled using different levels of volatility as correlated with permanent shocks to labor income. In the authors' model, households repay their debt by the time they die and never default on their debt, while housing assets and secured mortgage debt are omitted from the analysis. Although this omission might overpredict equity holdings, the authors do not believe it has a large influence on the results.

Key Findings

- The attractiveness of the alternative investment options matters for the relative appeal of the two income-linked assets: the presence of equity (as in the baseline scenario) makes the income-linked loan relatively more attractive, as households can invest some of the borrowed money in a high-return asset, while the income-hedging instrument is in less demand if equity is not available.

- The benefits of income-linked assets can be considerable, but are highly sensitive to how the assets are designed. The decision of whether to link income positively to the interest rate on a loan or negatively to the return on a savings instrument has a large impact on the welfare gains the model predicts.

- Potential welfare gains are very sensitive to the assumed correlation between the return on the income-linked asset and an individual's permanent labor income shock. As a consequence, unless the correlation is very high, the income-linked assets can eliminate only a rather small part of the welfare cost imposed by income shocks over the life cycle. The relative attractiveness of the investment assets is determined by their assumed return volatility—those assets with higher volatility provide households with more "bang for the buck." The size of the cost differential between borrowing and lending is also very important: the larger it is, the less households gain from having access to the proposed income-linked assets.

- Over the entire household life cycle, income-linked loans are more attractive than income-hedging instruments. Early in the life cycle, households' financial market participation consists mainly of borrowing at high interest rates (effectively, they are consuming part of their higher future expected income). Income-linked loans cost less than using an income-hedging instrument, which has to offer a risk-adjusted return that exceeds the cost of unsecured borrowing. As households age, their portfolios increasingly consist of equity investments, and historically returns from the stock market best the expected return on an income-hedging asset.

- For a baseline calibration in which the correlation between permanent income shocks and the interest rate on the income-linked assets is 0.5 and the volatility of the rate of return is 0.5, we find that income-linked loans would produce a welfare improvement of 1.4 percent (an annual increase in consumption of about $400 in 2009 U.S. dollars), while the income-hedging instrument is essentially worthless. Although the income-linked loans appear more promising, the welfare gains are rather small for the parameterizations deemed most realistic.

- Under some assumptions, the authors find that the gains to households from having access to income-linked loans could be significant, whereas it is more difficult to come up with a scenario in which income-hedging instruments would have an equally positive effect on welfare.

Welfare Gains (Over Benchmark)

Panel A. Income-Hedging Instruments

Gain in certainty-equivalent consumption (% over benchmark)
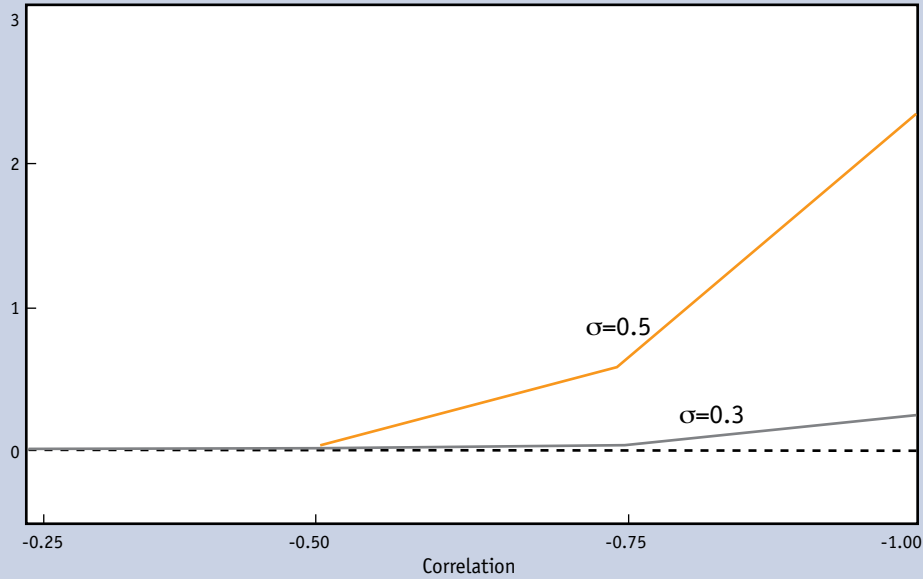
Panel B. Income-Linked Loans

Gain in certainty-equivalent consumption (% over benchmark)
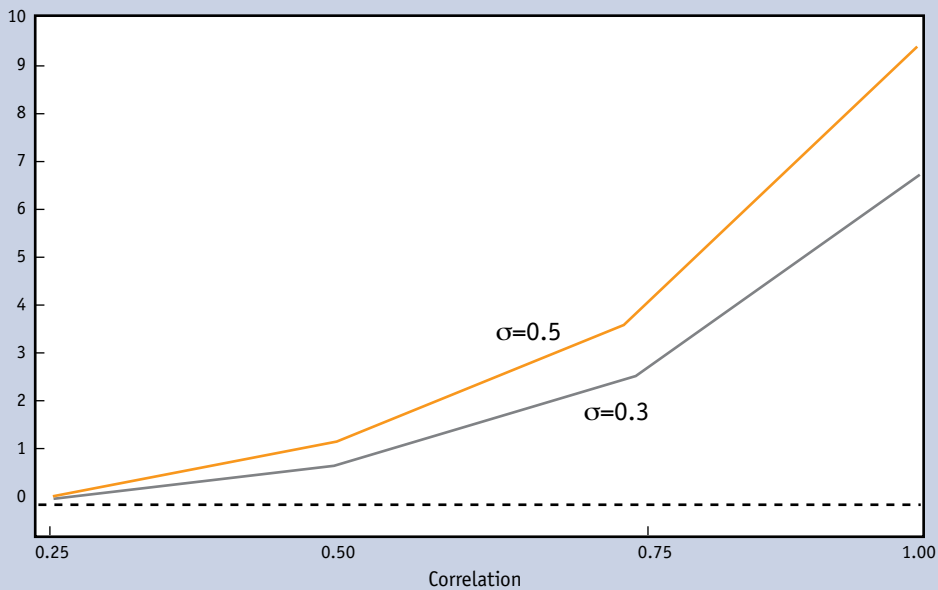
Source: Authors' calculations.
Note: Panel A:"Correlation" stands for the correlation of the rate of return on the income-hedging instrument with the permanent shock to labor income, and σ denotes the volatility of the rate of return on the income-hedging instrument. Panel B:"Correlation" stands for the correlation of the interest rate on the income-linked loan with the permanent shock to labor income, and σ denotes the volatility of the interest rate on the income-linked loan.

Implications

Income-linked assets, particularly income-linked loans, could fill a gap not met by current public policy programs designed to mitigate income risk and consumption volatility. Most existing programs are designed only for temporary setbacks or for extremely adverse events. Income-linked assets would provide insurance against less extreme shocks, potentially at a low cost. Thus, while currently a household facing an adverse income shock due to prolonged unemployment may have no alternative but to default on loans and declare bankruptcy—actions that have costly long-term implications—the opportunity to insure against income risk via these new forms of assets would enhance welfare. Yet in order to offer these financial instruments, it will be necessary to surmount the challenge of measuring household risks and the covariance of these risks with those associated with other risky financial instruments, as welfare gains depend crucially on the correlation between the income-linked asset's return and the risk associated with a potential permanent labor income shock.

What Explains Differences in Foreclosure Rates? A Response to Piskorski, Seru, and Vig

By Manuel Adelino, Kristopher S. Gerardi, and Paul S. Willen

Motivation for the Research

Piskorski, Seru, and Vig (2010), hereafter referred to as PSV, use micro-panel data on the repayment behavior of mortgage borrowers to study the role securitization plays in foreclosure loss mitigation efforts. PSV find that the process of securitization induces a bias toward foreclosure in servicing decisions. Specifically, they find large differences in foreclosure sale rates between seriously delinquent loans held in a mortgage servicer's portfolio (hereafter referred to as portfolio-held loans) and loans securitized by private trusts (hereafter referred to as private-label loans). PSV interpret this difference in foreclosure rates as evidence that servicers of private-label loans renegotiate with borrowers less often than do servicers of portfolio-held loans. They attribute such differences in renegotiation behavior to contract frictions, present in securitization trusts, that prevent an optimal amount of renegotiation from taking place.

Research Approach

Adelino, Gerardi, and Willen (hereafter AGW) discuss three issues that they believe shed serious doubt on PSV's empirical findings, and instead provide their own interpretation of those results. First, AGW replicate PSV's main foreclosure rate results, using a 10-percent random sample of mortgages from the same Lender Processing Services (LPS) dataset and imposing the same sample restrictions. AGW then perform a sensitivity analysis to test the robustness of PSV's findings to slight variations of the covariates and to different subsamples.

Next, AGW discuss a quasi-experiment used by PSV in an attempt to solve the problem of omitted variables bias inherent in the determination of whether or not a mortgage is securitized. Even when the observables are taken into account, it is possible that the loan performance is affected by unobserved factors that are correlated both with mortgage outcomes and with the probability that a loan is securitized. PSV's strategy to deal with this issue involves using early payment defaults as an instrument for whether a loan remains in a securitization trust and is serviced as a securitized loan or is transferred to the originator's balance sheet and serviced as a portfolio loan. Early payment default (EPD) clauses are part of the contractual setup of some securitization trusts and usually require the originator to buy back mortgages that become delinquent shortly after being securitized. Making use of the fact that EPD and repurchase clauses no longer apply to late defaulters, PSV compare

loans that become delinquent in the third month after securitization and are bought back by the originators with loans that become delinquent in the fourth month after securitization and remain securitized—the advantage of this strategy being that one can reasonably argue that the fact that a loan becomes delinquent in the third versus the fourth month is random. PSV draw the conclusion that the securitization status of these loans is as if they were randomly assigned. In response to PSV's claims, AGW discuss the problems with using EPD status as an instrument for securitization.

Finally, AGW discuss PSV's interpretation that differences in foreclosure sales rates between private-label and portfolio-held loans represent differences in the incidence of renegotiation between borrowers and servicers of each type of loan. As an alternative to using differences in foreclosure sale rates, AGW propose looking both at differences in modification behavior and at differences in mortgage cure rates, where a "cure" is defined as an instance in which a seriously delinquent borrower catches up on late payments and becomes current on his or her mortgage.

Key Points
- AGW's results are very close to those obtained by PSV, with the minor differences likely attributable to the fact that AGW use a 10-percent random sample, while PSV use the entire sample. PSV find that foreclosure rates of seriously delinquent, portfolio-held loans are lower by 3.8 to 7 percentage points in absolute terms (relative to the unconditional mean of the private-label foreclosure rate) than comparable private-label loans, whereas AGW find that foreclosure rates of portfolio-held loans are 2.8 to 11.1 percentage points lower in absolute terms than foreclosure rates on comparable private-label loans.

- Small changes to the set of covariates used by PSV significantly reduce the magnitude of the differences in foreclosure rates between securitized and nonsecuritized loans. For example, allowing the time between origination and serious delinquency to enter the equation in a nonlinear manner rather than in the linear manner employed by PSV results in about a 50 percent change in the estimated coefficient of the variable indicating whether a loan is held in portfolio.

- AGW offer four main reasons why EPD status is not a valid instrument for the securitization status of the loans and why the empirical implementation chosen by PSV for using EPDs is not a valid instrumental variables approach. The first problem with using EPDs as an instrument for securitization is that the correlation of EPDs with securitization is very weak. AGW confirm that for the first five months after securitization, PSV's finding that the percentage of delinquent loans immediately sold back to the originator following delinquency is very low. Second, AGW show that PSV's assumption that repurchased loans are serviced like normal portfolio loans is not confirmed. Third, and most importantly, AGW point out that instead of using EPDs as an instrument, PSV create and compare two samples of loans—those that default in month three and are repurchased by the originator and those that default in month four and remain securitized. For this approach to be valid, the subset of loans that are repurchased must be a random subset of all loans that default. At least two facts suggest that this is not the case: first, the securitization trusts that include EPD clauses in their contracts are unlikely to be a random subset of all securitization trusts and, second, the share of loans that are actually bought back is a small, highly selected percentage of even the subset of trusts that have EPD clauses. The correct way to use EPD status as an identification strategy is to use it in an instrumental variables (IV) setup—for example, two-stage least squares. In the first stage, EPD status can be used as an instrument for whether or not the loan is securitized, and in the second stage the instrumented securitization dummy can be used as an independent variable in a regression that predicts foreclosure sale. The problem with this approach is that the EPD instrument is too weak to be used for estimating the effect of securitization on mortgage outcomes. The fourth problem is that in the LPS dataset the moment of securitization is not clearly defined, so that it is impossible to know when the loan was securitized

- In AGW (2009), the authors directly identified the renegotiation decisions of both portfolio and private-label mortgage servicers, employing a simple algorithm to identify instances of permanent loan modifications in the LPS data, and then compared modification rates across private-label and portfolio loans. They found negligible differences (not statistically significantly different from zero) and they interpret this finding as evidence against PSV's interpretation that differences in foreclosure rates are the result of frictions in the securitization process that inhibit renegotiation. Furthermore, in the research underpinning this response, AGW found very small (for the most part not statistically significant) differences in cure rates between private-label and portfolio-held loans.

- On balance, the evidence in PSV indicates that there are at most small differences in the outcomes of delinquent loans, regardless of whether these are retained by the mortgage servicer or securitized as private-label loans. Yet it remains an open question whether these differences reflect accounting issues, willingness to renegotiate, or unobserved heterogeneity.

Implications

AGW's evidence and arguments, combined with results from AGW's prior work, shed serious doubt on PSV's interpretation that differences in foreclosure rates between portfolio-held and private-label mortgages are driven by differences in the extent of renegotiation between mortgage borrowers and the servicers of each type of loan.

Early Payment Default Repurchases

Percent of loans repurchased

Month of serious delinquency (relative to time of securitization)
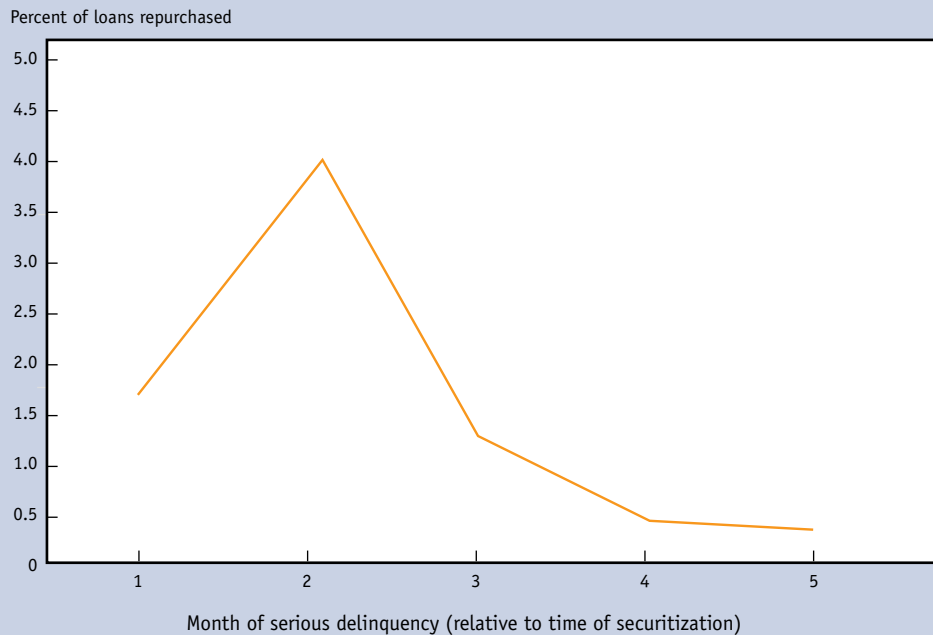
Source: LPS data.
Note: One way to assess the importance of the 90-day cutoff rule that PSV stress is to look at whether there is a discontinuity in the number of delinquent loans that are transferred from private securitization trusts to the originators' portfolio at three months. This cannot be tested rigorously, but according to the figure, the raw percentage of loans that are "put back" seems to decrease smoothly as a function of the time of the first delinquency from about 4 percent in month two, to 1.3 percent in month three, to 0.4 percent in month four.

A Short Survey of Network Economics
by Oz Shy

Motivation for the Research

In this survey, the term "network" refers to a group of users (consumers or firms) who employ products and services that are based on similar technologies. Network effects are a special type of externality in which consumers' utility and/or firms' profits are directly affected by the number of consumers and/or producers using the same or a comparable technology. Loosely speaking, network effects are generated by increasing the adoption rate (popularity) of a good or service. Consumption network effects may be positive, in the sense that consumers benefit from an increase in the number of consumers using the same or a compatible brand, or negative, in which case consumers are worse off when more consumers use the same or a compatible brand. (In the network effects literature "brand" refers to a product with distinct technical specifications.) Negative network effects are often the result of snobbism or vanity, in that a consumer loses the sense of belonging to an elite group when a product is adopted more widely. As advances in technology have increased the scope of network effects, interest in network effects has intensified.

Research Approach

This paper summarizes the literature on a number of key topics related to network economics, focusing on the theoretical foundations and implications of the main ideas. The presentation of each topic begins with a short analytical model demonstrating the logic behind the main results, followed by a discussion of the literature. Topics covered include consumer demand under network effects, compatibility decisions and standardization, technology advances in network industries, two-sided markets, information networks and intellectual property, and social influence.

Key Points

- Analysis of the demand for telecommunications services demonstrates two common characteristics of consumer demand and choice under network effects: (1) the existence of multiple consumer equilibria and (2) the presence of coordination problems. At every given price, if all consumers correctly anticipate low demand, this level will be realized. In this equilibrium, only those who value this service highly will subscribe. If all consumers anticipate high demand, the gain from a larger anticipated network will induce additional consumers with lower valuations to subscribe. The number of subscribers at the low-demand equilibrium—the minimum number of subscribers that the service provider must secure in order to ensure nonzero demand for this service—is called the critical mass of subscribers at the associated price. The low-demand equilibrium is unstable in the sense that a small increase in the number of subscribers would induce more subscribers to join, pushing the number of subscribers to the high-demand equilibrium level. A third equilibrium occurs at zero demand: if all consumers believe that no one will subscribe, this belief is self-fulfilling. Coordination problems arise because consumers' decisions whether to subscribe to a given service depend on their knowledge or expectation concerning the number of other subscribers.

- Empirical research by various authors in a number of different contexts has found evidence that network externalities do, in fact, exist. A study examining the magnitude of network externalities in the Federal Reserve automated clearinghouse (ACH) payment system finds that, as a result of network effects, ACH appears to be underused relative to its socially optimal level and recommends that the Federal Reserve encourage ACH adoption and use.

• Competing brands are said to be compatible if they can work together by operating on the same standard. There are three commonly used methods of modeling interbrand compatibility: (1) the network externalities approach, (2) the components approach, and (3) the software variety approach. In the network externalities approach, brands A and B are said to be compatible if the utility of a brand A user is enhanced by an increase in the number of brand B users and the utility of a brand B user is enhanced by an increase in the number of brand A users. In the components approach, brands A and B are compatible if consumers can purchase hybrid systems composed of components made by different manufacturers. Compatibility that works both ways is called two-way compatibility; however, compatibility need not be symmetric: one-way compatibility also exists. The software approach, also known as the supporting services or indirect network externalities approach, replaces the network externalities hypothesis with the assumption that consumers care about the variety of services supporting the specific brand they buy. For example, if computer hardware is incompatible with some software applications, someone buying a new computer will base the purchase decision on the number of software applications that can operate on a particular brand of hardware.

• Firms gain from producing compatible brands rather than incompatible brands. Compatibility weakens price competition because firms are less tempted to reduce prices in order to subsidize consumers' switching costs. Formally, compatibility lowers the price elasticity for each firm's brand, and this explains why firms benefit from agreeing on common technological standards.

• Network economics is often in the news when antitrust authorities suspect that a firm with a significant market share may be able to preempt competition and maintain its dominance simply because consumers would not find it beneficial to incur the costs of switching to incompatible brands and be connected to smaller networks. Generally, there is no law against maintaining a large market share even in network industries. Thus, dominant firms can challenged only if they "abuse their dominant position" (European competition law) or "monopolize or attempt to monopolize (Section 2 of the United States' 1890 Sherman Antitrust Act).

• The theory of two-sided markets analyzes demand and supply spillovers between two markets for complementary services. For example, new stores and shopping malls emerge when more people settle in an area, and the availability of new stores and shopping malls attracts new residents. In the payment card industry, if more merchants accept a certain payment card, more buyers adopt the card. This then induces more merchants to accept the card, and so on. The payment card example illustrates why two-sided market models should be confined to immature markets: once all buyers and merchants have adopted the card, no new spillovers can be created.

• Digital convergence [the transformation of printed, analog, audio and video material to binary (computerized) files], the increased dependence on computer software, and the increase in connectivity via the Internet have made it easier than ever to violate copyright protections. The economics literature has identified several situations in which providers of copyrighted material may benefit from some degree of infringement on their intellectual property rights. It has been demonstrated in theoretical papers and confirmed by empirical studies that the existence of strong network externalities implies that a firm's earnings need not be reduced as a result of piracy as long as the demand for legal copies is enhanced by the distribution of illegal copies. However, publishers and the authors and artists whose work they distribute may have conflicting interests with respect to the enforcement of copyright protection.

Implications

Although the adoption of common standards obviously influences the extent of network effects that come into play with respect to any technology, not much can be said about what role, if any, governments and regulatory agencies should play in the selection of standards. To some degree, the coexistence of multiple, incompatible standards may accelerate innovation because the sponsors of each

standard will race to demonstrate superiority over competing technologies. The potential dangers from having governments mandate standards have been known since long before the development of this literature. A notable example is the FCC's choice of the CBS color TV standard in 1949. The market rejected the standard, leading the FCC to change its decision and to mandate the NBC standard, which was then used until the introduction of high definition television (HDTV) in 1996. This example illustrates that markets can produce more socially desirable results than can government mandates regarding the adoption of technological standards.

In order to predict the likely directions of future research on network economics, one must look at which industries are now experiencing rapid change. One of the fastest-changing is the payments industry, where the issue of standardization plays a crucial role. Multiple payments standards are common: buyers can pay with cash, debit cards, credit cards, prepaid cards, paper and electronic checks (in some countries), and electronically via automated clearing houses (ACH). The fact that cash is legal tender does not preclude innovation in the direction of more convenient payment instruments. In some regions of East Africa, mobile phones now serve as a means to send and receive money for people who lack access to a bank account (the worldwide unbanked population, estimated to be over two billion persons). Similar technologies [sometimes labeled person-to-person (P2P) mobile banking] are now being introduced in other parts of the world, including the United States. Payment systems, such as the Single Euro Payments Area (SEPA) will be integrated with payment networks in other countries, a development that requires negotiations on setting standards. Another line of emerging related research deals with social networks and other virtual and actual organizations.

w-10-4

The Asymmetric Effects of Tariffs on Intra-Firm Trade and Offshoring Decisions
by Federico J. Díez

complete text: http://www.bos.frb.org/economic/wp/wp2010/wp1004.htm
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Motivation for the Research

With the world's economy increasingly interconnected, international trade and foreign direct investment are among the fastest growing activities. Offshoring—the movement of production activities abroad—is at the center of these activities. The international trade flows stemming from offshoring activities can take two forms: if an offshoring firm controls all the production stages for a good (is vertically integrated) it engages in intra-firm trade, while if the offshoring firm outsources production to an independent contractor it engages in arm's-length trade. Almost half of U.S. imports occur within the context of multinational firms engaging in offshoring activities, so it is important to understand what factors help a U.S. firm determine whether or not to engage in intra-firm trade.

The author points out two novel features that describe the relationship between tariffs and the amount of intra-firm trade and provides a formal theoretical framework, tested empirically, to better explain this connection. Broadly speaking, the interplay between U.S. tariffs and foreign tariffs determines whether and how a firm engages in offshoring activities. First, U.S. industries with low tariffs have relatively less intra-firm imports than do industries with higher tariffs. Second, U.S. imports originating from countries that impose relatively high tariffs include a smaller fraction of intra-firm imports than those coming from countries with lower tariffs, as shown in the figure below. This study is related to a burgeoning empirical literature on the determinants of intra-firm trade. Other recent studies examine the theoretical link between trade liberalization and a firm's organizational choices, but unlike this paper do not perform an empirical test of the theoretical implications.
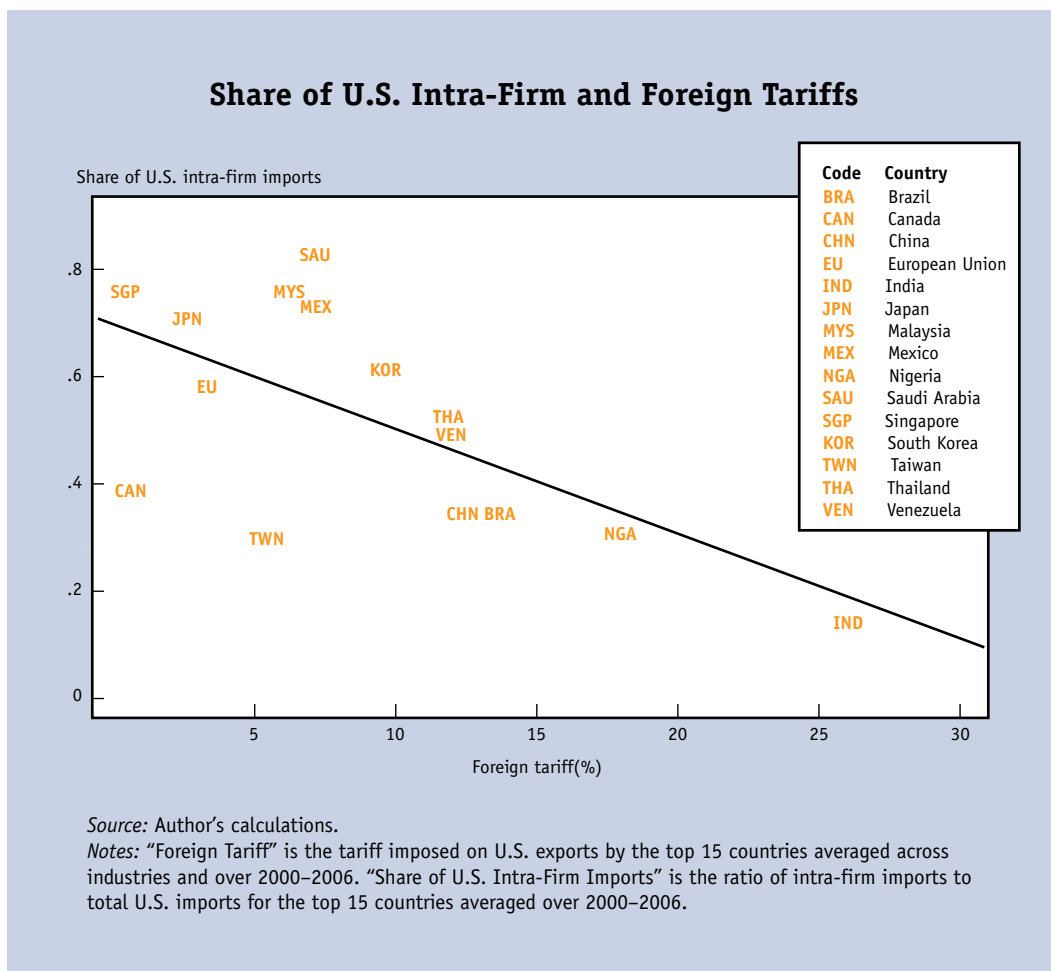
Research Approach

To analyze the behavior of U.S. firms engaging in offshoring activities, the author extends the Antràs and Helpman (2004) North-South model of international trade with incomplete contracts. In both models, there are two kinds of goods, homogeneous and differentiated, and the production of differentiated goods requires an entrepreneur located in the North and an assembly manager located in the North or the South who is either an employee of the firm (vertical integration) or an independent supplier (outsourcing). The author assumes that each entrepreneur has a critical input and engages the manager to process this input into a final good. The decision whether to vertically integrate or to outsource involves a tradeoff between the North's lower fixed costs and the South's lower variable costs and entails weighing outsourcing's lower fixed costs (compared to vertical integration) against the entrepreneur's lower final share of the surplus. Since each organizational form has particular fixed costs, firms decide which form to take based on their own productivity and the headquarter intensity of the industry. Headquarter intensity refers to the relative importance of activities like design and research & development in the firm's production function—activities that generally require skilled, white-collar tasks as opposed to less skilled, blue-collar tasks.

The paper focuses on the outsourcing decisions of headquarter-intensive industries located in the United States (the North). The author's model differs from the Antràs and Helpman (2004) framework in two important ways: tariffs are explicitly included in the model and the offshoring activity is defined as the foreign sourcing of final goods, rather than intermediate goods, production. Hence, offshoring implies that final goods production will move from the North to the South; this contrasts with the Antràs and Helpman framework, which has final goods production occurring in either region. The author derives two testable implications: higher Northern tariffs will generate a larger share of intra-firm imports while Southern tariffs will have the opposite effect on the share of intra-firm imports. If there is more vertical integration than outsourcing, the composition of U.S. imports will shift toward relatively more intra-firm trade and relatively less arm's-length trade. These theoretical predictions are tested against empirical evidence about the ratio of intra-firm imports to total imports.

Using data on imports, tariffs, and headquarter intensity, together with the extended model, the author studies how U.S. final goods industries with relatively high headquarter intensity make the decision about how to organize production, given U.S. and foreign tariffs, and how this choice affects the ratio of intra-firm imports to total imports. The trade data come from the Foreign Trade Division of the U.S. Census Bureau. Importers must disclose whether the transaction is with a related party, allowing the author to distinguish whether the imports are from intra-firm trading or from an arm's-length transaction. The data are at the 6-digit level of the Harmonized System (HS) and cover the years 2000 to 2006. This database includes imports from the top six U.S. trading partners—Canada, Mexico, China, Malaysia, Ireland, and Brazil—conditional on at least two-thirds of the intra-firm imports involving a U.S. parent company. The tariff data come from the United Nation's TRAINS (Trade Analysis and Information System) database. For each HS6 industry the author observes the tariffs "effectively applied" by the United States on American imports and by foreign countries on their imports from the United States over the 2000-to-2006 period. An "effectively applied tariff" is defined as the minimum of the most-favored nation tariff and a preferential tariff if one exists. The NBER productivity database, constructed in 1996, is used to measure headquarter intensity, based on a firm's total workers, the number of skilled workers, and capital. Using these data, the author constructs a skill-intensity measure as a default measure of headquarter intensity, and a capital-intensity measure as a robustness measure of headquarter intensity. The firm's decision whether to vertically integrate or to outsource production centers on productivity cutoffs influenced by the size of the Northern and Southern tariffs.

Key Findings

• The empirical results strongly support the theoretical model's prediction that tariff rates affect the imports of all offshoring firms but have an especially pronounced effect on firms that outsource production. Higher U.S. (Northern) tariffs hurt all imports but especially non-related party imports. Therefore, higher U.S. tariffs have a positive effect on the ratio of intra-firm imports to total imports and higher foreign (Southern) tariffs are associated with lower intra-firm import shares.

• Higher U.S. tariffs increase the ratio of American intra-firm imports to total American imports, while higher foreign tariffs decrease this ratio. In the relevant subsample of the data, the mean ratio is 44 percent (29 percent if observations with a ratio of zero are included). Using this subsample, a 1-percentage point increase in the U.S. tariff is associated with a 1.3-percentage point increase in the ratio, while a 1-percentage point increase in the foreign tariffs implies a 0.3-percentage point decrease in the ratio.

Share of U.S. Intra-Firm and Foreign Tariffs

Source: Author's calculations.
Notes: "Foreign Tariff" is the tariff imposed on U.S. exports by the top 15 countries averaged across industries and over 2000–2006. "Share of U.S. Intra-Firm Imports" is the ratio of intra-firm imports to total U.S. imports for the top 15 countries averaged over 2000–2006.

• The Northern tariff decreases the market shares of offshoring firms. The magnitude of the tariff is particularly important for firms with mid-range productivity, as these firms are on the margin between locating in the North and vertically integrating, or locating in the South and outsourcing production.

• U.S. tariffs on average are lower than foreign tariffs; in many cases, by country and by industry, the U.S. tariffs are zero. Overall, the mean U.S. tariff is 1.5 percent, but the median tariff is zero. In contrast, foreign tariffs show greater variation across countries and industries. While Canada and Mexico usually impose no tariffs on the United States, other countries usually impose much higher values. This is particularly true of Brazil and China.

The ratio of U.S. intra-firm imports to total imports varies widely across countries, ranging from 25 percent for China to 89 percent for Ireland. There is no clear income or geographic factor that determines this behavior. The two lowest ratios, 25 percent for China and 32 percent for Brazil, are from relatively poor countries, while two other poor countries, Mexico (58 percent) and Malaysia (72 percent) have high ratios. Canada, at 46 percent, has a relatively high ratio and, like Mexico, borders the United States. Yet distant countries, including Ireland and Malaysia, have even higher ratios.

• The author's results are robust to alternative specifications, including ordinary least squares as well as nonlinear methods like quantile regressions and correction for possible selection bias.

Implications

The implications of these findings can proceed along several paths. One, it would be interesting to study the welfare effects of tariffs, as the author finds that tariffs affect not only a firm's offshoring decisions but also its insourcing/outsourcing decision. Exploring this issue in greater detail could shed light on governments' optimal tariff policies and explore the role (if any) of trade agreements. Second, the author suggests that a better understanding of the different kinds of offshoring is needed—there is offshoring that takes place for intermediate goods (inputs) as well as for final goods. Third, developing a theoretical framework to account for the outsourcing decision when only some firms are exporters would help to explain empirical observations in the data. Fourth, in the future, nations located in the South can be expected to play a bigger role in world trade and tariff negotiations. If tariffs in both the North and South decrease, the share of intra-firm imports should remain fairly steady after controlling for market size. But if only Southern tariffs decrease, then intra-firm imports in the North should increase. Likely outcomes under these different scenarios would be good subjects for future research.

w-10-5

Public and Private Values

by Dan Ariely, Anat Bracha, and Jean-Paul L'Huillier

Motivation for the Research

In many everyday instances, before making our own decisions we investigate what other people have done in similar circumstances. For example, we may find it helpful to see what prices others have paid for similar goods or services before making our own purchases. Generally, this heuristic (decisionmaking rule) of looking at other people's pricing decisions is a good strategy, since many typical situations we encounter share some common (public) characteristics and therefore the choices others have made can be useful for informing our own decisions. But sometimes this heuristic is not appropriate, as in the case of private-value goods or experiences, where an item's worth to an individual is determined solely by the value the person assigns to it, as reflected in the price the individual demands or is willing to pay. The authors investigate experimentally whether people over-apply the heuristic of considering other people's pricing decisions when the rule is not applicable.

Research Approach

By designing an experimental auction of a uniquely private-value experience—annoying sounds—the authors create a situation with purely private value. Using this purely private experience, they investigate whether the values people assign are interrelated. The authors recruited 45 students at the Massachusetts Institute of Technology to participate in a two-stage experimental auction, with 10 rounds per stage. In both stages and in all rounds, participants bid their asking price (the minimum amount of money they demanded to listen to an unpleasant tone through a headset). Stage 1 recorded the actual bids of the first group of 22 participants, using a second-price auction against a random

number. (A second-price auction is a procedure that yields a result that is incentive-compatible, meaning that the optimal strategy is to bid one's true cost of listening to the sound.) In stage 1, if a subject's bid was lower than the number drawn, the subject would listen to the sound and be paid the amount indicated by random number drawn. Otherwise, the subject would not listen to the sound and would not be paid.

Stage 2 sorted the bids from stage 1 according to the four highest and the four lowest values, which were used in a high and a low treatment, respectively. As in stage 1, participants were asked to place a bid for listening to the tone on the headset. In stage 2, however, the second-price auction was conducted against the four other bidders from stage 1 (the highest four in the high treatment and lowest four in the low treatment) rather than against a random number, and participants placed their bids starting in the second round after observing the other bids of the first round.

Key Findings
• In stage 2, participants who had observed bids from the high treatment made bids that were consistently higher across all rounds than bids made by participants who had observed results from the low treatment.

• Observing others' prior bids has a statistically significant effect on the subsequent bids made by participating individuals. That is, the value an individual assigns to a private-value good—a purely subjective experience—is highly influenced by the values others place on a similar experience.

Implications
Determining how much individuals are willing to pay for even "simple" experiences may be more complex and less readily discerned than economists usually consider. As a consequence of this complexity, individuals may over-apply the strategy of using others' behavior as an informational guidepost when making their own choices. This tendency may create a seemingly common value even in

Price Demanded to Listen to Unpleasant Sound
(Mean bids)

Source: Authors' calculations.
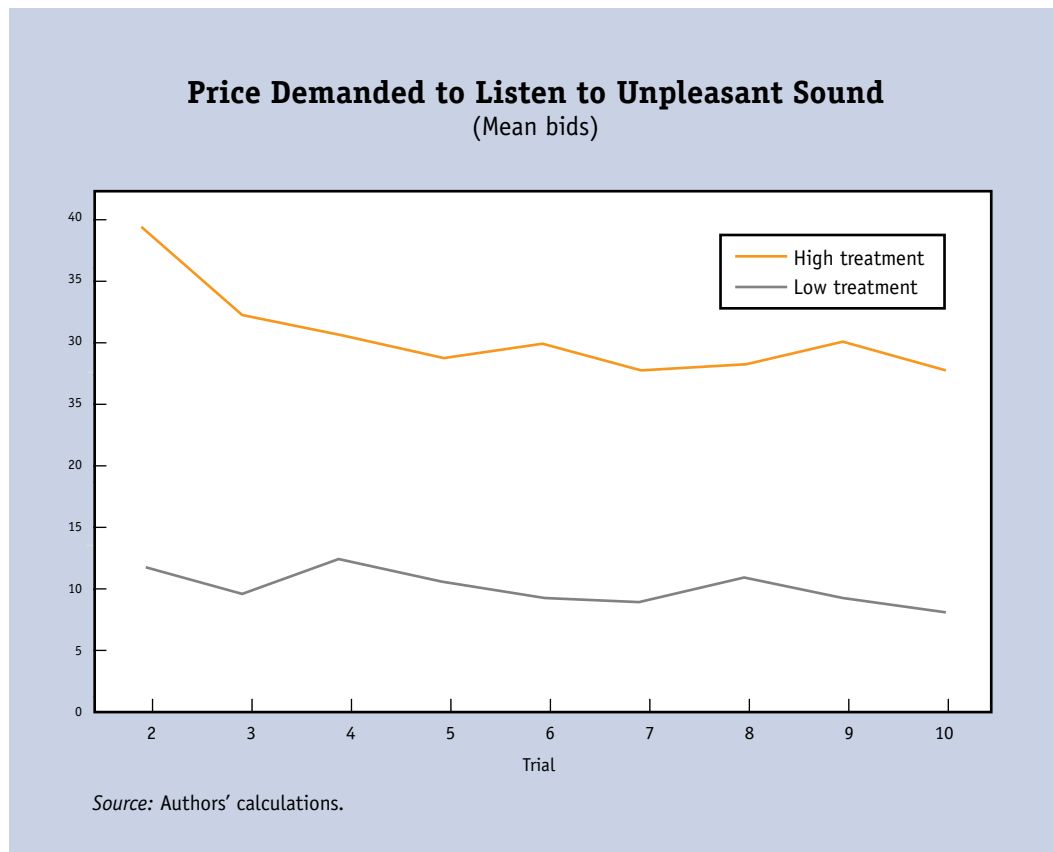
the absence of such a value, as in the case of unusual fashion trends. Interrelated private valuations have interesting industrial organization and marketing implications and applications. Such considerations add new aspects to firm-consumer interactions and give an additional explanation for why firms may hire public-opinion makers. Beyond providing information, public-opinion makers may generate consumers' value and, in turn, economic rents. Interrelated private valuations may help to explain macroeconomic effects in the form of nominal rigidities of prices or quantities.

Moral Hazard, Peer Monitoring, and Microcredit: Field Experimental Evidence from Paraguay
by Jeffrey Carpenter and Tyler Williams

Motivation for the Research
Microcredit programs make small loans to the very poor, mostly in the developing world, to spur entrepreneurial activities that can help the borrowers escape poverty. Many of these programs make group loans rather than loans to individuals, on the theory that the lending risks involving moral hazard and adverse selection can be lowered by making a group of people responsible for repaying the loan instead of relying on a single person. Since most borrowers using microcredit loans do not have collateral to post as insurance for repayment, group lending can solve the moral hazard problem of default by creating incentives for group members to monitor fellow members. Further, adverse selection might be attenuated because issuing loans only to groups provides each group member with an incentive to think hard about which group to join. While the incentives seem clear, there is no conclusive empirical evidence that peer monitoring actually works in practice. By combining and extending previous work in behavioral and experimental economics, the authors examine whether there is a significant connection between peer monitoring and group loan performance.

Research Approach
Participants in an actual group lending program took part in a social dilemma experiment that directly measures individual propensities to monitor one's peer group. These measures of peer monitoring were then linked to loan performance in the subsequent six-month period. The participants were women taking part in a group loan program administered by the Paraguayan Foundation for Cooperation and Development, a nonprofit agency headquartered in Asunción. Its mission is to empower the country's low-income citizens, chiefly by helping them via funding small business ventures. Ranging in age from 17 to 60 years, the women are from two uniformly poor neighborhoods, one in Asunción and the other in one of its suburbs. A few participants had a high school education and/or some college, but 57 percent had no more than a primary school education. Sixty percent were married, although in Paraguay long-term cohabitation outside of formal marriage is common, and 26 percent identified themselves as the head of household. Among the participants, the lowest monthly income was 100,000 PGY (about U.S. $17), the highest monthly income was over six million PGY (about U.S. $1,020), and the median monthly income was 1.5 million PGY (about U.S. $235). More than 80 percent of the participants had no savings, and among those that did, the mean savings amount was 24,650 PGY (about U.S. $4). All these equivalent terms are for 2005, when the study took place.

Each loan group was composed of 15 to 20 women who were matched both by the Foundation and on their own initiative; the group approved each potential member. The size of the group's loan request was based on each woman's individual loan, an amount determined both by the borrower's desired amount and by the group's and Foundation's determination of how much a member could afford to borrow. For their first loan, individuals were only allowed to request between 100,000 PGY (about

U.S. $17) and 400,000 PGY (about U.S. $67). Each group member was responsible for repaying her portion of the loan's principal and interest. To provide a motivation for repayment, the Foundation requires that all borrowers repay their part of the loan in order to participate in a second group loan; thus, the entire group is liable for any defaulting member's payments. Once a group loan is reimbursed and before the next loan cycle begins, the group may change in one of three ways, but membership in the original group is reduced only via voluntary or involuntary attrition: individual members may leave or be expelled; a member may remain in the group but not request a loan, although she bears responsibility for making up any defaulted payments; and individuals may request a loan that is up to 50 percent higher than their previous loan. The interest rate depends on the loan's duration and payment frequency, but interest paid is less than a 50 percent annual rate, which is much lower than the rates offered by banks and loan sharks. Since many of the participants also regularly borrow from loan sharks at much higher interest rates, defaulting on the Foundation's loan entails a high cost.

The experimental design modifies one already used in the field by Carpenter, one of the paper's authors, and various other coauthors to gauge cooperative and sanctioning behavior. Over eight sessions participants were randomly divided into anonymous groups of four that remained intact for the experiment's entire duration. Each session had eight rounds, with each round beginning with each group member receiving an endowment of 15 coins, each worth 100 PGY. At the start of each round, participants were asked if they would like to contribute some of their endowment to a group project and were informed that the shared contributions would be increased by 50 percent and then evenly redistributed to all four members. The experiment's incentives are those of a standard social dilemma—each 100 PGY contribution an individual makes to the group project returns only 37.5 PGY (the 150 PGY divided four ways), so an individual can gain the most by making no group contribution, but the socially efficient outcome occurs when each member contributes the maximum amount. After the contributions were made, each woman was shown her gross income for the round and the total group contribution. To focus directly on a participant's decision to monitor her peers, individuals were asked whether they wanted to see the contributions made by other group members. By agreeing to pay a 50 PGY fee, the individual was allowed to view, in random order, the anonymous contribution levels of the other three members. Yet since the contributions remained anonymous, participants could not condition their monitoring choices on any observable individual characteristics or social connections, so the monitoring propensities measured were inherent (pure) gauges of an individual's basic "nosiness" and the experiment captured how monitoring tendencies affect group outcomes. Someone who is more inclined to be a busybody is more disposed to monitor others' behavior, especially when an individual's behavior is linked to the group's loan performance. Since the loan performance was examined six months after the authors collected the behavioral data, the study is unlikely to be affected by endogeneity and simultaneity bias, a problem encountered in previous studies.

Key Findings
- The results suggest that there is a significant link between peer monitoring and group loan performance. The authors find that individuals in groups populated by inherently "nosy" members are approximately 10 percent less likely to experience problems repaying their loan. Peer monitoring reduces a group's moral hazard.

- When controls are added, the effect increases, such that borrowers in groups with above-median monitoring are 36 percent less likely to have a problem repaying their share of the group loan. Thus, an individual borrower's repayment behavior is affected by the group's average monitoring propensity.

- Slightly more than 15 percent of the participants never monitored their peers, while about 15 percent always monitored their fellow group members.

- Using the random coefficients model and the Wald test for parameter consistency confirms that

the peer monitoring choices are heterogeneous and are lagged responses to free-riding behavior. While some participants react strongly to the amounts contributed by others—the more the other group members kept in the previous round, the more likely they were to be monitored in the next round—other participants were just as apt to reduce their monitoring when other group members retained more, some participants never monitored their peers, and some participants always monitored their fellow group members.

- The authors' results are robust to different formulations of the peer monitoring measure and the inclusion of four other factors that might affect loan repayment. Participants answered three questions from a standard nonverbal IQ test, participated in an experimental lottery to measure individual risk aversion and impatience (and thus individual discount rates), and answered questions to measure their social orientation within the group. Borrowers who had defaulted previously were more apt to default on a group loan, but educational levels, number of years of business experience, and community engagement had little effect on loan performance. IQ levels did have a robust effect on repayment rates, while time preferences did not have a large effect on overall repayment rates, although very risk averse borrowers were between 9 and 13 percent less likely to experience repayment problems.

Implications

Compared with previous studies, the exogeneity of the experiment's monitoring measure gives a purer measure of the inherent monitoring behavior and provides conclusive empirical evidence that peer monitoring influences group loan performance. It is not clear whether groups form in anticipation of monitoring behavior, so further exploration into possible self-selection may shed more light on group outcomes, although the authors suspect that self-selection likely does not have a strong effect.

Contribution to Group Project versus Monitoring Behavior in a Field Experiment

Source: Authors' calulations.
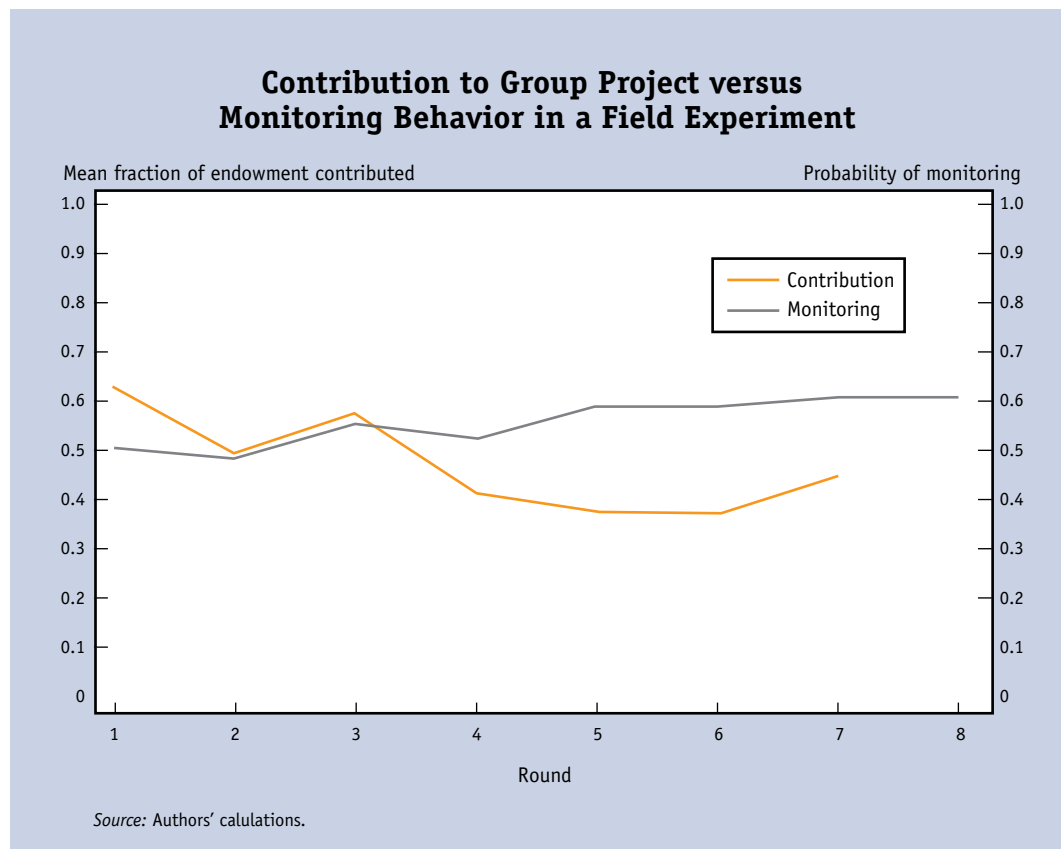
The Sensitivity of Long-Term Interest Rates to Economic News: Comment
by Michelle L. Barnes and N. Aaron Pancost

Motivation for the Research
In a 2005 paper published in the *American Economic Review*, Refet Gürkaynak, Brian Sack, and Eric Swanson (hereinafter, GSS) provide both theoretical and empirical evidence that long-term inflation expectations are not well-anchored in the United States, in part because the Federal Reserve does not have an explicit inflation target. GSS show that long forward rates, which can reasonably be taken as indications of future expected short-term rates, are sensitive to current macroeconomic news—a finding that contrasts sharply with the results of most standard macroeconomic models. GSS point out that although shocks in even highly backward-looking models die out in at most a few years, empirically 10- and 15-year forward rates still move in response to current macroeconomic news.

Perhaps the most surprising finding of the GSS paper, and certainly the most relevant from a monetary policy perspective, is that long forward rates actually respond negatively to surprise monetary actions. In other words, GSS find that although a surprise tightening by the Fed does increase short-term interest rates, from 1990 to 2002 a surprise tightening actually lowered expected future interest rates. The rationale they give for this result is that during this period a surprise contraction reduced long-term inflation expectations. They derive a simple model of output and inflation expectations to argue that explicitly stating an inflation target would obviate this effect and anchor long-term expectations.

The GSS paper has become very influential in the inflation-targeting debate because of its strong results on both theoretical and empirical grounds. The authors of this comment re-examine the evidence with the aim of gaining a better understanding of GSS's surprising findings.

Research Approach
The authors describe and analyze the GSS model by comparing it with a model that differs in only one respect: in the authors' model agents are allowed to know the central bank's inflation target with certainty, whereas in the GSS model agents do not know the target. The authors then replicate GSS's empirical findings, using their same data, estimation methodology, and model, but draw different conclusions.

Key Findings
• GSS's interpretation of their results—that an explicitly stated inflation target anchors long-term inflation expectations—is untenable when the model is extended to include either a known or an unknown fixed inflation target. Explicitly stating the inflation target in their model does not completely eliminate the excess sensitivity of forward rates to surprise monetary tightening; in their model the best way to dampen this sensitivity is to fix the inflation target in the short term.

• The empirical results of GSS depend heavily on eight particular dates for which monetary policy expectations cannot be accurately measured. These are dates when the Federal Open Market Committee responded endogenously to unemployment reports. The issue is that GSS, as well as most other papers in this vein, use daily data from the federal funds futures markets to measure monetary policy expectations, so it is impossible to disentangle the effect of the unemployment report on these days from the effect of the monetary policy action.

- Even using the same assumptions as GSS, the estimated effect of the monetary shock does not persist: although, on average, long forward yields do respond negatively to monetary policy shocks on the day the shock occurs, on average these yields tend to revert back to their previous level two days later, so the three-day effect is indistinguishable from zero.

Implications

Unlike the central banks in many other advanced economies, the Federal Reserve has a dual mandate to foster maximum employment consistent with stable inflation. Although the Fed has begun including long-term inflation projections with some of its policy statements, which some have likened to having an implicit inflation target, many economists question whether an explicitly stated inflation target would better anchor long-term inflation expectations, as seems to be the case in some countries. GSS offer empirical evidence that long-term inflation expectations are not anchored in the United States, and they present theoretical evidence that this is consistent with agents having to infer the central bank's inflation target from noisy interest rate movements.

The authors of this paper find that the evidence of un-anchored expectations in the GSS data is not convincing, and that the model used by GSS in fact supports a different conclusion: explicitly stating the central bank's inflation target will stabilize long-term expectations less than merely keeping an unknown target fixed in the short term. The authors see opportunities for exciting future research focused on issues such as how to identify economic conditions that warrant a long-term inflation-target change and how to re-establish a preferred long-term target, once those conditions are no longer present.

Wage Setting Patterns and Monetary Policy: International Evidence
by Giovanni P. Olivei and Silvana Tenreyro

Motivation for the Research

A wide body of empirical evidence suggests that monetary policy has an important effect on the behavior of real variables at business cycle frequencies. Most theoretical models that seek to identify the connection between nominal causes and real effects posit some form of nominal rigidity in wages and/or prices. Empirical evidence assessing the extent of nominal wage rigidity and its relevance in the transmission mechanism from monetary policy to real variables is, however, regrettably scarce. This paper attempts to partially fill this empirical void by providing a study that exploits differences in the effective degree of nominal wage rigidity within and across countries.

Research Approach

The authors begin by observing that the synchronization of wage setting decisions varies significantly across advanced economies. In Japan, the best-known example of synchronization of wage setting decisions, the majority of firms set wages during the first and second quarters of the calendar year in what is known as "Shunto," (or spring offensive), and wages remain in place until the following year. In the United States, the available evidence suggests that a large fraction of firms set wages once a year, typically at the end of the calendar year. In contrast, wage bargaining renegotiations in Germany take place throughout the year, and contracts tend to last one to three years. Theories of the transmission of monetary impulses to real variables based on wage rigidity would hence predict that, other things being equal, monetary policy innovations in Japan should have a larger effect when the shock takes place in the second half of the year, that is, after the Shunto has occurred and wages are relatively rigid. In the United States, the effect should be larger when the shock occurs in the

first half of the year, as wages tend to be reset at the end of the calendar year. However, in Germany, where there appears to be little bunching in wage setting decisions within the year, the effect should not vary with the quarter in which the shock takes place.

The aim of this study is to test whether these predictions are supported by the data. More precisely, the authors assess whether the economy's response to monetary policy shocks differs according to the time of the year when the shock takes place and whether this difference can be reconciled with the observed variation in the timing of wage setting decisions. To this end, the authors introduce quarterly dependence in an otherwise standard recursive vector autoregression (VAR) setup and analyze the empirical impulse responses of aggregate variables to a monetary policy innovation in five large and highly developed countries: France, Germany, Japan, the United Kingdom, and the United States. The focus on these countries is related to the extant literature on central banking practices: the relatively wide consensus in the literature on the monetary instruments used by these countries' central banks provides a natural baseline from which the authors deviate to study the potential for seasonal dependence in monetary policy effects.

The authors' empirical exercise has a "difference-in-difference" flavor, in that they test for potential differences in the effect of monetary policy across quarters of the calendar year for each of the countries under consideration and then relate their findings across countries to each country's degree of wage rigidity over the calendar year.

Key Findings
• For both Japan and the United States there are, indeed, important differences in the economy's response to monetary policy shocks that depend on the timing of the policy innovation. These differences, in turn, can be related to the differing degree of wage rigidity across the calendar year. Specifically, a monetary policy innovation in Japan that occurs during the first or second quarter—that is, during the Shunto period, when wages are being reset—has a remarkably large effect. The pattern is reversed in the United States: a monetary policy innovation in the first half of the calendar year has a significantly larger effect on output, whereas an innovation in the second half has a relatively small effect. Again, this pattern corresponds well with the degree of wage rigidity in the United States, which is high in the first half of the year and low in the second half. In sharp contrast, in Germany, France, and the United Kingdom, where the degree of wage rigidity is more uniform and the contracts are of longer duration, the quarter in which a monetary policy shock takes place appears to be less relevant.

• This paper essentially replicates the findings in Olivei and Tenreyro (2007) for the United States and extends the empirical analysis of the earlier paper to test whether the degree of synchronization in wage setting decisions also matters for the transmission of monetary impulses in other countries. Overall, the findings of this study complement and reinforce the earlier conclusions that wage rigidities can play an important role in the transmission of monetary policy.

Implications
In this paper, the authors make no claim as to whether synchronization of wage changes is preferable to uniform staggering. This is a problem that has been studied in the past, and the general finding of this literature is that synchronization is the equilibrium timing in many simple Keynesian models of the business cycle. Yet the new generation of Keynesian models has glossed over this finding and assumed uniform staggering as both a convenient modeling tool and an essential element in the transmission mechanism of monetary policy shocks. This paper notes that while uniform staggering may be a realistic assumption for some countries, it is not for others. For these other countries, the empirical implications of nonuniform wage staggering can be important and should be taken into consideration from a modeling standpoint. Finally, the authors note that there appears to be some synchronization in the timing of wage and price changes. In this respect, January is a month when

the frequency of adjustment for wages and prices is relatively high in some countries. The extent to which this relationship is causal, with the seasonality in wage changes imparting seasonality to price changes, is a topic that deserves much more research.

Public Policy Briefs

State Government Budgets and the Recovery Act
by Katharine Bradbury

Motivation for the Research
With revenues reduced sharply by the recession, state and local governments are responding by cutting services, increasing tax rates, and drawing down reserves. They are also receiving some relief in the form of stimulus funds provided by the federal government via the American Recovery and Reinvestment Act (ARRA). Yet the stimulus funds legislated in the ARRA only partly offset the recession-induced shortfalls and the funds are scheduled to phase out before most analysts believe state and local governments will see fiscal recovery well underway. Thus, observers are concerned that the state-local sector will create a substantial drag on the overall economy during fiscal year 2011 and into 2012. This concern arises because almost all state and local governments in the United States are required to adopt balanced budgets; hence the recession-induced declines in tax revenues lead to budget-balancing by state and local governments, and these activities in turn tend to amplify national business cycle swings. This brief compiles nationwide data on state gaps, budgetary responses, and stimulus funding and discusses potential implications for the U.S. economy.
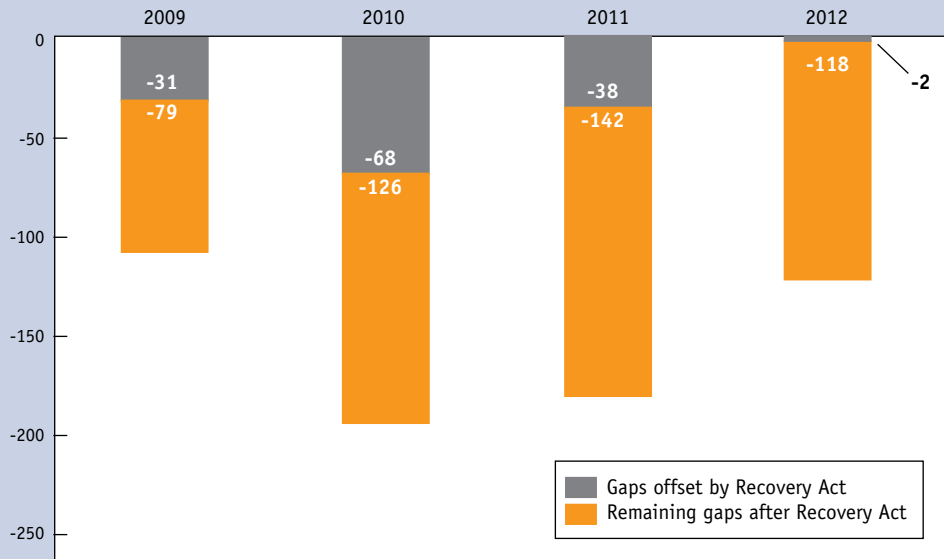
Research Approach
The author documents the record-setting decline in state tax revenues that occurred nationwide as the U.S. economy fell into recession in 2008 and 2009 and reports the overall size of state budget gaps that emerged in fiscal year (FY) 2009—which ended in June 2009 for most states. She then describes several provisions of the ARRA aimed at the state-local sector and discusses the role these provisions have played in offsetting FY2009 budget gaps. The author concludes by examining estimates of the stimulative effects of ARRA funds and the likely negative effects of state budget adjustments on the well-being of residents and economic growth, as stimulus funds run out and states are forced to make additional cuts.

Key Points
• For the 50 states combined, the 16-percent year-over-year decline in total tax revenue in the second quarter of 2009 was the worst on record (going back almost 50 years). The steepest drops occurred in individual income taxes, which account for more than one-third of state tax revenues nationwide. While the decline in 2009:Q3 was smaller, the bulk of individual income tax collections occur in the second quarter because of April filing deadlines for these taxes.

• Analysts who study the state-local sector focus on "budget gaps," deficits that would occur if states were not required to balance their budgets. States' estimates of their budget gaps in (and for) fiscal year 2009 (running from July 1, 2008 through June 30, 2009 for most states) compiled by the Center on Budget and Policy Priorities (CBPP) show shortfalls totaling $110 billion across the 50 states, amounting to about 15 percent of nationwide state government general funds. In addition to declines in tax revenues, these gaps reflect declines in nontax revenue, such as fees, and increased needs for public services and government transfers in a weak economy.
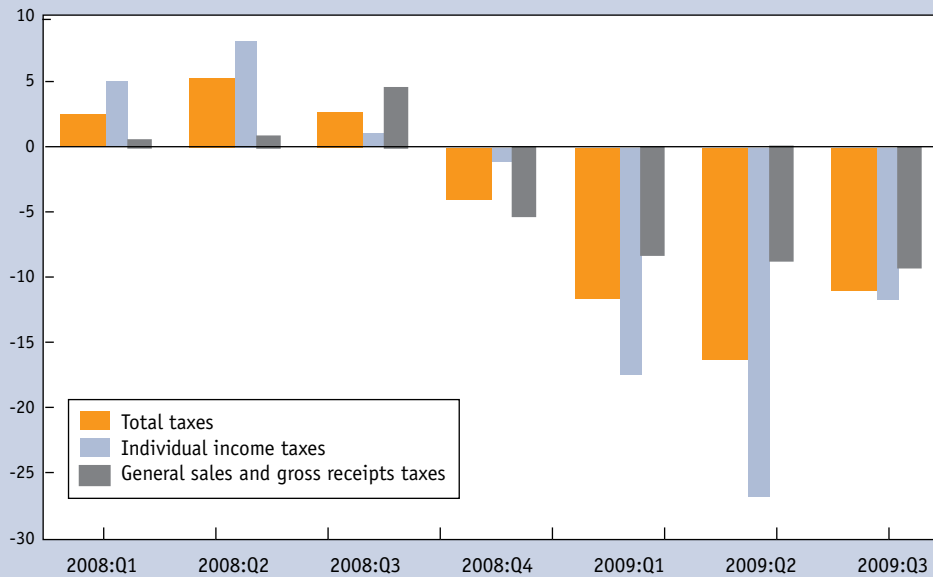
• States eliminate their gaps to arrive at a balanced budget by some combination of cutting spending and services, increasing taxes, and drawing down reserves. In addition, the stimulus bill—adopted in February 2009 (more than halfway through states' 2009 fiscal years)—provided a fourth type of gap-filler. FY2009 budget gaps were addressed more by spending cuts and drawing down reserves than by tax increases, at least in part because the U.S. economy and revenue situation deteriorated so rapidly that states did not have time to develop and implement tax-increase options. States cut general fund spending from FY2008 by $31.3 billion, reduced their year-end balances by an estimated $27.1 billion, and enacted revenue increases amounting to $1.5 billion. ARRA transfers from the federal government provided about $30 billion of fiscal relief for states' FY2009 budgets.

• The stimulus bill provides funds for states in their budgets for fiscal years 2009–2012. Of the $30 billion in general purpose stimulus funds that helped fill states' FY 2009 budget gaps, $22.5 billion came through an increase in the federal matching rate for Medicaid (FMAP); the remaining $7.5 billion came via the Department of Education's State Fiscal Stabilization Fund. These programs prevented cuts to state-local spending that would otherwise have occurred in FY2009—avoiding layoffs and increasing services and transfers to individuals; that is, these funds were expended as fast as the cuts would otherwise have been implemented in order to balance FY2009 budgets. These spending effects were felt sooner than even "shovel-ready" road and building projects; due to the inevitable delays in implementation, the 50 states saw only about $250 million in infrastructure outlays from the Department of Transportation in FY2009 and only $5.6 billion by the end of December 2009.

• States are using all available methods to close gaps in FY2010. They have enacted revenue increases amounting to almost $24 billion and spending cuts in excess of $55 billion. Many states have reduced aid to local governments. Most states have cut a broad range of services, including health care, corrections, higher education, K-12 education, services to the elderly and disabled, and other programs, such as public assistance, that might otherwise have helped the most vulnerable families better weather the recession. These spending cuts involve reductions in payments to individuals, cancellation of contracts with (or reductions in payments to) businesses and nonprofits, and public sector layoffs.

• States are also using federal stimulus money to prevent even greater procyclical tax increases and spending cuts that would have occurred in the absence of these funds. The Center on Budget and Policy Priorities estimates that general purpose stimulus funds going to state and local governments are filling about 30 percent of state budget shortfalls nationwide in fiscal years 2009 through 2011.

• At least 44 states have looked ahead to FY2011 and anticipate gaps. Initial estimates put these shortfalls at $102 billion for the 41 states that have estimated their size. In all, the Center on Budget and Policy Priorities projects at least $180 billion in shortfalls nationwide in FY2011—over one quarter of state budgets. Many of the governors' budget proposals for FY2011 released in early 2010 involve significant spending cuts. The biggest element of ARRA general fiscal assistance to states—the elevated FMAP—is scheduled to decline to zero after December 31, 2010, in the middle of most states' 2011 fiscal year. States have signaled to the Department of Education that most of the education funding will have been used by then as well. Thus, ARRA will offset a smaller fraction of shortfalls in FY2011 than in FY2010. In FY2012, when very little general purpose ARRA funding will be available, the Center on Budget and Policy Priorities projects shortfalls totaling about $120 billion.

• Because joblessness in the current recession has reached double digits, forecasters expect unemployment rates to remain elevated into 2012. High unemployment impairs family incomes and

State Budget Gaps and Recovery Act Offsets by State Fiscal Year, Billions of Dollars

	2009	2010	2011	2012
Gaps offset by Recovery Act	−31	−68	−38	−118
Remaining gaps after Recovery Act	−79	−126	−142	−2

Legend:
- Gaps offset by Recovery Act
- Remaining gaps after Recovery Act

Source: Iris J. Lav, Nicholas Johnson, and Elizabeth Johnson, "Additional Federal Fiscal Relief Needed to Help States Address Recession's Impact," Center on Budget and Policy Priorities, updated January 28, 2010, Figure 1.

State Tax Revenues: Percent Change from Year-Earlier Quarter

Legend:
- Total taxes
- Individual income taxes
- General sales and gross receipts taxes

X-axis: 2008:Q1, 2008:Q2, 2008:Q3, 2008:Q4, 2009:Q1, 2009:Q2, 2009:Q3

Source: Author's calulations based on data from U.S. Census Bureau, *Quarterly Summary of State and Local Government Tax Revenue*, Table 3, State government tax collections by state and type of tax.

thereby keeps state revenues depressed and causes demand for state-funded services to remain swollen. As a result, even though the overall U.S. economy is recovering, states are expected to continue to suffer shortfalls into FY2012.

• One determinant of the stimulative effect of policies is how fast they make their way into the economy. Three other criteria typically used in judging these impacts are bang-for-the-buck, protecting vulnerable populations, and the broader long-term value of program "outputs." Fiscal relief for state-local government scores quite well along these three lines, as well as for implementation speed. Economists measure bang-for-the-buck via multipliers, indicating how many dollars higher GDP will be in response to an additional dollar from the government budget (via a spending increase or tax cut). One of the determinants of bang-for-the-buck is the extent to which the public spending or tax cut is targeted toward people who will spend, rather than save, the additional money, since the idea is to have the dollars circulate as soon and as widely as possible. Low-income families generally spend a higher fraction of their incomes than high-income families, and this is particularly true of those whose incomes are suddenly reduced by job loss in a recession. Thus, bang-for-the-buck tends to be higher for programs that protect the neediest families—those who tend to be more vulnerable to economic downturns.

Implications

According to consensus estimates, tax cuts have lower multipliers (a less amplified effect on the economy) than spending increases, with tax-cut multipliers generally below one and spending multipliers greater than one. The stimulative effects of the state fiscal relief elements of ARRA depend on what states would have done in the absence of ARRA. The Council of Economic Advisers projected the effects of state-local transfers by assuming that 60 percent of the transfers to states would be used to prevent spending reductions, 30 percent to avoid tax increases, and the remaining 10 percent would slow states' withdrawals from rainy-day funds. The 60-30 assumption implies that the average impact of ARRA state-local transfers is greater than that of tax cuts alone, but lower than pure government spending increases; along similar lines, the Congressional Budget Office estimates that the multiplier for "transfer payments to state and local governments for other [non-infrastructure] purposes" is about three-quarters the size of their estimated multiplier for direct federal spending.

The overall effect of the state-local sector's budget-balancing on the economy—the degree to which it exacerbates the cyclical slowdown—will depend on the mix among state-local tax increases, spending cutbacks, reserve draw-downs, and ARRA funds in filling looming budget gaps. The multipliers also apply in reverse. Thus, state tax increases have a smaller damping effect on the economy than equal dollar state spending cuts. Historically, the state-local sector has accounted for about 12 percent of GDP and added about one-quarter of a percentage point to annual GDP growth on an ongoing basis; if the sector slips back into negative territory, especially if it happens as soon as this summer, it could contribute to a reversal of the still-fragile recovery.

b-10-2

The Role of Expectations and Output in the Inflation Process: An Empirical Assessment

by Jeffrey C. Fuhrer and Giovanni P. Olivei

Motivation for the Research

This brief examines two issues of current interest concerning inflation: (1) whether "well-anchored" expectations (that is, expectations that are based on long-term inflation trends and are thus relatively insensitive to short-term fluctuations) will help to restrain inflation's decline and whether an "un-anchoring" of expectations could lead to undesirably high inflation and (2) to what extent gaps between actual and potential output are useful components of empirical inflation models and, if these are useful, to what extent current gaps might counterbalance the effect of expectations on inflation. The goals of conducting this examination are to articulate a reasonably coherent framework for the discussion, highlight the key areas of uncertainty, and provide new empirical evidence that sheds some light on these areas.

In almost all models of inflation, the expectations of private agents about future inflation play an important role in determining current inflation. In older-style Phillips curves of the type canonized in Gordon's (1982) "triangle model," expectations were implicitly captured via the lags in inflation, which proxied for an autoregressive or (loosely speaking) adaptive expectations process. In more recent models, private agents form rational expectations of future inflation that are consistent with the model's structure. For example, in the so-called New Keynesian Phillips curve, inflation depends on the rational expectation regarding the next period's inflation, discounted at a rate less than one, as well as on the current value of an output gap (or marginal cost). In this model, the role of expectations is, at one level, completely transparent. What may be less obvious is that in the model the role of inflation expectations is somewhat limited. Only the expectation of next period's inflation enters directly in the model. Other roles for expectations are less direct. Manipulating the equation for inflation by successively substituting future values of inflation results in an expression in which inflation is solely a function of the infinite expected future values of output gaps (marginal cost). This makes it clear that it is fundamentally the expectation of future output that matters in determining inflation.

But this conclusion raises the question: what determines (the expectation of) future output? In most conventional models of output and inflation, output is determined in a way that is remarkably similar to the way in which inflation is determined. Output depends on the expectation of next period's output and (negatively) on the real rate of interest, defined as the difference between the nominal interest rate and the expected rate of inflation. This suggests, in turn, that output is a function of the expected path of all future real rates. The real rate, in this simple depiction, depends on the federal funds rate, set by the central bank according to a policy rule of the type made popular by Taylor (1993), and on the rate of inflation. An important term in the equation determining the federal funds rate is an inflation goal or target, which can, and likely does, vary over time.

Research Approach

The key issues in determining the path of inflation revolve around the roles of output, inflation expectations—rational or not—and the time-varying inflation target. This brief examines these issues from both a theoretical and an empirical point of view. On the theoretical side, the brief argues that in structural models of inflation that highlight the importance of expectations and monetary policy, the currently low level of real marginal cost—the primary driver of inflation in such models—acts as a powerful downward force on inflation, even when expectations are well anchored in the sense that the public understands the central bank's firm commitment to a specific numerical inflation

objective. The brief next considers alternative ways of characterizing the expectations that may influence inflation. These include "rational" or model-consistent expectations, backward-looking expectations, and two survey measures of expectations that reflect shorter- and longer-horizon inflation forecasts. Finally, the brief examines some evidence of the effects of output and unemployment gaps on inflation.

Key Findings

The authors note that they are hesitant to draw any firm conclusions, given the difficulties in modeling inflation, especially over the past decade when inflation has been relatively tranquil and the U.S. economy—up until 2007—has been similarly placid by historical standards. Nevertheless, the analysis presented in this paper points to some tentative conclusions about inflation and its likely trajectory over the coming years:

- With structural models of inflation that highlight the importance of expectations and monetary policy (the models discussed in this paper), the current configuration of output gaps (however poorly estimated) and the low level of real marginal cost suggest that inflation is likely to remain low, perhaps even declining, and below the Federal Reserve's implicit goal for several years.

- Within more formal models of inflation, apart from the extreme position of a purely forward-looking model, there are significant downside risks to inflation, even if expectations are very well anchored.

- Evidence on the influence of survey measures of inflation expectations on current inflation suggests that model-consistent expectations have not reflected well the expectations that have influenced CPI or PCE inflation over the past three decades. The effect of lagged inflation has been large at times, but appears to have declined in recent years.

- Expectations that are well-proxied by slow-moving survey expectations appear to have had some influence over the decades; for some models that influence has recently increased.

- In a model that substitutes slow-moving survey expectations measures for model-consistent expectations, the forecast for the near term envisions a decline in inflation that is somewhat more muted. In this sense, the risks to more pronounced disinflation could be mitigated by well-anchored inflation expectations. Correspondingly, however, the time required for inflation to rise to the Fed's implicit goal will be quite long.

Implications

While numerous issues surround the measurement and definition of the output or unemployment gap that sits at the center of many inflation models, evidence in this paper is consistent with that of Stock and Watson (2009). Both they and the authors of this brief find that gaps are important predictors of inflation in periods (such as the current one) characterized by what appear to be large activity gaps, for example, an unemployment rate that is more than 1.5 percentage points from its estimated (time-varying) non-accelerating inflation rate of unemployment (NAIRU).

Altogether, these observations suggest that across a fairly wide array of inflation frameworks, one would expect U.S. inflation to decline in the near term. Precisely how much depends on the model's key parameters, about which the authors admit a fair amount of uncertainty. But one extreme among the alternative inflation models—a purely forward-looking model with little effect from inertial variables—appears to be significantly at odds with the data. It could be risky to count too much on the implications of such a framework.

Conferences

Oil and the Macroeconomy in a Changing World: A Symposium

agenda and presentations: http://www.bos.frb.org/economic/conf/oil2010/index.htm

The Federal Reserve Bank of Boston held an interactive symposium, *Oil and the Macroeconomy in a Changing World*, on June 9, 2010, in Boston. The symposium gathered oil-market experts, industry analysts, and academic authorities to discuss their perspectives on the science, technology, politics, and economics of oil and competing energy sources and to share their views with economists and policymakers from the Federal Reserve System and other institutions, as well as academics and business leaders. Key topics included the historical context, the supply and demand for oil, financial innovation and oil markets, modeling oil prices, and the macroeconomic effects of oil-price shocks.

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