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Executive Summaries in This Issue

Public Policy Discussion Papers

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Public Policy Discussion Papers

p-09-4

Why Don't Lenders Renegotiate More Home Mortgages? Redefaults, Self-Cures, and Securitization

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

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0904.htm
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Motivation for the Research

Many commentators have attributed the severity of the foreclosure crisis in the United States during 2007–2009 to the unwillingness of lenders to renegotiate mortgages—and as a consequence have placed renegotiation at the heart of the policy debate. It is easy to understand the appeal of renegotiation to policymakers: if a lender makes a concession to a borrower by, for example, reducing the principal balance on the loan, it can prevent a foreclosure. This is clearly a good outcome for the borrower, and possibly good for society as well. But the key to the appeal of renegotiation is the belief that it can benefit the lender too: the reasoning holds that the lender loses money only if the reduction in the loan's value exceeds the loss the lender would sustain in a foreclosure. In short, proponents of home mortgage renegotiation see it as a type of public policy holy grail, in the sense that it may help both borrowers and lenders while costing the government little.

In this paper, the authors seek to discover why renegotiation is so rare in practice, since it seemingly benefits both borrowers and lenders. The leading explanation for lenders' reluctance to renegotiate has been the process of securitization, which involves slicing and dicing the loans into many pieces and selling them to other investors, distributing ownership rights in the process. Thus, securitization sets up conflicting interests that complicate what might otherwise have been a simple resolution between the borrower and the original lender. But some market observers and researchers have expressed doubts about the role securitization plays in limiting such renegotiations.

Research Approach

The authors employ a variety of analytical and statistical techniques to examine a large, detailed dataset of residential mortgages from Lender Processing Services (LPS), covering approximately 60 percent of the U.S. mortgage market. They explore several definitions of renegotiation, looking initially at concessionary modifications that serve to lower a borrower's monthly payment by reducing the principal balance or interest rate, by extending the term of the loan, or by employing various combinations of these methods. Renegotiation that involves lowering a borrower's monthly payment is a key focus of the analysis, because many market observers believe that concessionary modifications are the most, or possibly the only, effective way to prevent foreclosures. The authors then broaden the definition of renegotiation to include any modification, regardless of whether it lowers the borrower's payment. Modifications are often thought to always involve concessions to the borrower, but many involve the capitalization of arrears into the balance of the loan and thus lead to increased monthly mortgage payments.

To examine the effect of securitization on renegotiation rates, the authors compare renegotiation rates for two types of loans: private-label loans—loans serviced for private securitization trusts not sponsored by any of the government sponsored enterprises (GSEs) such as Fannie Mae and Freddie Mac—and portfolio loans—loans that are kept on banks' balance sheets. Private-label loans are subject to contract frictions, including global limits on the number of modifications a servicer can perform for a particular pool of mortgages, expense reimbursement rules that may provide a perverse incentive to foreclose rather than modify a loan, and the possibility that investors whose

claims are adversely affected by modification may take legal action. Portfolio loans are immune to such frictions, but may be subject to accounting concerns on the part of banks and servicer resource constraints.

One potential problem with the data is that there may be unobserved heterogeneity in the characteristics of portfolio and private-label loans. To address this, the authors exploit subsets of the LPS data, in which servicers provide an exceptional amount of information about borrowers. To further test the robustness of the results, the authors limit the sample to only subprime loans (as defined by LPS). These loans comprise only 7 percent of the LPS data but account for more than 40 percent of serious delinquencies and almost 50 percent of the modifications identified in the data. Another potential issue, arising from the authors' focus on 60-day delinquent loans, is that portfolio lenders can contact borrowers at any time, whereas some securitization agreements forbid lenders from contacting borrowers until they are seriously delinquent (at least 60-days late, equivalent to two missed payments). To address this, the authors also examine 30-day delinquent borrowers (one missed payment).

By looking at the "cure rate"—the percentage of delinquent loans that transition to current status after being 60-days late—in both the full sample and the subprime sample, the authors test the proposition that servicers engage in loss mitigation actions other than renegotiation, for example, forbearance agreements and repayment plans. They then formalize the basic intuition of the investor renegotiation decision with a simple theoretical model that, in a stylized way, mirrors the net present value calculation that servicers are supposed to perform when deciding whether to offer a loan modification. Finally, because so much of the policy debate has focused on institutional obstacles to modification—particularly obstacles associated with securitization—the authors examine institutional evidence to further test their conclusions.

Key Findings

- Regardless of the definition of renegotiation used, one message is quite clear: lenders rarely renegotiate. Fewer than 3 percent of the seriously delinquent loans in the sample received a concessionary modification in the year following the first serious delinquency. More loans were modified under the broader definition, but the total number of renegotiations still accounted for fewer than 8 percent of the seriously delinquent loans. These numbers are small both in absolute terms and relative to the approximately half of the sample of seriously delinquent loans against which foreclosure proceedings were initiated and the nearly 30 percent that were completed.

- The empirical analysis provides strong evidence against the role securitization plays in preventing mortgage renegotiations. For the narrowest definition of renegotiation, a payment-reducing modification, the differences between a private-label loan and a portfolio loan in the likelihood of renegotiation in the 12 months subsequent to the first 60-day delinquency is neither economically nor statistically significant. For the broader definition that includes any modification at all, which one would expect to be most affected by securitization, the data reject even more strongly the role of securitization in preventing renegotiation. Servicers are more likely to perform modifications, broadly defined, and to allow the borrower to prepay on a private-label loan than on a portfolio loan.

- The results are highly robust. When the authors exclude observations where the servicers failed to report whether the borrower's income was fully documented at origination, or what the debt-to-income ratio was at origination, the results become even stronger. For loans made with full documentation of the borrower's income at origination, the results are broadly consistent with, or in some cases stronger than, the results for the full sample. Results for the subprime sample only are also consistent with the results for the full sample. Focusing on 30-day delinquencies rather than 60-day delinquencies continues to show no meaningful difference between renegotiation rates of private-label and portfolio loans.

- In the full sample, private-label loans are less likely to cure, but the gap, although statistically significant, is small—correcting for observable characteristics. The authors find a cure rate of around 30 percent for the typical portfolio loan and about 2 percentage points less for an otherwise equivalent private-label loan. However, for three subsamples—subprime loans, loans with information about income documentation and debt-to-income status, and fully documented loans—the private-label loans are significantly more likely to cure than portfolio loans.

- The model results show that higher cure rates, higher redefault rates, higher expectations of house price depreciation, and a higher discount rate all make renegotiation less attractive to the investor. Thus, one cannot evaluate a modification by simply comparing the reduction in the interest rate on the loan or in the principal balance with the expected loss in foreclosure. One must take into account both the redefault and the self-cure risks, something that most proponents of modification fail to do.

Implications

If contract frictions are not a significant problem, then what is the explanation for why lenders do not renegotiate with delinquent borrowers more often? The authors argue for a very mundane explanation: lenders expect to recover more from a foreclosure than from a modified loan. This may seem surprising, given the large losses lenders typically incur in foreclosure, which include both the difference between the value of the loan and the collateral and the substantial legal expenses associated with the conveyance. The problem is that renegotiating exposes lenders to two types of risks that can dramatically increase their cost. The first is what the authors call "self-cure" risk: more than 30 percent of seriously delinquent borrowers "cure" without receiving a modification; if taken at face value, this means that as much as 30 percent of the money a lender spends on modifications is wasted. The second cost comes from borrowers who subsequently redefault; the results show that a large fraction of borrowers who receive modifications become seriously delinquent again within six months. For them, the lender has simply postponed an inevitable foreclosure, and in a market environment with rapidly falling house prices, the lender will now recover even less in foreclosure. In addition, a borrower who faces a high likelihood of eventually losing the home will do little or nothing to maintain the property and may even contribute to its deterioration, again reducing the lender's expected recovery.

This research has three main implications for policy. First, "safe harbor" provisions, which shelter mortgage loan servicers from investor lawsuits, are unlikely to affect the number of modifications. Second, and more broadly, the number of "preventable foreclosures" may be far fewer than many observers believe. Finally, the model result showing why investors may not want to perform modifications does not necessarily imply that modifications may not be socially optimal. One key input to the authors' theoretical model is the discount rate, and it is possible that investors, especially in a time when liquidity is highly valued, may be less patient than society as a whole and therefore may pursue foreclose when the broader society would prefer renegotiation. Large financial incentives to investors or even to borrowers to continue payment could mitigate this problem

p-09-5

Securitization and Moral Hazard: Evidence from a Lender Cutoff Rule

by Ryan Bubb and Alex Kaufman

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0905.htm
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Motivation for the Research

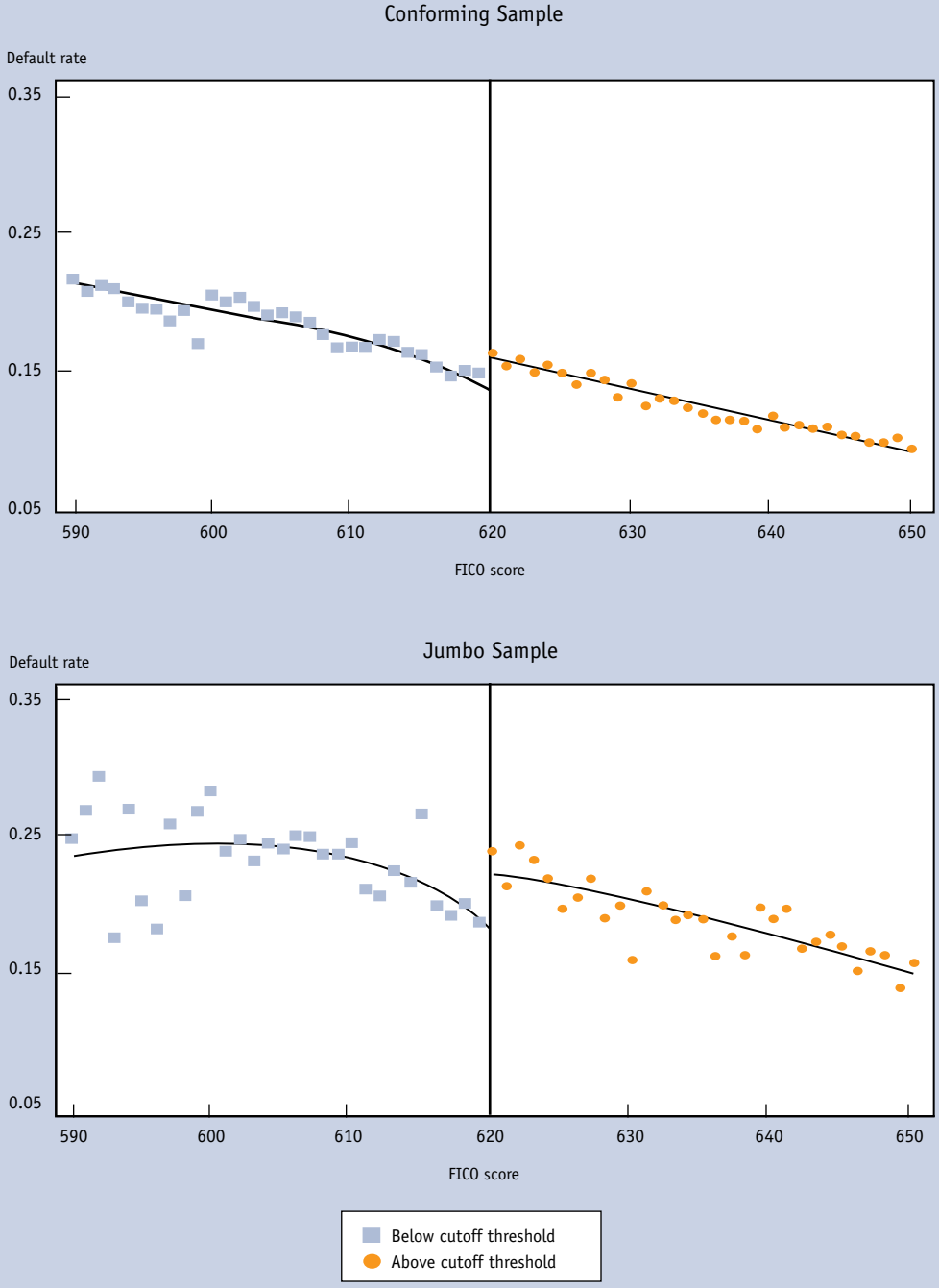
A key question about the recent subprime mortgage crisis is whether securitization reduced originating lenders' incentives to carefully screen borrowers. A fundamental role of financial intermediaries is to produce information about prospective borrowers in order to allocate credit. But lenders' incentives to generate information and screen borrowers may be attenuated if they know that they plan to securitize the loans they originate by selling them to dispersed investors. On the other hand, rational loan purchasers may recognize this moral hazard problem and take steps to mitigate it. Determining whether securitization played a role in the recent sharp rise in mortgage defaults is critical to evaluating the social costs and benefits of securitizing residential mortgages.

One promising strategy to address this question is to examine variation in the behavior of market participants induced by credit score cutoff rules. Credit scores are used by lenders as a summary measure of default risk, with higher credit scores indicating lower default risk. Histograms of mortgage loan borrower credit scores reveal that they are step-wise functions. It appears that borrowers with credit scores above certain thresholds are treated differently than borrowers just below these thresholds, even though potential borrowers on either side of the threshold are very similar. These histograms suggest using a regression discontinuity design to learn about the effects of the change in behavior of market participants at these thresholds. But how and why does lender behavior change at these thresholds? In this paper, the authors attempt to distinguish between two explanations for credit score cutoff rules, each with different implications for what they imply about the relationship between securitization and lender moral hazard. The authors investigate two hypotheses to explain the cutoff rules: the explanation currently most accepted in the literature, which Bubb and Kaufman call the securitizer-first theory, and an alternative theory, which Bubb and Kaufman propose in this paper and call the lender-first theory.

The securitizer-first theory, initially put forth by Keys, Mukherjee, Seru, and Vig (2008), posits that secondary-market mortgage purchasers employ rules of thumb whereby they are exogenously more willing to purchase loans made to borrowers with credit scores just above some cutoff. The difference in the ease of securitization induces mortgage lenders to adopt weaker screening standards for loan applicants above the cutoff, since lenders know they will be less likely to keep these loans on their books. In industry parlance, they will have less "skin in the game." Because lenders screen applicants more intensely below the cutoff than above, loans below the cutoff are fewer but of higher quality (that is, they have a lower default rate) than loans above the cutoff.

In the lender-first theory, the causality goes the other way. As in the securitizer-first theory, lenders will collect additional information only about applicants whose credit scores are below the cutoff score. According to this theory, the reason they do so is that the benefit to lenders of collecting additional information and thereby screening out more high-risk applicants is greater for borrowers at higher risk of default than for those at lower risk of default and therefore outweighs the per-applicant fixed cost of screening, which drives use of the cutoff rule. A screening cutoff rule also results in a discontinuity in the amount of private information lenders have about loans. Securitizers may respond to this problem in a variety of ways. Because the efficient amount of screening is greater and therefore more costly below the screening cutoff, rational securitizers who are unable to contract on

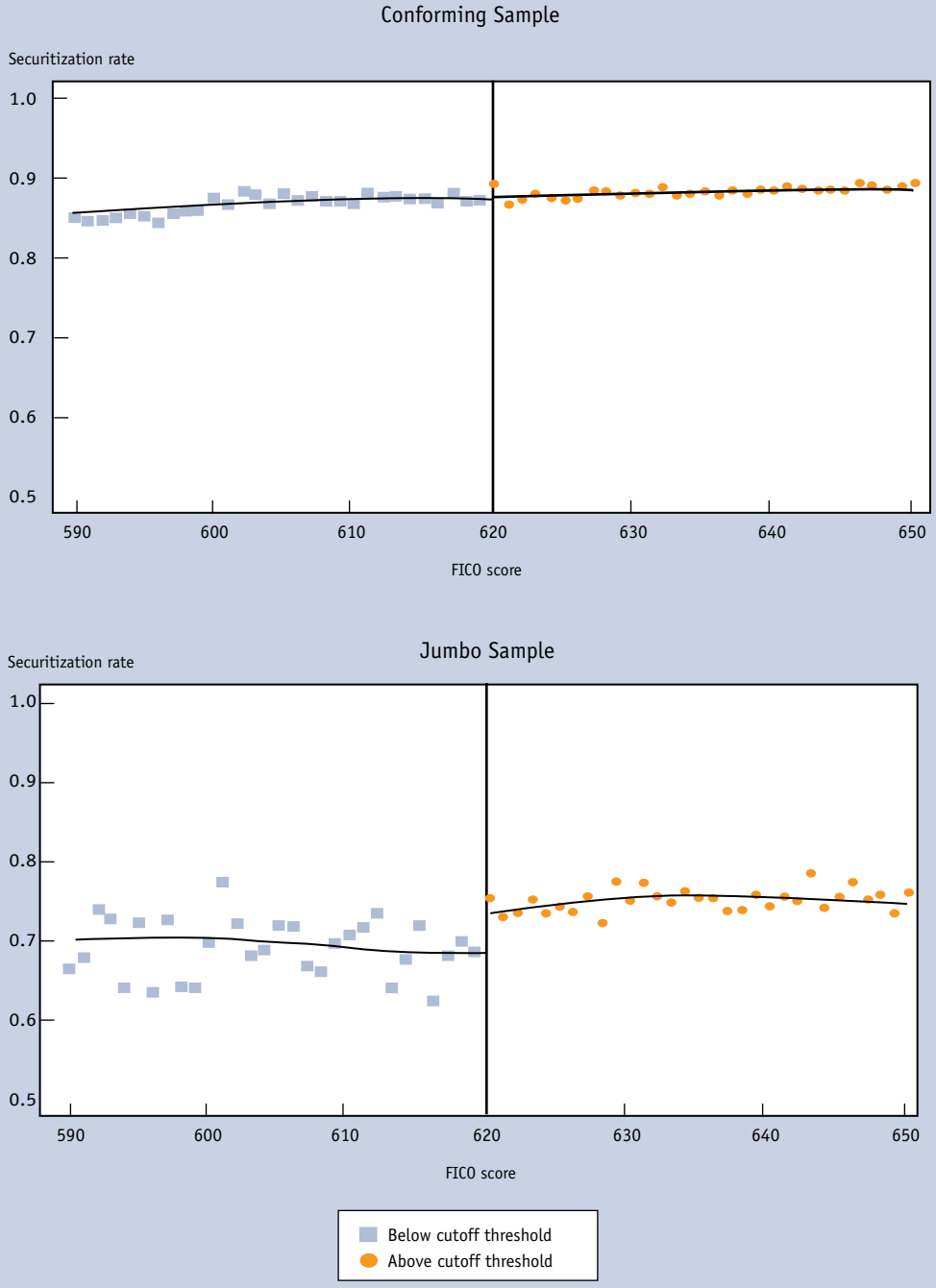
Rates of Conforming and Jumbo Loans by FICO Score



Source: Authors' calculations.
Note: Fitted curves from 6th-order polynomial regression on FICO interval [500,800} without year fixed effects.

screening directly because of asymmetric information may reduce loan purchases below the cutoff score, leaving more loans on the books of originating lenders, in order to maintain their incentives to bear the costs of efficient screening. However, if securitizers have alternative incentive instruments to police lender moral hazard, they may use those instruments rather than leave more loans below the threshold credit score on the books of lenders.

Rates of Conforming and Jumbo Loans by FICO Score



Source: Authors' calculations.
Note: Fitted curves from 6th-order polynomial regression on FICO interval [500,800} without year fixed effects.

Under the securitizer-first theory, finding discontinuities in the default rate and securitization rate at the same credit score cutoff is evidence that securitization led to moral hazard in lending screening. Under the lender-first theory, finding discontinuities in the default rate and the securitization rate at the same credit score cutoff is evidence that securitizers that had asymmetric information-adjusted purchases to maintain lenders' incentives to screen. The robust prediction of the lender-first theory

is that lenders will use cutoff rules—how securitizers will respond to this situation depends on their degree of sophistication and on the incentive instruments they have available to police lenders' moral hazard.

The securitizer-first model predicts discontinuities in the lending, default, and securitization rates expected for a single FICO score. This pattern of predictions is similar to that of the lender-first model in the case of a rational securitizer with asymmetric information, except that the endogenous screening threshold has been replaced by the securitizer's exogenous threshold. Moreover, under the securitizer-first theory, the change in the default rate of loans at the securitizer's threshold cutoff score is a measure of the extent to which securitization leads originating lenders to conduct less applicant screening.

Research Approach

To test these two theories of credit score cutoff rules, the authors examine loan-level data from Lender Processing Services.These are data collected through the cooperation of 18 large servicers, including 9 of the top 10 mortgage servicers in the United States. After establishing that the data show discontinuities in the frequency of loan issuance, with the largest discontinuity in log point terms occurring at a FICO score of 620, the authors develop a lender-first model in which the securitization rate jumps up discontinuously as the screening threshold is crossed from below. The authors then use the loan-level data and institutional evidence to test the lender-first and the securitizer-first theories.

Key Findings

- Institutional evidence suggests that, as predicted by the lender-first theory, lenders make discrete choices about screening intensity at a FICO score of 620, for reasons unrelated to the ease of securitization.

- The lender-first theory of cutoff rules is substantially more consistent with the data than is the securitizer-first theory: evidence from the loan-level dataset shows that in the conforming mortgage market, largely serviced by the government-sponsored enterprises Fannie Mae and Freddie Mac, as well as in a low-documentation sample, there are screening cutoffs at 620 but no securitization discontinuity—a pattern of evidence consistent with the lender-first theory but not with the securitizer-first theory.

- In the jumbo mortgage market for large, nonconforming loans (in 2010, greater than $417,000 in the contiguous United States for a single-family residence), in which only private securitizers participate, the securitization rate is lower just below the screening threshold (a FICO score of 620). This suggests that private securitizers were aware of the moral hazard problem posed by loan purchases and sought to mitigate it. However, in the conforming (non-jumbo) market dominated by the GSEs, there is a substantial jump in the default rate at the 620 threshold but no jump at 620 in the securitization rate. One possible explanation for this result could be that the GSEs were unaware of the moral hazard threat posed by securitization. An arguably more plausible explanation is that, as large repeat players in the industry, the GSEs had alternative incentive instruments to police lender moral hazard.

Implications

Interpreting the cutoff rule evidence in light of the lender-first theory, the results from this study suggest that private mortgage securitizers adjusted their loan purchases around the lender screening threshold in order to maintain lender incentives to screen applicants. Although the paper's findings suggest that securitizers were more rational with regard to moral hazard than previous research has judged, the extent to which securitization contributed to the subprime mortgage crisis is still an open and pressing research and public policy question.

p-09-6

Reinvigorating Springfield's Economy: Lessons from Resurgent Cities

by Yolanda K. Kodrzycki and Ana Patricia Muñoz, with Lynn Browne, DeAnna Green, Marques Benton, Prabal Chakrabarti, David Plasse, Richard Walker, and Bo Zhao

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0906.htm
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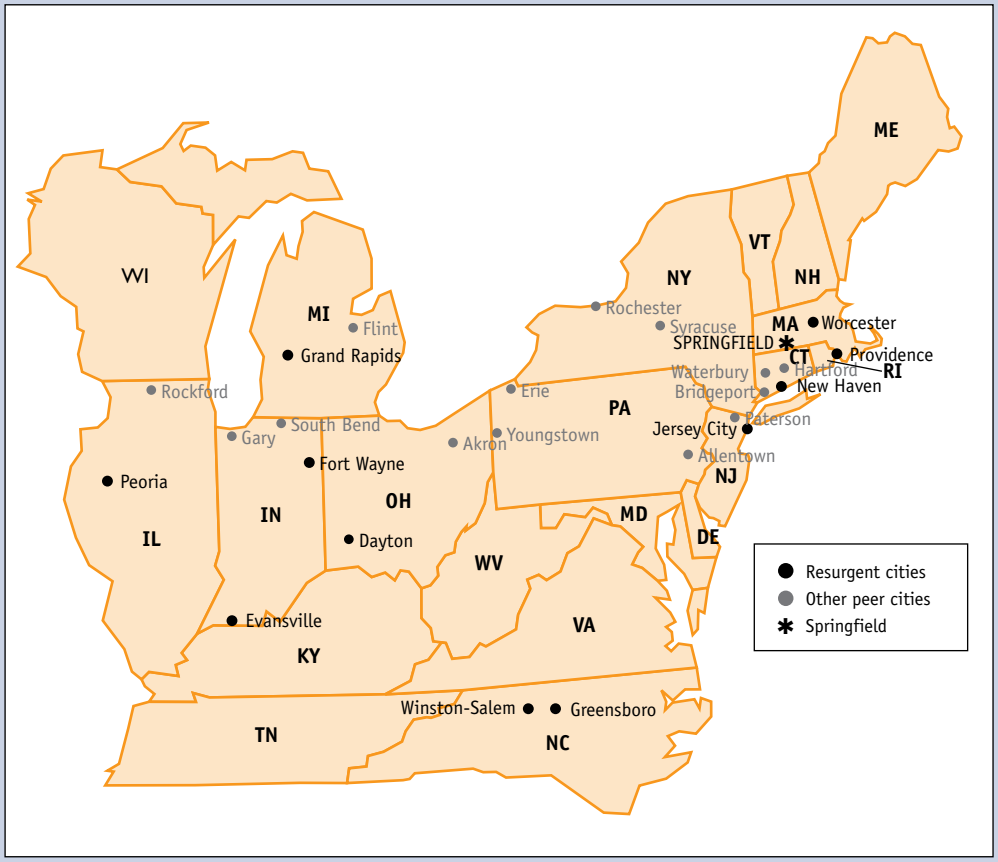
Motivation for the Research

The economic position of Springfield, Massachusetts, has eroded over the past five decades. In 1960, median family income in the city was slightly higher than the national average. By the mid-2000s, median family income in Springfield had decreased to only about two-thirds of the national average. Its poverty rate went from a little below average in 1980 to over twice the U.S. average in recent years. To some extent, this deterioration in Springfield's living standards reflects the forces of deindustrialization and suburbanization that challenged many city economies during these decades. However, these nationwide forces do not fully account for Springfield's decline. Although its economic position was in line with its peer group of mid-sized manufacturing-oriented cities in the 1960s, by 2005–2007

Springfield, MA and 25 Peer Cities



*Based on population, employment in manufacturing, and the role of the city in the region in 1960.

median annual family income in Springfield had fallen to nearly $4,000 below the peer-city average and the poverty rate had risen to 4 percentage points above the peer-city average. As part of the Federal Reserve Bank of Boston's commitment to supporting efforts to revitalize Springfield's economy, this paper seeks to draw some lessons that may be useful in guiding the city's revitalization efforts.

Research Approach

From among a comparison group of 25 municipalities that were similar to Springfield in 1960, the study identifies and draws some lessons from 10 "resurgent cities" that have made substantial progress in improving living standards for their residents compared with other metropolitan centers facing similar challenges and opportunities. Recognized by experts on economic development and policy as vital communities in a broader sense, these 10 peer cities were chosen based on their being mid-sized manufacturing-oriented cities and on the role each city plays in its region. Like Springfield, each of the peer cities constitutes the primary urban center of its metropolitan area. Most had a population of between 100,000 and 200,000 residents from 1960 to 1980, although a few started with larger populations in 1960 before declining in size.

To characterize the cities, the authors considered broad measures of residents' economic well-being plus other information on community vitality drawn from a wide range of reports, books, and newspaper articles, and they focused on long-term trends as opposed to more temporary developments associated with business cycles. From the set of peer group cities, the authors defined the subset of resurgent cities as those showing better performance than Springfield in each of the following respects: the median family income in 2005–2007, change in median family income ranking since 1960, poverty rate, and percentage point change in poverty rate since 1980. The percentage change in population since 1960 and additional indicators were used as secondary criteria to distinguish resurgent cities from others in the peer group.

After identifying the resurgent cities and quantifying key economic and social differences between these 10 cities and Springfield, the authors present a brief economic history of Springfield. This is followed by case studies of each of the resurgent cities, focusing on their challenges and economic development efforts. The authors conclude by drawing lessons from the case studies and suggesting implications for Springfield.

Key Findings

- The research strongly suggests that industry mix, demographic composition, and geographic location are not the key factors distinguishing the resurgent cities from Springfield. Therefore, the erosion of Springfield's economic position relative to its peer cities has been due mostly to other factors. Identifying these other factors and taking the appropriate actions is likely to increase Springfield's chances of reaching its economic potential.

- The most important lessons from the resurgent cities concern leadership and collaboration. Initial leadership in these cities came from a variety of key institutions and individuals. In some cases, the turnaround started with efforts on the part of the public sector, while in other cases nongovernmental institutions or private developers were at the forefront. In all cases, the instigators of revitalization in the peer group cities recognized that it was in their own interest to prevent further deterioration in the local economy, and they took responsibility for bringing about improvement. Regardless of who initiated the turnaround, economic redevelopment efforts spanned decades and involved collaborations among numerous organizations and sectors. These joint efforts involved creating new, distinct entities, with names like "Growth Alliance" or "Development Corporation."

- The stories of the resurgent cities involve fundamental shifts in local economies and human and physical infrastructure. Mid-sized cities that were once known for manufacturing goods rang-

ing from refrigerators and home furnishings to jewelry and cigarettes have earned new identities. Many have turned to more technology-related forms of manufacturing for part of their transformation. All of the cities have diversified their economic base away from the manufacturing sector.

- In addition to experiencing blows from the recent nationwide recession and financial crisis, the resurgent cities continue to face the challenges of providing quality education and training to broader segments of their populations and extending the benefits of resurgence to more of their neighborhoods. Their efforts along these lines are multifaceted but often involve key initiatives on the part of local educational institutions and foundations.

Implications

This study attempts to lay out reasonable aspirations for Springfield and add to the available information concerning the economic development approaches tried by its peer cities. On one hand, the message is a positive one: nothing about Springfield's past or present industry mix, demographic composition, or geography prevents the city from becoming as successful as the 10 resurgent cities that confronted similar circumstances half a century ago. On the other hand, the report challenges Springfield's various constituencies to compare their actions with those taken by their counterparts in other cities and to formulate and act upon some fresh ideas about how to deal with the lingering challenges facing the city.

p-09-7

Did Easy Credit Lead to Overspending? Home Equity Borrowing and Household Behavior in the 2000s

by Daniel Cooper

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0907.htm
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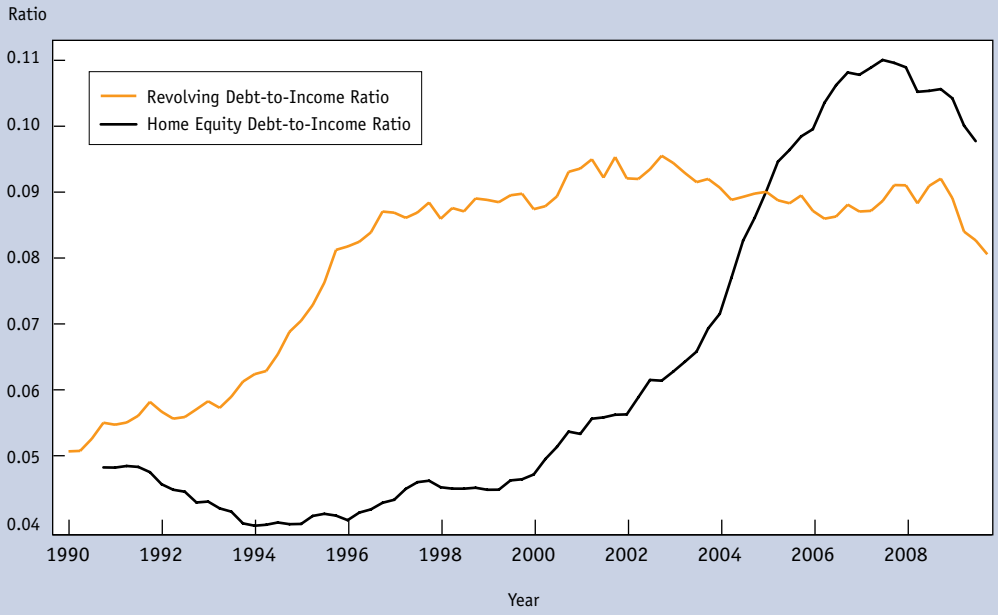
Motivation for the Research

According to work by Greenspan and Kennedy (2007), U.S. households' net equity extraction from their homes averaged nearly 6 percent of disposable income between 2001 and 2005. This paper examines the role of equity extraction during the recent house-price boom by analyzing what factors influence households' decisions to extract equity from their homes. The paper further considers how equity extraction affects household spending, balance sheets, and residential investment.

There are multiple reasons why households may extract equity from their homes besides the need to finance desired expenditures and/or to smooth consumption in response to a negative income shock. Households may borrow to make home repairs or improvements. In this case, equity extraction is used to fund residential investment needs. Alternatively, households may borrow against their homes to consolidate more costly debt, such as credit cards. Recently, home equity credit has been one of the cheapest forms of borrowing, so it makes sense for households to substitute toward such financing. Not only are the interest rates on home equity lines of credit low compared with rates on credit cards, but interest payments on home equity debt are, for the most part, a tax-deductible expense. Home equity borrowing may also offer households a less expensive (and tax-deductible) way to help finance their children's education. In this regard, equity extraction helps finance human capital investment. Households may extract equity to invest in personal businesses or other entrepreneurial ventures, and to help finance the purchase of second homes and/or other real estate. Finally, some households may extract equity to engage in a form of investment arbitrage. To the extent that such households believe they can earn a greater return in the financial markets than the tax-adjusted cost of equity extraction, they may borrow against their homes to invest in stocks, bonds, or other financial instruments

Home Equity and Credit Card Debt



Sources: Income - NIPA; Home Equity Debt - Federal Reserve Z.1 release; Revolving Debt - Federal Reserve G.19 release.

Understanding households' uses of extracted equity is important for understanding the potential implications of the decline in house prices and households' reduced ability to borrow against their homes. Equity extraction that goes primarily toward funding household expenditures is potentially a concern, since it will likely cause a decline in consumption when house prices fall, and consumer spending makes up nearly two-thirds of U.S. GDP. A reduction in the availability of cheap forms of credit to fund investment in residential or human capital is also a concern, but the macroeconomic implications are likely different from the impact of a fall in consumer spending. In addition, if much of households' extracted home equity goes toward balance sheet reshuffling, then a drop in available home equity will likely lead to fewer balance sheet changes and have a much more limited impact on the overall macroeconomy than a sharp drop in household expenditures.

Research Approach

Using data through 2009 from the Panel Study of Income Dynamics (PSID), the author estimates a cross-sectional, binary choice model to study the determinants of a household's decision to extract equity from its home. In addition, he uses a consumption function to study whether consumption rises (or falls) when households extract home equity, conditional on the other factors that are known to explain households' spending behavior. The PSID tracks households over time and includes detailed data on households' income, housing wealth, mortgage debt, balance sheets, automobiles, active saving, and home improvement investments. Beginning in 1999, the PSID added detailed data on household expenditures in addition to food consumption, and the spending data were further extended in 2005 to cover most of households' personal spending categories. The 2009 data are available in a limited pre-release from the PSID and include information on homeownership and household balance sheets, but not on household spending or income. The analysis of households' reasons for extracting equity focuses on the 1997–2009 period.

Key Findings

- Households with greater financial wealth were less likely to extract equity than other households, since wealthier households possessed other resources to finance their spending and investment needs. Households with less than 20-percent equity in their homes were substantially less likely to borrow, as they had less extractable equity available. Households with college-age children also had a higher predicted probability of borrowing against their homes, consistent with some households' extracting equity to finance educational expenses. The bi-yearly results over the sample period suggest that the vast majority of households whose head was unemployed for 13 weeks or more during the year were more likely to extract equity, and households with higher income growth were less likely to extract equity, although neither effect is precisely estimated. There do not appear to be time-specific patterns in the reasons for equity extraction.

- A $1 increase in equity extraction between 2003 and 2007 led to a 10 to 20 cent increase in overall nonhousing expenditures for homeowners who did not relocate. This effect appears strongest in the 2003 and 2005 periods (covering equity extraction in 2001–2003 and 2003–2005, respectively), which preceded the 2006 downturn in house prices. The exact expenditure categories that increased as a result of extraction in these years varied somewhat, but overall the increase was broadly concentrated in transportation-related expenses, food, schooling, and minor home upkeep (including utilities). Equity extraction had a much smaller impact on consumer spending in 1999 and 2001, when a good portion of the expenditure impact was concentrated in healthcare costs.

- Equity extraction also resulted in greater residential investment (home improvement spending), as well as increased household saving. During the 2003–2005 and 2005–2007 periods, a $1.00 increase in equity extraction led to a roughly 20 cent increase in capital spending on home additions and improvements for households that made such improvements. Household saving increased by a similar amount over those time intervals. Overall, there was a positive relationship between equity extraction and household saving between 2001 and 2007. The exact balance sheet location for the increased saving varies by period, but, overall, households extracted equity to invest in personal businesses as well as other real estate.

- The results do not explain the entire destination of each dollar of equity extracted during the recent U.S. house-price boom. This is likely because the PSID data do not adequately account for households that extracted home equity as part of financing the purchase of a new home.

Implications

It will be interesting to see how U.S. household behavior with regards to home equity borrowing changes, now that prices have dropped and households' outstanding equity has generally declined. The pre-release 2009 data provide a glimpse of what may happen, but it is difficult to draw strong conclusions from such limited data. What little data there are suggest that some of the household saving patterns in response to equity extraction observed in this paper remain, but are perhaps less strong.

An additional question worth considering in future work is the extent to which the timing of the data matters for capturing the relationship between equity extraction and household spending and investment behavior. In particular, this paper finds little if any empirical relationship between equity extraction and repayment of noncollateralized debt (credit card debt and education loans) despite the potential cost savings for households and anecdotal evidence suggesting that households did indeed extract equity to consolidate other debt. This paper argues that this discrepancy could be due to the timing of the PSID data, and the larger question is whether one gains additional insight into household behavior by trying to pin down households' spending and investment decisions at the exact moment they choose to extract home equity. It is not clear whether such data exist, however, and this issue is left for consideration in future work.

p-09-8

A TIPS Scorecard: Are TIPS Accomplishing What They Were Supposed to Accomplish? Can They Be Improved?

by Michelle L. Barnes, Zvi Bodie, Robert K. Triest, and J. Christina Wang

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0908.htm
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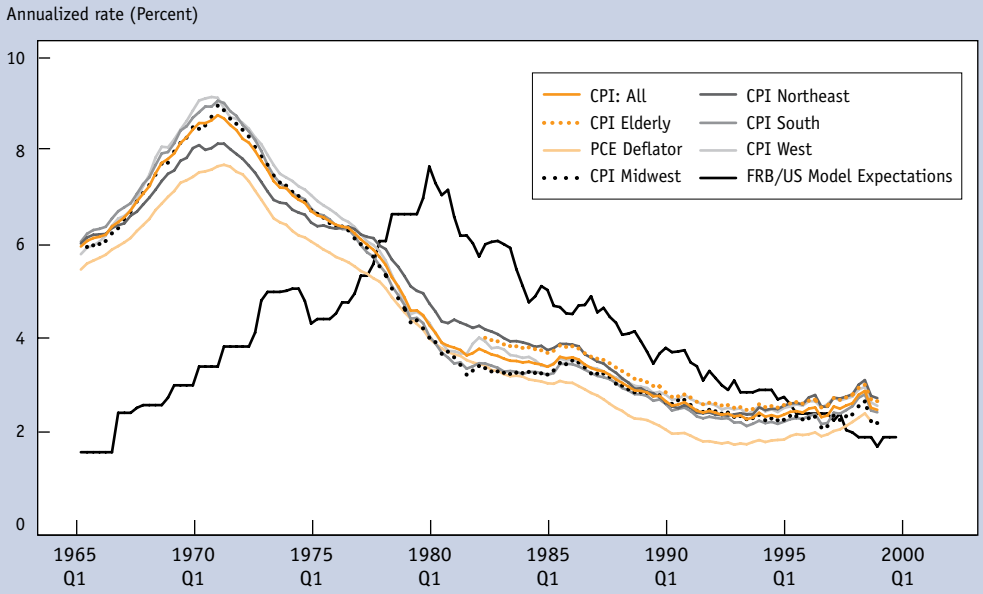
Motivation for the Research

The U.S. Treasury designed and issued Treasury Inflation-Protected Securities (TIPS) in order to achieve three major policy objectives: (1) to provide consumers with a class of assets that enable them to hedge against real interest rate risk; (2) to provide holders of nominal contracts with a way to hedge against inflation risk; and (3) to provide everyone with a reliable indicator of the term structure of expected inflation. This paper examines the extent to which these objectives have been achieved and seeks to identify ways they can be achieved better in the future.

The viability of the TIPS market hinges on whether TIPS provide an effective hedge for most investors against unexpected changes in the real rate of interest that could result from unexpected fluctuations in inflation. Inflation-protected indexed bonds are designed to deliver, a certain pre-tax real return to maturity. In the United States, these bonds are indexed to the nonseasonally adjusted consumer price index for all urban consumers (CPI-U). This paper focuses on two important factors that may limit the ability of this class of securities to offer investors a complete hedge against unexpected changes in the real rate: (1) the possibility that the CPI may not be an appropriate index for all investors, and (2) the potential for biases due to technical revisions to the measurement of the CPI, such as those recommended by the Boskin Commission just before the initial TIPS auction in January 1997. Either or both of these factors could engender inflation basis risk.

Actual and Expected Inflation Over a 10-Year Horizon



Source: Haver Analytics, Bureau of Labor Statistics, Bureau of Economic Analysis, and Federal Reserve Board.

During the summer of 2008, a spate of popular press articles emerged claiming that the existing methodology for computing the CPI underestimates true inflation. It was even asserted that the measure is subject to political influence and has been biased downward over time via methodological changes made during several presidential regimes. Since these concerns speak to uncertainties regarding TIPS' ability to hedge effectively against unexpected changes in the real rate, it is not surprising that a few of these articles concluded that TIPS are not, in fact, good hedges of inflation for many investors. Another criticism of TIPS that arises occasionally is that break-even inflation rates as implied by simultaneously considering the TIPS and nominal Treasury markets often diverge substantially from survey measures of inflation expectations. Such mounting criticisms and concerns could jeopardize the viability of the TIPS market. This paper evaluates the premises of these criticisms, and, to the extent that the criticisms are valid, assesses their implications for the efficacy of TIPS as a hedge against unexpected changes in the real rate of interest.

Research Approach

The authors explain the design of TIPS, their tax implications for investors, the demographics of TIPS holders, and other considerations relating to whether TIPS should yield measures of break-even inflation rates comparable with survey measures of consumers' inflation expectations. The authors use both theoretical and empirical analysis to evaluate criticisms of the CPI as an inflation benchmark used to adjust the return on TIPS and discuss a number of issues that have been raised concerning TIPS. These issues include: whether the potential mismeasurement of the CPI is relevant to the efficacy of TIPS as a hedging instrument to guarantee the real return, whether the CPI is a good measure for everyone, and whether there might be more appropriate measures for certain heterogeneous groups, as well as the costs and benefits of issuing such securities. The authors then demonstrate the efficacy of TIPS as a short-term versus a long-term hedge by comparing various ex ante and ex post inflation measures. They conclude by drawing implications of their findings for the design of the TIPS market.

Key Findings

- Buying and holding to maturity a newly issued TIPS is an effective way to lock in a risk-free real rate of return. If TIPS had been available during the 1970s and early 1980s (periods characterized by high or highly fluctuating inflation), they would have been a very effective means of achieving a certain real rate of return. In contrast, long-term nominal Treasury issues produced unexpectedly erratic rates of return.

- Although there are important differences across price indexes, the changes in the inflation rate based on the CPI-U are highly correlated with inflation rates based on other price indexes over long periods. In particular, many measures of inflation, including those designed for the elderly or based on particular geographic regions, move together, so differences among these measures are swamped by the difference between any of these measures and any survey-based measure of expected inflation.

- The difference between expected (ex ante) real yields on long-term Treasuries at the time of issue and their ex post realized real returns provides one measure of the potential value of TIPS as a hedge against unexpected fluctuations in inflation.

- Inflation basis risk arising from mismeasurement of the CPI is both small and uncorrelated with common risk factors, suggesting that the concern on the part of the popular press that such mismeasurement leaves TIPS investors poorly hedged against inflation risk is unfounded. Since various inflation measures are so highly correlated, it follows that inflation basis risk arising from specific mismeasurement issues or from the fact that certain heterogeneous groups may face different inflation rates also tends to be uncorrelated with common risk factors, implying that the CPI-U is a good index for TIPS for a variety of investors, despite a variety of measurement issues.

- Buy-and-hold investors are hedged best, and investors who buy and hold long-maturity TIPS are better hedged than investors who hold short-term TIPS maturities. The same shocks that generate unexpected changes in inflation will alter the coupon yield on new TIPS issues, so the short holding period strategy becomes an ineffective hedge against short-term inflation fluctuations.

- TIPS-implied break-even inflation rates are conceptually not the same as inflation expectations and hence are not necessarily good measures of inflation expectations. As a result, TIPS-implied break-even inflation rates are also unlikely to be good forecasts of future inflation.

- For investors subject to the federal income tax, TIPS can provide protection against only a fraction of inflation because the inflation compensation of TIPS is taxable on individual federal returns. This is essentially no different than the tax treatment on nominal bonds, since the inflation premium component of nominal interest payments is also taxed. Of course, the investor receives full inflation protection if TIPS are held in a tax-preferred account, such as a 401(k).

- Since the CPI does not take into account the aspect of durable goods as long-lived assets and the attendant variations in their market values over time, it is likely more efficient to offer consumers separate instruments (other than TIPS) to hedge the risk of unexpected changes in house prices. Furthermore, house prices exhibit substantial heterogeneity across geographic regions.

- The most appropriate and useful role for TIPS may be for life cycle saving by individuals and their agents.

- The TIPS market provides a good hedge against inflation risk, and from a cost/benefit perspective there seems little to be gained from indexing to other inflation measures—be they broader, such as the GDP deflator, or narrower, such as regional inflation measures or the CPI-E for the elderly. As the proportion of retirees who have defined-benefit pensions continues to decrease, the need for individuals to manage lump-sum accounts to provide a steady stream of real income during their retirement becomes more difficult. A "ladder" of TIPS with maturities linked to the dates when the money will be needed for expenses is a safe investment well-suited to retirees and those approaching retirement.

Implications

TIPS have the potential to be the backbone asset underlying inflation-indexed annuities, but to facilitate use of these annuities, the maximum duration of TIPS would need to be extended, since the time horizon for many retirees extends to 30 or more years.

With respect to housing as an investment as opposed to a consumption good, there is room for alternative hedging instruments and they are currently available in the form of futures contracts on Standard & Poor's/Case-Shiller Metro Home Price Indexes or forward contracts on the Residential Property Index 25-MSA Composite (RPX). Intuitively, the need to hedge short-to-medium term house-price fluctuations should be greatest for people who plan to make substantial changes in the near future in the amount of housing held in their asset portfolio. One such group is those who plan to become first-time home buyers in the next few years. Another group is those who plan to downsize or upsize their houses. A third group is households that plan to move to an area where the housing market is substantially different in terms of housing prices or price movements.

p-09–9

Impending U.S. Spending Bust? The Role of Housing Wealth as Borrowing Collateral

By Daniel Cooper

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0909.htm
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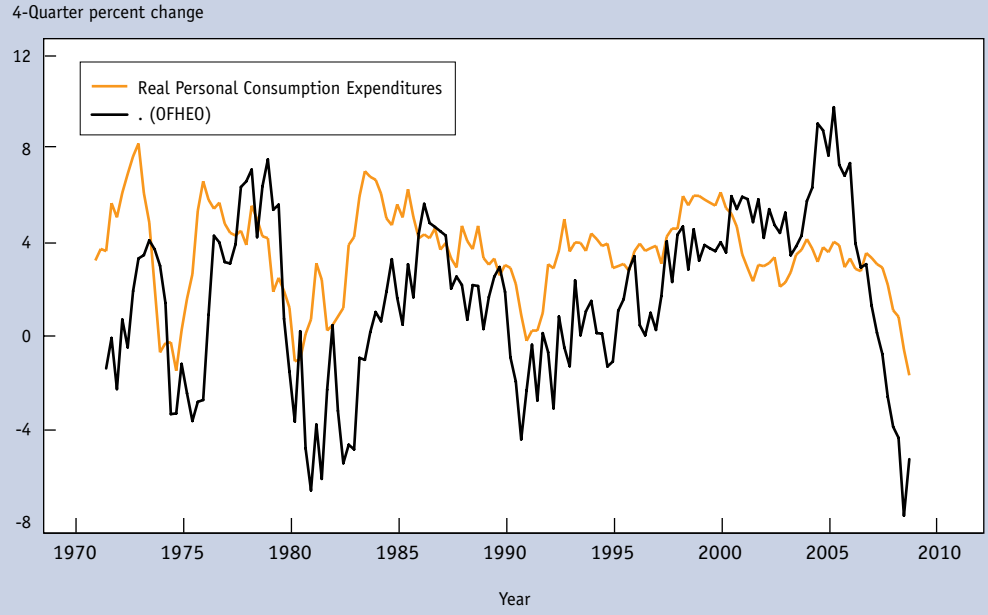
Motivation for the Research

Life cycle models of household spending posit that individuals attempt to smooth their consumption over their entire lives based on their expected lifetime earnings. An example of consumption smoothing is younger households borrowing and consuming more (saving less) in a given year, knowing that their incomes will rise in future years. The theory assumes, however, that households are not borrowing constrained—they have access to all the credit they desire.

In the United States, an important component of a household's wealth (assets) is its housing investment. As a durable good, housing provides a service flow that contributes to a household's annual consumption. In addition, people can use their housing equity as borrowing collateral to the extent that they have sufficient equity in their homes. Rising house prices provide households with increased borrowing capacity, but when house prices are falling, individuals are limited in the degree to which they can finance additional consumption through housing wealth. The key question therefore is to what extent are spending decisions by U.S. households driven by housing's changing value as a financial asset? Of the two standard explanations, the first holds that increases in housing wealth directly affect consumption through what is termed the "wealth effect"—household balance sheets improve, so consumers feel justified in spending more. The alternative argument holds that housing wealth serves as borrowing collateral to finance nonhousing consumption, thus relaxing the income

U.S. Real Consumption Growth versus U.S. Real House Price Growth



Source: Author's calculations based on NIPA data (Real PCE) and house price data. (OFHEO)

constraints a household may face. Households that own their primary residence can access the equity they have amassed in their homes via a home equity line of credit (HELOC) or a cash-out refinancing, thus freeing up funds to achieve their desired level of current consumption. The ability to tap into housing wealth is particularly advantageous for households that may be experiencing a negative income shock due to unemployment or that are confronting high medical or educational expenses. Compared with using a credit card, HELOCs tend to offer much lower interest rates, higher borrowing limits, and potential income-tax deductibility of some of the financing costs.

Throughout the first half of the last decade, real house prices rose rapidly in the United States. Aggregate U.S. consumption was strong during this period despite two notable events in 2001: the collapse of the bubble in technology stocks and the economic slowdown following the September 11 attacks. Between 2000 and late 2006, real house prices rose 50 percent, while the Federal Reserve Board found that between 2002 and 2005 the dollar value of outstanding HELOCs grew at an annual rate of 30 to 40 percent—evidence that households were borrowing against their homes to finance personal spending. The annual personal savings rate in the United States steadily decreased to almost zero in 2005 before recovering slightly in 2006, when U.S. house prices peaked. Given the recent financial crisis, understanding how household spending decisions may be driven by changes in perceived housing wealth can inform how the U.S. economy will recover from the current economic recession and can quantify the implied aggregate impact of falling house prices. Now that U.S. housing prices have declined substantially, how might household consumption respond to this changed financial landscape?

Research Approach

By comparing the net wealth effect channel with the borrowing collateral channel, the author investigates how individual U.S. households respond through consumption to changes in their house's asset value, conditional on their being content with their current level of housing services. Since the households under consideration remain living in their current home, this approach isolates how household spending decisions may be influenced by balance sheet gains or losses in the value of their housing investment. The existing literature and many macroeconomic forecasting models do not control for households' individual borrowing needs when evaluating the relationship between housing wealth and nonhousing consumption, but a household-specific measure of borrowing demand is important for analyzing this relationship. Using household-level data from the Panel Study of Income Dynamics (PSID) allows the author to distinguish between individual households that do and do not have a high demand for consumption financed by borrowing. Comparing a household's current real income with its average income—a measure of a household's lifetime mean earnings—identifies its deviations from average income and indicates its potential inability to fund its desired current consumption. The author's estimation includes all households in the PSID between 1984 and 2005 that own their primary residence and whose head of household is 65 years old or younger. The sample starts in 1984, when the PSID began to track financial wealth data. The author deems that a household is constrained, hence a potential borrower, if its current income is at least 10 percent below its average income.

Key Findings

- The author finds that across all households, a $1.00 increase in house values leads to a roughly 3.5 cent permanent increase in nonhousing expenditures. For constrained households, a $1.00 increase in home values yields approximately an 11 cent increase in nonhousing consumption. Yet for households that have limited borrowing needs, changes in their home values have a small effect on consumption that for the most part is not statistically different from zero. Overall, when the role of housing wealth as household borrowing collateral is controlled for, there is little evidence of a net housing wealth effect on consumer spending.

- Controlling for their borrowing needs, when households are categorized by age group—young households under 35 years of age, middle-aged households 35 to 50 years old, and older households 50 to 65 years old—housing wealth has a substantial direct impact on nonhousing consumption for the middle-aged and older groups, 11 cents and 12.6 cents, respectively, for each $1.00 increase in housing wealth. For young households that are constrained, spending increases 6 cents for every $1.00 increase in housing wealth. Overall, this suggests that the relationship between household spending and housing wealth cannot be explained entirely by life cycle differences in individual households' housing tenure and spending needs. Rather, regardless of age, those households with higher borrowing needs to finance nonhousing consumption will potentially use the value of their housing wealth as collateral.

- When high versus low amounts of household leverage are compared against whether households experience a positive or negative change in their housing wealth, the average consumption of highly leveraged households increases in response to a housing capital gain. In addition, the marginal consumption response to changes in housing wealth is substantially larger for highly leveraged households than for households with lower debt levels.

- Extrapolating from his results, the author estimates that the roughly 11 percent decline in real housing wealth between 2007:Q4 and 2008:Q4 caused about a 75 basis point (three quarters of 1 percent) decrease in aggregate real nonhousing consumption, a result that is robust to alternative calculation approaches. Yet, overall, this finding shows that the direct effect of falling house prices on aggregate U.S. consumption is small. About two-thirds of the reported aggregate decline in spending is traced to the behavior of households with high borrowing needs. When home prices fall, housing assets are worth less, so households have less equity to use as borrowing collateral.

Implications

While the borrowing collateral channel has a more important positive effect on consumption than the largely negligible net wealth effect channel, it would be useful to understand better what specific areas of consumer spending are impacted by rising or falling house prices. Particularly in the case of declining home values, such information could indicate which sector(s) of the economy might be most affected by falling house prices. Work in this area will depend on better data that are not yet available.

p-09-10

The 2008 Survey of Consumer Payment Choice

by Kevin Foster, Erik Meijer, Scott Schuh, and Michael A. Zabek

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0910.htm
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Motivation for the Research

In 2003, the Federal Reserve Bank of Boston launched the Survey of Consumer Payment Choice (SCPC) program to develop high-quality, timely, comprehensive, and publicly available data on consumer payment behavior. A general shortage of such data has inhibited the payments industry, researchers, and public policymakers from fully understanding the ongoing transformation of the U.S. payment system. Traditional paper-based payment instruments have been giving way to new payment instruments that have emerged from innovations in information and communication technologies as well as from innovations in financial markets.

This paper presents the 2008 version of the SCPC, a nationally representative survey developed by the Consumer Payments Research Center of the Federal Reserve Bank of Boston and implemented by the RAND Corporation with its American Life Panel. This survey fills a gap in knowledge about

the role of consumers in the transformation from payments using paper as the primary medium of exchange to those using electronic media. It provides a broad-based assessment of U.S. consumers' adoption and use of nine payment instruments, including cash. Besides helping researchers learn how consumers choose among the nine payment instruments, the 2008 SCPC data should also help public policymakers design policies affecting the U.S. payment system and economy.

These data, which are expected to be produced annually, can be used for at least two purposes: (1) to create aggregate time-series data that can be used to characterize and analyze trends in payment markets pertaining to U.S. consumers and (2) to create a longitudinal panel of data that can be used to study consumer payment behavior and evaluate public policies pertaining to the U.S. payment system. The consumer-level micro data from the 2008 and 2009 SCPC will be released to the public in 2010.

This paper's primary purpose is to publish and document for general readership the aggregate statistics obtained from the 2008 SCPC, which appear in a series of detailed tables in the full paper. More information about the CPRC and supporting documentation for the 2008 SCPC, including the survey instrument, tables of standard errors, and the purpose and methodology of the SCPC program, are available at http://www.bos.frb.org/economic/cprc/index.htm and in Schuh 2010 (forthcoming).

A secondary purpose of this paper is to provide a brief snapshot of the U.S. payments transformation from using paper instruments to using electronic and other new payment instruments. The authors report the most salient basic facts in this paper, but do not provide any economic or business interpretation of the 2008 results. A companion paper (Foster, Schuh, and Zabek 2010, forthcoming) will provide a more in-depth, yet nontechnical, overview of the results from the 2008 SCPC. That paper will include economic and business interpretations of the 2008 facts in historical context with results from other surveys and data.

Research Approach

As noted above, the 2008 SCPC was developed by the Consumer Payments Research center of the Federal Reserve Bank of Boston and implemented by the RAND Corporation with its American Life Panel, a nationwide panel of U.S. consumers. Since the intent of the SCPC is to measure the payment choices of consumers, the survey concepts and definitions were constructed from the perspective of a typical consumer. This demand-side approach to payments helps to fill a gap in knowledge about consumer payment behavior. It also provides the information needed to understand payment trends and to develop optimal public policies toward payments.

The consumer-oriented concepts and definitions may seem different from the terminology and perspectives of the supply side of the payment system, especially in the area of electronic payments. For example, the supply-side perspective (the viewpoint of banks, the Federal Reserve System, nonbank payment service providers and consultants, as well as merchants who accept payment from consumers) focuses on the network on which payments are settled. In contrast, the SCPC looks at payments from the perspective of how a consumer initiates the payment.

The central focus of the SCPC is on measuring consumer choices about payment instruments. The 2008 SCPC asks questions about nine payment instruments commonly available to U.S. consumers: four types of paper instruments—cash, checks, money orders, and travelers checks; three types of payment cards—debit, credit, and prepaid; and two types of electronic payment instruments—online banking bill payment (OBBP) and electronic bank account deduction (EBAD).

Consumers make three basic choices about payment instruments: (1) whether to get, or "adopt," them; (2) whether or not to use them (incidence of use); and (3) how often to use them (frequency of use, or simply, "use"). The 2008 SCPC measures consumers' adoption of payment instruments, as well as consumers' various banking and other payments practices. The survey also measures the use

of payment instruments by incidence (the percentage of consumers who use them), frequency (the number of payments each consumer makes), and the types of transactions for which each consumer uses the various instruments. The 2008 SCPC also asks questions about seven types of payment transactions: three types of bill payments—automatic, online, and in person/by mail; one type of nonbill online payment; two types of retail goods payments—essential and nonessential; and other nonretail payments. For each transaction type, the survey asks questions about the number of payments made with each payment instrument that can be used for that type of transaction. Additionally, the 2008 SCPC asks respondents to rate eight types of payment characteristics—acceptance for payment; acquisition and setup; control over payment timing; cost; ease of use; payment records; payment speed; and security—for each of six payment instruments—cash, check, debit card, credit card, prepaid card, and both types of electronic account deductions combined. Finally, the survey collects demographic information about the respondents.

Key Findings

- The nine common payment instruments enumerated above mean that U.S. consumers have more payment instruments to choose from than ever before. In 2008, the average consumer had 5.1 payment instruments and used 4.2 payment instruments in a typical month.

- Consumers have widely adopted some, but not all, payment instruments. The vast majority of consumers have adopted cash. Both checks and payment cards (separately) have been adopted by more than 90 percent of consumers. Slightly more consumers now have debit cards than credit cards (approximately 80 percent of consumers have debit cards, versus the 78 percent that have credit cards), and consumers use debit cards more often than cash, credit cards, or checks.

- Consumers make 53 percent of their monthly payments (in terms of number of payments) with a payment card (credit, debit, and prepaid) and only about 37 percent with paper instruments.

- Most consumers have used newer electronic payments, such as online banking bill payment, but these instruments account for only 10 percent of consumer payments.

- Cash, checks, and other paper instruments are still popular and account for 37 percent of U.S. consumer payments, but more than half of consumers said that they wrote fewer paper checks in 2008 than in 2005. In contrast, during the same time period nearly half of consumers reported an increase in their use of debit cards, more than 40 percent reported increasing their use of electronic bank account deductions, and more than 60 percent reported increasing their use of online banking bill payments.

- For retail payments, cash is the most widely used payment instrument, and credit cards and debit cards are the second and third most widely used payment instruments. Paper checks are still the most widely used instrument for bill payment.

- Consumers rate security and ease of use as the most important characteristics of payment instruments.

Implications

Although the 2008 SCPC aggregate statistics presented in this paper are preliminary and subject to revision, they shed new light on consumers' practices and preferences in the use of various payment media, and thus provide insight into where we are in the transition from paper to electronic media.

The SCPC complements and supplements existing sources of payments data. The two main publicly available sources are the Survey of Consumer Finances (SCF) and the Federal Reserve Payment Studies (FRPS). The main advantages of the SCPC over both of these alternative data sources are: (1) it is higher frequency (annual instead of triennial), so it will provide more timely information on payments; and (2) it contains a more comprehensive assessment of payment behavior.

A number of private companies also provide some data on consumer payment behavior. Among others, these sources include: the American Bankers Association; Hitachi (formerly Dove Consulting), which contributed to the FRPS; Javelin Strategy & Research; The Ohio State University Consumer Finance Monthly; Phoenix Marketing International; Synergistics Research Corp; the U.S. Postal Service Household Diary (NuStats); and Visa Inc. Most of these data sources are proprietary and either unavailable to the public or prohibitively expensive, and the details and methodology underlying these data sources are often opaque and difficult to obtain.

Together, the information in these public and private data sources overlaps a great deal. As a result, an opportunity exists to consolidate and streamline the data collection process into one publicly available, standardized, and consistent data source on consumer payment behavior. The SCPC offers that opportunity and the CPRC welcomes partners in this endeavor. Toward that end, the CPRC developed a Board of Advisors in 2009, including representatives from industry, academia, and the public sector, to provide input and help develop a consolidated and standardized source of data on consumer payments as viewed from the consumer's perspective.

p-09–11

Jobs in Springfield, Massachusetts: Understanding and Remedying the Causes of Low Resident Employment Rates

By Yolanda K. Kodrzycki and Ana Patricia Muñoz with Lynn Browne, DeAnna Green, Marques Benton, Prabal Chakrabarti, Richard Walker, and Bo Zhao

complete text: http://www.bos.frb.org/economic/ppdp/2009/ppdp0911.htm
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Motivation for the Research

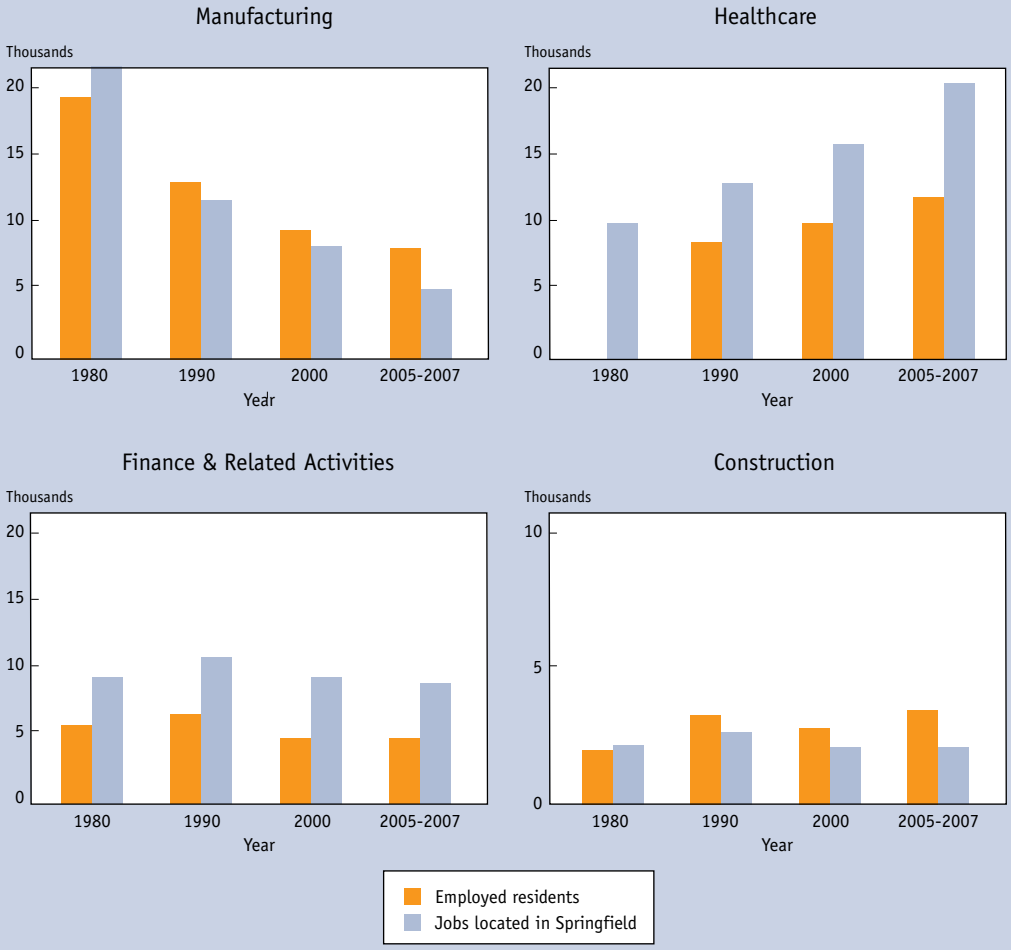
For decades the economy of Springfield, Massachusetts has lagged behind its peer cities in New England. As part of the Federal Reserve Bank of Boston's multi-year project to promote Springfield's economic revitalization, this paper examines the causes of and potential remedies for the city's low resident employment and labor force participation rates, particularly in neighborhoods of concentrated poverty. As of 2000, labor force participation rates in some poor neighborhoods were below 50 percent. Since any potential solutions to Springfield's economic problems must include increasing its resident employment rates, this paper seeks to outline policy priorities to help achieve this goal.

Research Approach

Addressing Springfield's employment challenges requires ascertaining whether there is a mismatch between the number of jobs available and the number of potential workers or whether the problems stem from other issues affecting the city's residents, such as inadequacies in education, training, and access to jobs. In 2005–2007 there were almost 76,000 jobs located in Springfield, plus another 90,000 jobs located within a 10-mile radius of the city. Springfield had approximately 148,000 total residents; its working-age population, comprising those aged 16 years and older, was about 113,000, of whom 58,000 were employed. This translates to 51 percent of Springfield's working-age population, which is lower than the average employment rates of 57–60 percent of its peer cities in New England. In contrast, the share of private industry jobs located in Springfield relative to the city's working-age population, 64 percent, is similar to the average job density in peer New England cities.

To explore the situation in more detail, the authors estimate the number of private sector jobs available by industry and neighborhood areas in Springfield, using the 2006 ZIP Business Patterns (ZBP). The ZBP data contain total employment in private establishments organized by zip code, and the size distribution of these businesses. Using these data allowed the authors to categorize

Employment in Springfield



Source: U.S. Bureau of the Census. Decennial Census (1980, 1990, 2000), American Community Survey (2005-2007); Massachusetts Executive Office of Labor and Workforce Development Employment and Wage (ES-202) data (2005, 2006, 2007).

Note: Healthcare and social assistance are reported as a single category in the 2000 and 2005-2007 census data. Excludes social assistance services, using the share (around 11 percent) of such services in the "healthcare and social assistance" sector from the ES-202 data from 2005-2007.

approximately 61,000 Springfield jobs, by industry and area. This classification does not fully account for employment in the city because the ZBP data exclude certain categories, notably the self-employed, and omit most public sector (government) jobs.

Key Findings

- Springfield's total job availability is not unusually low. Using the city job density rate, which compares the number of jobs to the size of the working-age population, Springfield has 67 jobs for every 100 citizens—somewhat lower than the average ratio among its peer cities. Included in the peer group are two state capitals, Hartford and Providence, which have comparatively high numbers of government jobs. In terms of private-industry jobs, Springfield's job density rate is 64, which is close to its peer group's average.

- Springfield's low resident employment rate is partly rooted in pronounced demographic changes over the last few decades. The rise in the city's percentage of Hispanic residents has been particularly dramatic. As of 2005–2007, 29 percent of Springfield's working-age population were Hispanic and 20 percent were black. Springfield's low employment rate is mostly traceable to the fact that its disadvantaged groups are less likely to be employed than those in other cities, and not to the high share of disadvantaged groups that make up Springfield's population. The city's employment rate was 2 percentage points below the corresponding average of other New England cities for the city's whites, 7 percentage points lower for blacks, and 9 percentage points lower for Hispanics.

- While a lower percentage of Springfield's residents have completed high school or college compared with those in other mid-sized New England cities, this gap in educational attainment plays a relatively minor role in accounting for the differential between the employment rate in Springfield and the average in other cities. The main difference is that at each level of educational attainment, Springfield residents are less likely to be employed than are comparably educated individuals in the other cities. This gap is particularly pronounced for less educated segments: only 39 percent of high school dropouts were employed in Springfield, compared with 45–53 percent in other cities, while 64 percent of high school graduates were employed, compared with 65–75 percent in peer cities.

- Since local labor markets extend beyond municipal boundaries, another way of measuring job availability for city residents is to directly measure commuting time or distance. The results are mixed for Springfield, for while a relatively high share of jobs are located within a 10-mile radius of its downtown, over the last decade there has been a pronounced decentralization of jobs outside this 10-mile radius.

- Distance between residential neighborhoods and jobs is one barrier to employment that deserves further attention. Springfield's poor are concentrated near its downtown. Jobs within the city limits are scattered across various neighborhoods. Most of the retail jobs, for example, are located on the eastern edge of Springfield, requiring a lengthy bus ride from the city center for those without a car. Jobs in the suburbs are moving even farther away from the city. To have full access to employment opportunities in manufacturing and construction, in particular, workers must be able to commute outside of Springfield.

- Healthcare and social assistance is Springfield's largest industry and has been a source of growing employment opportunities for the city's residents. Service-sector industries, particularly leisure and hospitality, also are significant employers in and near downtown Springfield. Hiring more people from inner-city neighborhoods in these industries should be a component of any jobs strategy.

- Other social services aimed at enhancing residents' abilities to hold a job are needed. Within the city, poorer residents in the downtown area are hampered by single-parenting duties and the need to rely on public transportation or carpooling to commute to jobs. Improving transportation options would help, as well as better matching of residents with jobs near their homes.

Implications

Solving Springfield's economic malaise depends heavily on improving its citizens' employment rates. Over 10 percent of the city's working-age population, or 6,000 more people, need to find jobs if Springfield's resident employment rate is to equal the average among its peer cities in New England. Increasing employment will involve some combination of job creation, improving residents' entry-level labor market skills so they are better employment candidates, improving informational access to job opportunities, and improving physical access to work sites. Job density rates are quite high in and near the Springfield neighborhoods with low incomes and low employment rates, so better job matching of inner-city residents with inner-city jobs is a promising strategy.

Working Papers

w-09-7

Trends in U.S. Family Income Mobility, 1967–2004

by Katharine Bradbury and Jane Katz

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0907.htm
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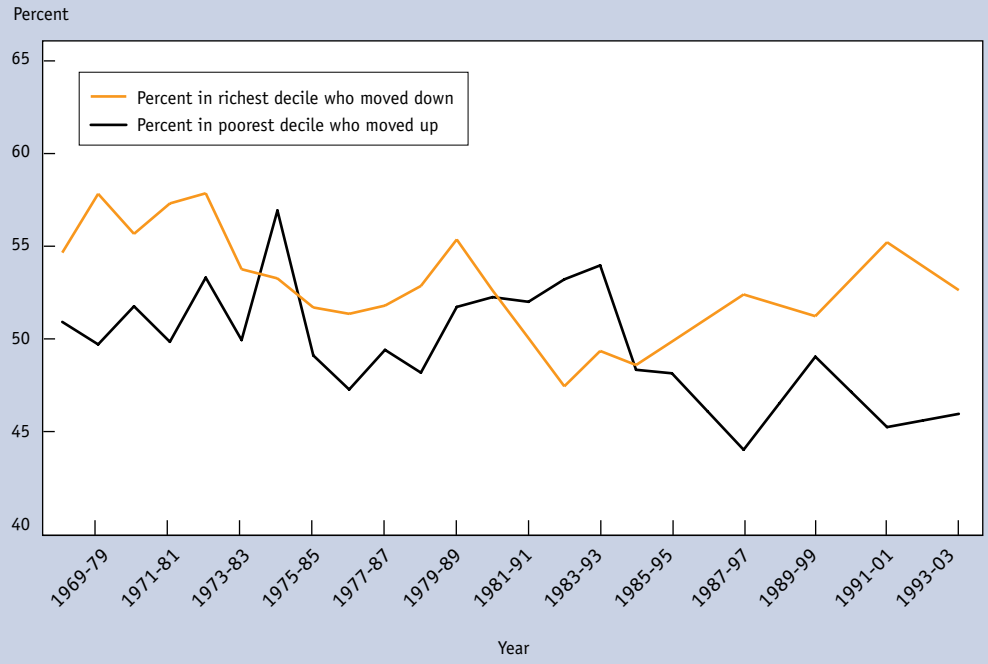
Motivation for the Research

Much of America's promise is predicated on the existence of economic mobility—the idea that people are not limited or defined by where they start in life, but can move up the economic ladder based on their own efforts and accomplishments. Family income mobility—changes in individual families' incomes over time—is one indicator of the degree to which the eventual economic well-being of any family is tethered to its starting point. In the United States, family income inequality has risen yearly since the mid-1970s, raising questions about whether long-term income is also increasingly unequally distributed. Changes over time in mobility, which can offset or amplify the cross-sectional increase in inequality, determine the degree to which longer-term income inequality has risen in tandem. Other things being equal, an economy with rising mobility—one in which people move increasingly frequently or traverse increasingly greater income distances—will result in a more equal distribution of lifetime incomes than an economy with declining mobility.

In the very broadest terms, economic mobility is the pace and degree to which individuals' or families' incomes (or other measures of economic well-being) change over time. Measures of mobility summarize the transition process from the set of incomes in the economy at one point in time to the incomes of those same individuals or families at a later point. Researchers have employed a variety

Mobility of U.S. Families Over 10-Year Periods



Source: Authors' calculations.
Note: The deciles shown are the highest and lowest 10 percent of the U.S. family income distribution.

of mobility concepts and measures, sometimes using different measures to address different underlying questions. In this paper, the authors focus on concepts and measures that most closely address questions related to mobility as an equalizer of long-term incomes and the degree to which end-of-period income (or position) is independent of beginning-of-period income or position. The authors are particularly interested in learning whether different concepts and measures tell a consistent story and whether findings from previous studies are artifacts of the particular measures used.

Research Approach

Using data from the Panel Study of Income Dynamics (PSID), the authors examine time patterns of income mobility for U.S. working-age families between 1967 and 2004 according to a number of mobility concepts and measures, including a measure of the degree to which mobility equalizes long-term incomes. Calculating these measures for overlapping 10-year periods, they document mobility levels and trends for U.S. working families, overall and by race. For purposes of comparison, the authors also look at shorter (4-year) periods and longer (16-year) periods.

The authors begin by discussing various concepts of income mobility and the associated measures. They first distinguish between relative, absolute, and interaction mobility. Relative mobility refers to individuals or families trading relative position in the distribution of outcomes between the beginning and end of a period. Absolute mobility is movement relative to some real standard of well-being or purchasing power, such as the poverty line or median income at the start of the period. Although relative and absolute measures may move together, rising absolute mobility can occur during a period of declining relative mobility and vice versa. Interaction mobility, a term coined by the authors, refers to the interaction of changes in families' relative ranks and the associated changes in the level and spread of the income distribution. Thus, interaction mobility reflects changes in the structure of rewards in the economy as well as changes in individual families' access to these rewards over time. Interaction measures are useful for summarizing how much movement the average family experiences—both relative to other families and in terms of absolute income change—taking into account contemporaneous changes in average income levels and the degree of inequality of the income distribution.

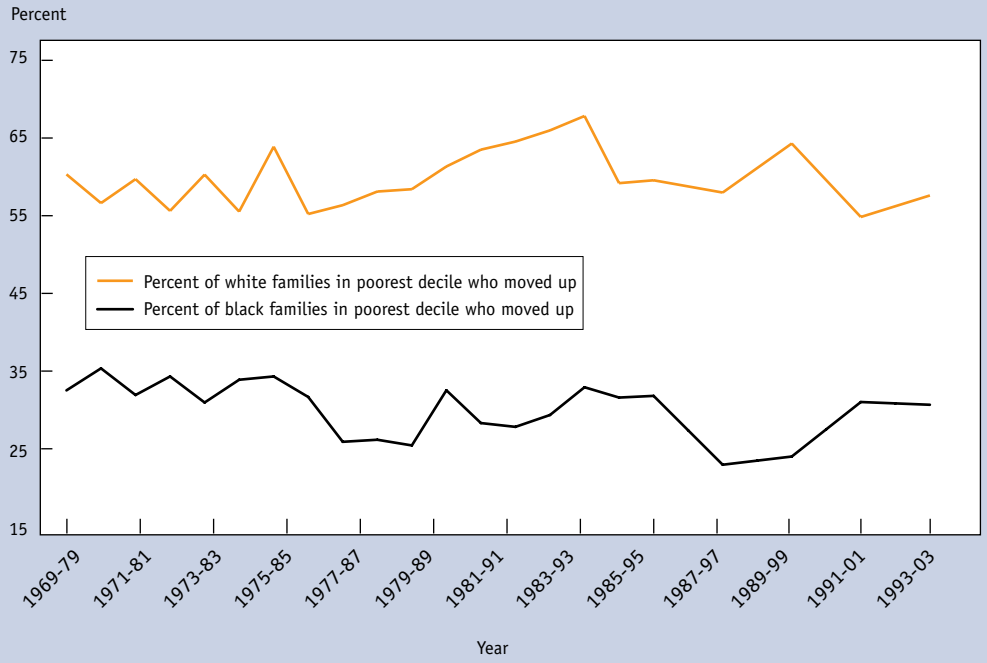
The authors next discuss the distinction between overall mobility—changes between the start and end of a period in an entire vector of individual observations of well-being, such as family income or rank in the distribution—and origin-specific mobility—changes over a period in the incomes of individuals or families defined by their position in the distribution at the beginning of the period. Origin-specific measures are of interest for several reasons, including concerns about the ability of the poorest families to escape the bottom rungs of the income ladder and concerns about stability at the top, as such measures may provide evidence of unequal opportunity or a lack of meritocracy. Introducing the concept of subgroup mobility, the authors focus on between-group mobility, which indicates how members of a subgroup move relative to members of another subgroup or relative to the overall income distribution, rather than within-group mobility, which indicates the extent to which members move relative to one another within a subgroup.

Key Findings

- Different measures yield similar pictures of mobility trends. By most measures, family income mobility has been lower in the more recent periods studied (the 1990s into the early 2000s) than in the 1970s.

- Family income mobility apparently decreased or did not increase enough between the 1970s and the 1990s to stem increases in long-term income inequality. Furthermore, a family's position at the end of a period was less likely to have been produced by a random process and more correlated with the family's starting position than was the case 30-plus years earlier.

Upward Mobility of Poorest U.S. Families Over 10-Year Periods, by Race



Source: Authors' calculations.
Note: The poorest decile is the lowest 10 percent of the U.S. family income distribution.

- Like overall mobility, the mobility of families starting near the bottom has worsened over time. In addition, declines in mobility seem to be more pronounced lower in the income distribution, as poorer families were decreasingly likely to move up.

- However, comparing only the most recent periods, the downward trend is less pronounced, or even nonexistent, depending on the mobility measure employed—although a decrease in the frequency of collection of panel data on family income in recent years makes it difficult to draw firm conclusions.

- Black families exhibit substantially less mobility than white families in all periods relative to the overall distribution of families and in absolute terms, but the disparity between the races' mobility patterns does not appear to be growing except in terms of the between-race difference in long-term income.

- Taken together, the evidence suggests that over the 1967-to-2004 time span, a low-income family's probability of moving up decreased, families' later year incomes increasingly depended on their starting places, and the distribution of families' lifetime income became less equal.

Implications

Although the authors find that family income mobility has decreased and long-term inequality has risen, they also note that there is no simple answer when it comes to evaluating levels and trends in inequality and/or mobility. Some inequality in the potential and actual economic rewards to individuals and families undoubtedly produces efficiencies in allocation and production; it may encourage people to work hard, to save, to invest in human and physical capital, and to innovate. But inequality may also reflect restricted opportunity or barriers to mobility. Such barriers—individual circumstances, economic/social institutions or arrangements, discriminatory practices, imperfect capital markets, imperfect information, or other impediments that prevent poor families from improving

their situation—result in unequal starting points being reinforced over time. These barriers not only distort market incentives and discourage the hard work and investment that lead to economic growth but are also likely to result in negative externalities such as crime and reduced social cohesion, making public policy decisions more difficult.

One public policy implication is relatively clear, however, based on the authors' finding that the typical poor family is less likely to move up and out of poverty within several years than it was 30 years ago: policy remedies for those at the bottom should aim beyond short-term help, as the poor at any point in time are likely to have low long-term incomes. Beyond the short term, the choice of policy presumably hinges, at least in part, on the reasons for the decline in mobility—for example, whether it reflects rising barriers to opportunity or rising returns to high-stakes labor market promotion practices. Further research is needed to assess the balance among these potential sources of the decline in mobility.

w-09-8

Real Estate Brokers and Commission: Theory and Calibrations

by Oz Shy

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0908.htm
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Motivation for the Research

This paper has two goals: (1) to model an inherent conflict of interest between a seller of a house and the real estate broker hired by the seller and (2) to calibrate the broker's commission rates that would maximize the seller's expected gain. The inherent conflict of interest between the seller and the broker results from the fact that the broker's commission constitutes only a small fraction of the transaction value. Thus, brokers often have an incentive to convince sellers that waiting for a higher-paying buyer would be risky. A lower price increases the probability of a sale and hence a faster sale. Faster sales often reduce brokers' costs by more than the extra commission they might receive from trying to sell at higher prices. The calibrated rates may provide a rough estimate of whether the widely used 6 percent commission rate reflects collusion among real estate agencies (in which case, the calibrated values should be much lower than the observed value of 6 percent) or whether this rate is competitively determined (in which case the calibrated values should be around the observed value of 6 percent). This investigation is important in view of the long-term investigations by the Federal Trade Commission (FTC) and the Department of Justice (DOJ) concerning the possibility that the widespread use of the 6 percent commission rate may reflect collusive behavior in the real estate brokerage industry.

Most homesellers in the United States pay a 6 percent commission to real estate brokers. However, under some circumstances, the individual agent who exerts most of the effort may receive only around 1.5 percent of the sale price because the seller's and the buyer's agents (if they are not the same) tend to split the 6 percent commission and each agency may take half of the remaining 3 percent. Outside the United States, sellers' commission rates are generally much lower, often ranging from 1.5 percent to 2 percent. This may be a consequence of the fact that buyers also pay some commission to brokers. Clearly, it is a puzzle why discount real estate brokers—who offer (perhaps) more limited services for a lower commission—are not observed more frequently in the United States, while discount brokers are now widely prevalent in U.S. financial markets.

This paper differs from the literature in that it does not attempt to explain the role played by middlemen. Instead, its scope is much narrower: to measure the magnitude of the conflict of interest between house sellers and real estate brokers by examining the difference between house prices set by sellers and those set by brokers.

Research Approach

The paper develops a dynamic model in which a house seller hires a real estate broker to handle the sale. Both the seller and the broker bear costs of delay each time the broker fails to sell the house and the sales effort continues in a subsequent period. The paper demonstrates the inherent conflict between a seller and a real estate broker, initially using a simple example with two types of buyers who differ in their willingness to pay for a house, with the brokerage commission exogenously determined by, say, an association of real estate brokers. The paper then extends the model to a continuum of buyer types and constructs a model in which the broker's commission is determined by a seller who maximizes the expected net-of-commission gain from selling a house. To address the second goal, the author computes the commission rate that maximizes the seller's expected gain, assuming that the house price is determined by the broker and not by the seller. This assumption generates an incentive on the part of sellers to pay a commission sufficient to motivate the brokers to avoid setting a low price just to accelerate the sale. This model then calibrates the sellers' most profitable commission rate, using data on housing prices and costs of delay taken from the website of the National Association of Realtors.

Key Findings

- A real estate broker will recommend a lower price than the price that maximizes the seller's expected gain as long as the broker's commission rate is below 50 percent, which is always the case. In other words, sellers prefer setting a higher price, which generally prolongs the sale of the house, compared with the price that would be set by a commission-paid real estate broker. This finding stems from the fact that a real estate agent has less to gain from selling at a high price than does the seller.

- The results imply that the standard 6 percent commission rate, if paid to a single broker, far exceeds the commission rate that would be preferred by a seller, despite the fact that a higher commission rate would motivate the broker to ask for a higher price. This, however, need not be the case if the commission is split among several brokers and agencies.

- If several brokers split the commission (for example, the buyer's and seller's brokers and the agencies that employ these brokers), then a 6 percent commission may be needed to motivate the broker to sell at a high price.

Implications

The conflict of interest between a house seller and the real estate agent hired by the seller harms the seller and benefits the buyer. In this model, real estate agents improve social welfare because they reduce the cost of delaying a sale. That is, the pressure agents put on sellers to reduce their prices shortens the amount of time it takes to sell a house. Since social welfare is not affected by the allocation of rents between sellers and buyers, and between sellers and real estate brokers, social welfare is enhanced when sales decisions are delegated to realtors.

The model developed in this paper and the calibration itself can be easily modified to capture situations in which several brokers or agencies split the commission paid by a house seller. The important empirical question to ask in this context is what fraction of real estate transactions involve one, two, three, or four real estate brokers.

Another related empirical question is how commission rates affect the speed of home sales. This investigation might be accomplished by comparing the number of house visits by potential buyers divided by the number of brokers involved in the sale. One could also investigate whether houses sold in countries with lower commission rates sell faster than in the United States. Clearly, in such investigations it may be impossible to control for the institutional differences of housing markets in different countries.

The model could be further extended by introducing two additional features. First, the model could be extended by incorporating benefits for the seller in hiring a real estate broker. To accomplish this, the seller's utility function should be modified slightly to include the seller's additional possible gains from employing a broker compared with "sale by owner." Second, the model could be extended to enable analysis of how the commission rate influences the efforts exerted by brokers and how these efforts are translated into the speed of sale.

The conflict of interest identified in this paper prevails not only in the market for residential real estate but also in some other markets. For example, in legal cases for which attorneys receive a fraction of the final settlement instead of fixed fees, attorneys may recommend to their clients that they should settle on lower compensation levels than the level that would maximize the client's expected benefit. Similar conflicts may exist between stock brokers and their clients because brokers' compensation is contingent on their clients' actual purchase and sale of stocks and mutual funds, and even in agricultural contracts involving cropsharing.

w-09–9

Efficient Organization of Production: Nested versus Horizontal Outsourcing

by Oz Shy and Rune Stenbacka

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0909.htm
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Motivation for the Research

Manufacturing firms rely on intermediate components when assembling final (finished) goods. A strategic part of a firm's production process, termed the "make-or-buy" decision, is determining whether to produce intermediate components in-house or to outsource some to subcontractors. Firms choose different patterns of outsourcing production of components, and two principal types of outsourcing are generally observed. The first involves outsourcing components to several component-producing firms. Under this outsourcing structure (which the authors call horizontal outsourcing), outsourced firms must produce the components themselves and cannot subcontract any production to other firms. In the second approach, the final good producer outsources the production of some components to another firm, which then outsources the production of some components to a third firm, and so on. The authors term this pattern nested (vertical) outsourcing because a subcontractor may hire additional subcontractors to perform some of the work. For industries that have high component-specific monitoring costs, how outsourcing is structured may have significant effects on the firm's overall production costs. For this reason, it is important to investigate two questions: (1) Why do firms in different industries adopt different patterns of outsourcing? (2) What is the optimal pattern of outsourcing in a given industry?

Research Approach

This paper adds to the literature by comparing nested and horizontal outsourcing to find which approach is the more efficient outsourcing method. Determining how to conduct outsourcing is important for a firm that relies on component-specific monitoring in its manufacturing process. The authors construct a model in which component-specific monitoring costs are incurred for managing the in-house production of intermediate parts and managing the outsourced production of intermediate parts. Monitoring costs also increase with the number of subcontractors being employed. By having constant marginal costs for production together with increasing marginal costs for monitoring production lines, the model focuses on the effects of these monitoring costs on the efficiency of the outsourcing choice.

Key Findings

- Under nested outsourcing, firms that are higher on the outsourcing ladder, where "higher" means closer to the original firm that assembles the final product, produce a larger number of components than firms that are lower on the outsourcing ladder.

- It is efficient to outsource a smaller fraction of production lines under nested outsourcing compared with horizontal outsourcing as long as there are no significant diseconomies with respect to monitoring a large number of subcontractors. Under this condition, nested outsourcing is inefficient relative to horizontal outsourcing.

- Nested outsourcing is more profitable for the final good producer than horizontal outsourcing if there are strong diseconomies with respect to the number of subcontractors.

- A market failure may arise in situations where nested outsourcing is the market outcome but horizontal outsourcing is the efficient outcome.

Implications

For firms that require intermediate components in order to produce finished goods, the strategic decision of whether to outsource production of some components and if so, how to efficiently allocate to subcontractors, has implications for their total production costs and profits. Despite a market bias towards using nested outsourcing, the authors find this approach to be inefficient in many instances. This paper's analysis of the most efficient approach to outsourcing might be extended by investigating the final good producer's degree of bargaining power relative to the subcontracting firms.

w-09-10

Estimating the Border Effect: Some New Evidence

by Gita Gopinath, Pierre-Olivier Gourinchas, Chang-Tai Hsieh, and Nicholas Li

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0910.htm
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Motivation for the Research

According to the "law of one price," the price of a given good will be the same everywhere once adjusted for exchange rates. Yet this prediction does not hold empirically. Price differences at the consumer level and at the wholesale level can result from varying transaction costs due to differences in currencies and regulations. Other factors such as different market conditions, wages, tastes, and infrastructures also can result in price differences across countries. In international economics, a critical question is the extent to which national borders and national currencies impose costs that segment markets across countries. In the existing literature attempts to identify the factors that generate the "border effect" and its magnitude have not controlled for heterogeneity among retailers or established clear benchmarks that separate the border effect from other factors generating price dispersion. This has given rise to an argument that a composition bias affects cross-country price indexes at higher levels of aggregation. To address these deficiencies, this paper develops a cross-border model of price determination and exploits critical information about the geographic location of individual stores to better estimate the factors that truly contribute to the border effect.

Research Approach

To address the issue of heterogeneity among retailers, the paper's first key innovation is its use of a dataset that contains weekly store-level price data from 325 grocery stores belonging to the same large food and drug chain retailer operating in the United States and Canada. Collected from January 2004 through June 2007, the data contain weekly total sales, quantities sold, retail prices, wholesale unit costs, and a measure of per-unit gross profit for 125,048 unique goods identified by

universal product codes (UPCs) in 61 distinct product groups. The product observations are mostly concentrated in the processed and unprocessed food and beverage category, housekeeping supplies, personal care products, and books and magazines. The retail prices exclude U.S. sales taxes and Canadian value-added taxes and provincial sales taxes. The authors match UPCs to get a set of 4,221 identical products available in at least one Canadian store and one U.S. store.

The second major innovation is the authors' use of the individual store's geographic location to isolate the border effect from other causes of price dispersion. In most of the existing literature, due to a lack of data, no distinction is made between stores that are close to a border and stores that are far from it. By developing a pricing model based on the store's distance from the border, and employing a regression-discontinuity approach, patterns of cross-border prices are established that capture more significant differences in market conditions and arbitrage costs for stores located close to and farther away from the shared U.S.-Canadian border. By locating stores on a circle, this model estimates the distribution of prices within and across countries in the presence of a border effect, and heterogeneity in marginal costs across countries. Through comparing the prices of identical products sold in stores run by the same retailer, the authors can test whether there are deviations in the law of one price between stores located close to but across the border from each other. The authors' results withstand four robustness checks.

Key Findings

- The study's results affirm the existence of significant border costs: at the border large and heterogenous price discontinuities across products are observed for retail prices and wholesale prices, and smaller discontinuities are observed in markups.

- When border costs become sufficiently large, markets are fully segmented across countries, and the magnitude of border costs no longer affects pricing decisions. The authors find strong evidence of international market segmentation, even for identical goods. The failure of the law of one price that they observe at the UPC level is very similar to the failure observed at a more aggregate level.

- The median retail and wholesale price discontinuities at the border move almost one-to-one with the U.S.-Canadian nominal exchange rate. The Canadian dollar appreciated in cumulative terms by 16 percent over the sample period. The median price gap across the UPCs between the average price and cost in Canada and the United States increased from –5 percent in June 2004 to 15 percent in June 2007, a variation that closely tracks the U.S.-Canadian nominal exchange rate. It appears that the U.S. dollar's depreciation between January 2004 and June 2007 increased both the costs and the prices in Canadian stores close to the border relative to U.S. stores on the other side. Overall, the evidence indicates that the median price gap moves closely with the nominal exchange rate and that cost differences play an important role.

- While the median price gap moves closely with the exchange rate, the price gap for an individual UPC is likely to be dominated by idiosyncratic factors. The border effect on prices varies substantially across products, and there is a large dispersion of price gaps across UPCs at any given point in time. Most differences in cross-border consumer prices arise from differences in an apparently tradeable component of costs, and not from systemic markup differences.

- The median price discontinuity across UPCs is as high as 15 percent for consumer prices and 17 percent for wholesale prices, while the median absolute price discontinuity is 21 percent for consumer prices and 21 percent for wholesale costs. The standard deviation across UPCs is large, indicating that the discontinuity at the border across goods varies from large and positive to large and negative.

Implications

The strong evidence of international market segmentation at both the barcode level and the aggregate level argues against the contention that aggregate-level differences in the law of one price are due to a compositional bias. It appears that wholesale markets are highly segmented, even when serving the same retailer, a striking result since wholesale costs are the most tradeable component of overall costs. To the extent that the nature of price setting and the costs of arbitrage vary across goods, or across retailers, further work that encompasses a wider range of goods and retailers would be very useful.

w-09-11

Social and Private Learning with Endogenous Decision Timing

by Julian Jamison, David Owens, and Glenn Woroch

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0911.htm
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Motivation for the Research

Individuals and organizations routinely have the option to undertake large sunk investments in technologies that could drastically alter how they operate. Typically, these expenditures come with significant risk: besides uncertainty as to whether a new technology will live up to its promises, the return on investment depends on factors outside their control, such as the cost of complements, market conditions, and macroeconomic trends. Contemporary examples include the deployment of an advanced computing or communications system or the adoption of green technologies to conserve energy and reduce pollution. While adoption initiates the stream of benefits from the innovation—whether these take the form of lowered costs or a new revenue source—delay allows a firm to gather additional information on the prospects of the technology's profitability.

Economists are generally puzzled as to how, in practice, superior technologies diffuse slowly through the population. The authors of this paper seek to contribute to the vast literature on the causes and patterns of the adoption and diffusion of innovations, concentrating on the portion that deals with how information is used by potential adopters to select among available innovations and decide when to adopt them. The aim of this paper is to investigate whether all the information available to members of an industry is employed in making the choice among several potential innovations and whether the best technology is chosen, given the available information. More specifically, the authors are interested in the choice between a safe and risky innovation, in the extent to which people delay adoption to gather private and public information, and in whether these two sources of information impact timing in different ways. While many econometric studies of diffusion models have been undertaken, few laboratory experiments have been conducted to test various hypotheses concerning these issues.

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Research Approach

This paper employs laboratory experiments to investigate behavioral patterns that govern firm and industry adoption of innovations as decisionmakers balance the tension between acting quickly and waiting for more information. In the authors' experiments, subjects choose between a safe and a risky innovation and also decide when to adopt the technology. Prior to adoption, subjects earn a return associated with a status quo technology that is smaller than the return on the safe innovation. The authors implement three treatments that differ in terms of the amount of information made available to the subjects. In addition to knowledge of the risk and return properties of the three technologies, each subject observes a private, imperfectly informative signal regarding the true return of the risky innovation; in the first treatment (the control) this private, imperfectly informative signal is the only information available. In the second treatment ("private values"), the subjects additionally

observe the prior adoption decisions of other subjects, but each subject has a unique return on the risky innovation—hence these observations are indicative of potentially useful timing information but not useful payoff information. In the third treatment ("common values"), the risky return is the same across all subjects—hence the observation of others' decisions is indirectly informative of one's own payoff. Adoptions are irreversible, so delaying the decision is the only way to acquire additional information about the return on the risky technology. Delay is not costless, however, since subjects incur an opportunity cost equal to the difference between the per-period profitability of the safe innovation and the status quo technology. To establish a benchmark against which to evaluate the experimental results, the authors solve for the Bayesian-Nash equilibrium strategies for the subjects in each of the three experimental treatments.

The laboratory experiments offer tests of several behavioral hypotheses. From a purely decision-theoretic perspective, subjects may rely solely on their private information to decide whether to opt for the risky alternative, ignoring completely the choices made by others. Delay would indicate a subject's desire to gather more private information to make a better choice between the two investment alternatives. At the other extreme, subjects may simply ignore their private information and imitate the adoption decisions of others who acted earlier. While such unreflective imitation can accelerate the diffusion of an innovation through the population, it can also lead to an industry-wide selection of an inferior technology. Furthermore, such conformity could also create perverse incentives, as when a firm adopts an innovation early to steer the industry toward one technology rather than another.

The authors' experimental design, together with their hypotheses about adoption behavior, has been greatly influenced by the rapidly growing body of research on social learning games and experiments. Theoretical models in that literature analyze sequential investment games played by rational agents who have access to both private and public information. These models have been preoccupied with the possibility that adopters choose to imitate prior adoptions as a means to free ride on the information gathered by others, but most previous models have assumed that the timing of such decisions is exogenously given.

Key Findings

- On average, subjects show a slight preference for choosing the safe innovation over the risky one. Their adoption decisions significantly improve upon pure randomization, indicating that subjects incorporate private and public information into their decisionmaking.

- Subjects do tend to be guided by their private signals. However, observation of others' earlier adoption decisions tends to improve subjects' performance by inducing them to respond to their own private signals earlier than they otherwise would have, even if their decisions are not based on common payoffs (that is, even if the information about other subjects' decisions does not provide useful information regarding the outcomes). Surprisingly, subjects do a better job at picking the better of the two innovations when they receive noninformative reports on prior adoptions than when those reports contain valuable information.

- Roughly half of the subjects in all treatments do not follow the theoretical prescription to adopt the technology favored by their first private signal. Instead, they delay the adoption decision with the apparent intent of acquiring additional information. With social information available (in this case, knowing the decisions of others, whether or not this information is payoff-relevant), subjects are slightly less likely to make the choice in the first round. However, when subjects observe their peers, they adopt more quickly as a group than when they do not. This result suggests that early adopters generate "competitive pressure" on other subjects to act, even when such action diverges from the most popular prior adoption decision.

- Profits earned by subjects appear to be related to their access to information, in that subjects earn a higher profit when they have the opportunity to observe their peers than when they lack that opportunity. This superior profit performance is, in large part, a result of subjects' tendency to adopt an innovation more quickly than they would otherwise; it therefore seems to be driven less by the diffusion of valuable information than by the competitive pressure mentioned above.

Implications

The finding that on average subjects make a decision about adopting a new technology earlier when they have access to information about the choices made by their peers suggests that people pay attention to others—even if others' choices have no direct implications for their own payoff—and that, relatively speaking, they pay more attention to the fact that others do something than to what in particular they do. This discovery has a range of implications both for firms that are attempting to maximize profits and for those that are attempting to predict what choices firms will make. A natural extension to this work, currently underway, is to include the additional possibility of direct network payoff externalities.

w-09-12

Housing and Debt Over the Life Cycle and Over the Business Cycle

by Matteo Iacoviello and Marina Pavan

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0912.htm
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Motivation for the Research

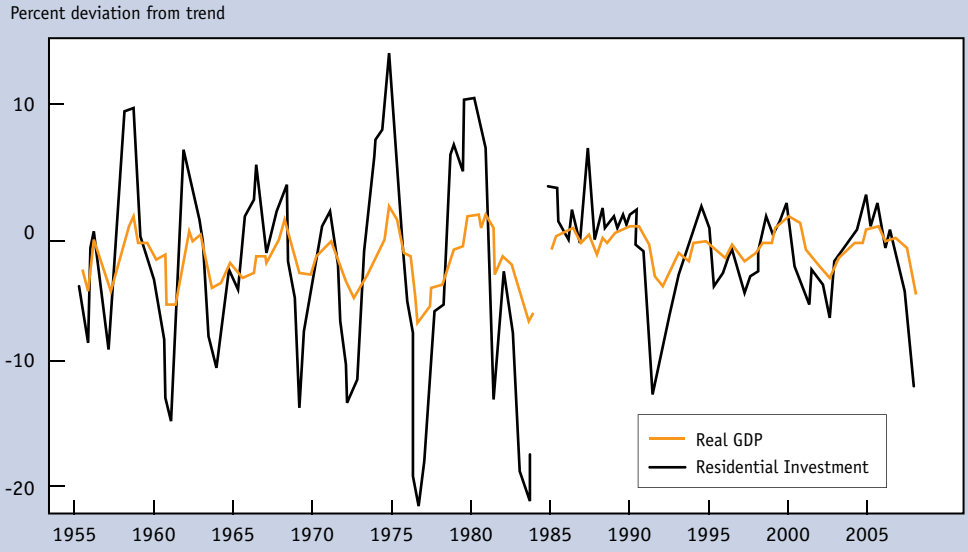
While housing investment is an important and volatile component of GDP and movements in the housing market are central to understanding aggregate fluctuations, modern business cycle models often treat housing as just another form of capital, thus ignoring the housing market. When housing is included in business cycle models, no allowances are made for the distinction between owning and renting, for income and wealth heterogeneity, borrowing constraints, transactions costs, or life cycle considerations. The authors seek to address this imbalance by studying the life cycle and business cycle properties of household investment and household debt in a quantitative general equilibrium model.

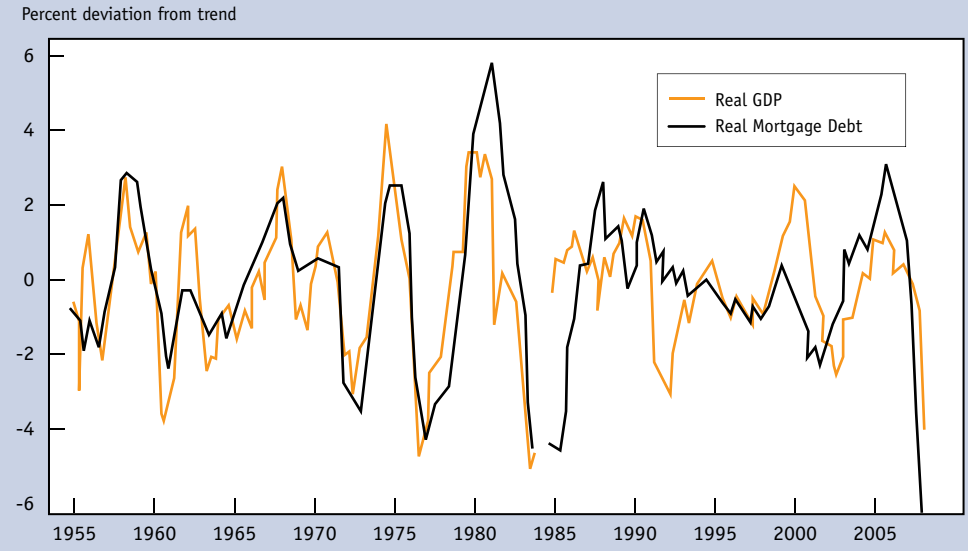
Research Approach

The starting point is a standard life cycle model in which households face idiosyncratic income and mortality risk. The authors modify it to include aggregate uncertainty (by making aggregate productivity time-varying) and an explicit treatment of the housing sector. The model accounts for characteristics that make housing different from other goods: the choice of renting versus owning, the role that housing can play as collateral for loans, and the fact that, at the individual level, changes in housing investment occur infrequently but in large amounts. Individual households differ in their age profile and labor productivity. They can also belong to either of two groups, termed "patient" and "impatient," a modification that allows one, at the cross-sectional level, to mirror the skewed U.S. wealth distribution and to replicate the life cycle profiles of housing and nonhousing wealth. Patient households prefer to save more relative to current consumption, while impatient households prefer consumption over saving. Recent literature suggests that heterogeneity in such preferences can account for the fact that households with similar income levels amass very different amounts of wealth over their life cycle.

At every stage of the life cycle, the model describes an individual household's behavior as choosing its preferred consumption, saving, labor supply, and housing investment by taking into account its income, both current and expected, its liquid assets, and its housing position at the start of each

Household Debt, Housing Investment, and GDP (Hodrick-Prescott Filtered Variables)





Source: Bureau of Economic Analysis, National Income and Product Accounts; Federal Reserve Board; Flow of Funds of the United States; and authors' calculations.

period, defined as one year. Households begin each period either as renters or homeowners; if renters have sufficient liquid assets, they become homeowners. Every period existing homeowners face four choices: continue in their current house, increase their house size, decrease their house size, or switch to renting. The option an individual household chooses depends on a combination of the housing and liquid assets it owns at the start of the period, as well as on its age and income. In the model, households that are young, old, and poor hold few assets and are renters, while households that are middle-aged and/or asset rich are homeowners.

The authors run a baseline calibration of their model from 1952 to 1982, a period when the U.S. economy was characterized by relatively high aggregate volatility but low individual income volatility. During this era, downpayment requirements were high, and household mortgage debt was strongly procyclical. Terming these years the early period, the authors then use their model to explore the business cycle implications of structural changes tied to increasing income volatility and lower downpayment requirements that began in the early 1980s. During this later period from the mid-1980s to the present, dubbed by many observers the Great Moderation, these structural changes might affect the sensitivity of macroeconomic aggregates to economic shocks—so higher income volatility and lower required downpayments would be potential candidates for explaining the role played by debt and the housing market in the post-1980s U.S. economy. The volatility of housing investment has fallen more than proportionately relative to GDP, while the correlation between mortgage debt and macroeconomic activity has dropped substantially, from about 0.8 to 0.3. The authors regard risk and the availability of mortgage financing as two key determinants of housing demand and housing tenure: higher risk should make individuals more averse to purchasing large-ticket items that are costly to sell in bad economic times, while the greater availability of financing should encourage housing demand, since a smaller amount of savings is needed to buy a house.

In sum, by using as inputs exogenous aggregate and idiosyncratic uncertainty, the model delivers the endogenously derived dynamics of housing and nonhousing investment over the household's life cycle and the business cycle to address the question: what are the implications of lower downpayment requirements and higher income volatility for macroeconomic performance?

Key Findings

- Lower downpayment requirements reduce the volatility of housing investment from about 6.7 to 6.4 percent. Effectively, lower downpayments allow people to more smoothly adjust their housing over the life cycle, irrespective of business cycle fluctuations. By contrast, high downpayments mean that more households are unable to save enough for a downpayment or are able to save only enough to afford the minimum house size. The housing investment for these agents reacts strongly to shocks: in good times they switch from renting to owning or to owning a larger house, and in bad times they switch from owning to renting—in other words, housing investment is more volatile when downpayment requirements are higher.

- Lower downpayment requirements lead to an increase in the homeownership rate and a decrease in the volatility of household investment and, to a lesser extent, of other components of demand. Lower downpayment requirements allow households with relatively little net worth to own homes. The model predicts that lower required downpayments substantially increase homeownership rates for households between the ages of 30 and 65 years, with the homeownership rate rising from 64 to 76 percent.

- The model finds that the combination of larger idiosyncratic risk and lower required downpayments reduces aggregate volatility and housing investment volatility. The model explains 10 to 15 percent of the reduced variation in GDP observed in the data, and about half of the reduction in the variance of housing investment. Compared with the early period, this effect explains the later period's decline in the correlation of household mortgage debt with GDP.

- Compared with renters, indebted homeowners are more likely to work during cyclical downturns in order to finance mortgage payments, thus offsetting the decrease in output due to negative productivity shocks. Since homeowners are less likely to adjust their housing capital over the business cycle, this effect mitigates both housing investment volatility and aggregate volatility, and might help explain some aspects of the Great Moderation.

- Higher income risk leads to higher precautionary savings and to a slight decrease in homeownership rates among impatient agents, going from 64 percent to 62 percent. Higher risk makes wealth-poor individuals more cautious, and thus they adjust their consumption, working hours, and housing demand by smaller amounts in response to aggregate shocks. Since housing is a particularly large purchase, this mechanism is quite pronounced for housing investment. Coupled with lower downpayment requirements, these forces reduce the procyclicality of household debt and reduce the sensitivity of housing demand to changes in aggregate conditions.

Implications

To the best of the authors' knowledge, no previous model with rigorous micro-foundations for housing demand has succeeded in reproducing housing's procyclicality and volatility in quantitative general equilibrium. Including these features should yield a better approach for central bank modeling and policymaking by helping to describe more precisely the effects that housing investment has on aggregate economic activity.

w-09-13

Financial Leverage, Corporate Investment, and Stock Returns

by Ali K. Ozdagli

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0913.htm
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Motivation for the Research

Firms with a high ratio of book value of equity to market value of equity (value firms) earn higher expected stock returns than firms with a low book-to-market equity ratio (growth firms). However, conventional wisdom tells us that growth options should be riskier than assets already in place and should therefore command higher expected returns than value firms, which derive their value from assets in place. Additionally, Fama and French (1992) have shown that portfolios of stocks with different book-to-market ratios have similar risk profiles, as measured by the standard capital asset pricing model (CAPM) of Sharpe (1964), Lintner (1965), and Black (1972). This phenomenon, known as the value premium puzzle, helped the Fama and French model replace the CAPM as the benchmark in the asset pricing literature.

This paper presents a dynamic model of the firm with risk-free debt contracts, investment irreversibility, and debt restructuring costs in order to analyze the effects of financial leverage on investment and explain the cross-sectional differences in equity returns. In a parsimonious and tractable way, the model captures several irregularities in the corporate finance and asset pricing literature.

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Research Approach

The author develops a theoretical model that extends the investment irreversibility model of Abel and Eberly (1996) by incorporating investors' risk preferences, risk-free debt contracts, and debt adjustment costs. He then calibrates the model, drawing on data from the literature and estimating the remaining parameters using maximum likelihood, based on the long-run stationary distribution of book-to-market values from the Compustat database. The financing decisions in this model are similar to those of Fischer, Heinkel, and Zechner (1989) and Gomes and Schmid (2009), who add debt restructuring costs to the standard tradeoff theory of capital structure, in which a firm chooses its financing policy by balancing the costs of bankruptcy against the benefits of incurring debt, such as tax shields due to interest payments. The model developed in this paper assumes that firms benefit from the tax shield of debt, as in the tradeoff theory, and that they face additional costs at the time of debt restructuring. However, in this paper debt has two properties distinct from its properties in previous papers: it is free from risk and endogenously limited by the lenders to a certain fraction of capital.

Key Findings

- An important property of the model is that book leverage—the fraction of total capital supplied by lenders—is state-independent. Book leverage is determined in a manner that ensures that the firm's value is nonnegative even in the worst-case scenario, in order to avoid bankruptcy. This worst-case scenario is independent of the state variables and hence a revision of the debt agreement at a later date would lead to the same amount of leverage. Thus, it is not optimal for a firm to change its book leverage once it is set, and book leverage remains the same across firms with different book-to-market equity ratios, whereas market leverage differs significantly. Moreover, because the debt level is constant when the firm does not invest, the firm's market debt-to-equity ratio varies closely with fluctuations in its own stock price. This implication of the model is in line with the results of Welch (2004), who finds that U.S. corporations do little to counteract the influence of stock price changes on their capital structures.

- Investment irreversibility alone causes a growth premium rather than a value premium. The firm's investment opportunity is a call option, because the firm has the right, but not the obligation, to buy a unit of capital at a predetermined price. As is known from the financial options literature, when the price of the underlying security rises and falls, the price of the call option rises and falls at a greater rate. This suggests that the value of a growth option, meaning the call option to invest, should be more responsive to economic shocks than the assets in place. Therefore, growth options increase the firm's level of risk. Similarly, the disinvestment opportunity is a put option—because the firm has the right, but not the obligation, to sell a unit of capital at a predetermined price. The value of this put option is negatively related to the value of the underlying asset because the gain from exercising the option is higher for less productive firms. Therefore, the disinvestment option provides value firms that have low productivity with insurance against downside risk and hence reduces their risk. This proposition is contrary to the conventional wisdom of recent literature—for example, Zhang (2005) and Cooper (2006) —which presents investment irreversibility as the source of the value premium.

- In the author's model, financial leverage affects stock returns directly—through its effect on equity risk à la Modigliani and Miller (1958), and indirectly, through its effect on business risk, by influencing investment decisions. These two channels have opposing effects on the relationship between book-to-market ratios and stock returns. However, the Modigliani-Miller effect strongly dominates the investment channel and explains the major share of the value premium.

- Financial leverage also affects investment—and hence the business risk—because it influences the effective degree of investment irreversibility faced by the firm's owners. When investment can be financed with leverage, the effective price of capital is reduced by the tax savings associated with debt financing at the time the investment was made. On the other hand, at the time of disinvestment, the firm has to repay its debt, in line with the debt agreement, and therefore has to give up the tax savings associated with the debt financing of that particular investment. Because the purchase price is greater than the resale price and both should be adjusted by the same value of tax savings, their ratio increases as a result of debt financing. In turn, this result increases the effective irreversibility perceived by the firm's owners. Since irreversibility reduces the value premium, the investment channel of leverage is also reduced.

- Although financial leverage can explain the major share of the value premium, while investment irreversibility alone generates a growth premium instead, investment irreversibility still contributes importantly to improving the model's fit with the data, by generating a wide range of book-to-market values.

Implications

This paper makes a number of contributions to the growing literature that tries to link corporate decisions to asset returns. First, the model's closed-form solution identifies explicitly how investment irreversibility, financial leverage, and their interaction affect the cross-section of stock returns. Second, the debt capacity of the firm is endogenously determined. Third, because of the interaction of financial leverage and irreversibility, the paper does not need to rely on a high degree of irreversibility in order to generate a sizable variation in stock returns. Fourth, the paper calibrates the model using maximum likelihood to capture the distribution of book-to-market values instead of plugging in parameter values in an ad hoc manner, and the calibrated model captures the distribution of market leverage reasonably well. Finally, the paper shows that financial leverage can explain the value premium.

Introducing debt into production-based asset pricing raises interesting possibilities for further research. For example, the model presented here could be extended with time-varying interest rates in a framework similar to Merton's (1973) intertemporal capital asset pricing model (ICAPM). This extension would serve two purposes. First, it would decrease the explanatory power of the conditional market beta for stock returns and get us one step closer to solving the value premium puzzle. Second, because firms with a high book-to-market ratio also have higher leverage, they would have greater exposure to interest rate shocks, further reinforcing the value premium.

w-09-14

Inflation Persistence

by Jeffrey C. Fuhrer

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Motivation for the Research

This paper examines the concept of inflation persistence in macroeconomic theory. For many decades, economists assumed that inflation is an inertial or persistent economic variable, meaning that the rate of change of the price level tends to remain constant in the absence of an economic force to move it from its current level. The concept of the sacrifice ratio—the number of point-years of elevated unemployment required to reduce inflation by a percentage point—implies that inflation does not move freely but requires significant economic effort in the form of elevated unemployment or lost output to reduce its level.

The early incarnations of the accelerationist Phillips curve modeled the apparent inertia in inflation by including lags of inflation. In this early literature, the theoretical justification for including lags of inflation was to serve as a proxy for expected inflation and for price-setting frictions, such as contracting. As an empirical matter, the lags helped the model fit the data.

The introduction of Muth's (1961) theory of rational expectations into the macroeconomics literature and the consequent move toward explicit modeling of expectations posed considerable challenges in modeling prices and inflation. In the earliest rational expectations models of Lucas (1972) and Sargent and Wallace (1975), the price level was a purely forward-looking or expectations-based variable like an asset price, which in these models implied that prices were flexible and could "jump" in response to shocks. It was difficult at first to reconcile the very smooth, continuous behavior of measured aggregate price indexes such as the consumer price index with the flexible-price implications of these early rational expectations models.

A number of economists recognized the tension between the obvious persistence in the price-level data and the lack of persistence implied by these early rational expectations models. Fischer (1977), Gray (1977), Taylor (1980), Calvo (1983), and Rotemberg (1982, 1983) developed a sequence of

models that rely on nominal price contracting in attempts to impart a data-consistent degree of inertia to the price level in a rational expectations setting. The overlapping contracts of Taylor and Calvo/Rotemberg were successful in doing so, allowing contracts negotiated in period t to be affected by contracts set in neighboring periods, which would remain in effect during the terms of the current contract. The subsequent trajectory of macroeconomic research drew heavily on these seminal contributors, who had neatly reconciled rational expectations with inertial (or persistent) macroeconomic time series.

However, in the early 1990s, a number of authors discovered that these rational expectations formulations yielded less satisfying implications for the change in the price level, that is, the rate of inflation. Ball (1994) demonstrated that such models could imply a counterfactual "disinflationary boom"—the central bank could engineer a disinflation that would cause output to rise rather than contract. Fuhrer and Moore (1992, 1995) showed that Taylor-type contracting models implied a degree of inflation persistence that was far lower than was apparent in inflation data of the postwar period to that point.

While much of economists' intuition about inflation persistence is obtained from responses to identified monetary policy shocks, considerable interest also centers on the behavior of inflation in response to a central bank-engineered disinflation The work of Ball (1994), Fuhrer and Moore (1992), and others emphasizes this aspect of inflation dynamics. In response to such a shock, the differences in the behavior of inflation are striking in purely forward-looking models versus its behavior in hybrid models. In purely forward-looking models, regardless of how persistent output is, the inflation rate jumps to its new equilibrium in the period after the policy announcement, with no disruption of output. In marked contrast, when lagged inflation is added to the inflation equation, inflation declines gradually to its new long-run equilibrium, with a concomitant decline in output during the transition.

Many view the dynamics of the purely forward-looking specification as strikingly counterfactual. Counterfactual or not, one needs to understand the dynamics of inflation to pursue appropriate monetary policy. Knowledge of the reduced-form behavior of inflation is not sufficient. The central bank needs to understand the sources of inflation dynamics: it needs to know whether inflation arises from the persistence of output, which may in turn arise from the behavior of monetary policymakers or from persistence intrinsic to the price-setting process. A third source of persistence is the behavior of the central bank. Either through the vigor (or lack thereof) of its systematic response to deviations of inflation from its current target or in the low-frequency movement in its inflation target the central bank can exert significant influence on the persistence of inflation. Thus, the issue of persistence is of more than passing interest to macroeconomists and policymakers.

Research Approach

The author analyzes and explains the existing literature and current knowledge in the area of inflation persistence, weaving into the analysis new econometric results and pointing the way to advancing the state of knowledge in this area. He begins by emphasizing the difference between reduced-form and structural persistence and goes on to examine a number of empirical measures of reduced-form persistence, considering the possibility that persistence may have changed over time. Next, he examines the theoretical sources of inflation persistence, distinguishing intrinsic inflation (inflation that occurs as a result of inherent price dynamics) from inherited inflation (inflation that occurs in response to changes in real activity and supply shocks) and deriving a number of analytical results on persistence with emphasis on the influence of the monetary policy regime. He summarizes the implications for persistence from the literatures on imperfect information models, learning models, and so-called trend inflation models, providing some new results throughout his analysis. Finally, he summarizes the results on persistence from the many studies of disaggregated price data.

Key Findings

- It may be early to draw firm conclusions about the structural sources of inflation persistence or about the extent to which these sources have changed and manifested themselves in changes in reduced-form inflation persistence. In the first case, it may be premature because there is not yet widespread agreement about the appropriate mapping between micro data or reduced-form aggregate data and economists' structural models. In the second case, the sample period from which to draw inferences about potential changes is fairly short.

- To the extent that reduced-form persistence has changed, policymakers need to gain clarity about the sources of the change. There may have been a number of structural channels through which persistence may have changed. There may have been a change in the intrinsic persistence of inflation—the importance of lagged inflation in the structural Phillips curves. Alternatively, the amount of inherited persistence may have changed. In principle, this could arise because the persistence of the driving process has changed, or because the coefficient on the driving process has changed, or because the relative variances of the shocks to inflation and the driving process have changed.

- It is unlikely that any change in inflation persistence has arisen from a change in the persistence of the driving process, as this has remained remarkably stable throughout the period. In addition, a dynamic stochastic general equilibrium model-based analysis suggests that while changes in the systematic component of monetary policy likely have led to inflation that is less persistent, the largest changes in persistence are most likely due to changes in the so-called intrinsic sources of inflation persistence—whether these arise from indexation, rule of thumb price-setters, or a rising price reset hazard.

- The models that depart from the standard Calvo framework suggest that other aspects of the economy that impinge upon inflation persistence may be responsible for changes in its persistence. These aspects may include smaller or less frequent changes in trend inflation or a smaller role for learning, as central bank transparency regarding its policy goals has increased.

Implications

An impressive and growing body of evidence now exists on price- (and wage-)setting behavior at the disaggregated level. This evidence strongly suggests that some of the inferences drawn from micro data about the frequency of price changes, as well as the degree of inflation persistence, may pertain largely to price responses to industry- or firm-specific shocks. The response to aggregate shocks by the aggregate component common to the individual price series may well have quite different properties from the responses of individual firms to idiosyncratic shocks. Integrating this evidence into our structural models, perhaps along the lines of rational inattention models (see Sims (2003), Gorodnichenko (2008), and Maćkowiak and Wiederholt (2009)) seems a promising avenue for research.

Finally, economists are currently accumulating additional evidence that should allow a firmer conclusion to be drawn on whether reduced-form persistence has changed and to discern the structural sources of any such changes. The upheaval created by the 2007–2009 financial crisis and recession, with the concomitant prospect of a prolonged period of elevated unemployment and depressed marginal cost, suggests that over the next decade sufficient evidence will have been gathered to enable economists to test more fully the hypothesis that reduced-form inflation persistence has declined and to test competing theories that identify the structural sources of persistence.

w-09-15

Closed-Form Estimates of the New Keynesian Phillips Curve with Time-Varying Trend Inflation

by Michelle L. Barnes, Fabià Gumbau-Brisa, Denny Lie, and Giovanni P. Olivei

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0915.htm
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Motivation for the Research

This paper illustrates the importance of imposing model discipline on inflation expectations when estimating a New Keynesian Phillips curve (NKPC). The standard difference equation (DE) form of the NKPC states that current inflation is a function of past inflation, expected future inflation, and real marginal costs. The alternative closed-form (CF) specification solves the DE form to express inflation as a function of past inflation and a present discounted value of current and expected future marginal costs. In essence, the CF solution explicitly states that if the NKPC were a good model for inflation, then inflation expectations should be formed in a manner consistent with this model. Therefore, CF estimates are particularly well suited to assess the validity of forward-looking relationships like the NKPC as (part of) a macroeconomic model.

There is now a large literature on estimating NKPC models. The forward-looking component in the NKPC is usually derived from a micro-founded problem in which firms cannot reset prices optimally in every period. Firms then take into account not only current market conditions, but also expected future conditions when setting prices optimally. This mechanism alone provides no role for lagged inflation in the NKPC. But in actual data the high degree of inflation persistence often means that purely forward-looking versions of the NKPC fit the data worse than "hybrid" versions where current inflation depends both on inflation expectations and on past inflation. The role of past inflation in the NKPC is frequently introduced through some ad hoc pricing mechanism (for example, indexation or "rule of thumb" price-setting). Nonetheless, this modeling approach is unsatisfactory as the mechanism lacks micro-foundations; from a theoretical point of view, a purely forward-looking NKPC would be much more convenient. Cogley and Sbordone (2008) explore the possibility that the persistence in the inflation process is due to a time-varying inflation trend rather than to some ad hoc element in firms' price-setting decisions. Their empirical findings favor a purely forward-looking Phillips curve where inflation persistence is entirely due to time variation in that persistent trend. Supporting this explanation for inflation persistence, there is considerable evidence that the Federal Reserve's inflation target has slowly changed over time (Ireland 2007).

As long as the inflation target does not move, a purely forward-looking NKPC implies that inflation is just as persistent as its driving process, which is typically a measure of real activity such as real marginal costs. Instead, when the NKPC is not purely forward-looking, the adjustment of inflation to movements in the driving process is slower because inflation also depends on its own past path. The two alternative models differ in their implied tradeoffs between inflation and real activity, an element of central importance to the optimal conduct of monetary policy.

Research Approach

The paper examines the differences that arise from estimating a New Keynesian Phillips curve (NKPC) when the relationship is expressed as a difference equation (DE) or in its closed-form (CF) specification. The initial Monte Carlo analysis ranks DE and CF estimates of the NKPC in terms of their small sample bias and dispersion, and in terms of their sensitivity to a particular form of misspecification that the authors consider plausible for this specific model. Next, the empirical exercise uses quarterly U.S. data from 1960:Q1 to 2003:Q4 to contrast the DE and CF estimates with and without controls for the misspecification analyzed in the Monte Carlo exercise.

The gain in efficiency from using the CF estimation shown in the Monte Carlo exercise is likely to apply to other relationships that express a variable as a function of its driving process, next-period expectations of the variable, and (possibly) its past value. The authors also present a general method to estimate this kind of relationship that avoids the problem of computing the CF. The method allows the econometrician to impose model-consistent expectations for a finite period of time instead of ad infinitum as in the closed form. The authors show that in the context of the NKPC, imposing model-consistent expectations for just a few periods forward yields efficiency gains that quickly approximate the gains in efficiency from using the closed form. Both Monte Carlo methods and actual U.S. data are used to illustrate this point.

Key Findings

- In the Monte Carlo exercise, the CF estimates are much more precise, are less affected by small sample bias, and are more robust to a particular misspecification that alters the ad hoc part of the model in a plausible way.

- Using actual data, deep parameter estimates of the NKPC obtained from the DE and CF specifications differ substantially. Some of the DE estimates imply that, once time-varying trend inflation is taken into account, the NKPC is purely forward-looking. Nonetheless, the corresponding CF estimates always find a more important role for lagged inflation. Indeed, according to the CF estimates, both lagged and expected future inflation enter the NKPC with rather similar weights.

- The CF estimates of the NKPC suggest that U.S. inflation has an important persistent component that is not fully explained by time variation in the inflation trend, or by persistence in the driving process of inflation. Focusing the analysis on the post-1984 subsample leaves the main results unaltered.

- Another important dimension in which the DE and CF estimates differ is the frequency with which prices are readjusted optimally. In the DE specification, this frequency is estimated to be 3.9 months, while in the CF specification it is close to one year.

- The estimation method that imposes some model discipline on expectations yields estimates that are very similar to the CF estimates. The authors show that having four quarters of model-consistent expectations already closes most of the gap between DE and CF estimates.

Implications

The Monte Carlo exercise illustrates that the CF estimates are more precise and less subject to small sample bias than the DE counterparts. Additionally, the CF estimates are less affected by a plausible form of misspecification in the ad hoc part of the NKPC. In order to place the DE and CF estimates on a more comparable footing, part of the empirical application estimated on U.S. data controls for this misspecification. The DE estimates obtained in that particular exercise are already very different from the DE estimates reported in Cogley and Sbordone (2008), which imply that the NKPC is not purely forward-looking. The CF estimates always place a larger weight on past inflation, quite close to the weight on expected inflation. The high autocorrelation of deviations of inflation from its (time-varying) trend appears to square better with the reported CF estimates than with a purely forward-looking specification of the NKPC.

The paper contributes to previous literature (Fuhrer, Moore, and Schuh 1995; Fuhrer and Olivei 2005) that compares DE and CF estimates, albeit in different settings and using different estimation methods. Moreover, it provides a formal explanation for an important source of differences between the DE and CF estimates of a forward-looking Euler equation, and illustrates how to improve on the DE estimates by placing some model-consistent constraints on expectations without resorting to the closed-form model solution. This is particularly convenient when the CF specification is

difficult to compute and in instrumental variables estimation settings where the CF involves infinite sums of present discounted values—which, at best, can only be approximated. In this regard, the paper links the estimation problem of forward-looking Euler equations (such as the NKPC) to the minimum-distance and GMM (generalized method of moments) estimation literature on the efficiency gains that can result from imposing additional estimation restrictions.

w-09-16

Estimating Demand in Search Markets: The Case of Online Hotel Bookings

by Sergei Koulayev

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0916.htm
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Motivation for the Research

In markets with multiple sellers and frequently changing prices, consumers often have to engage in costly search in order to collect information necessary for making a purchase. A rational consumer in such a situation would make a sequence of search efforts, stopping when the expected benefit from another attempt falls short of the search cost. When the search is over, the consumer makes a purchase from the set of goods discovered during the process, representing the choice set. Generated in this way, choice sets have two distinct properties. First, since searching is costly, choice sets are usually small compared with the full set of available products: according to comScore data, only a third of all consumers visit more than one store while shopping online. Second, choice sets are endogenous to (depend on) preferences. This is because the decision to stop searching is dictated in part by the expected benefit of any additional search, which is itself a function of a searcher's preferences. These properties complicate inference about consumer demand for differentiated goods in search markets. The standard approach is to recover preferences from the joint variation of market shares of goods and their attributes, including price. Implicitly, this method assumes that consumers possess full information about all goods available on the market. Therefore, the variation of choice sets across consumers comes from the availability of goods across markets, which is arguably exogenous to (independent of) preferences. In search markets, where the variation of choice sets comes through individual search efforts, these assumptions do not hold and the application of this method leads to biased estimates of demand. The purpose of this paper is twofold: First, to propose an alternative estimation method that corrects for this bias. Second, using this method, to evaluate the overall magnitude of the bias due to search and to assess the individual contributions of its two sources—its limited nature and the endogeneity of choice sets. The emphasis on separating the two sources of bias is motivated by the fact that their correction requires rather different approaches, both in nature and in the cost of implementation.

Research Approach

Correcting for the limited nature of choice sets can be achieved either by using information on actual choice sets (as done in this paper) or by employing simulation methods developed in the literature. To correct for the endogeneity bias, the author takes the approach of estimating preferences within a model that includes as outcome variables both observed search decisions and purchases. Indeed search decisions are precisely the channel through which preferences affect the distribution of choice sets, leading to the endogeneity problem. However, explaining search decisions in the context of differentiated goods contains an identification problem. A person may stop searching either because she has a high idiosyncratic valuation for goods already found (her status quo) or because she has a high search cost. Therefore, an observed measure of search intensity (such as the distribution of search duration) can be explained either by variability in utilities across goods or by moments of the search cost distribution. To separate the effects of search costs and preferences on

search decisions, one may use exogenous shifters of search costs. Alternatively, as in this paper, one can use conditional search decisions: a search action together with the observable part of the search history preceding the action. Using this approach, the author obtains a source of exogenous variation in the status quo across consumers, which allows separation of the effects of search costs from the effects of preferences on search decisions.

The author implements these ideas by estimating a structural model of sequential search, using a unique dataset of search histories by consumers who were searching on a popular website for hotels in Chicago. Although this website offers a variety of search tools, the author focuses on a subset of consumers who employed a simple yet common strategy: start the search by sorting hotels by increasing price and then flip through the pages of search results. The advantage of this dataset is that it offers detailed information on search histories: search actions, observed hotels, and clicks. The author compares price elasticities from the search model with those from a static discrete choice model with full information. To correct for the limited choice sets, the author next drops the assumption of full information and re-estimates the static model using data on actual choice sets.

Key Findings

- There is significant heterogeneity of search costs among the population. While the model does a good job of predicting average search intensity, it performs rather poorly at detecting heterogeneous incentives to search.

- Both properties of choice sets generated by a search process—their limited nature and endogeneity to preferences—have a significant impact on estimates of the price elasticity of demand, an important input in many applications, including pricing decisions, welfare analysis of mergers, and benefits from the introduction of new products. Both factors lead to biased estimates in a static demand framework that takes choice sets as given.

- Within a linear utility framework, the mean utility function and the search cost distribution of a representative consumer are nonparametrically identified.

- The nested logit model with full information overestimates the price elasticities by as much as a factor of five compared with the results from the search model. One explanation is that the choice sets of these searchers include mostly cheaper-brand hotels that are located farther from the city center. As a result, consumers choose lower-quality hotels not only because they are price sensitive (as the full information model predicts), but also because the higher-quality ones are often not observed. Although intuitive, this argument appeals only to the limited nature of choice sets, while both properties of choice sets are responsible for the bias.

- After correcting for the limited choice sets by dropping the assumption of full information, the logit model still overestimates the price elasticity by a factor of four. This is a consequence of the endogeneity of choice sets. For example, if we see someone willing to incur a cost in order to find more expensive but potentially better-quality hotels, we should conclude that the consumer in question is less price-sensitive than the static model would predict. A static demand model ignores this piece of information and therefore makes biased conclusions.

- The results indicate that accounting for actual choice sets but ignoring their endogeneity leads to overestimation of price elasticity by 17 to 400 percent across specifications. However, contrary to the above case, the direction of the bias is specific to the dataset being used and cannot be determined a priori.

Implications

The biases found in this study are of significant magnitude from the perspective of decisionmaking by a firm. If for simplicity we assume that every hotel is a monopolist, the inverse elasticity

rule (which states that the optimal markup of a monopolist is inversely related to the elasticity of demand) implies that overestimation of elasticity by 50 percent leads to (1 – 1/1.5)*100=33 percent loss of markup, because the price charged is suboptimal.

While the model does a good job of predicting average search intensity, it performs rather poorly at picking heterogeneous incentives. This fact points to some limitations of the model that suggest directions for future research. In particular, it would be desirable to relax the assumptions of common prior and search cost distributions by introducing consumer heterogeneity. Also, the model estimates are obtained for a rather select group of the population, that is, consumers who search by price sorting. To generalize these results, it is important to increase the scope of search strategies by adding more pages and other sorting and filtering tools.

This paper takes another step toward more realistic modeling of the search process, both in terms of the specifics of the actual search environment and in terms of the complexity of goods searched for. Clearly, greater realism comes at an increased cost of implementation and computation, which can limit the scope of search behavior that can be modeled in a fully structural way. Nevertheless, the author believes this is a fruitful direction for research and offers two main reasons for this contention. First, one can look more closely at the implications of search frictions for demand for heterogeneous goods. Second, a comprehensive search model allows one to evaluate different ways of organizing the display, an important problem in online markets such as those for hotel accommodations or airline tickets.

w-09-17

Multiple Selves in Intertemporal Choice

by Julian Jamison and Jon Wegener

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0917.htm
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Motivation for the Research

The notion of self has a long tradition in both philosophy and psychology, dating back to at least Hume (1739). In economics, the focus on self has been primarily implicit, yet prominent in the assumption that an individual maximizes his or her utility function and in performing welfare analyses by aggregating and comparing across individuals. The concept also has a long legal history, with questions of autonomy rising to the forefront. Of course, "self" has essentially no meaning except in distinction to some other individual or group, and so the relevant question becomes where to draw the line between the self and the other entity.

Recent neuroscientific studies have found evidence that systems involved with the general process of imaginatively putting oneself into the shoes of another (that is, the ability to distinguish between the self and the other, or, stated differently, to perceive one's own mental state and attribute analogous but distinct mental states to others—known in the Theory of Mind (ToM) literature as mentalizing) are similar to those involved in prospection (imagining oneself in the future). This raises the question as to whether this neuroscientific evidence can shed light on the process of intertemporal decisionmaking (decisionmaking over multiple points in time) as conceptualized implicitly or explicitly in economic theory.

Research Approach

The authors draw connections between recent findings in neuroeconomic research and traditional economic thinking about intertemporal choice. They describe the neuroscientific evidence that leads them to propose a novel view of how individuals see their future selves. The authors then suggest additional studies—behavioral, clinical, and neuroimaging—to confirm their conclusions. Finally, they discuss the policy implications of their conceptual framework.

Key Points

- The new discipline of neuroeconomics has been defined as a set of experimental, empirical, and theoretical analyses of the decisionmaking process that take into account the physical (and especially the neurological) embodiment of the decisionmaker. Neuroeconomics combines neuroscience, economics, and psychology, but also touches on the concerns of philosophy, medicine, and public policy.

- Humans seem to use the same brain systems to think about themselves in the future as they do to think about other conscious agents. By "think about," the authors refer to empathy (not just affinity), the mentalization of intentionality, and the prediction of behavior.

- The authors propose that individuals consider future versions of themselves to be truly separate persons from their present selves in terms of actual brain systems and that the decisionmaking process involving a tradeoff between one's current and future selves is substantially the same as the decisionmaking process involving a tradeoff between oneself and other individuals. The authors' approach differs from previous studies that draw a parallel between mentalizing and prospection in that the authors argue that intertemporal choice and decisions concerning time preferences are more analogous to mentalizing than is prospection, since intertemporal choice involves an implicit prediction of future actions.

- Since similar outcomes from experimental studies could easily arise from entirely separate brain processes, it is difficult to determine using only observed behavioral data whether a similar mechanism is being used for decisions relating to others and to one's future selves. On the other hand, since it is known that some subjects are better at mentalizing than others, it would be possible to compare this trait with a related version regarding future selves. In particular, one could test whether individuals who are proficient at predicting the behavior of others are also relatively proficient at predicting their own future actions, controlling for age and other relevant variables. Such a correlation would be suggestive (although not conclusive) in confirming the validity of the analogy between mentalizing and intertemporal choice along the dimension of predicting choice.

- It would be interesting to test whether subjects who are known to have theory of mind impairments (for example, subjects with a specific lesion to the tempoparietal junction) demonstrate impairments in prospection and whether they discount future outcomes more heavily than normal subjects. Patients with autism also would be expected to discount the future more than normal subjects, and this prediction too could be tested. Both these hypotheses could be tested with purely behavioral (choice-based) data and potentially augmented with neuroimaging.

- Merely observing the choices made by those with and without mentalizing impairments would be insufficient to draw any conclusions about the underlying processes. Neuroimaging via fMRI (functional magnetic resonance imaging) could shed light on the brain processes involved while healthy subjects were engaged in behavioral economic experiments, allowing direct comparison of brain activity in various regions during decisionmaking in each case. Experiments could be conducted to compare brain processes during activities that involve mentalizing about others and mentalizing about subjects' future selves. Other behavioral economics research could also benefit from information provided by neuroimaging about the areas of subjects' brains engaged during experiments. For example, any types of choices, (for example, those involving house purchases, severe medical interventions, or the environment) are simply infeasible to study via controlled nonhypothetical laboratory experiments. Given the fact that survey or self-reported responses are viewed as inherently less trustworthy than observed behavior, there is a clear rationale for augmenting studies of such decisions with concurrent neurological data in order to determine at least whether the decisionmaking process is proceeding in a manner known to be valid and consistent in other circumstances. Although finding overlapping areas of brain activity does not necessarily prove that precisely the same system is at work, it is highly suggestive that similar cognitive processes are involved.

Implications

Social norms do not allow individuals to do excessive harm to their neighbors, and the empirical findings discussed in this paper (that in the brain, a person's future self is viewed as a neighbor) suggest that perhaps society should likewise protect the welfare of an individual's future selves. As with one's relations with one's neighbors, this does not imply that the government or a panel of experts would (or should) tell anybody what choices to make or exactly how to behave. Rather, the government might make certain negative behaviors harder or more expensive to engage in to counterbalance the underlying potentially harmful tendencies. For instance, the government might require a waiting period before allowing individuals to make life-altering choices such as entering into marriage. Neuroscience can provide a scientific foundation for why we as a society might want to do this, and it can inform the debate as to when, to what extent, and how we should collectively engage in trading off present freedom of choice against benefits to future selves.

The authors are not explicitly suggesting such policies; such a recommendation would depend on both further scientific work and broader social decisions regarding the relative rights of future selves (not future generations, as is more commonly debated). The purpose of this approach is to make these sorts of choices more explicit and to provide the scientific input that is necessary but not sufficient for sound policymaking. The fact that future selves have no current voices of their own raises the question of who gets to speak for them; hence any such policies face unusual constraints and would need to be weighed especially carefully. Nevertheless, the authors believe that this view of future selves is fundamentally different from the prevailing one, that it is based on sound data from multiple sources, and that it has deep implications for policy that should be openly discussed.
If one takes seriously the idea of multiple selves over time, there are also individual responses that do not require any government intervention These can range from simply being more attuned to discrepancies between past and present (leading to better predictions of one's future actions or future welfare), to playing a parental-equivalent role with friends and relatives, to voluntarily joining or creating institutions to encourage specific behaviors that take into account the welfare of future selves.

w-09-18

The Valuation Channel of External Adjustment

by Fabio Ghironi, Jaewoo Lee, and Alessandro Rebucci

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Motivation for the Research

The experience of the United States over the past few decades shows that measured by changes in a country's net foreign asset position, external adjustment can take place not only through changes in quantities and prices of goods and services—the so-called trade channel of adjustment—but also through changes in asset prices and returns—the so-called financial channel of adjustment. International financial integration has greatly increased the scope for adjustment through the financial channel. Although the precise magnitude, composition, and working of the financial channel of adjustment are the subject of an ongoing debate, there is consensus that this channel is quantitatively important in the case of the United States.

This paper examines a specific component of the financial channel of external adjustment that works through valuation effects only, which the authors call the valuation channel of external adjustment. The valuation channel works solely through a country's capital gains and losses on the stock of gross foreign assets and liabilities due to expected or unexpected asset price changes. In this paper, the authors seek to understand the determinants of the valuation channel and its relative importance in external adjustment and to illustrate its working and implications for macroeconomic dynamics and risk sharing.

Research Approach

The authors examine the valuation channel theoretically in a dynamic equilibrium portfolio model with international trade in equity that encompasses complete and incomplete asset market scenarios. The model is a two-country DSGE (dynamic stochastic general equilibrium) model with production under monopolistic competition. In the model, households supply labor, consume a basket of goods that aggregates subbaskets of differentiated domestic and foreign goods in constant elasticity of substitution fashion, and hold shares in domestic and foreign firms. To preserve the ability to obtain a set of analytical results, the authors consider a simple production structure in which output is produced using only labor, subject to country-wide productivity shocks. Monopolistic competition, based on product differentiation within countries, generates nonzero profits and firm values, essential for the asset dynamics being studied. Uncertainty arises as a consequence of productivity and government spending shocks, and asset markets are incomplete when both types of shocks are present. The authors solve the model by combining a second-order approximation of the portfolio optimality conditions with a first-order approximation of the rest of the model, using the technique developed by Devereux and Sutherland (2009a) and Tille and van Wincoop (2008). They then illustrate their results with numerical examples, presenting impulse responses to relative productivity and government spending shocks.

Key Findings

- The authors show that separating asset prices and asset quantities in defining asset positions makes it possible to characterize the first-order dynamics of valuation effects (changes in relative cross-country equity prices, interchangeably referred to as valuation in the paper) and portfolio adjustment (changes in quantities of net foreign equity holdings, or the current account of balance of payments statistics in the authors' model) and their relative contributions to net foreign asset and macroeconomic dynamics.

- The initial response of valuation to a shock at time t is unanticipated as of time $t - 1$, but the dynamics in all following periods are fully anticipated when the shock occurs. For instance, the response of the valuation channel to relative productivity shocks is generally described by an ARMA (autoregressive moving average) (1, 1) process, while the response to relative government spending is described by an i.i.d. (independent and identically distributed) variable. These results stem from the fact that the cross-country dividend differential, which determines relative equity values in the authors' model, is proportional to the contemporaneous productivity and consumption differentials. The i.i.d. nature of valuation effects in response to government spending shocks then follows because the consumption differential in the model obeys a random walk process. The proportionality of relative dividends to productivity (in addition to relative consumption) results in richer ARMA dynamics of valuation.

- The share of valuation in net foreign asset adjustment is positive and constant in all periods after the impact of a productivity shock, thus playing a distinct role in the adjustment of external accounts. In contrast, the share of valuation in the adjustment to government spending shocks is zero in all periods except the impact period, with portfolio adjustment responsible for all changes in net foreign assets in subsequent periods.

- The difference between the authors' measure of the valuation channel and an excess return-based measure used in Devereux and Sutherland (2009b) is nonnegligible in response to productivity shocks. Excess returns are i.i.d., unpredictable variables in the authors' model. Thus, their approach yields nonnegligible predictable valuation effects along the dynamics that follow productivity shocks.

- In response to productivity shocks in an incomplete markets scenario, plausible parameter values imply that valuation represents a significantly larger share of net foreign asset movements than

portfolio adjustment. This finding is consistent with an equilibrium allocation that remains close to the complete markets outcome. However, analytical results and numerical illustration show that portfolio adjustment is the most important determinant of net foreign asset movements following government spending shocks.

- Finally, separating quantities and prices in net foreign assets also enables the authors to fully characterize the role of capital gains and losses versus the current account in the dynamics of macroeconomic aggregates. The authors show how excess returns, changes in asset prices, and portfolio adjustment affect consumption risk sharing with incomplete markets, contributing to dampening or amplifying the impact response of the cross-country consumption differential to shocks, and to keeping it constant in subsequent periods.

Implications

The paper's contribution to the literature on the financial channel of external adjustment is twofold. On the methodological side, it shows the importance of distinguishing quantities and prices in the definition of asset positions. On the substantive side, the authors obtain and illustrate a set of results that shed light on the mechanics of valuation effects and portfolio adjustment that can be at work in richer, quantitative models of international portfolio and business cycle dynamics.

w-09-19

Productivity, Welfare, and Reallocation: Theory and Firm-Level Evidence

by Susanto Basu, Luigi Pascali, Fabio Schianterelli, and Luis Serven

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Motivation for the Research

What portion of aggregate growth is due to innovation and technological advances and what portion is due to changes in the efficiency of resource allocation? This question arises in a variety of economic contexts, and in fields as diverse as growth and development, international trade, and industrial organization. Yet despite the importance of the question, there is no consensus regarding the answer. A large number of papers have proposed a bewildering variety of methods to measure the importance of allocative efficiency, leading to a wide range of numerical estimates. Much of the confusion stems from the lack of an organizing conceptual framework for studying this issue. This paper proposes such a framework and provides a quantitative answer, using one particular set of data.

Research Approach

The authors start building their framework by using a standard utility-maximization approach. It assumes that a representative household (consumer) with infinite horizons values both consumption and leisure, and maximizes its utility based on a standard intertemporal budget constraint. The authors prove analytically that the change in welfare of a representative consumer is summarized by the current and expected future values of the standard Solow productivity residual (a measure of the change in total factor productivity) if the representative household maximizes utility while taking prices as given. This result justifies using total factor productivity (TFP) as the right summary measure of welfare, even in situations where it does not properly measure technology, and makes it possible to calculate the contributions to aggregate welfare of disaggregated units (industries or firms), using readily available TFP data. Based on this finding, the authors compute firm and industry contributions to welfare for a set of European OECD countries (Belgium, France, Great Britain, Italy, and Spain), using industry-level (EU-JLEMS) and firm-level (Amadeus) data. After adding further assumptions about technology and market structure (firms minimize costs and face com-

mon factor prices), they show that changes in welfare can be decomposed into three components that reflect, respectively, technological change, aggregate distortions, and allocative efficiency. Using appropriate firm-level data, they assess the importance of each of these components as sources of welfare improvement in the same set of European countries.

Key Findings

- The present value of aggregate TFP growth is a complete welfare measure for a representative consumer, up to a first-order approximation. This result rigorously justifies using TFP, rather than technological change or labor productivity, as the central statistic of interest in any exploration of productivity at all levels of aggregation. Importantly, the result holds even when TFP is not a correct measure of technological change—for example, as a result of increasing returns, externalities, or imperfect competition. It also suggests that productivity decompositions should be oriented towards showing how particular features or frictions in an economy either promote or hinder aggregate TFP growth, since that measure is the key to economic welfare.

- The theoretical results point to a key role for the persistence of aggregate TFP growth, since welfare change is related to the entire expected time path of productivity growth in addition to the current growth rate.

- In order to create a proper welfare measure, TFP must be calculated using prices faced by households rather than prices faced by firms. In advanced economies with high rates of indirect and income taxation, the gap between household and firm TFP can be considerable.

- One can explore the sources of welfare change using both nonparametric index numbers and formal econometrics. The nonparametric approach has the great advantage of simplicity, and it avoids the need to address issues of econometric identification. Many interesting cross-country comparisons can be performed using the index-number approach, including calculating summary statistics of allocative efficiency for each country, based on firm-level data. However, if one wants to ask what share of aggregate TFP growth is due to technological change as opposed to scale economies or improvements in allocative efficiency, one needs to make additional assumptions and estimate production functions at the firm level, as the authors do in an example.

- In the majority of the OECD countries analyzed in this paper (Belgium, France, Great Britain, Italy, and Spain), most of the growth in productivity during the period studied is accounted for by advances in technology. This is certainly true for France and Great Britain. Moreover, aggregate distortions are quite important in many countries, such as Belgium, Italy, and Spain. Finally, the reallocation terms for primary factors or materials account for a small proportion of productivity growth in all countries over the 1995–2005 period.

Implications

In a deep sense, neither the nonparametric approach nor the production-function approach can answer the most interesting questions regarding the sources of welfare change. The reason is that neither approach allows one to answer the most interesting counterfactual questions, such as "How much lower would welfare be if there had been no technological change in sector *x* over an interval of time *y*?" In order to answer such questions, one needs to estimate a full general equilibrium (GE) model. However, realistic GE models that allow for dynamic imperfect competition and nontrivial, firm-level heterogeneity are very complex to specify, let alone to estimate. The authors' results, based on theory, enable them to suggest an exercise that would be rigorous without requiring a full GE model.

One interesting question concerns the effects of various government policies on welfare. These policies might be trade policies, such as joining NAFTA, or purely domestic, such as a change in the income tax rate. If one can isolate exogenous measures of policy change—an exercise that is difficult

but not impossible, as the literature on identifying exogenous monetary and fiscal policy shocks suggests—then, knowing that the entire welfare-relevant effects of these policy changes are summarized by their effects on the time path of national TFP, one can simply regress TFP on current and lagged measures of policy changes (in a single time series or using a panel of countries) and take the present discounted value of the impulse response. The results would yield the effects of a particular policy change on national welfare, without requiring the researcher to develop a GE model that specifies all the channels through which the policy might operate. A similar exercise could be conducted for the components of productivity growth resulting from technological change or resource reallocation.

w-09-20

State-Dependent Pricing and Optimal Monetary Policy

by Denny Lie

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Motivation for the Research

In modern macroeconomic theory, monetary policy is assumed to have real effects because of a tradeoff between nominal and real activity. When responding to various shocks to the economy, the central bank's policy goal is the optimal exploitation of this tradeoff. A large and growing literature analyzing the nature of optimal monetary policy is dominated by time-dependent pricing (TDP) models, which hold that firms have no choice about the timing of their price adjustments. Under this assumption, price changes are exogenous and the frequency of price adjustment is constant—in this type of environment, firms may not be able to adjust prices even if the economy experiences a large shock. Yet there is increasing microeconomic evidence that firms' price adjustments are state-dependent and that it is the frequency, rather than the size of price adjustment, that has a strong positive correlation with inflation. Under state-dependent pricing (SDP) models, individual firms decide when to change prices and pay a small menu cost when they do so. Since the endogenous timing of price adjustments may alter the monetary authority's inflation-output tradeoff, the use of SDP models may alter the prescription of what constitutes the optimal conduct of monetary policy. This paper analyzes optimal monetary policy in a SDP environment.

Research Approach

The author compares the optimal responses under TDP with and without monetary distortions and under TDP and SDP with "full" distortions to gauge the optimal monetary policies under each condition, and compares the difference prescriptions imposed by using a TDP or a SDP framework.

The SDP model used in this paper assumes the presence of monopolistically competitive firms and nominal price rigidity. The approach studies the optimal precommitment monetary policy using a timeless perspective policy implemented long ago and focuses on the long-run responses to either a productivity shock or a government purchase shock. This study departs from the widespread use of the linear-quadratic approach; instead, it follows the public finance literature's common practice of evaluating social welfare through households' lifetime utility. This alternative approach identifies market distortions and how monetary policy influences the variations in these distortions and thus affects welfare. The author's SDP model features four distinct sets of distortions: (1) the markup distortion that arises from a firm's monopoly power, which causes the market-generated output level to be inefficient; (2) the relative-price distortion arising from firms' asynchronous price-adjustment process; (3) the monetary (or exchange) distortions due to the use of money and credit to purchase final consumption goods; and (4) the menu cost distortion due to the fixed cost of price adjustment. The tradeoffs among these distortions require the central bank to balance the overall effect of the distortions with the goal of achieving the socially optimal allocation.

Another innovation is the author's method for solving the optimal policy problem. He computes a second-order approximate equilibrium solution to the optimal policy problem in addition to employing the standard first-order (linear) approximation method most often used in the literature. Using the second-order approximate solution addresses recent criticism that first-order approximations to SDP models miss the state-dependent nature and the nonlinear properties of these models.

Unlike most previous studies, this paper also examines the optimal monetary policy start-up problem, as the true Ramsey solution maximizing the welfare of representative agents specifies that the monetary authority should treat the early period of implementing a precommitment policy differently from later periods. This is so because in the starting period there is no past commitment that the central bank has to follow. The existing literature contends that to address the start-up problem, the monetary authority should temporarily stimulate the economy by generating surprise inflation in the starting period.

Key Findings

- Under the timeless perspective, the optimal monetary policy response to either a temporary productivity shock or a temporary government purchase shock can be characterized as an approximate price stability rule—in the sense that the price level is still largely stabilized around its deterministic trend. Hence, the optimal policy under SDP closely replicates the dynamics under the TDP assumption found in previous studies. However, the SDP's endogenous timing of price adjustments alters the policy tradeoff faced by the monetary authority: it is optimal to let inflation vary more under SDP.

- Within the long-run timeless perspective policy, the optimal response based on a second-order approximation to the policy problem is virtually identical to the response computed using a standard linear approximation method. This finding suggests that there are second-order components (state-dependence and nonlinearity) in the optimal policy response under SDP. However, this finding is conditioned on the standard assumption in the literature that prior to the shock the economy was at steady state. If this assumption is relaxed, there are some differences between the first-order and second-order approximate dynamics under SDP. The degree of nonlinearity is shown to depend on the interaction between the state of the economy before the shock, the size of the shock, and the assumed policy rule.

- The cost of inflation variation in the relative price distortion is lower under SDP than under the standard TDP assumption. The presence of endogenous timing of price adjustments alters the tradeoff faced by the monetary policy authority. Thus, compared to the standard TDP assumption, under SDP it is desirable for the monetary authority to put less weight on inflation stabilization relative to other stabilization goals.

- Incorporating SDP in the model leads to different start-up dynamics from the dynamics under the standard TDP assumption. In particular, it is optimal to generate much higher start-up inflation despite the fact that the monetary authority is shown to have less leverage over real activity in the presence of SDP. This result is once again due to the subtle modification to the policy tradeoff involving the lower cost of inflation variation on the relative-price distortion. However, the welfare improvement from generating this surprise inflation is shown to be relatively small. Thus, the timeless perspective policy may be a good approximation to the true Ramsey policy.

- The author concludes that unlike TDP models, SDP models generally exhibit some degree of nonlinearity, both under optimal monetary policy and when the policy rule itself is linear. The nonlinearity depends on the interaction between the state of the economy and the size of the shock. Although this nonlinearity does not seem to change the qualitative property of the responses, there are some important quantitative differences. It follows that a conventional first-order approximation to the equilibrium solution may be good enough for some purposes, such as when an analyst is only

interested in looking at the qualitative dynamics of an SDP model. But for other purposes such as forecasting, estimation, and so on, a second- or higher-order approximation may be warranted.

Implications

Many of the findings for the SDP case closely track the response under TDP, but SDP offers a better model of actual price-setting behavior. The paper's analysis can be extended in several ways. While the present study focuses on characterizing optimal monetary policy under SDP, the implementation issues should be considered in evaluating the model's usefulness for policymakers. In the current paper, the cyclical fluctuations are driven by a productivity shock and a government spending shock, but consideration of a cost-push inflation shock should be added, and its inclusion will result in a nontrivial modification to the SDP model's policy tradeoff.

w-09-21

Seeds to Succeed: Sequential Giving to Public Projects

By Anat Bracha, Michael Menietti, and Lise Vesterlund

complete text: http://www.bos.frb.org/economic/wp/wp2009/wp0921.pdf
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Motivation for the Research

Fundraisers usually use one of two basic approaches: a simultaneous or a sequential fundraising campaign. In a simultaneous campaign, the total amount required is announced and all charitable donations are accepted in the order in which they are pledged. A sequential campaign employs a two-step approach: First, a substantial amount of seed donation(s) is secured in a silent phase, and only then is the campaign's public phase launched. For instance, raising $500,000 for a project could be achieved using a campaign that first secures pledges totaling $300,000 and then announces this amount while publically launching the campaign to raise the additional $200,000. This type of sequential strategy is a widely accepted fundraising practice, especially for capital campaigns with large fixed costs such as those for new building construction or buying expensive equipment.

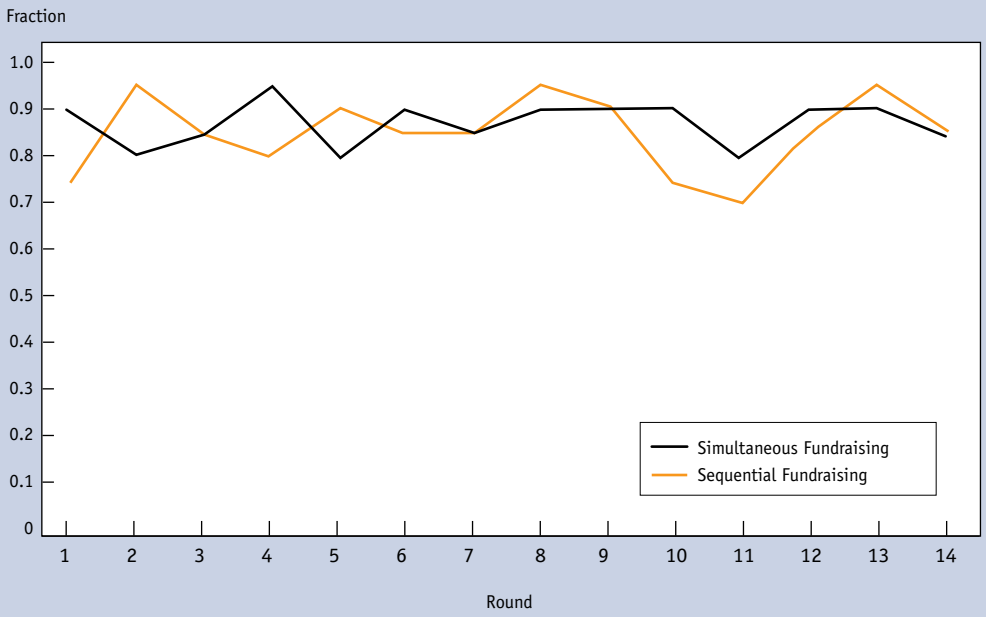
Despite the common use of sequential fundraising, from a theoretical perspective sequential fundraising seems to have no advantage over a simultaneous campaign. This is because one donor's contribution is a perfect substitute for another's, and therefore sequential provision will only shift contributions, thus allowing the initial donor to free ride on subsequent donors (Varian 1994). This mismatch between widely accepted fundraising practice and a theoretical prediction has prompted further research to identify when it might be optimal to employ sequential fundraising campaigns. Andreoni (1998) argued that when there are large fixed production costs, a sequential fundraising effort is preferable to a simultaneous one. He showed that in the presence of large fixed costs multiple outcomes (equilibria) are possible, some of which will secure the fundraising target, while others will not. Thus, capital campaigns that rely on the simultaneous fundraising strategy may fail, while a sequential strategy is more apt to succeed, as a sufficiently large initial donation incentivizes subsequent donors to eliminate inefficient outcomes and secure the desired goal. A study by List and Lucking-Reiley (2002), using an actual campaign, shows evidence in line with Andreoni's, and it is also consistent with other models of sequential fundraising, as in the field it is difficult to vary seed donation and fixed production costs while keeping the treatments otherwise comparable. This paper uses laboratory experiments to test whether sequential fundraising eliminates inefficient outcomes that arise in the presence of fixed costs, as suggested by Andreoni.

Research Approach

The authors construct an experiment to examine simultaneous and sequential giving in the presence and absence of fixed costs, resulting in four different treatments. They designate the fixed cost to be six units, large enough so that no single donor has an incentive to cover it single-handedly, yet

Fraction of Public Goods Provided Under Simultaneous versus Sequential Fundraising

(with Fixed costs of 6)



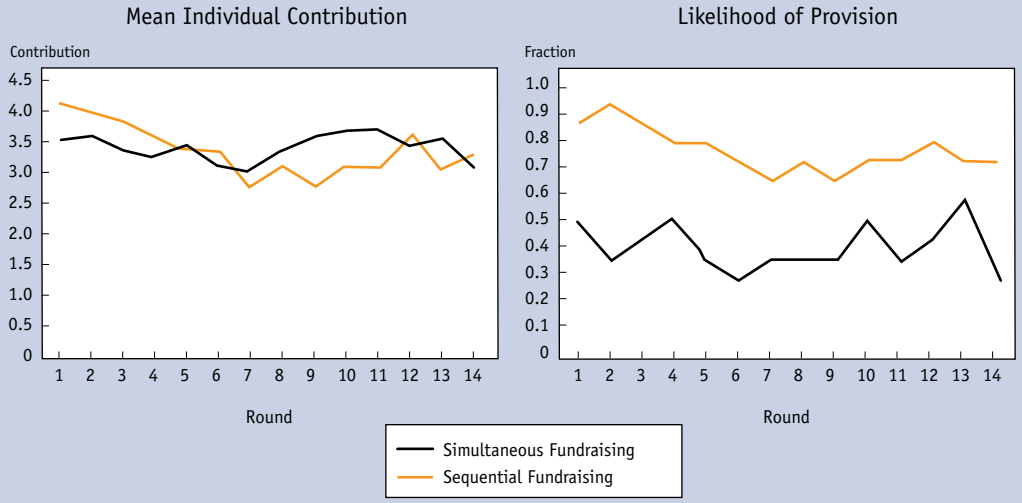
Source: Authors' calculations.

small enough to secure both positive and zero provision outcomes in the simultaneous treatment with fixed costs. Indeed, in the simultaneous treatment with fixed costs of six, there are two possible equilibria: one with each player contributing three units, exactly covering the fixed costs and providing the public good, while the other has each player contributing zero units and no provision of the public good. In the sequential treatment, the zero provision outcome is eliminated, since the first mover has an incentive to provide a sufficiently large donation to ensure that the second player covers the remaining fixed cost.

The experiment was conducted at the University of Pittsburgh's Experimental Economics Laboratory. Three sessions lasting one hour each were held for each of the four treatments. Fourteen undergraduates participated in each session for a total of 168 participants. Each session had 14 rounds (periods) in which participants played a public good game. More specifically, at the onset of each session, each participant was assigned a role of either first mover or second mover, and this role was kept throughout the session. At the beginning of each round, pairs of first and second movers were created randomly and then each participant was given a $4 endowment that could be invested in a public account (project). The public good account of each pair was designed to yield benefits for both participants if their joint investment equaled or exceeded the fixed costs. Investment was made in "units" and investment could be any integer amount between zero and 10 units. Although the benefit was for both paired participants, the per-unit investment cost was charged to the individual making the contribution—it was 40 cents for the first three units, 70 cents for units four through seven, and $1.10 for the last three units. Contributions were made either simultaneously or sequentially: in the simultaneous public good game, the total contribution was revealed only after both parties placed their contribution, while in the sequential public good game the second player was informed of the first mover's contribution before making his or her own contribution decision. After completion of the 14 rounds, three rounds were randomly selected to count for payment, and average earnings were $22.

Simultaneous versus Sequential Fundraising Results

(with Fixed costs of 8)



Source: Authors' calculations.

The comparative statics across treatments allowed the authors to answer the following three questions: (1) In simultaneous play, do fixed costs give rise to inefficient outcomes? (Inefficient outcomes are outcomes in which the public good is not provided, even though it is socially desirable.) (2) If such inefficiencies exist under simultaneous play, does the sequential treatment help to eliminate them and to increase the likelihood of positive provision? (3) Comparing the change in behavior from simultaneous to sequential play with and without fixed costs, is the potential increase in contributions under sequential provision greater in the presence of fixed costs?

Key Findings

- Surprisingly, the authors found that in the presence of fixed costs of six, simultaneous provision increased rather than decreased individual provision. Individual donors seemed uncertain of which outcome would result, and opted to increase their contributions to ensure the positive provision outcome. All else equal, with fixed costs of six, sequential play reduced individual contributions by almost one unit.

- For fixed costs of six, sequential play was shown to decrease both contributions and individual payoffs. The reason for this deviation from theory is rooted in the simultaneous game, where the introduction of fixed costs increases rather than decreases contributions. The larger-than-expected contributions in the simultaneous treatment are due to coordination difficulties combined with relatively low fixed costs. Since the sequential treatment alleviates the coordination problem by making the first mover's contribution known to the other player, both participants can safely contribute less and still secure a positive outcome. In the simultaneous situation, the cost of contributing is so low relative to the benefit from provision that individuals contribute an inefficiently large amount to make sure the good is provided.

- Given these results, the authors ran similar treatments, but with a higher fixed cost of eight. In this case they found that individual contributions were similar whether employing sequential or simultaneous giving. However, although sequential giving did not increase individual donations, it did increase the chances of provision and individual earnings. As predicted, with simultaneous play, many participants did not contribute to the public good, or failed to coordinate on meeting the

fixed cost level needed to provide the good. Hence, the authors' results support Andreoni's claim, but only for sufficiently high fixed costs. In this case, using seed money mitigated the risk of falling short of the target goal.

Implications

This paper provides mixed support for Andreoni's theory: it does not find evidence consistent with the theory given small fixed costs, but does find support for it when fixed costs are sufficiently high. That is, the findings affirm the fundraising practice of securing seed donations for projects with fixed costs that are sufficiently large. However, the evidence reveals that in these cases fundraisers must be cautious when designing a campaign: setting too low an initial contribution, they run the risk of first movers exploiting their advantage and causing subsequent donors to undercontribute, and therefore failing to secure the public good. A concern for equity may help to explain why fundraisers have specific targets for the size of the seed donation as a share of the overall goal.

Public Policy Briefs

b-09-1

A Proposal to Help Distressed Homeowners: A Government Payment-Sharing Plan

by Christopher L. Foote, Jeffery C. Fuhrer, Eileen Mauskopf, and Paul S. Willen

complete text: http://www.bos.frb.org/economic/ppb/2009/ppb091.htm
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Motivation for the Proposal

This public policy brief presents a proposal designed to help homeowners who are facing foreclosure because their incomes have fallen and because the balances owed on their mortgages exceed the value of their homes. These homeowners represent a subset of all distressed homeowners, but according the authors' research, they face an elevated risk of default and are unlikely to be helped by current programs aimed at reducing foreclosures. The authors' proposal was originally posted in January 2009 on the website of the Federal Reserve Bank of Boston.

Proposal Summary

The authors propose a government payment-sharing arrangement that provides a significant reduction in the homeowner's monthly mortgage payment. Previous research indicates that foreclosures most often occur when a homeowner has negative equity (owes more on the house than the property is worth) and has suffered an adverse life event, such as job loss, illness, or divorce, making it difficult to keep up with the mortgage payments.

The plan does not involve reducing the mortgage's outstanding principal. Rather, it provides homeowners with direct government assistance to meet their monthly mortgage payments. Two options are presented, both designed to help people with negative housing equity and a significant income disruption. In one version, the government assistance comes in the form of a loan that must be repaid when the borrower's financial well-being is restored. The second version of the proposal features government grants that do not have to be repaid. In either case, the homeowner must provide evidence of negative equity in the home and of job loss or other significant income disruption.

Key Points

- Upon determining eligibility, the government pays a significant share of the household's current mortgage payment directly to the mortgage servicer.

- The government's share of the mortgage payment is equal to the percentage decline in the family's earned income as a result of the adverse life event.

- With both options, the plan requires proof of a recent and significant income disruption—the authors suggest 25 percent.

- The assistance terminates upon resumption of the borrower's normal income stream or after two years, whichever comes first.

- The plan caps the maximum monthly payment that the government will pay. The authors offer $1,500 as a plausible amount for the cap.

- In the loan version of the plan, the government's payments accrue to a balance the homeowner must repay with interest to the government at a future date. The interest rate reflects the risk entailed in lending to the borrower and thus may be above the rate charged on prime mortgages. If the homeowner eventually sells the house for more than the value of the mortgage balance, the government has first claim on any equity remaining after the mortgage has been paid off.

- In the grant version, there is no required repayment to the government for the share of the homeowner's mortgage payments it has made. This version includes an income limit for qualifying households.

- The cost of the plan depends on which version policymakers choose—loans or grants. Under the grant version, the authors estimate the cost to the government of providing help to 3 million homeowners (a generous estimate of the number of homeowners who would be eligible) to be about $25 billion annually, or about $50 billion overall. Under the loan version, the cost would be significantly smaller. If all recipients paid back their government loans, the program would be virtually costless to the government; some defaults on these loans are likely, however, and it is difficult to estimate the rate of such defaults.

Implications

The plan has a number of important advantages. First, the authors believe that the plan will stop most preventable foreclosures from occurring. This benefits the borrower, the lender/investor, communities with many distressed mortgages, and the financial markets more broadly. Second, the plan provides a significant reduction in the homeowner's payment during a period of income loss, in contrast to existing loan modification programs that either lower payments insufficiently or even raise monthly mortgage payments. Third, because it works with the homeowner's existing mortgage, the plan does not depend on lender/servicer or second lien-holder cooperation, a major stumbling block to aiding a wider group of distressed homeowners. The plan works equally well for individual loans held in portfolio and for securitized loans. Fourth, the private lender should be considerably better off under this plan than by pursuing foreclosure.

The plan also has some disadvantages. First, it is unlikely to stop homeowners with very large negative equity positions from defaulting when the government aid ends. To the extent that such foreclosures are ultimately unavoidable, this plan may delay such an outcome without providing any guarantee that such a delay is beneficial on either economic or social grounds. Next, there are potential disadvantages that are specific to which option is implemented. If the program takes the form of loans, some borrowers may be wary of taking on a government loan and may choose to default instead. If it takes the form of grants, moral hazard problems could be more serious, despite the safeguards included in the plan. Finally, administering this program would likely require some cooperation from the mortgage servicers, such as providing information on such items as outstanding mortgage loan balances of applicants. The government could offer some payment to the servicer for performing this function.

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