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Credit Policy as Fiscal Policy

ABSTRACT   The $1.6 trillion that U.S. households borrowed in 2010 through government-backed direct loan and loan guarantee programs—most notably from Fannie Mae and Freddie Mac, the student loan programs, and the Federal Housing Administration, but also more than 100 smaller programs—provided credit subsidies and relaxed credit-rationing constraints that caused both borrowing and spending that year to be higher than they would otherwise have been. A simple theoretical model illustrates these channels. Estimates of the increases in borrowing, scaled by multipliers similar to those applied to traditional government spending and tax policies, suggest that the programs provided a fiscal stimulus of roughly $344 billion, similar to what was provided by the American Recovery and Reinvestment Act of 2009. Although there is considerable uncertainty about this point estimate, its size suggests the importance of taking the stimulus and automatic stabilizer effects of federal credit programs into account, particularly during economic downturns that are accompanied by severe financial market distress. However, though credit programs are shown to be a relatively low-cost source of fiscal stimulus, to assess their overall welfare implications, these benefits must be weighed against the significant costs of the programs during more normal times, including the likelihood that lax federal credit policies were an exacerbating cause of the 2007 financial crisis.

With the notable exception of William Gale (1991), federal credit policies have been largely overlooked in analyses of the macroeconomic effects of fiscal policies. In this paper, I make the case that because of this omission, the amount of these policies' fiscal stimulus to the U.S. economy has in recent times been seriously underestimated. In general, this error is likely to be particularly severe during downturns that are accompanied by major disruptions in private credit markets, as occurred during the Great Recession of 2007–09 and in its aftermath. The estimates here for 2010 suggest that the stimulus effects of federal credit programs were likely to have been similar in magnitude to those of the American Recovery

and Reinvestment Act of 2009 (ARRA), which provided about $392 billion of additional spending and tax cuts that year (CBO 2011b). I also find that federal credit subsidies had a big "bang for the buck"—a large amount of stimulus per $1 in taxpayer cost. Furthermore, government credit programs acted as automatic stabilizers because their participation rates and loan amounts could increase during the downturn without legislative action.

The finding of large stimulus effects in 2010 reflects the size and reach of U.S. federal credit support activities, along with the apparent unwillingness of private lenders to extend credit to certain borrowers and market segments during that year. Through its traditional credit programs, the U.S. government routinely provides direct loans and loan guarantees for housing, education, agriculture, small businesses, energy, trade, and other private activities via more than 150 separate programs that appear in the federal budget. New loans originated under these programs totaled $584 billion in 2010.[1] Federal credit-related activities also include implicitly or explicitly guaranteeing the obligations of government-sponsored enterprises such as Fannie Mae and Freddie Mac, the Federal Home Loan Banks, and the Farm Credit System; and insuring bank deposits and defined-benefit pension plans. Notably, Fannie Mae and Freddie Mac, which had received explicit government backing by that time, guaranteed more than $1 trillion in newly originated mortgages in 2010.

To understand how, in principle, such a surprisingly large stimulus could be attributed to incremental loan volume arising from federal credit programs, it is necessary to first consider the ways in which government credit subsidies can affect lending volumes. There are two distinct channels: (i) a traditional elasticity channel (the intensive margin), whereby the demand for loans increases when the costs of borrowing fall; and (ii) a credit-rationing channel (the extensive margin), whereby individuals who are unable to obtain the desired amount of credit at any rate from fully private lenders (for instance, because of asymmetric information about borrower quality) are able to borrow when a direct government loan or a government loan guarantee is made available. A simple model, in the spirit of Michael Rothschild and Joseph Stiglitz (1976), and related analyses shows that the second channel can be highly nonlinear, and that it can be the more important of the two when both are operative. The model also shows why credit rationing can, in some instances, be alleviated with quite small credit subsidies.

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1. Elliott (2011) provides a history and more complete discussion of federal credit programs.

Having established that, in principle, credit subsidies can generate large increases in loan volume, the next step in making the case for a potentially large stimulus effect is to link increased loan volumes to increased aggregate output. This connection is made using a fiscal multiplier approach, following a large body of literature that includes Alan Auerbach and Yuriy Gorodnichenko (2012), Charles Whalen and Felix Reichling (2015), and the Congressional Budget Office (CBO 2011b, as well as the references therein). A multiplier approach has the strengths of simplicity and empirical grounding, but there is significant uncertainty associated with point estimates. Because traditional multiplier analysis focuses on tax and expenditure policies, adjustments are required in order to apply existing estimates of fiscal multipliers to credit subsidies. A key adaptation made here is that the multipliers suggested by the literature for various categories of government spending are applied to the estimates of incremental borrowing rather than directly to the credit subsidy amounts. The idea is that because taking out a loan generally involves significant effort and cost, people tend to spend the borrowed funds quickly. When borrowed funds are spent on goods and services, the effects on aggregate output should be similar (or perhaps stronger, because the funds are unlikely to be saved) to those arising from traditional fiscal tax and spending policies directed at similar activities. However, when the borrowed funds are used to refinance existing debt, as when mortgages are refinanced, little money is freed up for new spending and the multiplier effect is assumed to be much smaller. Similarly, on a per-dollar basis, mortgages used to purchase existing houses are unlikely to contribute as much to aggregate demand as loans for education or for investment by small businesses. In principle, the multiplier effects of credit could also be reduced by the fact that the loans need to be repaid. However, because most federally backed loans have a long maturity, the effects of repayments are largely outside the horizon of interest.

Estimates of the subsidies associated with the government's major credit programs are needed to do bang-for-the-buck calculations and to predict increases in borrowing along the intensive margin for each program. For most noncredit fiscal policies, the standard way to assess subsidy cost is as the net cash outflow in a given year, which corresponds to the budgetary cost. Credit subsidies are more complicated because loans and loan guarantees involve uncertain cash flows that extend over many years. For traditional credit programs, federal budgetary estimates of credit subsidies are on an accrual rather than a cash basis. Calculating subsidy cost involves projecting cash flows over the life of the loan and discounting them to the date of origination at Treasury rates to produce a lifetime or accrual cost of the loan.

Most administrative costs are omitted from these subsidy estimates (but accounted for elsewhere in the budget, on a cash basis). The legislatively mandated practice of discounting at Treasury rates and omitting administrative costs causes budgetary estimates of credit subsidies to understate the full economic cost to taxpayers of credit assistance (Lucas and Phaup 2010; CBO 2012, 2014). To provide a more accurate cost measure that is conceptually the most comparable to the cash cost of other types of stimuli, the cost estimates used here are fair-value estimates derived from pricing models that my colleagues at the CBO and I have developed to provide fair-value estimates for most major federal credit programs. Conceptually, the fair-value subsidy cost is the lump-sum cash payment at origination that the government would need to make to private lenders in a well-functioning market to induce them to extend credit at the same terms to the same people as under the government program. These fair-value estimates often significantly exceed reported budgetary costs, but for most programs they nevertheless represent a modest fraction of the loan principal.

Extensions in loan volume at the extensive margin are a quantitatively important driver of the stimulus effects of credit programs. Unfortunately, the estimates of increased borrowing along the extensive margin are by necessity subjective because data are not available to rigorously measure these effects. However, the estimates are informed by the programs' histories and by the observed market behavior of private lenders, and the conclusion of a large stimulus effect is robust to fairly conservative assumptions about the size of these margins.

Federal credit support has many other important economic consequences, and it is beyond the scope of this analysis to attempt to quantify its net effect on social welfare. To undertake a welfare analysis, the salutary effects of credit programs during severe downturns that are highlighted here would need to be weighed against the inefficiencies that government credit policies tend to cause during more normal times. These issues have been written about extensively (Gale 1991; Lucas 2012, 2014; La Porta, Lopez-de-Silanes, and Shleifer 2002): Credit subsidies tend to be target-inefficient; they are opaque; they can distort the allocation of capital and crowd out more productive private investment; they encourage excessive levels of household and business debt; and they create incentives for excessive risk taking that have systemic consequences. Furthermore, some observers have suggested that the overly liberal credit policies of Fannie Mae and Freddie Mac were an underlying cause of the 2007 financial crisis. A further caveat to this analysis is that credit policy includes a panoply of regulations that are likely to have fiscal effects not considered here.

The remainder of this paper is organized as follows. Section I lays out a model that illustrates the channels through which federal credit programs can provide an economic stimulus. Section II provides a context for the analysis by giving an overview of federal credit support activities. Section III explains the calibration of inputs into the model, including subsidy rates for each major program, elasticities, extensive margin effects, and multipliers. Section IV presents estimates of the stimulus provided by federal credit assistance in 2010 under the base case assumptions and for a range of alternative assumptions. Section V concludes.

I. Theoretical Underpinnings

To understand how government credit programs might be expected to affect aggregate borrowing and ultimately aggregate demand, this section lays out a stylized model of credit markets that illustrates the channels through which federal credit subsidies affect loan volumes and pricing. The model is in the spirit of Rothschild and Stiglitz (1976) and other analyses that emphasize the effects of asymmetric information or costly state verification on insurance or credit market outcomes and the potential effects of government intervention.[2] The conceptual linkages between incremental loan demand and aggregate demand are then quantified in section II to estimate the stimulus effects of federal credit programs in 2010.

I.A. Government Credit as a Fiscal Policy Tool

We assume that the credit market consists of large numbers of two types of borrowers, Type A and Type B, and a large number of competitive lenders. Loans last one period, and utility is realized at time 1 when the loan is repaid.[3] The population share of Type A borrowers is μ_A. Type A borrowers always repay their loans in full. Type B borrowers default and repay a fraction, ρ_B, of the promised amount. Both know their own types, and have the same utility function that depends on fixed parameters v and γ, and on the amount borrowed, L, net of the expected amount repaid inclusive of interest, RL:

(1) $$U(L) = \frac{vL^{(1-\gamma)}}{(1-\gamma)} - RL \qquad \text{for } L \geq 1 \text{ or } L = 0.$$

2. Related theoretical analyses include those by Jaffee and Russell (1976), Stiglitz and Weiss (1981), Smith (1983), Smith and Stutzer (1989), Gale (1990), Lacker (1994), and Williamson (1994).
3. This assumption economizes on notation and is without a loss of generality.

Setting a minimum loan size reflects the possibility that the activities financed may have a minimum required investment amount, and also the presence of fixed costs in loan origination. The desired amount of borrowing is found from rearranging the first-order condition that results from maximizing equation 1 with respect to the choice of L:

$$(2) \qquad L_i^* = \left(\frac{R_i}{v}\right)^{-1/\gamma} \qquad \text{for } i = A, B.$$

Competitive lenders offer borrowers a contractual interest rate and loan size that satisfy a zero-profit condition. The supply of loans is assumed to be infinitely elastic at these equilibrium rates. Lenders cannot identify the type of an individual borrower directly, but they know the population shares and can infer whether a borrower of each type will accept the loan terms $[L(\theta), r(\theta)]$ offered, where $r(\theta)$ is the contractual interest rate on the loan, and θ is the lender's information set. Thus the lender anticipates whether there is a pooling equilibrium or a separating equilibrium and will choose an offer consistent with that inference and with the zero-profit condition. The offered rate, $r(\theta)$, reflects the fact that the gross expected return to lenders, $1 + r_m(\theta)$, includes a premium for the systematic risk in risky loan returns and any other priced risks. This market rate schedule is an equilibrium outcome that is taken as known and as exogenously given for this partial equilibrium analysis.

The model admits both pooling and separating equilibria (and possibly both), depending on the selected parameter values. In a separating equilibrium, Type A borrowers are offered the risk-free rate, r_f, and a loan amount that is the lesser of the optimal loan amount implied by equation 2, with $R_A = 1 + r_f$, and a loan amount that is the maximum size that is small enough to deter Type B borrowers from mimicking Type A borrowers. Type B borrowers are offered a contract with a gross promised return $(1 + r_m(\theta))/\rho_B$, an expected gross repayment $R_B = 1 + r_m(\theta)$, and a loan amount that satisfies equation 2. Because the minimum loan size is 1, it is possible that depending on parameter values, one or both types will not borrow anything.

In a pooling equilibrium where the offered rate is a population-weighted average of the two separating rates, Type Bs would like to borrow more than Type As. However, to maintain pooling, Type Bs can only borrow L_A^*, the optimal level of borrowing for Type As at the offered rate. The offered rate, $r(\theta)$, solves the zero-profit condition:

$$(3) \qquad 1 + r_m(\theta) = \mu_A(1 + r(\theta)) + (1 - \mu_A)\rho_B(1 + r(\theta)).$$

Rearranging implies that

$$(4) \qquad 1 + r(\theta) = \frac{1 + r_m(\theta)}{\mu_A + (1 - \mu_A)\rho_B}.$$

It follows immediately that as the proportion of Type Bs becomes large, and as their expected repayment becomes small, there will be no pooling equilibrium because the required return goes to infinity. There may be a separating equilibrium in which only Type Bs borrow.

This model can be easily extended to include government credit guarantees. We shall see that the introduction of guarantees can significantly change equilibrium quantities and the rates offered by private lenders, and that large increases in borrowing may be achieved at a low subsidy cost to the government. The government guarantees a portion, g, of the promised repayment, R. For the guarantee to affect outcomes, $g > \rho_B$. With the guarantee, the offered rate in the pooling equilibrium falls to

$$(5) \qquad 1 + r(\theta) = \frac{1 + r_m(\theta)}{\mu_A + (1 - \mu_A)g}.$$

The offered rate in a separating equilibrium where only Type Bs borrow is also given by equation 5, with $\mu_A = 0$. Note that in all cases, g is in the information set θ and affects the equilibrium expected return (for example, with a 100 percent credit guarantee, the expected return is the risk-free rate).

The subsidy rate, s, is defined as the cost to the government of providing the guarantee per \$1 of loan principal:

$$(6) \qquad s = \pi(g - \rho_B)(1 - \mu_A),$$

where π incorporates the market risk premium associated with these losses.

Result 1: If there is a pooling equilibrium in the private market, the introduction of a guarantee lowers the offered rate and increases loan demand through an elasticity effect. The elasticity effect operates at the intensive margin.

Result 2: If there is an equilibrium in the private market with no borrowing or with only Type Bs borrowing, then there exists a $g \leq 1$ such that a pooling equilibrium exists. This creates an expansion of lending along both the extensive and intensive margins.

The potential for large increases along the extensive margin induced by the availability of government guarantees is the mechanism whereby federal credit programs can have large stimulus effects. The link between

Figure 1. Loan Demand and Subsidy Cost as a Function of the Government-Guaranteed Share

Equilibrium loan value
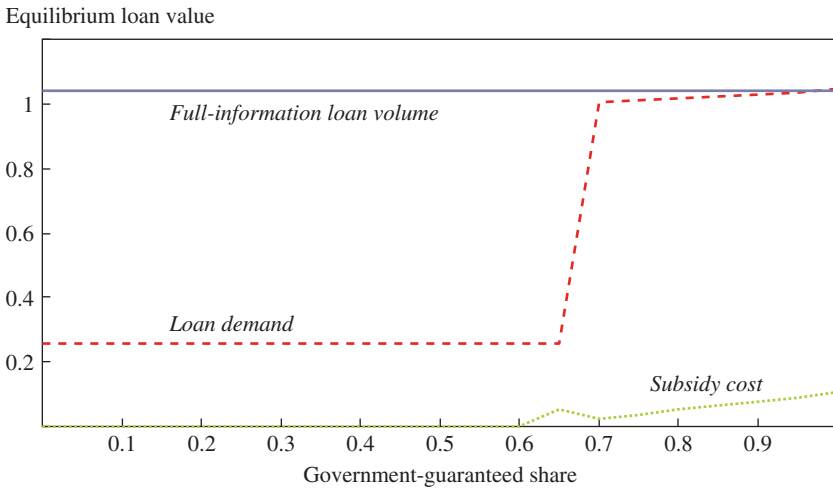
Source: Author's calculations.

borrowing and stimulus also involves an assumption about how the borrowed funds are used, as discussed in the next section. Clearly, similar conclusions about the stimulus effects of government credit follow from direct lending programs. A more general specification—for example, as given by Stiglitz and Andrew Weiss (1981)—would allow for the probability of default and for the expected recovery rate to also depend on the interest rate for Type B borrowers. This possibility was not incorporated for simplicity, but results 1 and 2 would still be expected to obtain in that more general setting. In that case, the introduction of a government guarantee would have the additional effect of mitigating default losses by making the loans more affordable.

Simulation of a parameterized version of the model illustrates the possibility of generating large increases in lending volume at a modest subsidy cost, primarily through the extensive margin. It also highlights the potentially high costs for government credit programs that fail to impose lending limits that prevent excessive borrowing by risky borrowers. This is the narrative that motivates the main calibration exercise in section IV.

Figure 1 shows the equilibrium lending volume, the full-information loan volume, and the cost to the government as a function of the government guarantee rate. The guarantee rate is varied between 0 and 1, but the guarantee only affects outcomes when $g > \rho_B$. In this example, parameters

are fixed at $v = 1.1$, $r_f = 0.01$, $r_m = 0.04$ [for Type Bs only], $\mu_A = 0.75$, $\rho_B = 0.6$, and $\gamma = 2$.

Figure 1 shows that for guarantee levels below about 70 percent, the pooling interest rate is too high for Type As to participate. Hence, there is a separating equilibrium in which Type Bs borrow at a fair rate and Type As do not borrow. When the guarantee is sufficiently high, the offered rate under the pooling equilibrium falls to a level at which both types borrow. Total loan volume roughly quadruples because of the entry of the safe borrowers. For guarantee rates in excess of the entry level for Type As, aggregate borrowing increases in the guarantee rate through the extensive margin. However, these extensive margin increases are relatively small. Notice also that the subsidy rate, which is the cost to the government per $1 of loan guaranteed, is only 2 percent at the guarantee level that causes loan demand to quadruple. This demonstrates that credit subsidies can have a large bang for the buck because of the nonlinear effects of the subsidies. Increasing the guarantee to 100 percent has a small incremental volume effect, but increases the subsidy rate to 10 percent.

The model also has lessons for the efficient structuring of federal credit programs. The upward blip observed in the subsidy rate at $g = 0.65$ is a reminder that if the guarantee protects lenders against some of the risk of bad borrowers but is insufficiently high to attract good borrowers into the market, it will provide an inefficient subsidy to low-quality borrowers who would have borrowed anyway. In such cases, setting a high enough guarantee rate to attract new good borrowers lowers the subsidy rate by increasing the average pool quality. The model further suggests that it is important for the government to impose quantity limits in its direct loan programs or in guarantee programs where the government fixes the borrowing rate, in order to avoid excessive borrowing by bad borrowers.[4] Recall that in the pooling equilibrium with private lenders making rate and quantity offers, both types are limited to loan amounts that maximize Type As' utility at a zero-profit interest rate. If there were no constraint on quantities, Type Bs would borrow more than Type As and the subsidy rate would increase. For example, for the figure 1 parameters, faced with the pooling equilibrium interest rates, unconstrained Type Bs would borrow about 30 percent more. That would increase the average subsidy rate by degrading the quality of

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4. A related problem for the government arises when it sets a uniform interest rate that is above the market rate for identifiably safe borrowers, and those borrowers are picked off by private lenders that can profitably underprice the government, as has happened at certain times with federal student loans.

the borrower pool, and the total subsidy cost would increase by a corresponding 30 percent.

A natural question is whether the large discrete changes in loan volume induced by modest credit subsidies could occur in a setting with a large number of borrower types or under other information structures. I believe that the basic intuition is robust and that similar results would be found in more general settings, but it remains for future research to establish more general conditions under which these effects are present.

I.B. From Loan Demand to Aggregate Output

To translate estimates of the increase in the availability of credit and reductions in its cost into an estimate of increased aggregate output requires several steps. The first is to calculate how much incremental borrowing is induced by the credit programs through both the intensive and extensive margins, adjusting for the offsetting effect of any crowding out of existing private sector loan supply. The second step is to take into account multiplier effects that could cause the amount of incremental borrowing to differ from its ultimate effect on aggregate output.

Incremental aggregate borrowing, ΔB, attributable to federal credit assistance net of crowding out, can be written as

$$(7) \qquad \Delta B = dA + S(dB/dS) - C,$$

where dA is incremental borrowing along the extensive margin, $S(dB/dS)$ is incremental borrowing along the intensive margin induced by the subsidy S, and C is the amount by which private lending is crowded out in aggregate.

This reduced form represents the net effect of supply and demand factors on volume. No distinction is made between guaranteed and direct lending because, as discussed below, in both cases the subsidy mechanisms that induce incremental demand—reduced interest rates and fees, and a decrease in credit rationing—are the same. This incremental demand puts upward pressure on interest rates that may crowd out other lending. The size of the crowding-out effect depends on the elasticity of credit supply.

Incremental borrowing along the intensive margin, $S(dB/dS)$, represents the sum of subsidy effects across individual credit programs. It can be approximated using estimates of the demand elasticities and estimated subsidies for each type of credit program. Specifically, the present value of subsidies associated with all new loans made in a given year, S, is multiplied by the corresponding demand elasticity, dB/dS. Hence, both previously

constrained and unconstrained borrowers contribute to increased demand at the intensive margin.

Similarly, total borrowing along the extensive margin, *dA,* is a sum across individual program effects. As in Gale (1991), and fundamentally by necessity, these estimates are largely judgmental, although they are informed by observations about credit programs and markets. Note also that the ex post observed amount of federally backed borrowing includes the incremental borrowing induced by the credit programs.

A fiscal multiplier approach is used to translate the incremental amounts borrowed into changes in aggregate output. Let Δb_i denote total incremental loan volume in program *i* (the sum of the intensive and extensive margin effects) and μ_i denote the corresponding output multiplier. Then the net stimulus effect of federal credit programs, *ΔY,* is

$$(8) \qquad \Delta Y = \left(\sum_i \Delta b_i \mu_i \right) - C \mu_c .$$

Although traditional multiplier analyses focus on tax and expenditure policies, there are additional considerations in applying them to credit policies. Perhaps most important, although existing multiplier estimates can provide guidance on the relationship between the incremental amounts borrowed and increases in output, it does not make sense to apply them directly to credit subsidies. To the extent that traditional stimulus policies influence aggregate demand primarily because they provide additional spending capacity to hand-to-mouth or liquidity-constrained consumers, access to $1 in additional borrowing can be expected to have similar effects to $1 received from a grant program. However, the relationship between the cost of a credit subsidy and its effect on aggregate demand would be poorly measured if the multiplier estimates in the literature were to be directly applied. One source of this problem is that credit subsidies are measured on an accrual basis, and from the perspective of the borrower have a wealth effect rather than an income effect.[5] Furthermore, the value of credit subsidies cannot be converted to cash, and therefore the subsidies in themselves do not relax liquidity constraints. Nevertheless, an important question is how much stimulus is generated for each $1 in cost to taxpayers. To provide an answer, multipliers are applied to the incremental borrowing amount and the resulting increase in output is divided by the subsidy cost.

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5. In a frictionless market, a subsidized borrower could turn around and sell the loan for an amount equal to the credit subsidy, but in practice it is prohibitively costly for borrowers to monetize the subsidy.

Other attributes of credit are also relevant in assessing the appropriate mapping to existing multiplier estimates for different types of policies. Because borrowers incur significant costs to take out and carry a loan, borrowed funds are likely to be disbursed fairly quickly. However, not all the money will be used for consumption or new investment. Particularly with mortgages, a large fraction of new borrowing goes toward refinancing existing debt or buying a home that is part of the existing housing stock. Another consideration with credit is that, over longer horizons, its stimulus effects could be reversed as the loans come due. However, because most federal loans have long initial maturities, the short-term effects of repayment, which are of interest here, are likely to be minimal.

II. Background on Federal Credit Programs

This section provides background information on the size and nature of federal credit activities in order to give a broader context for the analysis of their fiscal stimulus effects and for the assumptions made in calibrating the model. Federal credit activities can be subdivided between programs classified in the budget as credit programs, which are referred to here as "traditional credit programs," and other programs that provide credit support but are not classified in the budget as credit programs, such as Fannie Mae and Freddie Mac, bank deposit insurance, private pension guarantees, and certain tax credits and exemptions. For the purposes of estimating stimulus effects in 2010, the main focus here is on the traditional credit programs plus Fannie Mae and Freddie Mac.

II.A. Stock Measures of Federally Backed Credit

The large footprint of federally backed credit in the U.S. financial markets can be clearly seen by comparing the stock of government-backed credit balances with those of different types of private credit outstanding. (However, the flow measures presented later on are more directly related to the potential size of the stimulus that these activities provide in a given year.)

The outstanding balances of federal direct loan and loan guarantee programs for the period 1970–2015 are given in figure 2, which shows the historically unprecedented expansion in these programs in the aftermath of the 2007 financial crisis. In reporting on traditional federal credit programs, it is standard to combine direct loans (loans originated and funded by the government) and government loan guarantees because, all else being equal, these two forms of assistance are economically equivalent in the credit support provided and the subsidy cost to the government and ultimately to taxpayers.

Figure 2. The Nominal Face Value of Outstanding Federal Credit, 1970–2016

Billions of dollars
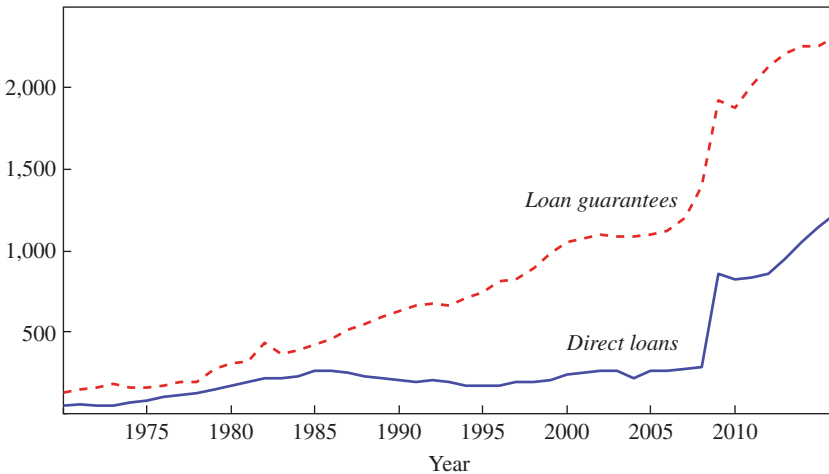
Source: OMB (2015).

The 2010 credit supplement to the federal budget (OMB 2010) lists more than 150 credit programs that are administered by various federal agencies and bureaus. Figure 3 groups the outstanding balances of federal direct loans and loan guarantees into major loan types—housing, education, farming, business, or other—for the period 1998–2010.[6] Housing is the single largest category in all years, though federal student loans underwent the most rapid growth. The total amount of federal guaranteed and direct loans outstanding roughly doubled during the period, reaching about $2.3 trillion in 2010.

The volume of explicitly government-backed credit increased dramatically with the 2008 federal takeover of Fannie Mae and Freddie Mac. That action converted those two government-sponsored enterprises (GSEs) from private companies with implicit government guarantees into entities that are fully owned by the government and whose losses the government has a legal obligation to absorb. Figure 4 shows the totals for federal credit programs that include the credit obligations of Fannie Mae and Freddie Mac. Including these activities plus some of the emergency programs of the Federal Deposit Insurance Corporation (FDIC) and the Federal Reserve brought total outstanding federally backed credit to more than $8 trillion in 2010.

6. This excludes programs classified as emergency lending associated with the financial crisis.

Figure 3. Total Outstanding Nonemergency Federal Loans, by Category, 1998–2010[a]

Billions of dollars
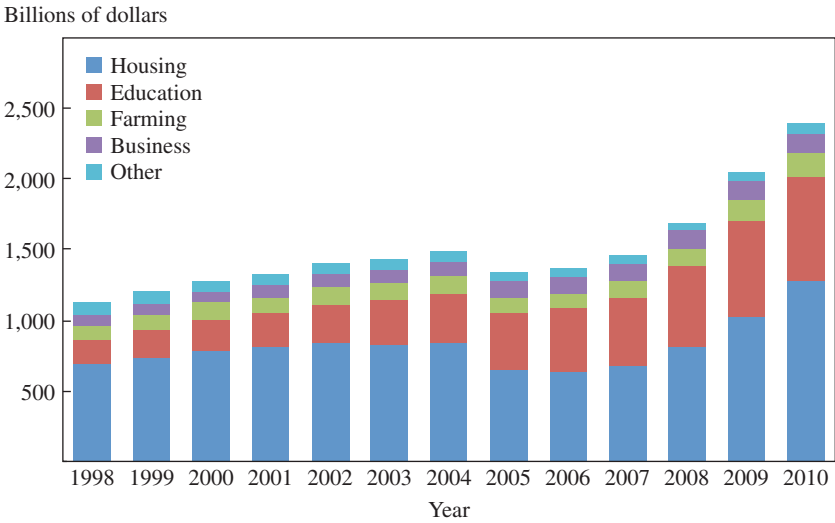
Source: Elliott (2011).
a. Includes direct loans and loan guarantees.

Figure 4. Total Outstanding Federal Loans and Obligations of Government-Sponsored Enterprises, 1998–2010[a]

Billions of dollars
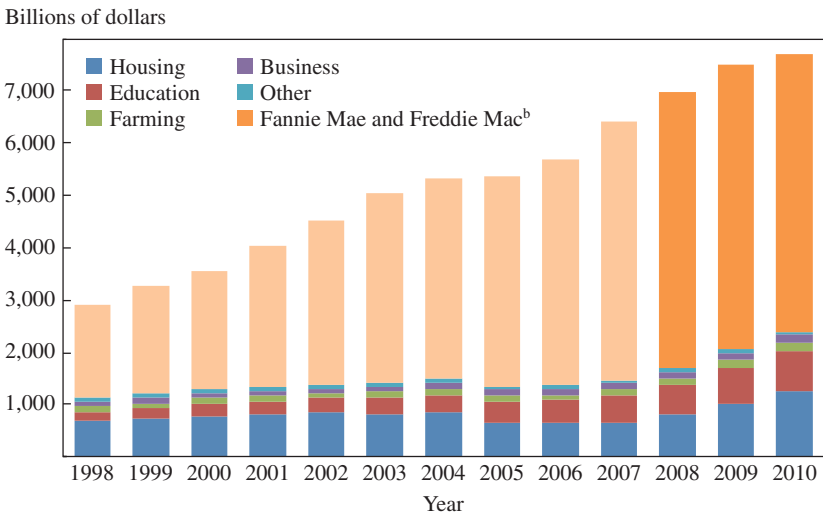
Source: Elliott (2011).
a. Includes direct loans and loan guarantees, plus the credit obligations of Fannie Mae and Freddie Mac.
b. The bars in the lighter shade indicate the period before the federal conservatorship of Fannie Mae and Freddie Mac.

The programs included in figures 3 and 4 are ones in which the federal government has a fairly direct role in determining eligibility and underwriting standards for the credit it backs, and these are the focus of the stimulus estimates here.

The government provides credit subsidies through other programs as well, and some of these may also provide fiscal stimulus under certain market conditions. These credit-related activities include (i) *federal deposit insurance*, through the FDIC, which in 2010 covered $6.2 trillion in bank deposits; (ii) *pension guarantees of private defined-benefit pension plans*, through the government's Pension Benefit Guarantee Corporation, which in 2007 had an estimated $2.8 trillion in covered liabilities, according to Alicia Munnell, Jean-Pierre Aubry, and Dan Muldoon (2008); (iii) *implicit guarantees to the Federal Home Loan Banks* (FHLBs) *and the Farm Credit System* (FCS), which lower these institutions' funding costs (in 2010 the liabilities of the FHLBs totaled more than $800 billion, and those of the FCS totaled about $200 billion); (iv) support for financial institutions through the *Troubled Asset Relief Program* (TARP), including purchases of preferred stock that peaked at about $540 billion in 2009 but subsequently declined; and (v) the *Federal Reserve System*, which is a large participant in debt markets and whose actions affect market prices, but most of whose activities do not involve direct subsidies (the portion of the Federal Reserve's assets that are potentially relevant for subsidy calculations here are its loans to financial institutions and Maiden Lane holdings, which stood at $140 billion in 2010).

In sum, the outstanding balances in the government's traditional direct loan and loan guarantee programs plus the mortgages held or guaranteed by Fannie Mae and Freddie Mac totaled about $8 trillion in 2010. Including credit-related activities—such as bank deposit insurance, private defined-benefit pension insurance, implicit guarantees to the FHLBs and FCS, TARP, and the Federal Reserve's nontraditional programs—increases the sum of federally backed obligations to about $18 trillion.

By comparison, flow-of-funds data for 2010 indicate that there was outstanding home mortgage debt of $10 trillion, other consumer credit of $2.4 trillion, and business (corporate and noncorporate) debt of $10.8 trillion. These aggregates suggest that a large fraction of mortgages and consumer credit in the United States is federally backed, whereas most business debt is not. Governments are also large borrowers; in 2010 state and local government debt stood at $2.8 trillion, and federal debt held by the public totaled nearly $9.4 trillion.[7] As noted by Gale (1991), spending

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7. See Barnett and Vidal (2012) and Financial Management Service (2011).

Figure 5. Disbursements from Traditional Credit Programs as a Percent of GDP, 1992–2011

Percent

Year
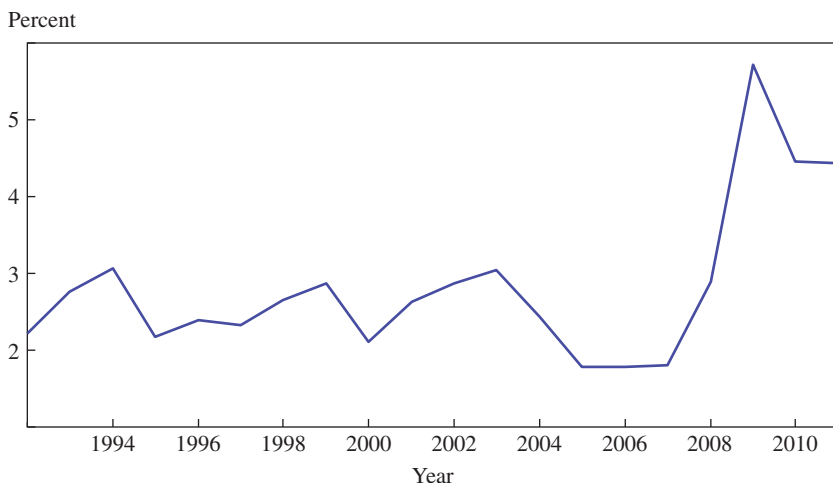
Sources: U.S. Office of Management and Budget; author's calculations.

by users of state and local debt is also affected by the associated federal credit subsidies.

II.B. The Extension of Federal Credit over Time and over the Business Cycle

The pattern of disbursements (that is, new loans originated) of federally backed credit over time via the government's traditional credit programs as a share of GDP from 1992 to 2011 is shown in figure 5. Until 2009, disbursement volumes were fairly steady as a share of economic activity, fluctuating between about 2 and 3 percent of GDP. Disbursement activity peaked in 2009, at 10.8 percent of GDP; and in 2010 it stood at 4.9 percent, still about twice as high as the historical average. The time series is not long enough to discern whether disbursements were countercyclical in the past, but demand for federally backed credit clearly increased dramatically in response to the financial crisis and recession that began in late 2007. Data from Gale (1991) for the 1980–87 period suggest little cyclical variation during that time frame, although disbursements from traditional credit programs were somewhat higher in the recessionary period of the early 1980s than later that decade.

III. Calibration of the Model

The inputs used to calibrate the model include estimates of subsidy rates for each major credit program, demand and supply elasticities, program disbursements, expansions on the extensive margin, and multipliers.

III.A. Program-Specific Subsidy Rates and Disbursement Amounts

Estimates of the credit subsidies received by borrowers in 2010 are important inputs into the calculations of incremental borrowing along the intensive margin and of the bang for the buck of credit programs' stimulus. Most noncredit federal subsidies are measured on a cash basis; and for the purposes of measuring stimulus, their sizes and costs are generally equated to the annual cash outflows that are reported in the federal budget. Measuring and interpreting credit subsidy costs is more complicated because credit involves risky cash flows over long horizons. To capture the effects of time and risk, the credit subsidy calculations used in this paper are computed on a fair-value accrual basis. Taking a fair-value approach arguably provides the best measure of the economic cost to taxpayers of credit support extended in a given year, and hence it is the logical basis for fiscal multiplier calculations. However, the fair-value estimates differ from the credit subsidy estimates that are reported in the federal budget. Those budgetary costs are also calculated on an accrual basis; but under the rules of the Federal Credit Reform Act of 1990 (FCRA), they do not recognize the cost of market risk. (See the online appendix for additional discussion of methods and issues.[8]) The fair-value estimates of subsidy costs used here are based on a series of analyses undertaken at the CBO and on a number of academic studies that were aimed at improving cost measurement for selected programs, and on extrapolations from those analyses to cover the larger set of programs considered here.[9] It is convenient to refer to subsidy costs in terms of a "subsidy rate," which is defined as the fair-value subsidy per $1 of loan principal.

MORTGAGE PROGRAMS Since the 2007 financial crisis, the federal government has absorbed the credit risk on most new home mortgages. In 2010, Fannie Mae and Freddie Mac provided financing for 63 percent of new

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8. The online appendixes for this and all other papers in this volume may be found at the *Brookings Papers* web page, www.brookings.edu/bpea, under "Past Editions."

9. In the interest of full disclosure, I was a coauthor or reviewer of all the CBO studies referenced except for the ones on fiscal multipliers and ARRA stimulus.

mortgages.[10] Adding to that the 23 percent of home loans insured by federal agencies such as the Federal Housing Administration (FHA), the Department of Veterans Affairs (VA), and the Rural Housing Service (RHS) (all of which are securitized by Ginnie Mae), about 86 percent of new mortgages originated that year carried a federal guarantee.

Fannie Mae and Freddie Mac. In 2010, the principal value of mortgages purchased by Fannie Mae and Freddie Mac was $1,011 billion ($625 billion by Fannie and $386 billion by Freddie). Most of these purchases were of fixed-rate, conforming mortgages on single-family homes. Based on estimates reported by the CBO (2010c), the subsidy rate on the guarantee of these mortgages is taken to be 4.05 percent.

The CBO provides an estimate of the annual fair-value subsidy on new mortgages guaranteed by Fannie Mae and Freddie Mac in its baseline estimates of federal spending. These estimates correspond to the concept of subsidy value used here: The annual estimate covers only the current year's new book of business; it does not reflect losses on mortgages guaranteed or purchased in the past, nor on expected future guarantees. The reported 2010 fair-value subsidy cost was $41 billion, which represents about a 4 percent subsidy rate dividing by the principal amount of originations.

The CBO (2010c) explains that its subsidy estimates are based on a model of expected future loss and prepayment rates, and a cost of capital based on the interest rate spread between jumbo and conforming mortgages. This interest rate spread is often taken as an indicator of the difference between the private cost of insuring mortgage credit risk and what the government charges for it. The spread also reflects other differences between jumbo and conforming mortgages. The CBO does not state the precise portion of the jumbo–conforming spread that it attributes to other factors, but other studies have suggested it was approximately half the spread in the precrisis period. Figure 6 shows that the spread had fallen from its peak levels by 2010, but it still remained substantially elevated above precrisis levels, at about 80 basis points at the beginning of 2010. The 4 percent subsidy rate reported by the CBO and used here can be understood as being roughly consistent with an annual subsidy of 40 basis points over the 10-year average life of a mortgage.

The Federal Housing Administration. In 2010, the FHA guaranteed about $319 billion in new mortgage loans, which represents about

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10. The volumes that are relevant to the subsidy calculations include refinanced loans even if the previous mortgage also carried a federal guarantee. This is because the models used to predict guarantee costs treat refinancing events as precluding further defaults.

Figure 6. The Interest Rate Spread between Jumbo and Conforming Mortgages, 2000–2010ᵃ
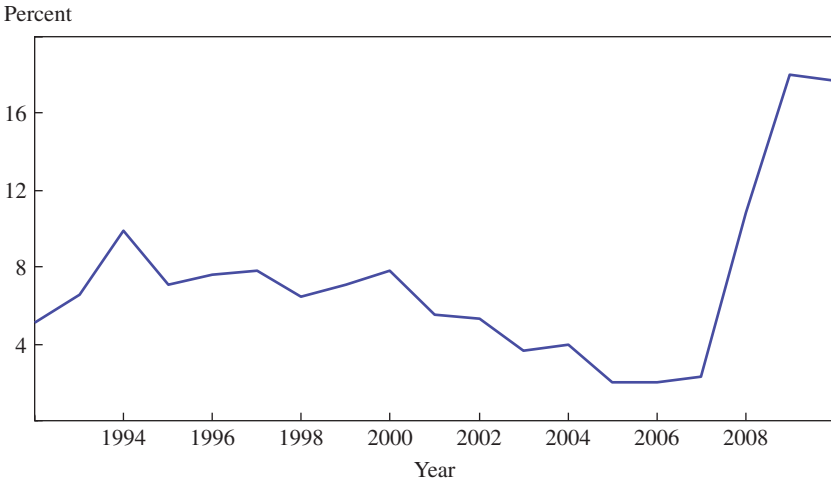
Percent
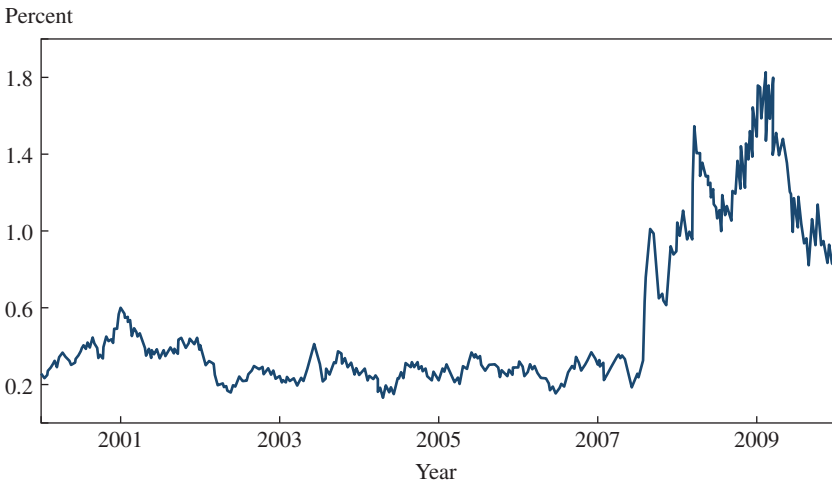
Source: CBO (2010a).

a. Conforming mortgages are loans that are eligible for purchase by Fannie Mae or Freddie Mac because the original mortgage amount does not exceed a dollar limit—which, as of 2009, was $417,000 for a single-family house in much of the United States. Jumbo mortgages are loans that exceed the dollar limit for conforming mortgages.

17 percent of single-family mortgages originated that year (see figure 7). The fair-value subsidy rate assumed here of 2.25 percent is based on the rate reported by the CBO (2011a) for 2012, adjusted upward to account for the higher credit spreads and lower fees prevailing in 2010.

The FHA's largest program is its single-family guarantee program, which was designed to provide access to homeownership to people who lack the savings, credit history, or income to qualify for a conventional (that is, GSE-eligible) mortgage. Guarantees are available to qualifying borrowers with down payments as low as 3.5 percent of a property's appraised value. The maximum amounts that can be borrowed are the same as on conforming mortgages insured by the GSEs. The FHA charges borrowers an up-front fee and annual premiums.

Valuing FHA guarantees made in the wake of the financial crisis is complicated by the lack of private subprime mortgage originations that would normally provide reference prices. However, the key insight from the analysis in CBO (2011a) is that information about the market price of mortgage credit risk was available at that time from the private mortgage insurance (PMI) market. Fannie and Freddie require borrowers with less

Figure 7. The Federal Housing Administration's Share of the Market for Single-Family Mortgages, 1991–2010

Percent

Source: CBO (2011a).

than a 20 percent down payment to purchase PMI. Controlling for borrower and other loan characteristics, the present value of fees charged for PMI plus the fair value of a GSE guarantee approximates the fair value of the guarantee provided by the FHA. The difference between this imputed value of the guarantee and the fees that the FHA is expected to collect approximates the FHA's subsidy at fair value.[11]

The CBO's analysis yielded a projected subsidy rate of 1.5 percent for FHA guarantees expected to be made in 2012. Two factors suggest assigning a higher subsidy rate to 2010 originations: The FHA's upfront fees were 50 basis points lower before April 2010, and credit spreads were wider in 2010 than in 2012. The 2.5 percent subsidy rate used here for 2010 is lower than the 4 percent rate used for Fannie Mae and Freddie Mac. Although it may seem surprising that the subsidy rate on much riskier FHA loans is lower than for loans purchased by the GSEs, the difference can be explained by higher FHA fees, which more than offset the higher default losses. It appears that most borrowers who qualify for GSE financing choose it over

11. The valuation exercise employed a Monte Carlo model of mortgage cash flows, together with the prices of PMI guarantees, GSE guarantees, and of mortgage-backed securities, to infer risk-neutral prices that could then be used to value FHA guarantees.

the FHA, which is consistent with the finding of a higher subsidy rate on GSE-backed mortgages.

The Department of *Veterans Affairs and the Rural Housing Service.* Like the FHA, the VA and RHS offer mortgage guarantees at more favorable terms to borrowers than are available privately. For example, the VA offers guarantees on mortgages, usually with no down payment, to active duty military personnel and veterans. RHS loans are means-tested and offered to relatively low-income rural residents. The subsidy rates for those programs are likely to differ from the FHA's because of differences in fee structures, product mix, and the borrower populations. The subsidy rates used here are 3.2 percent for the VA, which insured $63 billion in mortgage principal in 2010, and 4.4 percent for the RHS, which insured $17 billion.

Detailed estimates of fair-value subsidies have not been published for the VA or RHS, or for other, smaller housing programs. Rough estimates can be constructed by starting with the official subsidy rates published in the federal budget, and adjusting them for a market risk charge based on the risk charge inferred for the FHA. That is, the budgetary subsidy estimates give the present value of projected losses discounted at Treasury rates. The budget calculations take into account differences in expected default and recovery rates across programs. The difference between the fair-value subsidy and the FCRA subsidy is the market risk charge for a program (see the online appendix). For the FHA, the subsidy rate reported in the budget for 2010 was −0.84 percent, whereas the fair-value rate is estimated, as described above, to be 2.5 percent.[12] The fair-value subsidy rate is therefore 3.34 percentage points higher than the FCRA subsidy rate. The assumption that the capitalized market risk charge is similar for all these mortgage guarantee programs can be justified by the many similarities between them—most of the loans are long-term, fixed-rate, and highly leveraged; and they are exposed to aggregate risk primarily through shocks to the housing market. In 2010, the FCRA subsidy rates for the VA and RHS were −0.16 percent and 1.21 percent, respectively. Adding a 3.34 percent risk charge implies a fair-value subsidy rate of 3.2 percent for the VA and 4.4 percent for the RHS.

STUDENT LOANS The federal government makes financing for higher education widely available through its student loan programs. Since July 2010, all new student loans have been made through the direct loan program administered by the Department of Education, but before that time the majority of federal student loans were made through the department's

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12. All FCRA estimates are from the OMB (2011).

guaranteed loan program.[13] The programs offer long-term, fixed-rate loans with a variety of terms.

The subsidy rates used for loans originated in 2010 were 13 percent for direct loans and 16 percent for guaranteed loans, following Lucas and Damien Moore (2010) and CBO (2010d). The higher subsidy cost of the guaranteed program can be attributed to the statutory fees paid to private lenders, which exceed the government's cost of administering the direct loan program. Collectively, the student loan programs disbursed $105 billion in new student loans in 2010.

Lucas and Moore (2010) and the CBO (2010d) develop fair-value subsidy estimates for the direct and guaranteed student loan programs at that time. The subsidies reported here are based on the subsidy rates reported in table 3 of CBO (2010d).[14] Cash flows on student loans are modeled using historical loan-level data from the Department of Education on performance, and risk-adjusted discount rates are derived from the spreads over Treasury rates charged on private student loans before the financial crisis. (During the crisis, the spreads widened enormously and private lending volumes fell sharply.) The loans have multiple embedded options, including prepayment and deferral options, which were also taken into account in the pricing model. Because the interest rates on the private student loans are primary rather than secondary market rates, adjustments had to be made to subtract an estimate of the fees that were included in the quoted rates.[15]

The subsidy rates used for student loans are much higher than for the mortgage guarantee programs. The higher rates reflect the fact that student loans are long-term, unsecured consumer debt, which is considerably riskier than even highly leveraged mortgages, which are protected by the collateral value of the house.

THE SMALL BUSINESS ADMINISTRATION The Small Business Administration (SBA) assists qualifying small businesses in obtaining access to bank credit by guaranteeing a portion of their loans through its largest program, the 7(a) loan guarantee program. This program had modest default rates in the years leading up to the 2007 financial crisis, but postcrisis loss rates increased dramatically (and in earlier years loss rates had also been high).

13. During that time the government also purchased guaranteed loans from lenders. Those purchases do not create new credit subsidies for borrowers and those loans are excluded from the reported subsidy estimates.

14. The methodology was similar in both analyses, but the reported subsidy rates are somewhat different, in part because of the time periods considered. However, the subsidy rates reported by the CBO (2010d) are more applicable to this analysis because they take into account the mix of loan types and interest rate conditions in 2010.

15. A complete description of the valuation model is given by Lucas and Moore (2010).

Based on the analysis by the CBO (2007), the fair-value subsidy rate used here is 6.5 percent for the $17 billion in small business loans guaranteed in 2010.

The CBO estimated the market value of the SBA's subsidy on guaranteed loans originated in 2006 using an options pricing model, which is described in CBO (2007).[16] The CBO reports a market-value subsidy rate for 2006 of 1 percent, versus an FCRA subsidy estimate of 0 percent. The report also concludes that under less benign market conditions (with 20 percent higher default rates and 50 percent lower recovery rates), the market-value subsidy would increase to 2.7 percent for 2006. For 2010, the Office of Management and Budget (OMB 2011) reports an FCRA subsidy rate for the SBA of 3.53 percent. The subsidy for 2010 is approximated by adding a market risk charge of 3 percent to the 2010 FCRA subsidy rate, which roughly corresponds to assuming a market risk premium of 50 basis points annually over an average 7-year loan life.

OTHER TRADITIONAL CREDIT PROGRAMS The programs discussed above account for more than 88 percent of the traditional credit program disbursement volume in 2010. The fair-value subsidy rate used for the $64 billion in loans covered by these other programs is 6 percent.

The larger programs in the "other" category provide credit assistance for agriculture and international trade. Although a few of these larger programs exceeded $5 billion in 2010 lending volume, most were much smaller. Fair-value subsidy estimates have not been published for these programs. However, the OMB (2011) provides summary data that include interest rates and fees, lifetime default and recovery rates, loans originated, and the FCRA subsidy rates.[17] From this information, it is possible to make estimates of a risk charge using a simple model of the annual expected cash flows on the underlying loans. That is, given an assumed prepayment rate, the lifetime default rate is converted into an annual default rate. The cash flows on the underlying loan are based on the borrower rate, the annual default rate, the prepayment rate, and the recovery rate conditional on default.[18] Discounting expected cash flows for each program at a risk-adjusted rate

16. The estimate is referred to in the report as a market-value estimate, but it is conceptually equivalent to what is described as a fair-value estimate in later CBO publications.

17. The data, which are reported by the federal agency running the program, are of mixed quality and in some cases are clearly incorrect. In these cases, the risk charge added to the FCRA subsidy rate is the average of the risk charges across all the smaller programs.

18. The present value of fees is assumed to be unaffected by the discount rate, which is only correct for upfront fees. However, the data on periodic fees are not reliable, which is why the effect of differential risk adjustment for fees is not calculated. Neglecting the difference is likely to have a very small effect on the total subsidy estimates.

yields an estimate of their fair value. Then the subsidy (either for a direct loan or a loan guarantee) is the difference between the loan principal and the present value of loan payments and fees. FCRA values are approximated the same way, except that Treasury rates are used for discounting.[19] The difference between the fair-value and FCRA estimates is the market risk charge, which is added to the official FCRA estimate for each program to produce a fair-value subsidy estimate.[20]

To risk-adjust the discount rates, the spread over Treasury rates is set at 1.15 percent, which corresponds to the historical risk premium on bonds rated Baa by Moody's Investors Service (Hull, Predescu, and White 2005). The weighted average risk charge is 6 percent, and the weighted average official FCRA subsidy rate is close to 0. Hence, the fair-value subsidy rate for the $64 billion in loans covered by other programs in 2010 is taken to be 6 percent.

III.B. *Credit Supply and Demand Elasticities*

The elasticity of credit supply affects the extent to which additional borrowing in government credit programs is offset by reductions in private borrowing. For the 1980s, Gale (1991) considers supply elasticities of 0.5 and 5.0 to span the range of plausible values. The high levels of reserves in the banking system and loose monetary policy in 2010 suggest a high elasticity of supply in 2010. Therefore, I do not include an aggregate crowding-out effect. However, in assessing the increase on the extensive margin attributable to credit programs below, I take into account the likely share of borrowers who could have obtained credit for the same purpose from the private sector but chose not to do so because of the more favorable terms offered by the government.

Demand elasticities are an input to the estimated expansion of borrowing at the intensive margin. For the main results reported, I follow Gale (1991) by using elasticities with respect to the dollar subsidy amounts of 1.8 for housing, 0.65 for student loans, and 0.8 for business and other. A more recent estimate of mortgage demand elasticity, from Anthony DeFusco and Andrew Paciorek (2014), finds a reduction in total mortgage debt of between 1.5 and 2 percent per each increase in the interest rate of 1 percentage point. To compare this flow estimate with the stock elasticity

19. The CBO (2011c) provides a detailed example of this approach for nuclear construction loan guarantees.

20. The risk charge plus the OMB's FCRA estimate is used instead of the rough fair-value estimates because the FCRA estimates are generally based on more complete information about cash flows and their timing.

of 1.8 requires an assumption about the life of a mortgage and the appropriate discount rate. Very roughly, assuming a 1 percent rate reduction over 7 years provides about 5 percent of the principal value in reduced cost, and the implied elasticity is 0.5. More generally, the literature is inconclusive on demand elasticities for credit, with more recent studies finding a mix of large and small values in different instances. This motivates using a fairly wide elasticity band for all types of borrowing in a sensitivity analysis.

III.C. Increases in Borrowing along the Extensive Margin

As the model in section I illustrates, if credit-rationing effects are important, then the increased availability of credit to previously constrained households from federal credit programs could significantly increase borrowing volumes. The size of these volume increases may be largely unrelated to the cost of the associated credit subsidies; in some instances, a small subsidy may lower the equilibrium interest rate enough to attract both low- and high-risk borrowers in situations where no private loans could be offered without lenders taking a loss. However, in other circumstances, large subsidies may have little incremental effect on loan volume.

The evaluation of extensive margin effects for each program is informed by observations about the programs and related markets, but by necessity is largely judgmental because the counterfactuals would be extremely difficult to estimate.[21] Nevertheless, to the extent that the assumptions are plausible, they are worth taking seriously, precisely because the implied stimulus effects are so large. Alternative assumptions considered in the sensitivity analysis provide some assurance that the effects are large, although they cannot be precisely measured.

The approach used here broadly follows Gale (1991). However, the goals of the two analyses are different, and hence different choices are made. Gale (1991) considers two scenarios for the world without credit subsidies in order to provide upper and lower bounds for his calculations of the effects of policy on the allocation and quantity of credit under normal market conditions. The first is that all markets would clear. The second is that tax-exempt and mortgage markets would clear, but farmers, students, and small businesses would be "redlined," meaning that credit would not be available, even at very high interest rates.

Here I consider two different scenarios for the effects of federal credit assistance on the expansion of credit along the extensive margin and on the

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21. Jeske, Krueger, and Mitman (2013) are an exception; they propose a structural model to assess the effects of the GSEs.

multipliers. The first scenario is for normal economic conditions; the second is for periods of recession and financial market distress. In calibrating the model for 2010, the question is: Which scenario more closely reflects conditions at that time, or did they lie somewhere in between? Financial markets had begun to normalize by 2010, and the recovery had officially started; but credit was still tight and unemployment remained elevated. Reflecting the fact that the economy was neither normal nor highly distressed, the reported stimulus effects are based on an equally weighted average of the outcomes in each of these scenarios.

The other two components of the calculation—estimates of credit expansion along the intensive margin, and crowding out—are directly calibrated to the conditions of 2010. The intensive margin effects depend on 2010 credit subsidies, and there is no basis in the literature for cyclically varying credit demand elasticities. Crowding out in 2010 is taken to be minimal because of the accommodative stance of monetary policy and the slack in the financial system.

HOUSING Real estate serves as high-quality collateral, making it relatively easy for firms and households to borrow against it. Perhaps for this reason, Gale (1991) assumes that the mortgage market would clear in the absence of federal housing programs. However, because house prices are volatile, there are limits to leverage. Government programs can increase the availability of mortgage credit by permitting higher loan-to-value ratios than a private financial institution would accept. The FHA, VA, and RHS all allow borrowers to make very small or no down payments. A larger down payment requirement would discourage some people from purchasing a home at all and cause others to buy a less expensive home. To take into account that these programs loosen collateral constraints even during normal times, the constrained share of borrowing for the FHA, VA, and RHS is set to 10 percent (that is, 10 percent of the funds borrowed through these programs would not be available at any price without government assistance). By contrast, the GSEs require a 20 percent down payment or PMI and also impose payment-to-income limits. These requirements appear to be at least as rigorous as those on nonconforming mortgages from private lenders. Hence, it seems unlikely that the GSEs have much effect on the availability of mortgage credit in normal times, and I assume they have no impact.[22]

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22. Indirect support for this assumption comes from the finding that GSE pricing is only slightly more favorable than that on comparable private-label mortgages (Passmore, Sherlund, and Burgess 2005).

Federal backing is likely to have a much larger effect on the availability of mortgage credit during periods of severe financial stress. However, the shift from private-label mortgages to government-backed mortgages following the 2007 financial crisis is not necessarily indicative of the size of that effect because the government also attracts additional borrowers at such times with its particularly favorable pricing. I assume that 90 percent of FHA borrowing is incremental during distressed periods because the program is specifically designed for borrowers with no credit history, low savings, and low incomes, and because the down payments allowed are so low.[23] For the VA and RHS, I set the constrained share to 50 percent because some VA borrowers are more likely to be in a position to obtain some credit privately than are FHA borrowers. For the GSEs, even during periods of stress, most conforming borrowers probably would be able to obtain credit from private lenders, albeit at higher interest rates. I assume that 25 percent of the volume of GSE credit is incremental during distressed periods.[24]

STUDENT LOANS The federal student loan programs make unsecured, long-term credit available to borrowers, most of whom have no credit history and little in the way of income or assets. Such loans are generally not offered by private financial institutions. For these reasons, the student loan program is thought to greatly increase the availability of funds for higher education.

I assume that during normal times, 75 percent of observed student loan volume would not have been available without federal support. The presumption that a quarter of the loans could have been obtained anyway is supported by the fairly sizable private student loan market that had emerged before the financial crisis. Also, some student loans are made to parents of students who are more likely to be able to obtain credit privately.

During the financial crisis, many private lenders withdrew from the student loan market, and the ones that remained sharply raised their underwriting standards and rates. I assume that during times of market stress, 95 percent of federal student loans represent incremental borrowing volume. This estimate may be on the high side if some families could use home equity or other forms of collateral to borrow funds to finance education when student loans are not available, or if they would have relied more on savings to cover educational expenses had government loans not

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23. To the extent that this may overstate the extent to which FHA borrowers would be constrained during a crisis, note that FHA lending is shown below to add only $67 billion in stimulus, and that shading that number down would not change the main conclusions.

24. For an estimate of the effects of GSE and FHA program rules on refinancing activity during this period, also see Remy, Lucas, and Moore (2011).

been available. However, also contributing to incremental borrowing was the fact that some students probably took out loans that were used by their families for other purposes because of the unusual difficulty of obtaining credit elsewhere.

SMALL BUSINESSES AND OTHER TRADITIONAL CREDIT PROGRAMS The SBA 7(a) program is explicitly aimed at increasing access to credit by businesses that would be unable to obtain loans on their own. The pricing that small businesses obtain through this program does not appear to be particularly favorable, and the volume of SBA loans did not increase much following the onset of the financial crisis.[25] I assume that the constrained share of these loans is 75 percent in normal times and 85 percent in stress periods. The relatively small difference between the normal and distressed share of constrained borrowers reflects the view that the program is relatively un- attractive in good times for unconstrained borrowers. As a result, the level of constrained borrowers in good times is assumed to be higher than for most other federal credit programs.

Other traditional credit programs include a mix of support for agri- culture, trade, energy, and other activities. The constrained share is set to 50 percent in normal times and 75 percent in periods of stress.

III.D. Fiscal Multipliers

The CBO (2011b) defines a fiscal multiplier as the change in a nation's economic output generated by each $1 of the budgetary cost of a change in fiscal policy. It reports a range of fiscal multipliers, reproduced in table 1, for various types of expenditures authorized under the ARRA. The wide range reflects the conflicting evidence in the literature on their size. Auerbach and Gorodnichenko (2012) show that some of the size variation is a function of the business cycle, with much larger multipliers in downturns that are at the high end of the range reported by the CBO.

As discussed in section I.B, under the interpretation that stimulus affects aggregate demand largely through the spending of hand-to-mouth con- sumers or liquidity-constrained households, these multipliers apply more naturally to incremental borrowing than to credit subsidies. The CBO mul- tipliers may in fact be conservative measures when applied to incremental borrowing because the offset from savings may be smaller than for govern- ment programs that distribute funds to some people who, unlike borrowers,

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25. De Andrade and Lucas (2009) find that SBA subsidies may benefit banks more than small businesses. However, Bach (2014) provides evidence that the effects of a French tar- geted credit program significantly reduced credit constraints.

Table 1. Ranges for U.S. Fiscal Multipliers

	Estimated multiplier	
Type of activity	*Low estimate*	*High estimate*
Purchases of goods and services by the federal government	0.5	2.5
Transfer payments to state and local governments for infrastructure	0.4	2.2
Transfer payments to state and local governments for other purposes	0.4	1.8
Transfer payments to individuals	0.4	2.1
One-time payments to retirees	0.2	1.0
Two-year tax cuts for lower- and middle-income people	0.3	1.5
One-year tax cut for higher-income people	0.1	0.6
Extension of the first-time homebuyer credit	0.2	0.8
Corporate tax provisions primarily affecting cash flow	0	0.4

Source: CBO (2011b).

have no immediate desire to spend them. However, how to map the differ-ent credit programs into the listed categories is not obvious. Student loans, small business loans, and other loans probably correspond most closely to "transfer payments to individuals," in that they put money directly into people's hands that is likely to be spent fairly quickly. Mortgages are most closely related to the extension of a first-time homebuyer credit, although the terms of this program are quite different from those for mortgages, and many mortgage borrowers are not first-time borrowers.

To capture the cyclical variation in multipliers at different phases of the business cycle suggested by Auerbach and Gorodnichenko (2012), higher multipliers are applied in the distressed scenarios than for normal times. For the distressed scenario, the multipliers are set to 2.0 for student loans, business loans, and other loans. This choice of multipliers is toward the high end of CBO's range for transfers to individuals, and slightly less than the multiplier suggested by Auerbach and Gorodnichenko (2012) for total spending in a recession. For normal conditions, the multipliers for these programs are set to 0.5, which is slightly above that suggested by Auerbach and Gorodnichenko (2012) for an expansion. For Fannie Mae and Freddie Mac, I assume much smaller multipliers of 0.3 under distressed conditions and 0.2 under normal conditions. For the other mortgage programs, the multipliers are set to 0.4 and 0.3, respectively. These numbers fall in the low to middle range that the CBO reports for the first-time homeowner credit. The choice of small multipliers for mortgage programs reflects the fact that refinancing accounted for about 73 percent of U.S. mortgage originations

in 2010 according to Freddie Mac's 2010 *Annual Report.*[26] Refinancing frees up some cash for borrowing-constrained households because it lowers monthly mortgage payments (both through a lower interest rate and because principal is reamortized), but the increase in free cash flow is much less than the principal amount refinanced. Most purchase mortgages also can be expected to have a limited stimulus effect because the money is spent on existing structures that are not part of output. The effects of larger and smaller multiplier are considered in the sensitivity analysis.

IV. Stimulus Estimates and Sensitivity Analysis

Recall from section I.B that incremental borrowing, ΔB, which is attributable to federal credit assistance net of crowding out, is $\Delta B = dA + S(dB/dS) - C$. The first two terms are incremental borrowing along the extensive and intensive margins, which can be easily quantified based on the assumptions made in section III. Crowding out, C, is set to 0, due to the slack in the financial system in 2010. Applying the multipliers to ΔB for each program and summing up the results yields the estimate of fiscal stimulus. Dividing the fiscal stimulus by the sum of credit subsidies quantifies the bang for the buck of credit subsidies.

IV.A. *Subsidy Totals and Borrowing Increases along the Intensive Margin*

Table 2 summarizes the assumed subsidy rates and the estimates of incremental demand along the intensive margin, $S(dB/dS)$. Multiplying the loan disbursements by the subsidy rates gives a subsidy cost for traditional credit programs of \$29.7 billion.[27] The GSE subsidies add \$40.9 billion to that, bringing the total estimated subsidies for 2010 to \$70.6 billion.

The construction of the estimates of incremental borrowing for each program on the intensive margin are shown in table 3, using the demand elasticities, disbursements, and subsidy rates described for each program in section III. In total, \$107 billion in additional borrowing is attributed to this channel in 2010, mostly from the housing programs.

Note that in an economy without credit market frictions, and under normal market conditions, federal credit subsidies of this magnitude would

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26. In the *Annual Report*, see table 8 on p. 66 (http://www.freddiemac.com/investors/er/pdf/10k_022411.pdf).

27. By contrast, a total subsidy cost of −\$11.7 billion (that is, savings) was reported in the federal budget.

Table 2. Summary of Fair-Value Subsidy Estimates for Federally Assisted Credit, 2010

Category	Agency	Loan volume (billions of dollars)	Fair-value subsidy rate (percent)	Fair-value subsidy value (billions of dollars)
Housing	Federal Housing Administration	319	2.5	8.0
Housing	Department of Veterans Affairs	63	3.2	2.0
Housing	Rural Housing Service	17	4.4	0.7
Student loans (guaranteed)	Department of Education	20	16.0	3.1
Student loans (direct)	Department of Education	85	13.0	11.0
Business	Small Business Administration	17	6.5	1.1
Other traditional	Various	64	6.0	3.8
Subtotal[a]		585		29.7
Housing	Fannie Mae and Freddie Mac	1,011	4.1	40.9
Total		1,596		70.6

Sources: Author's calculations; OMB (2011).

a. The sum of disbursements is lower than the total in the OMB's "Analytical Perspectives" because the Treasury's TARP and mortgage-backed securities transactions and the Department of Education's purchases of seasoned student loans are excluded.

Table 3. Calculation of Incremental Borrowing along the Intensive Margin, 2010

Category	Agency	Loan volume (billions of dollars)	Elasticity	Subsidy rate (percent)	Incremental borrowing (billions of dollars)
Housing	Federal Housing Administration	319	1.8	2.5	14.3
Housing	Department of Veterans Affairs and Rural Housing Service	80	1.8	3.5	5.0
Student loans	Department of Education	105	0.65	14.0	9.6
Business	Small Business Administration	17	0.8	6.2	0.8
Other traditional	Various	64	0.8	6.0	3.1
Subtotal[a]		585			32.8
Housing	Fannie Mae and Freddie Mac	1,011	1.8	4.1	74.6
Total		1,596			107.4

Sources: Author's calculations; OMB (2011).

a. Loan volume is lower than the total disbursements in the OMB's "Analytical Perspectives" because the Treasury's TARP and mortgage-backed securities transactions and the Department of Education's purchases of seasoned student loans are excluded.

be expected to have modest effects on economic aggregates; $70.6 billion is only about 11 percent of the $666 billion in nondefense discretionary spending, and 0.5 percent of GDP. In this case, the subsidies would cause some redistribution of wealth from taxpayers to borrowers. Demand would increase for subsidized loans, and there would be some crowding out of unsubsidized loans. Because eligibility for subsidies is linked to specific investments and increases the demand for them, some or all of the subsidy would be absorbed in higher relative factor prices (for example, subsidized mortgages encourage more housing purchases, putting upward pressure on house prices).

IV.B. Borrowing along the Extensive Margin and Aggregate Stimulus Effects

The computations of borrowing for each program along the extensive margin and the computation of aggregate stimulus effects under the normal and stress scenarios are shown in tables 4 and 5. Incremental borrowing along the extensive margin is found by multiplying the assumed share of incremental loan demand for each program by the actual disbursement amounts. The sum of incremental loan demand along the extensive and intensive margins for each program is multiplied by the corresponding fiscal multiplier to estimate incremental output. Note that the intensive margin effects reported are the same in both tables 4 and 5 because they were directly computed for 2010.

Under the assumption that the effects in 2010 were at the midpoint of the two scenarios that show $587 billion in incremental output with distressed conditions and $101 billion with normal conditions, the conclusion is that federal credit programs generated an estimated $344 billion in incremental output. This additional output was at a cost of $70.6 billion, which translates into a substantial $4.86 of stimulus per $1 of taxpayer cost. By comparison, the CBO estimated that the ARRA increased output by $392 billion, with an average multiplier on spending of less than 1.5.

IV.C. Sensitivity Analysis

Clearly, the estimate of the stimulus effects of credit policies is highly sensitive to the many assumptions that went into the calculations, and the true value could be considerably more or less than the $344 billion that has been presented as the most plausible point estimate. However, the conclusion that federal credit policies have provided a significant amount of fiscal stimulus in recent years would be robust to a fairly wide range of parameter choices. The normal and distressed scenarios in themselves may

provide lower and upper bounds for the range of plausible stimulus effects of falling between $101 billion and $587 billion. Although there is no way to assign probabilities, the midpoint was chosen to represent the best estimate because 2010 was an early year in the recovery, but credit markets remained tight. The assumptions about mortgages and student loans are the most critical because of the large size of these programs. To the extent that student loans are the most credible source of stimulus and that the private student loan market was highly distressed, the estimate of $219 billion in stimulus from this program in distressed conditions could be taken as a tighter lower bound. A range of $219 billion to $587 billion still leaves an uncertainty factor of roughly 3 from top to bottom, but this is narrower than the fivefold ranges of multiplier uncertainty shown in table 1 above. Given the uncertainties about multiplier effects, it would be difficult to make a strong case for further narrowing the range.

As noted by Gale (1991), tax-exempt borrowing also provides federal credit subsidies via the tax code. He reports a subsidy rate of 19 percent for this assistance. The CBO's multiplier range for transfers to state and local governments are similar to those for transfers to individuals. Applying this subsidy rate and a mid-range multiplier of 1 to 2010 long-term municipal issuance volume, which totaled a record high $430 billion, translates into an additional stimulus of $81.7 billion. The base case estimates are also conservative, in that the subsidy estimates mostly exclude administrative costs.

V. Discussion and Conclusions

A unique aspect of U.S. credit markets is the large presence of ongoing government-backed direct loan and loan guarantee programs, most notably Fannie Mae and Freddie Mac, the student loan programs, and the FHA, but also more than 100 smaller programs. Collectively, these activities provided credit subsidies of varying sizes on $1.6 trillion of loans disbursed in 2010, and they relaxed credit-rationing constraints on many borrowers. Taking into account the likely effects these programs had on causing borrowing in that year to be higher than what would have been extended privately in their absence, and applying a multiplier to these incremental balances similar to those applied to traditional government spending and tax policies, yields an estimate of fiscal stimulus from these programs in 2010 of roughly $344 billion, similar to the amount that the CBO attributes to the ARRA. This estimate is in some ways conservative because it excludes other forms of credit support such as tax breaks on municipal bonds, which would add

Table 4. Incremental Output in a Normal Period

Category	Agency	2010 loan volume (billions of dollars)	Constrained share	Incremental loan volume along extensive margin in normal times (billions of dollars)	Incremental loan volume along intensive margin in 2010 (billions of dollars)	Multiplier in normal times	Incremental output (billions of dollars)
Housing	Federal Housing Administration	319	0.10	31.9	14.3	0.3	13.9
Housing	Department of Veterans Affairs and Rural Housing Service	80	0.10	8.0	5.0	0.3	3.9
Student loans	Department of Education	105	0.75	78.8	9.6	0.5	44.2
Business	Small Business Administration	17	0.75	12.5	0.8	0.5	6.6
Other traditional	Various	64	0.50	31.9	3.1	0.5	17.5
Subtotal[a]		584		163	33		86
Housing	Fannie Mae and Freddie Mac	1,011	0.00	0.0	74.6	0.2	15
Total		1,595		163	107		101

Sources: Author's calculations; OMB (2011).

a. Loan volume is lower than the total disbursements in the OMB's "Analytical Perspectives" because the Treasury's TARP and mortgage-backed securities transactions and the Department of Education's purchases of seasoned student loans are excluded.

Table 5. Incremental Output in a Distressed Period

Category	Agency	2010 loan volume (billions of dollars)	Constrained share	Incremental loan volume along extensive margin in distressed times (billions of dollars)	Incremental loan volume along intensive margin in 2010 (billions of dollars)	Multiplier in distressed times	Incremental output (billions of dollars)
Housing	Federal Housing Administration	319	0.90	286.8	14.3	0.4	120.5
Housing	Department of Veterans Affairs and Rural Housing Service	80	0.50	40.0	5.0	0.4	18.0
Student loans	Department of Education	105	0.95	99.8	9.6	2.0	218.6
Business	Small Business Administration	17	0.85	14.1	0.8	2.0	29.9
Other traditional	Various	64	0.75	47.8	3.1	2.0	101.7
Subtotal[a]		584		488	33		488.6
Housing	Fannie Mae and Freddie Mac	1,011	0.25	252.8	74.6	0.3	98
Total		1,595		741	107		587

Sources: Author's calculations; OMB (2011).
a. Loan volume is lower than the total disbursements in the OMB's "Analytical Perspectives" because the Treasury's TARP and mortgage-backed securities transactions and the Department of Education's purchases of seasoned student loans are excluded.

an estimated $82 billion to the stimulus, and omits administrative costs from subsidy estimates. Although there is considerable uncertainty about this point estimate, its size suggests that the effects of fiscal policy cannot be fully understood without taking the stimulus effects of federal credit programs into account. And it also suggests that structural changes in the larger federal credit programs have potential macroeconomic and fiscal policy implications.

A few points deserve emphasis. Although the uncertainty surrounding the reported point estimates of the stimulus is considerable, under a wide range of plausible parameterizations the estimated effects are extremely large. Hence, rather than dismissing these effects because the impact is difficult to measure precisely, it makes sense to continue to look for better ways to measure this phenomenon. It is also important to remember that although the focus here has been on federal credit programs as a relatively low-cost source of fiscal stimulus and automatic stabilization during a severe economic downturn, these programs have significant costs during more normal times that also must be considered in assessing their overall welfare effects. These costs include the likelihood that overly lax federal credit policies, particularly mortgage-related subsidies, were one of the exacerbating causes of the 2007 financial crisis. A final caution is that the cost of the stimulus, though low compared with traditional fiscal policy, is significantly more than the budgetary cost of the programs that are calculated under rules that cause the full economic costs of credit extension to be underreported.

This analysis raises several fundamental questions. The first is how these results should change our perceptions about the depth of the downturn and the effectiveness of other types of fiscal and monetary stimuli. If the high-end estimates presented here are correct, then one might conclude that either the economy was in worse shape than most economists thought, or conventional fiscal and monetary stimuli had less effect than some had previously estimated. Addressing this issue in depth is beyond the scope of this analysis. My view is that there remains a great deal of disagreement among prominent economists about how effective either fiscal or monetary policy was, or what would have transpired in the absence of those policies. This professional uncertainty is reflected, for instance, in the wide range of multipliers reported in table 1 that were derived from surveying the literature. My preferred estimate of additional output of $344 billion in 2010, although large in comparison with the ARRA, is small compared with the $14.66 trillion in GDP and deficit of $1.3 trillion. Hence, although the findings here should shift the perception of the total amount of the fiscal

stimulus that was provided, it need not significantly shift one's prior beliefs about the severity of the downturn or the effectiveness of other policies. With regard to monetary policy, the analysis raises the intriguing question of whether the recovery of the housing market benefited more from the loosening of borrowing constraints via federal housing credit programs or from the Federal Reserve's actions that lowered interest rates.

A further question is definitional, and concerns whether credit policy, which up until now has acted as what might be called a shadow stimulus, should be classified as fiscal policy, as monetary policy, or as a third category of its own. The subsidies associated with credit policies clearly are an expenditure of economic resources by the government, and hence are fiscal in nature. The treatment of credit subsidies in the federal budget as costs (albeit underestimated costs) concurs with this view. At the same time, the channel through which the subsidies translate into fiscal stimulus—by accommodating increased borrowing, and thereby increased spending—is different than for other fiscal policies. This difference was taken into account in the analysis by applying estimates of fiscal multipliers to incremental borrowing rather than directly to the subsidies. Nevertheless, because subsidy provision is the root cause of the increase in aggregate demand, it seems reasonable to consider these policies as part of fiscal policy, broadly defined. Although the policies have some similarities with actions the Federal Reserve took at about the same time through its creation of emergency lending facilities, the case for treating the programs as part of monetary policy is weak. It has been observed that to the extent that the Federal Reserve was taking uncompensated credit risk through its emergency facilities, its actions were fiscal and not monetary. In fact, the Federal Reserve claimed that it was providing liquidity and not taking credit risk. The CBO (2010b) for the most part concurred; it found that because most of the risky Federal Reserve facilities were backstopped by the Treasury through TARP (which was counted as part of fiscal policy) or were otherwise protected against credit losses, the fiscal costs of these facilities were in fact small. By contrast, federal credit programs involve significant uncompensated risk transfers and little liquidity provision.

There are also interesting areas for further research. An intriguing question is to what extent similar channels for fiscal policy through credit policy can be seen in other countries. In the case of Europe, although governments affect credit by intervening heavily in the banking system, there is much less reliance on U.S.-style government credit programs. This raises the possibility that one reason for the relatively strong U.S. recovery is that this channel for fiscal stimulus is less available than in Europe.

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Comments and Discussion

COMMENT BY

ALAN J. AUERBACH
During the Great Recession, the struggle to come up with effective countercyclical policies while confronting significant financial market disruption and the zero lower bound led to innovations in monetary policy that in some cases tested the boundaries between monetary and fiscal policy. In her paper, Deborah Lucas offers us another prospective element of an expanded view of countercyclical fiscal policy: the use of government credit subsidies to increase private sector borrowing at both the intensive and extensive margins. Lucas argues that credit policy played a significant role in lessening the severity of the Great Recession, and that the output multipliers of U.S. government credit policy are much larger than standard fiscal policy multipliers, especially in periods of recession.

This is an interesting and thought-provoking paper that should stimulate further research. My comments all relate to its striking implication that very large multipliers should make credit policy a major element of countercyclical policy.

WHAT DOES THE MULTIPLIER MULTIPLY? A critical step in Lucas's multiplier calculation is her assumption that multipliers—taken from the fiscal policy literature relating output changes to changes in government taxes, transfers, and direct purchases—should be applied to the additional borrowing per unit of subsidy. Thus, because the subsidy amount is just a fraction of the induced increase in borrowing, there is a first-stage multiplier before the standard multiplier is applied. Lucas argues that for the liquidity-constrained, access to additional borrowing should have a similar impact as the receipt of grants, although she does make adjustments for programs and circumstances where the refinancing of existing loans is important.

To decide whether this approach makes sense, it is useful to clarify how the multiplier is being defined. In the recent literature from which Lucas draws, one may find a variety of definitions—including the impact effect on output of a shock to, say, government spending, $\dfrac{dY_t}{dG_t}$; the cumulative effect on output over some horizon, $\dfrac{d\left(\sum_{i=0}^{T} Y_{t+i}\right)}{dG_t}$; the peak effect on output over some horizon, $\dfrac{d\left(\max_{i \leq T} Y_{t+i}\right)}{dG_t}$; and the cumulative effect on output relative to the initial spending shock *plus* the cumulative government spending induced by the initial shock over the same period, $\dfrac{d\left(\sum_{i=0}^{T} Y_{t+i}\right)}{d\left(\sum_{i=0}^{T} G_{t+i}\right)}$. Whether it makes much of a difference which approach one chooses depends, among other things, on the nature of the policy shock—for example, whether it is temporary or long-lived. In the case of the borrowing shocks that Lucas considers, there is effectively a reversal of policy in subsequent years, as increased borrowing induces increased payments of principal and interest. Thus, one would expect a smaller cumulative impact relative to the initial shock than would be the case for typical fiscal policy interventions. However, to the extent that repayments are small relative to initial borrowing over the relevant horizon (which Lucas indicates is the case) and borrowers are liquidity constrained, the eventual reversal of shocks does not seem quantitatively important. The bigger issue, in my view, is the assumption that output responds to the initial increase in borrowing rather than to the present value embedded subsidy or some other measure of policy. On this issue, a key question is who is doing the initial borrowing; and the paper appears to offer more than one answer. The theoretical model that Lucas develops to explain why small subsidies can lead to large increases in borrowing, as depicted in figure 1 of her paper, indicates that the expansion at the extensive margin comes from low-risk borrowers being enticed into the market. But the narrative surrounding the empirical section strongly suggests that much of the expansion reflects lending to individuals who have no other access to credit. This story is more consistent with her multiplier assumptions, but not with her theory. My sense is that the latter perspective is more what Lucas has in mind, which supports her multiplier assumption but also raises other issues, such as how estimated subsidies should respond to expansions of lending.

Overall, I agree that cash up front should also matter, not just the present value subsidy; but I am not entirely convinced that the impact on

aggregate activity should be as large as is implied by applying fiscal multipliers to the amount of new borrowing.

Are the multipliers themselves reasonable? Lucas relies heavily on the empirical multiplier literature, particularly that from the Congressional Budget Office (2011), in assigning multipliers to the different credit programs, in good times and bad. Based on my own work cited in her paper, I am of course very sympathetic to using larger multipliers when the economy is in a distressed period than during a normal period, the two cases she distinguishes in her analysis. The biggest impact of this cyclical variation comes through student loans, using multipliers based on treating them as similar to transfer payments to individuals. Although students resemble recipients of transfer payments in an important respect—they have low current incomes and assets—I am unsure whether this similarity itself justifies the multiplier assumption. In particular, student loans cover tuition, and payments to universities are quite different than payments to private producers. Given states' balanced budget requirements, reductions in public university revenues could have large effects on aggregate demand, but not necessarily right away. Also, one would expect access to student loans to have a big impact on labor force participation among younger workers, much bigger than among many groups receiving transfer payments, notably the elderly. This, too, could reduce the relative impact on aggregate activity of an increase in student loans.

I do not mean to be overly critical of the assumptions Lucas makes here, given the lack of empirical evidence regarding the relevant multipliers. But existing empirical estimates of multipliers are subject to large standard errors, especially for particular components of the federal budget, for which there are fewer reliable estimates. Translating these estimates into multipliers for credit programs involves another big layer of uncertainty. So we need to assume large confidence intervals around the paper's multiplier estimates, leaving aside the distinction between normal and distressed times.

SUBSIDIES AND CREDIT EXPANSION An important part of the paper's analysis involves the estimation of subsidies for a range of government credit programs. Lucas argues for a more rigorous approach than is commonly used by the government itself, and which typically yields larger estimated subsidy costs. But applying her methodology to the current exercise still requires assumptions and judgment, because 2010—the year on which she focuses—was a very atypical one in credit markets. She does one set of calculations for the subsidy rates for different programs, which are held fixed across the two scenarios—distressed and normal—that she considers in her simulations. But one might expect the composition of borrowers

and the embedded subsidy per dollar of new loans to vary across the two scenarios. For example, if riskier borrowers enter, then the subsidy rate should be higher.

If the subsidy rate does not increase substantially in the distressed scenario, even though the federal government is accounting for a substantially larger expansion of credit, this suggests that an important function of government credit programs in bad times is the provision of liquidity, rather than subsidies. Lucas distinguishes between these two functions at the end of the paper, in contrasting the effects of credit programs with the actions of the Federal Reserve during the Great Recession, but I am not convinced that credit subsidies, rather than simply the provision of credit, were important during this period. Of course, the central role of financial market disruption distinguishes the Great Recession from serious earlier postwar recessions, and Lucas notes that there was little cyclical variation in credit program disbursements in these earlier periods. But if credit expansion follows the normal scenario in a typical recession, then the amount of additional stimulus provided by credit subsidies would also be small, even if the multiplier is large, for there would not be much additional credit.

I am not clear from her paper how Lucas envisions the relationship between subsidies and credit expansion. On the intensive margin, she uses assumed elasticities to translate subsidy rates into credit expansion; but on the extensive margin, she simply estimates the amount of additional credit that is attributable to the programs. It is not clear whether this expansion relates to the subsidy rates or to other elements of the programs, such as the provision of liquidity. Thus, her estimates of the program's bang for the buck—the additional output per $1 in program subsidies, $4.86 per $1 in taxpayer cost—cannot necessarily be thought of as a marginal effect that tells us how much additional output we will get for an additional $1 subsidy.

CREDIT PROGRAM DESIGN AND STABILIZATION POLICY The tax system's function in providing an automatic stabilizer is important, and it can be substantially affected by changes in the tax structure (Auerbach and Feenberg 2000; Kniesner and Ziliak 2002). For example, the traditional tax reform approach of lowering tax rates and broadening the tax base reduces the strength of automatic stabilizers. With few exceptions (McKay and Reis 2013), however, little thought has been given to how the stabilization function should guide tax policy design. The same critique applies to government credit programs, now that Lucas has called our attention to their potential role in countercyclical policy. How should such concerns shape the design and reform of government credit programs?

The question of how large subsidies should be, given the counter-cyclical objective, is a hard one to address based on this paper, for though it specifies the relationship between subsidies and borrowing at the *intensive* margin (summarized in table 3 of the paper), it does not do so for borrowing at the *extensive* margin. It may well be that the subsidy rate, within a plausible range, has a relatively small impact on cyclical variation. This may be fortunate, in a way, given that subsidy rates seem to vary across programs in a manner that has no apparent rationale and may be dictated by political rather than economic objectives. For example, the program with the highest subsidy rate—student loans—has the lowest response elasticity on the intensive margin. However, scaling the amount of available credit to economic conditions might help a lot, although perhaps much more in recessions like the most recent one than in the typical recession. Also, as the paper emphasizes, credit expansion can have both potential benefits and economic costs, such as increased moral hazard and a distorted allocation of capital. Here again, a crucial issue is who is doing the additional borrowing when credit expands. Just as with the debate over financial bailouts and financial regulation, we have an opportunity to reform credit programs before the next recession, aiming to not only improve the stabilization function that Lucas has highlighted but also to do so without unnecessarily exacerbating the economic costs of associated market distortions.

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COMMENT BY

WILLIAM G. GALE   By the end of 2010, outstanding federal debt stood at about $9 trillion. At the same time, as Deborah Lucas notes in her paper, the government's outstanding loans and loan guarantees, combined

with the mortgages held or guaranteed by Fannie Mae and Freddie Mac, equaled about $8 trillion, and other government-backed debt obligations include deposit insurance, pension insurance, a variety of implicit guarantees, the Troubled Asset Relief Program, and several Federal Reserve programs. Looking at the sheer size of federal borrowing versus federal lending is not an apples-to-apples comparison, of course, but it suffices to make the basic point that federal lending has been studied very little relative to other areas of federal activity.[1]

Lucas's paper is a welcome and intriguing exception and will, I hope, spur further research on this topic. The paper, which might be alternatively titled "The Accidental Stimulus," provides illustrative calculations of the impact of federal credit subsidies on output during good times and bad. Essentially, it is a "proof of concept" that federal lending could have boosted the economy significantly during and after the Great Recession, and thus provided an automatic stabilizer and a stimulus that previous research and policy discussions have not recognized.

The main line of argument is straightforward. Federal lending has effects through two channels. It provides loans that would not have otherwise been made by the private sector—the extensive margin. And, by offering loans at subsidized rates, it increases the quantity of loans demanded—the intensive margin. Summing the intensive and extensive margin effects generates an estimate of the additional lending due to the programs, to which program-specific multipliers are then applied to generate the net increase in output. The increase in output is divided by the subsidy value of new loan activity (not loan volume) to obtain bang-for-the-buck estimates that are comparable to those that are typically estimated for federal spending and tax changes.

Lucas estimates that federal credit policies, as they existed in 2010, provided stimulus effects totaling between $101 billion and $587 billion (between 0.7 and 4.0 percent of GDP). This is obviously a very wide range of possible effects, but one that is consistent with the fact that the key parameters—the extensive margin effects and the multipliers— are extremely difficult to pin down. The extensive margin effects are elusive due to a lack of evidence. And the multipliers are hard to calculate both because there is uncertainty about the size of the multipliers that apply to spending programs and because it is not clear how appropriate it is to apply those multipliers that have been estimated for spending programs to

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1. For broad discussion of the relevant issues, see Bosworth, Carron, and Rhyne (1987) and Elliott (2011).

credit programs. Loans need to be paid back, so the loan multiplier for a given sector of the economy may be smaller than the spending multipliers. Conversely, a government loan might crowd in a project that also has other loans and equity investment associated with it, so the loan multipliers could be larger than the spending multipliers.

Although the paper recognizes that there may be crowding out, the quantitative calculations assume that there is none. In principle, crowding out can occur in several ways. First, in order to lend an additional $1, the government must first borrow it (holding other tax and spending policies constant). This borrowing may somewhat reduce the supply of credit to private investors, unless the supply of credit is perfectly elastic or is not being utilized to provide loans to begin with—conditions that Lucas argues apply to 2010. Second, when the first type of crowding out exists, borrowing by one target group for federal lending could crowd out borrowing by other target groups (Gale 1991). This depends crucially on who the marginal borrower is in the market. Suppose there are unsubsidized borrowers and two target groups that receive government subsidies. If the government increases subsidies to one target group, this group's demand will increase, and the resulting increased flow of funds to this group may come at the expense of loans to the other target group.

The assumption that there is no crowding out may be reasonable in the bad times scenario, where the credit market collapses; but in the good times scenario, it may be a stretch. If crowding out is more extensive in good times than in bad ones, as seems plausible, there are at least two implications. First, the $101 billion output stimulus estimate during good times is overstated (and the true stimulus effect could be zero or negative, depending on the extent of crowding out). Second, the automatic stabilizer effect of federal credit would be even larger than what Lucas estimates. Under Lucas's assumptions, as the economy falls into a tailspin, not only would the extensive margin and multiplier effects rise (as she already posits) but the crowding out parameter would fall, too, adding a third channel for stimulus.

The theoretical model developed in the paper exists to provide motivation, not to generate empirical specifications. The model has several main findings. First, extensive margin effects can be large; small changes in subsidies can generate big responses in outcomes. This is a typical result for models of credit or insurance markets with imperfect information (Rothschild and Stiglitz 1976; Stiglitz and Weiss 1981; Mankiw 1986; Gale 1990a, 1990b). But there is little evidence pertinent to this issue. It would be helpful to have examples or evidence on this subject,

given this feature's ubiquity in imperfect-information models of lending and insurance.

Second, in Lucas's model, federal credit crowds in safer borrowers. This suggests that expansions of federal lending would be associated with declines in default rates. My impression is that the data do not support this implication. For example, the vast expansion of federal housing loan guarantees that helped lead to the 2007–08 financial crisis and the Great Recession also led to an increase in defaults, not a decline. The idea that subsidies crowd in safer borrowers is a feature of the models developed by Michael Rothschild and Joseph Stiglitz (1976), but not necessarily of other approaches (Smith and Stutzer 1989; Gale 1990a). In Mankiw (1986), safer or riskier borrowers could be crowded in by subsidies, depending on the parameter values. In Gale (1990b), subsidies crowd in riskier borrower groups. Determining whether the marginal borrower under federal credit programs is safer or riskier than average seems like a very important direction for new research.

More broadly, the paper suggests a need to rethink the economics of the Great Recession and recovery. If Lucas's results are correct—especially her bad times scenario—then either the economy would have been in much worse shape in 2010 than people thought if there had not been a stimulus, or the other fiscal and monetary stimulus efforts provided were much less effective than people think. This creates a bit of a puzzle, however, because one would expect a fiscal stimulus to be most helpful in precisely the type of economy where credit subsidies are helpful—when there are borrowing constraints, incomplete markets, and other types of friction.

Another interesting issue is how credit subsidies would work in a general equilibrium model that (i) generates business cycles and (ii) has credit markets that shut down in bad times. It is plausible to think of some aspects of credit policy as fiscal policy; for example, lending at a subsidized rate seems quite similar to the spending subsidies or tax wedges that are traditionally analyzed in public finance. It is also plausible to categorize some aspects of credit policy as monetary policy; during the Great Recession, the Federal Reserve set up facilities to lend to banks so they could in turn lend to particular target groups, which does not seem that different, in economic terms, from the government lending directly to those groups (Kohn 2010). It is less important, however, whether credit policy is characterized as fiscal or monetary policy in those models, and more important to understand the channels through which credit policies work and the offsets that are created elsewhere in the economy. On the basis of Lucas's intriguing findings, this seems like a fruitful direction for future research.

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GENERAL DISCUSSION　　Robert Hall spoke first, asserting that the central question of the paper was the extent to which government credit programs affected consumption, and that it is useful to look at this question from the perspective of what happened to consumption over the relevant period. He argued that, during the period from about 2001 to the beginning of 2007, consumers played a Ponzi game. That is, consumption was sufficiently high that it was financed in part by continuous borrowing. Or to put it differently, borrowing was greater than the amount of interest paid on outstanding household debt. Then, starting in late 2008, 2009, and 2010, in particular, an enormous squeeze took place on consumption. Paradoxically, he noted, this was seen as a big increase in household saving in the national income accounts, despite there being strong evidence of a credit squeeze on the household. The squeeze would have been a lot worse if it had not been for the fact that people were able to use government lending programs to some extent to offset the squeeze that was taking place on the household, and that reduction in consumption would

have been even larger. The question is: How much larger? This question is basically one of how much leakage there was.

Hall also spoke to the question of fiscal multipliers. It is widely agreed upon in the literature that multipliers are substantially higher at the zero lower bound. (This is because normally there is an interest rate offset operating through the Taylor rule that offsets a spending expansion. With a zero lower bound, this offset does not occur, implying a high multiplier.) Hall disagreed with the view held by some that only distinctively Keynesian models have multipliers. On the contrary, any kind of macroeconomic model involving a government policy that affects spending will result in some sort of fiscal multiplier. As a skeptic about some of the features of Keynesian models, Hall still believes in multipliers.

Justin Wolfers made three brief points. First, he argued that the large amount of uncertainty surrounding the magnitudes of Lucas's estimates was a *feature* of the model, not a bug. During his remarks, discussant Bill Gale had noted that the net effect ranged from 0.7 to 4 percent of GDP. Wolfers encouraged everyone to be candid about how little is really known about this topic. Second, he noted that it seems quite straightforward that the view of the world outlined by Lucas has very clear empirical implications about whose consumption should go up, and whose did not. A household with student loans, for instance, would clearly benefit more than a household with no student loans. Third and finally, he expressed concern that Lucas's "bang-for-the-buck" framework seemed nonobvious, and wondered if she could do more to motivate the cost calculation.

David Romer, in relation to Wolfers's first point, argued for actually making the range of possible estimates wider. According to the paper, it seems that about one-half of the effects are coming from housing loans, and about one-third are coming from student loans. He wondered about the extent to which the multiplier channels for these programs differed from those of conventional fiscal policy. For instance, suppose that when someone takes out a student loan, he or she goes to college instead of working. Does the fact that the person is not working lead to a reduction in GDP? Does the person going to college make it easier for someone else to get a job? What are the GDP effects when the person graduates? And so on. Likewise, for housing, much of the first round of spending presumably goes toward buying existing homes, meaning that the funds that are being lent end up in the pockets of the person who just sold the home, who is presumably no longer liquidity constrained. The channels, therefore, again sound completely different from normal multipliers. Romer admitted to not having a good

handle on what the precise issues were, but wondered if Lucas could do more to expand upon them.

Romer also mentioned the possibility of unusual effects tied to the nitty-gritty of particular programs. He referenced a recent paper by Marco Di Maggio, Amir Kermani, and Christopher Palmer, in which the authors discuss some unexpected effects of the refinancing provisions of the Home Affordable Refinance Program.[1] Rather than cash-out refinance, the authors found evidence of cash-in refinance: People were scraping together money from various sources to get their loan-to-value ratios down to 80 percent. It is therefore possible, Romer noted, that in some cases, the government's helping people out by allowing them to refinance actually reduced consumption (a negative multiplier). All this is to say, he concluded, that some complicated government programs make it very difficult to have much confidence in our ability to estimate multipliers with any precision, and he congratulated Lucas for at least trying something.

Related to Romer's comments, William Brainard encouraged Lucas to spend more time addressing housing specifically. When housing prices crashed, with prices in many places well below replacement cost, there was very little reason for new house construction. Individuals were likely to use new loans either to refinance or buy an existing house, and they were not likely to contract the construction of a new house; nor was there likely to be much speculative building. Multipliers, he concluded, might be very different when housing prices are depressed than when housing prices are high.

Matthew Shapiro suggested that government's expansion of credit, which requires borrowers to repay, might actually be less effective in boosting economic activity than standard government rebates, which are not required to be paid back. Multipliers reported by the Congressional Budget Office typically assume a policy experiment in which the economy crashes, the government sends out rebate checks, and policymakers analyze consumers' marginal propensities to consume. One could imagine that as a stimulus policy, instead of giving rebate checks, the government gave out credit cards. It is not unreasonable to assume a lower multiplier for the credit cards (which would have to be paid back) than for the rebate checks (which would not have to be paid back). What underlies the size of the multiplier is whether or not people are liquidity constrained; that kind of

1. Marco Di Maggio, Amir Kermani, and Christopher Palmer, "Unconventional Monetary Policy and the Allocation of Credit," Columbia Business School Research Paper no. 16-1 (March 2016).

thinking, Shapiro argued, should support the notion of lower multipliers. Furthermore, if a recession is accompanied by people being in a panic from having borrowed too much, having policies that make it easier to borrow might actually not be that effective because people are just not in a borrowing mode. People who have the ability to borrow probably do not need help with credit, and the people who are constrained might actually want to borrow *less.* According to Shapiro, when auto sales were collapsing in November 2008, it was not that people wanted car loans but could not get them, it was that they really did not want loans during that period. Freeing up credit, therefore, probably would not have caused a huge stimulus.

Ricardo Reis wanted to push further on the analogy between the sorts of credit policies outlined in the paper and monetary policy more generally. In monetary policy, a credit subsidy extended to a bank lowers the cost at which the bank funds itself in order to make a loan, which is presumed to lead to more loans, stimulating economic activity. The credit channel that Lucas isolates in the paper reminded Reis of the bank lending channel in monetary policy. There has been a lot of work in the last few years trying to establish by how much exactly credit subsidies lead to an increase in lending. Whether or not the credit policies in the paper qualify as *monetary* or *fiscal*, there does seem to be a lot of overlap between the bank lending channel of monetary policy. Perhaps, he suggested, the fairly reliable estimates produced in this literature could help inform Lucas's analysis.

Where the literature has struggled, Reis noted, is in linking increased lending to real economic activity. That is, how much does the extra $1 lent lead to an increase in output? What the literature has found—and Reis reiterated that the estimates are not very accurate—is that most multipliers are not way above 1. That is, going from lending into output does not look like a transfer multiplier or a purchase multiplier, or at least the numbers do not seem to quite match up. Reis also noted that what is different about credit subsidies relative to the bank channel of monetary policy is that the credit subsidies are much more targeted, whereas monetary policy would lower the cost of lending of all kinds of loans. It is certainly plausible, and potentially even likely, that because credit subsidies are targeted they would indeed have much stronger effects.

Martin Baily said the paper did not fully capture the extent to which the 2008 financial crisis caused a semicollapse of the infrastructure of lending, particularly mortgage lending. Many of the banks were capital constrained, with regulators breathing down their necks telling them to reduce risk and tighten lending standards. Many households did not want to buy a house because housing prices had been declining. The government took over

Fannie Mae and Freddie Mac and had them continue issuing mortgage loans and, more important, continue refinancing existing loans. Securitization had collapsed; nobody wanted to be in the business of securitization, and there was a belief that it would take some time to repair private credit markets and allow them to operate normally. Credit policies at that time, he suggested, were playing a different role than credit subsidies in normal times.

Phillip Swagel agreed with Reis that the ability to target credit subsidies was vital during the crisis because, as Baily had noted, it would have been very difficult to repair the credit markets and allow them to operate normally. In housing, for example, private label securitization had ended by late 2008, and banks were not eager to do balance sheet lending; the rescue of Fannie Mae and Freddie Mac in September 2008 involving targeted credit subsidies for housing was essential to supporting continued economic activity even as other parts of credit markets locked up. Institutional arrangements in other areas made it similarly important to be able to target credit subsidies such as credit for auto dealers—without these so-called floor plan loans, the institutional arrangements in the auto retail sector would have had a seriously negative impact on auto sales. This was especially the case in late 2008 and early 2009, when credit markets were particularly strained.

In the specific case of General Motors, there were institutional arrangements that Swagel believed turned out to be very important. He described that when someone buys a car from a dealer, the dealer finances the car, which is why he wants it off the lot as quickly as possible. The type of floor plan loan, according to Swagel, was not initially included in the Federal Reserve's Term Asset-Backed Securities Loan Facility (TALF) program. Karen Pence, an adviser at the Board of Governors of the Federal Reserve System, interjected enthusiastically, "That's not right!" Moderator Janice Eberly, not wanting to hold her back, let Pence continue. As someone who worked on the TALF program, Pence assured everyone that they were made very aware that the floor plan financing was a big problem. Rather, the issue was that the automakers could not achieve AAA ratings for their floor plans, and the Federal Reserve was not allowed to take anything that was not rated AAA. She added that the Federal Reserve actually worked very well with staff at the Treasury Department to try to find a way around that.

Wendy Edelberg, representing the Congressional Budget Office, wanted to clarify the apparent conflation of two different ways that multipliers can vary over the business cycle. The multipliers used in Lucas's paper rep-

resented the total aggregate fiscal multiplier, the full range that the Congressional Budget Office used when the economy was at the zero lower bound. This total aggregate fiscal multiplier, she explained, is actually a combination of two things: the impulse to aggregate demand, coupled with the way in which it churns through the economy using a demand multiplier. Standard practice at the Congressional Budget Office is to use the same demand multiplier for any given impulse to aggregate demand. The consensus in the room seemed to be that both components of the total multiplier—the impulse and the churning—could vary over the business cycle. Clearly, the churning can vary over the business cycle, she noted, due to the response of monetary policy. The consensus seemed to also be that the impulse to aggregate demand could vary, for instance, because of how liquidity constrained borrowers are, points raised earlier by Romer and Shapiro. Nonetheless, Edelberg wanted to stress the point that it seems useful to separate the two components of the total aggregate fiscal multiplier.

Karen Dynan noted that, given the importance of housing in Lucas's results, past results are no guarantee of future performance. One important channel through which the housing stimulus came in the recent recovery was people being able to refinance, unlocking cash through lower monthly payments. A lot of that refinancing, she added, could not have been done without the complementary programs that allowed people with underwater homes to refinance. Dynan noted that the next time this sort of housing crisis occurs, there will probably be a different housing finance regime in place, so it is worth thinking about the points made in this paper when talking about how to design that system.

On the uncertainty surrounding the estimates of the multipliers brought up by Gale, Wolfers, and others, Lucas disagreed with Gale's implication that there is *no* evidence to say whether the numbers are right or wrong. She also suggested that, as a profession, economists should pay attention to things where the mean effect is known to be very large, despite there being a high degree of uncertainty. She stressed that it is very important to talk about things that are hard to quantify when they are likely to be large.

On the question of her bang-for-the-buck calculation, Lucas agreed with remarks made by Gale that the calculation is not marginal; nor is the same multiplier likely to apply to the next episode, as Dynan had suggested. She only meant to suggest that this is a potentially powerful mechanism, and large in this instance. She emphasized that the Great Recession was a particularly severe financial crisis, and the next recession and past recessions might not look the same.

On the discussion of whether or not *credit* policy was analogous in some ways to *monetary* policy, a point pushed by Reis, Lucas sought to clarify her point of view. She outlined that monetary policy helped credit markets by providing what the Federal Reserve calls "greater liquidity." The distinction she sought to make between *liquidity* and *subsidy* follows the party line of the Federal Reserve, namely, that providing liquidity does not require taking on credit risk, the canonical example being that when a bank comes to the Federal Reserve's discount window, there is plenty of collateral, and so there is very little credit risk involved. The bottom line is, although the Federal Reserve did provide small credit subsidies—a point Lucas conceded members of the Federal Reserve might not agree with her on—the Troubled Asset Relief Program basically covered the riskier of the Federal Reserve's programs. She was unwilling to concede that the credit policies outlined in her paper resembled anything close to traditional monetary policy.

On the question of whether her model was literally applicable to the situation in 2010, Lucas was sympathetic with the view that the story might not be so simple, but she still thought that credit subsidies and the channels identified in the model were the essence of why credit programs create a fiscal stimulus. There were all kinds of complicated reasons for credit markets being disrupted, but at the heart of it, the government for the most part extended credit opportunities categorically to otherwise-constrained borrowers—for example, all students are allowed to take out student loans, regardless of their circumstances—which is a big difference from the way that private markets operate.

Lucas joked that she was saddened by having to defend the concept of fiscal multipliers. She appreciated Hall's sympathy, and his unbridled defense of multipliers. She had considered the issues raised, the range of the multipliers, and the choices about how much the movement of extensive margins reflected those considerations. Lucas defended her choices of relatively small extensive margins for most of the housing programs. Some other papers, she noted, have argued that Fannie Mae and Freddie Mac do not provide much incremental credit during good times. In contrast, during the 2008 financial crisis, Lucas believes they did provide incremental credit that increased aggregate demand. For student loans, she argued for a high incremental effect, since there is a general understanding that most students are heavily constrained.

Specifically on the issues relating to housing—brought up by no less than Romer, Brainard, Baily, and Dynan—Lucas noted that she had put a lot of effort into making reasonable assumptions. She was well aware of

the fact that a lot of the credit subsidies do go toward refinancing. The cash-out refinancing, mentioned by Dynan, is one mechanism for mortgages to create a stimulus. Purchase loans, even if they are used to buy existing structures, also create a stimulus because when people buy new houses they spend a lot of money on other things, such as new furniture and appliances. However, Lucas's assumptions of relatively small multipliers for housing programs reflect the fact that much of the money does go to purchasing existing structures or to replace existing debt.

Shapiro had brought up the question of how much it mattered that loans, as opposed to rebates, had to be repaid. Lucas noted that a lot of government loans are fairly long term. Government loans are typically not analogous to a credit card, where one has to pay back the balance relatively quickly. Student loans, for instance, have a horizon of 20 to 30 years; likewise, mortgages can range anywhere from 15 to 30 years. The fact that one has to repay the loans eventually, Lucas believes, is not that important.

Others, notably Romer and Brainard, had argued that credit multipliers would tend to be smaller than traditional multipliers. Lucas disagreed, and argued that credit multipliers might actually be bigger than regular multipliers. If someone receives a tax rebate, for instance, that person may actually save a portion of it. A loan, conversely, is very costly to take out, so it is much more likely that the borrower will spend all that money. The only issue is what the money is spent on and whether what it is spent on is going to have a big multiplier effect or not. Therefore, one should not think of credit as naturally having a smaller multiplier effect than other spending.