

WHAT THE GOVERNMENT PURCHASES MULTIPLIER ACTUALLY MULTIPLIED IN THE 2009 STIMULUS PACKAGE

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ABSTRACT

Much of the recent economic debate about the impact of stimulus packages has focused on the size of the crucial government purchases *multiplier*. But equally crucial is the size of the government purchases *multiplicand*—the change in government purchases of goods and services that the multiplier actually multiplies. Using a new data set, we find that the American Recovery and Reinvestment Act (ARRA) of 2009 increased federal government purchases as a share of GDP by only .19 percent and infrastructure by only .05 percent at its peak in the third quarter of 2010. While state and local governments received substantial grants under ARRA, they did not use these grant to increase their purchases of goods and services as many had predicted. Instead they reduced borrowing and increased transfer payments. A review of research on similar stimulus programs in the 1970s reveals similar behavior on the part of state and local governments, which raises questions about the design and feasibility of such programs in the federal system of the United States.

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The debate about the impact of the American Recovery and Reinvestment Act of 2009 (ARRA) has been accompanied by a surge of research on the size of the government purchases multiplier. In a recent review of model simulations and empirical studies, Ramey (2011) finds that the range of estimates of the “multiplier for a *temporary, deficit-financed* increase in government *purchases*...is probably between 0.8 and 1.5,” adding that “Reasonable people can argue, however, that the data do not reject 0.5 or 2.”

In order to evaluate the impact of ARRA on the economy, however, one needs to know what the government purchases multiplier actually multiplied in the case of ARRA—that is, the change in government purchases due to ARRA. Even for extremely large values of the multiplier, the impact on GDP and employment will be very small through this channel if ARRA did not increase government purchases by very much. The purpose of this paper is to estimate the actual change in government purchases due to ARRA, both at the federal and at the state and local level. We use a new data series on the direct effects of ARRA on federal government purchases and on grants to state and local governments.

Because the ARRA grants to state and local government are fungible and not synchronized with purchases, determining the effect of ARRA on state and local government purchases is more difficult and uncertain than determining the effect on federal government purchases. We therefore analyze the state and local purchases data in detail. We trace where the money went since ARRA began, estimate time-series regressions of the relationship between ARRA grants and state and local government purchases, and consider a counterfactual. Our main finding is that the increase in government purchases due to the ARRA has been remarkably small, especially when compared to the large size of the overall ARRA package. In fact, the effect of ARRA on purchases appears to be so small that the size of the government purchases

multiplier does not matter much compared to many other factors affecting the growth of GDP. We compare our findings on the 2009 stimulus with research by Gramlich (1979) on a similar countercyclical program in the 1970s and find the results to be remarkably similar.

1. The Debate and the Importance of Data on Government Purchases

The recent resurgence in the debate over the size of the government purchases multiplier began in January 2009, when Romer and Bernstein (2009) released a paper showing that the multiplier was around 1.5 and that the stimulus package would have a large effect. Then, in February 2009, Cogan, Cwik, Taylor, and Wieland (2010) issued a working paper arguing that the results of Romer and Bernstein (2009) were unlikely to be robust because they excluded simulations from more modern “new Keynesian” models, where the multiplier in the case of ARRA was much smaller—around .5 as illustrated with a model based on Smets and Wouters (2009) and Christiano, Eichenbaum, and Evans (2005).

These papers were followed by a series of papers using new Keynesian models, including Christiano, Eichenbaum, and Rebelo (2011), Eggertsson (2009), Erceg and Linde (2009), Hall (2009), and Drautzburg and Uhlig (2010). While the multipliers differed somewhat among the new Keynesian models, Woodford (2010) showed they were quite similar once one controlled for timing differences. More recently, Coenen et al. (2011) calculated and compared the government purchases multipliers from seven estimated new Keynesian models used for policy evaluation at the Bank of Canada, the Federal Reserve Board (two models), the European Central Bank, the European Commission, the International Monetary Fund, and the OECD plus the models of Cogan, Cwik, Taylor and Wieland (2010) and Christiano, Eichenbaum, and Evans

(2005). This study found that the government purchases multiplier was on average about the same size as that presented in Cogan, Cwik, Taylor and Wieland (2010).

As Hall (2009) has emphasized the government purchases multiplier that has been the subject of this debate is the change in GDP associated with a change in government *purchases*—or simply the G in C+I+G+X. Government purchases are much different from government expenditures. Government purchases do not include transfer payments, subsidies, and interest payments, which are all part of government expenditures. The best source of data on government purchases for macroeconomic purposes is the quarterly national income and product accounts (NIPA). Throughout this paper we use seasonally adjusted quarterly NIPA data stated at annual rates.

Government purchases in the NIPA are divided into two major components: consumption expenditures and gross investment. Consumption expenditures consist of goods and services produced for public consumption such as law enforcement services, national defense, and elementary and secondary education.¹ Gross investment includes purchases of new structures, equipment and software. The NIPA also breaks down government purchases into two sectors (1) federal and (2) state and local. The federal sector is further broken down into defense and non-defense.

In addition to the NIPA data, the Bureau of Economic Analysis (BEA) provides quarterly data on the effect of ARRA on federal government sector transactions in the NIPA. The data are updated each month at the time of the advance estimates and updates of quarterly GDP in “Effect of the ARRA on Selected Federal Government Sector Transactions,” which is posted on the BEA website at <http://www.bea.gov/recovery/index.htm?tabContainerMain=1>.

¹ Government consumption expenditures also include consumption of fixed capital, a partial measure of the value of the services from fixed government capital.

The BEA data focus on the federal sector and thus give the amount of ARRA that is in the form of federal government purchases—both consumption and gross investment. From these data it is straightforward to determine the effect of ARRA on federal government purchases.

It is more difficult, however, to determine the effect of ARRA on state and local government purchases. The BEA reports the amount of ARRA that is in the form of current grants to state and local governments for Medicaid, education, and other items as well as capital grants to state and local governments for roads, bridges, and other public infrastructure projects. But the BEA does not report whether or how these funds were used to purchase goods and services. In the next section we present the results for federal government purchases and in the following section we consider the impact at the state and local level.

2. Effect of ARRA on Federal Government Purchases

Table 1 shows the effect of ARRA on total federal government purchases as a percentage of GDP starting in the first quarter of 2009 when ARRA began. It also shows the impact on the two main components of government purchases—government consumption and government gross investment.

Table 1. Effect of ARRA on federal government purchases, federal government consumption and federal government gross investment as a percent of GDP.

	Federal Government Purchases	Federal Government Consumption	Federal Gross Investment
2009Q1	0.00	0.00	0.00
2009Q2	0.01	0.01	0.00
2009Q3	0.11	0.09	0.02
2009Q4	0.10	0.09	0.01
2010Q1	0.12	0.11	0.02
2010Q2	0.15	0.12	0.03
2010Q3	0.19	0.14	0.05
2010Q4	0.15	0.11	0.04
2011Q1	0.13	0.09	0.04
2011Q2	0.12	0.09	0.03
2011Q3	0.12	0.08	0.04

Note that the impact of ARRA on federal purchases built up gradually during 2009 and 2010, and did not reach a peak until the third quarter of 2010. However, the impact never amounted to more than a very small percentage of GDP. At its peak, ARRA increased federal government purchases by only .19 percent of GDP and federal infrastructure spending by only .05 percent of GDP.

Figure 1 illustrates the effect of ARRA compared with the overall trend and the fluctuations in federal purchases since 2000. It shows, at annual rates, federal government purchases with and without the effect of ARRA. While clearly visible the graph, the impact of ARRA is no larger than many of the other short run fluctuations in federal purchases over this period.

Of the total stimulus package—originally estimated to be \$862 billion in size—the amount allocated to federal government purchases was \$7.5 billion in 2009 and \$22.2 in 2010 according to the BEA data. The portion allocated to infrastructure investment at the federal level was \$0.9 billion in 2009 and \$4.8 billion in 2010. Clearly these amounts are too small to be a

material part of the changes in real GDP growth during the recent recovery, even if the multiplier were quite large.

3. Effects of ARRA on State and Local Government Purchases

A key feature of the ARRA is that it provided large transfers to state and local governments in the form of grants-in-aid. For the purposes of assessing the impact of ARRA on GDP, it is important to distinguish between two types of grants. First are those that state and local governments may directly use to finance purchases of goods and services. Grants for transportation projects and elementary and secondary schools are included in this category. The second type is transfers that supplement household resources. Federal Medicaid grants to states fall into this category. Under NIPA accounting conventions, state Medicaid expenditures are treated as transfer payments to households which raise their disposable personal income. Their impact on GDP depends on how much of the rise in income results in a rise in personal consumption expenditures. In addition, to the extent that higher federal Medicaid grants are fungible at the state level they may free up other state revenues, and their impact may also be reflected by higher state government purchases of goods and services.

Table 2 ARRA federal transfers (grants) to state and local governments
(Billions of dollars at annual rates and percent of GDP)

				<u>Percent of GDP</u>		
	Total	Medicaid	Other	Total	Medicaid	Other
2009Q1	49.4	48.9	0.5	0.36	0.35	0.00
2009Q2	73.4	39.1	34.3	0.53	0.28	0.25
2009Q3	90.4	38.4	52.0	0.65	0.28	0.37
2009Q4	102.9	38.9	64.0	0.73	0.28	0.45
2010Q1	117.2	51.7	65.5	0.82	0.36	0.46
2010Q2	128.6	40.9	87.7	0.89	0.28	0.61
2010Q3	131.5	42.7	88.8	0.90	0.29	0.61
2010Q4	120.6	48.4	72.2	0.82	0.33	0.49
2011Q1	62.7	4.3	58.4	0.42	0.03	0.39
2011Q2	62.5	1.8	60.7	0.42	0.01	0.40
2011Q3	44.3	2.1	42.2	0.29	0.01	0.28

Table 2 shows the amount of ARRA grants, expressed in annual rates and as a percentage of GDP. Except for the first half of 2009, a majority of the grants are for areas other than Medicaid. The total grants to state and local governments rose to .9 percent of GDP by the 3rd quarter of 2010 and then start to taper off.

ARRA grants are part of total receipts or aggregate income of the state and local government sector. Figure 2 shows total receipts with and without the ARRA grants. These ARRA grants reached a peak of 6 percent of total state and local government income in the 3rd quarter of 2010 before declining.

The Budget Constraint for State and Local Governments

The important question is what effect of these grants had on government purchases at the state and local level. To answer this we must consider how state and local governments respond to these grants. We view the response of state and local governments as somewhat analogous to how the household sector responds to changes in transfer payments by adjusting consumption, where permanent income or life cycle models have proved useful and accurate. Like the

household sector, state and local government officials recognize that the grants are temporary. And like the household sector, state and local governments can use federal grants for other purposes than purchases of goods and services. Depending on the timing and the degree to which ARRA grants are fungible, state and local governments could borrow less, save more, or increase expenditures on “non-purchase” items such as transfer payments to individuals. And of course the incentives and constraints facing state and local governments may be more complex than households, which may make the permanent income theory less valid.

The budget constraint for the state and local government sector helps frame the issues.

The following variables² refer to the state and local sector in the aggregate:

G_t = government purchases

E_t = expenditures other than government purchases

L_t = net lending or net borrowing (-)

R_t = receipts other than ARRA grants

A_t = ARRA grants

The budget constraint facing state and local governments is

$$G_t + E_t + L_t = R_t + A_t \quad (1)$$

² Each variable has an exact counterpart in the NIPA accounts. In BEA Table 3.3, the variable G is Line 22 plus Line 35. The variable E is Line 33 less G. L is Line 39. A is the ARRA component of Line 20 plus Line 28 of the BEA publication “Effect of the ARRA on Selected Federal Government Sector Transactions.” The variable R is line 30 of Table 3.3 less A. Note that total expenditures (Line 33 of Table 3.3) include net purchases of “non-produced assets” and exclude consumption of fixed capital. These series are also consistent with the state and local sector of the Federal Reserve’s flow of funds accounts. As explained the appendix, net lending or net borrowing equals net financial investment minus the statistical discrepancy due to the difference between data on acquisition of financial assets/ liabilities and income/expenditure data.

The key question is how much an increase in ARRA grants A_t resulted in an increase in state and local government purchases G_t . Note that, depending on various constraints and expectations, an increase in A_t could also affect other expenditures E_t or loans/borrowings L_t .

The Lack of a Response in Government Purchases to ARRA

Figure 3 shows the pattern of state and local government purchases from 2000 to the third quarter of 2011. One critical fact stands out in this figure: state and local government purchases declined sharply in the fourth quarter of 2008 and remained remarkably flat for two years. There is no noticeable increase in government purchases during the period of the ARRA grants. Not until the first quarter of 2011, did they pass the level reached in the fourth quarter of 2008.

The timing and magnitude of these income and spending changes are shown in more detail in Table 3 which focuses on the period of the ARRA starting in the first quarter of 2009. The table shows the *change* in state and local government spending and receipts from 4th quarter 2008 levels. The first column shows receipts excluding the ARRA grants. The effect of the recession on state and local income is clear. As the data in column 1 show, state and local receipts declined sharply in the first quarter of 2009 and they then began to rebound, passing the 2008Q4 level by 2009Q4.

Table 3. Change in Receipts and Purchases of Goods and Services from 2008Q4 Level
(Billions of dollars at annual rates)

	Receipts ex ARRA	Purchases	ARRA grants ex Medicaid	Receipts ex Medicaid
2009Q1	-58.8	-19.8	0.5	-58.3
2009Q2	-18.7	-10.2	34.3	15.6
2009Q3	-6.3	-12.6	52.0	45.7
2009Q4	9.1	-17.8	64.0	73.1
2010Q1	19.8	-17.3	65.5	85.3
2010Q2	32.1	-9.8	87.7	119.8
2010Q3	78.0	-8.7	88.8	166.8
2010Q4	101.8	-3.9	72.2	174.0
2011Q1	141.5	4.6	58.4	199.9
2011Q2	180.6	11.6	60.7	241.3
2011Q3	138.0	8.9	42.2	180.2

The change in state and local government purchases from the level in the 4th quarter of 2008 is presented in column 2. Government purchases show no appreciable rebound until 2011 despite the receipt of ARRA grants starting in early 2009. The ARRA grants are shown in column 3 and exclude Medicaid grants, reflecting the assumption that Medicaid grants are not fungible. The non-Medicaid ARRA grants begin in the first quarter of 2009 and flow into state and local governments in larger amounts as time progresses. By the third quarter of 2009, the non-Medicaid ARRA grants reach over \$50 billion on an annualized basis and continued rising. But, as Table 3 makes very clear, state and local government purchases show no response.³

Where Did the Money Go?

The data presented in Table 3 raise the question: if the ARRA grants to states were not spent by state and local governments on increased purchases of goods and services, how were these grants spent? Assuming that tax codes are not changed in response to ARRA, the budget

³ Including Medicaid grants in receipts reinforces this point. Under the alternative assumption that Medicaid grants are fungible and, hence would be included in state and local receipts available to finance purchases, the total ARRA grants received in 2010 rise to \$103 billion and \$127 billion in the first two quarters, respectively.

constraint (equation 1) allows for only two other possibilities: higher expenditures on “non-purchase” activities and lower borrowing. Figures 4 and 5 provide some indication of each of these alternatives.

Figure 4 shows that state and local government “non-purchase” expenditures kept growing without any slowdown. The pace of their growth appears to have picked up around the time that the ARRA grants began. Note also that the growth declines around the time that ARRA grants begin to taper off.

The data in Table 4 focus on the period of the ARRA and confirm these graphical observations. Column 1 shows the change in non-purchase expenditures from the level in the 4th quarter of 2008 to each subsequent quarter. Non-purchase expenditures rise at an almost unbroken rate and, by the 4th quarter of 2010, they are 26 percent higher than they were two years earlier. This increase stands in sharp contrast to the decline in state and local purchases. As the table also shows, the rise and fall of non-purchase expenditures corresponds quite closely to the rise and fall of ARRA grants, shown in column 2.

Table 4 Change in Receipts and Non-Purchase Expenditures from 2008Q4 Level
(Billions of dollars at annual rates)

	Non- Purchases	ARRA Grants
2009Q1	17.7	49.4
2009Q2	27.4	73.4
2009Q3	40.0	90.4
2009Q4	35.0	102.9
2010Q1	44.9	117.2
2010Q2	49.6	128.6
2010Q3	66.5	131.5
2010Q4	101.2	120.6
2011Q1	92.5	62.7
2011Q2	96.7	62.5
2011Q3	74.7	44.3

Figure 5 shows the pattern of state and local net lending or net borrowing, the remaining area that could be impacted by ARRA grants. As the chart shows, although state and local governments have on average been borrowing in recent years, there have been large swings. Borrowing increased sharply after the dot com bubble burst in 2000 and did not start falling again until 2003 long after the recovery from the 2001 recession began. Borrowing increased again as the housing bubble burst, but then started turning around before the recession was over, much earlier than in the previous recession.

Table 5 shows the behavior of total state and local net lending and its relation to ARRA receipts during the current recession. As with Tables 3 and 4, the amounts are the changes from 2008Q4. Column 1 shows total state and local expenditures. Columns 2, 3, and 4 show state and local receipts excluding ARRA grants, ARRA grants, and total receipts, respectively. Column 5 shows net lending, simply the difference between column 1 and column 2.

Table 5. Change in Receipts and Net Lending from 2008Q4 Level
(Billions of dollars at annual rates)

	Total Expenditures	Receipts ex ARRA	ARRA Grants	Total Receipts	Net Lending
2009Q1	-2.1	-58.8	49.4	-9.4	-7.3
2009Q2	17.2	-18.7	73.4	54.7	37.6
2009Q3	27.4	-6.3	90.4	84.1	56.6
2009Q4	17.2	9.1	102.9	112.0	94.8
2010Q1	27.6	19.8	117.2	137.0	109.4
2010Q2	39.8	32.1	128.6	160.7	120.9
2010Q3	57.8	78.0	131.5	209.5	151.8
2010Q4	97.3	101.8	120.6	222.4	125.1
2011Q1	97.1	141.5	62.7	204.2	107.1
2011Q2	108.3	180.6	62.5	243.1	134.8
2011Q3	83.6	138.0	44.3	182.3	98.8

An inspection of these data suggests that the ARRA grants to state and local governments were closely associated with an increase in net lending or, equivalently, a decrease in the rate of borrowing. As ARRA grants increased, so did net lending; as ARRA grants tapered off so did net lending. Indeed, the peak in net lending occurred in precisely the same quarter as the peak in ARRA grants. In contrast there was no such association with the change in government purchases during the period of ARRA.

Time Series Regression Estimates of the Impact of ARRA

Simple time series regression techniques can also be used to estimate the impact of ARRA grants at the state and local level. Using the notation previously introduced, we consider the following three equations:

$$G_t = a_0 + a_1G_{t-1} + a_2R_t + a_3A_t \quad (2)$$

$$E_t = b_0 + b_1E_{t-1} + b_2R_t + b_3A_t \quad (3)$$

$$L_t = c_0 + c_1G_{t-1} + c_2E_{t-1} + c_3R_t + c_4A_t \quad (4)$$

Equation (2) describes how government purchases responds to ARRA grants and to receipts other than ARRA grants. The lagged dependent variable allows for the possibility that purchases respond with a lag to changes in income, much as an estimated consumption function for households includes lagged consumption to portray such lags. Equation (3) for non-purchases expenditures is of the same functional form.

The state and local budget constraint (1) along with equations (2) and (3) imply equation (4) for net lending. The relationship between the coefficients in equation (4) and the

coefficients in equations (2) and (3) can be obtained by substituting equations (2) and (3) into equation (1). This gives

$$\begin{aligned} L_t &= R_t + A_t - a_0 - a_1G_{t-1} - a_2R_t - a_3A_t - b_0 - b_1E_{t-1} - b_2R_t - b_3A_t \\ &= -(a_0 + b_0) - a_1G_{t-1} - b_1E_{t-1} + (1 - a_2 - b_2) R_t + (1 - a_3 - b_3)A_t \end{aligned} \quad (5)$$

which implies the following identities:

$$c_0 = -(a_0 + b_0) \quad (6)$$

$$c_1 = -a_1 \quad (7)$$

$$c_2 = -b_1 \quad (8)$$

$$c_3 = (1 - a_2 - b_2) \quad (9)$$

$$c_4 = (1 - a_3 - b_3) \quad (10)$$

We estimated equations (2), (3), and (4) subject to the constraints in equations (6) through (10) by least squares over the period from 1969.1 to 2011.3. An inspection of the residuals of the estimated equations showed some serial correlation and heteroskedasticity which differed from equation to equation, so we computed the standard errors of the estimated coefficients in each equation with a heteroskedasticity auto-correlation consistent (HAC) method due to Newey and West (1987). The estimated coefficients along with t-statistics using these standard errors are reported in Table 6.

Observe that there is a very large and significant effect of ARRA grants on net lending. The coefficient on ARRA grants is .93, quite close to one. Thus, these regression results are consistent with the findings from the graphical and numerical analysis presented above that states and localities used ARRA grants primarily to reduce their borrowing. Note also that the

coefficient on ARRA grants in the government purchases equation is negative and statistically different from zero, while the coefficient on ARRA grants in the non-purchase expenditures equation is positive and statistically different from zero. Taken together, the two coefficients imply that ARRA had a relatively small impact on total state and local government expenditures but shifted these expenditures away from purchases toward transfers.

Table 6. Estimated regression coefficients for the equations for government purchases (G), non-purchase expenditures (E), and net lending (L) as a function of total receipts less ARRA grants (R) and ARRA grants (A). Sample 1969.1 - 2011.3. In the parentheses are t-statistics computed from Newey-West (1987) estimated standard errors

	Dependent Variable		
	G	E	L
Constant	3.659 [3.863]	-6.100 [-4.809]	2.442 [1.919]
G(-1)	0.876 [57.880]		-0.876 [-57.880]
E(-1)		0.743 [24.716]	-0.743 [-24.716]
R	0.113 [8.864]	0.0559 [8.681]	0.831 [58.680]
A	-0.0967 [-3.495]	0.163 [5.832]	0.933 [30.730]
R ²	0.999	0.997	0.958

Why the Widely Different Impact of ARRA on Purchases Versus Other Expenditures?

While additional research is needed to form a strong conclusion, one likely explanation for the stark difference in the behavior of state and local purchases and non-purchases in response to ARRA lies in the design of the federal stimulus plan. The lion's share of non-purchase expenditures consists of state and local spending on health and welfare programs; in

particular, Medicaid, TANF, and general assistance programs.⁴ A large share of the ARRA grants was designed to supplement these programs, especially states' Medicaid programs. In the first quarter of 2009, virtually all (99 percent) of ARRA grants are accounted for by Medicaid. In the 2nd quarter of 2010, Medicaid grants still accounted for over half of the ARRA total. The ARRA conditioned states' receipt of federal Medicaid grants on their willingness to not reduce benefits nor restrict eligibility rules. In some states, this also meant undoing benefit reductions or eligibility restrictions that had been implemented in the six months prior to the ARRA's enactment. It is possible that this "hold-harmless" provision, in the face of rising health care costs and recession-induced Medicaid enrollment increases, forced states to reallocate funds that would have otherwise been devoted to state and local purchases to their Medicaid programs.

To examine this hypothesis we split ARRA grants into two components, Medicaid grants and all other ARRA grants, and we then re-estimated the above regressions. In our original research on this project (using data through the second quarter of 2010) we found the effects of Medicaid grants on purchases to be negative and significant. However, when we added new incoming data through the third quarter of 2011, the coefficient turned from negative and significant to positive and insignificant, as Medicaid grants dropped sharply starting in the first quarter of 2011. Hence, splitting the grants into Medicaid versus non-Medicaid does not in the end provide evidence in support of this hypothesis.

⁴ Under Section 5001 of the ARRA (P.L.111-5), to be eligible for additional Medicaid grants state Medicaid programs must maintain eligibility standards and benefits that are not more restrictive than those in effect on July 1, 2008. More restrictive eligibility would preclude a state from receiving the increased Medicaid funds until it had restored eligibility standards, methodologies or procedures to those in effect on July 1, 2008. (https://www.cms.gov/Recovery/Downloads/ARRA_FAQs.pdf)

A Counterfactual

What would have happened to government purchases in the counterfactual event that there had not been an ARRA? One way to answer this question is to simulate the estimated equations under the assumption that ARRA grants are zero and that other state and local receipts are unchanged. The resulting impacts on purchases, other expenditures, and net borrowing are shown Table 7. The first column shows actual ARRA grants and the actual cumulative changes in purchases, other expenditures, and borrowing from their pre-ARRA levels (4th quarter of 2008). From the 1st quarter of 2009 to the third quarter of 2011, state and local governments received a total of \$246 billion in ARRA grants. During this period, these governments reduced their rate of borrowing compared to pre-ARRA levels by \$257 billion, reduced their purchases of goods and services by \$19 billion, and increased other expenditures by \$162 billion.

In the counterfactual absence of ARRA, the simulations indicate that state and local governments would have not reduced their net borrowing by nearly as much. We show this in the last row of the second column labeled “counterfactual” in Table 7, where net borrowing increases from -\$257 billion to -\$33 billion, or by \$224 billion. The counterfactual increase in “other expenditures” of \$38 billion, also shown in Table 7, would have been \$124 billion less than the actual increase. And purchases would have risen by \$83 billion rather than fall by \$19 billion, a difference of \$102. Note that this difference in state and local government purchases is larger than the \$44 billion increase in federal purchases due to ARRA over the 2009Q1-2011Q3 period as discussed above in Section 2, suggesting that ARRA may have actually reduced total government purchases (Because the model fits very well, the differences between the actual data and the counterfactual estimates are very close to the differences between simulations with ARRA and the counterfactual simulations without ARRA)

Table 7. Total Changes in Budget Amounts from Pre-ARRA Levels: 2009Q1 to 2011Q3
(Cumulative Change from 2008Q4, Billions of Dollars)

	Actual	Counterfactual	Difference
ARRA Grants	246	0	-246
Purchases	-19	83	102
Other expenditures	162	38	-124
Net Borrowing	-257	-33	224

Acquiring Financial Assets as ARRA Grants Came In

One objection to this counterfactual hypothesis is that state and local governments would have found it difficult to increase their net borrowing if ARRA had not existed. Because of the financial crisis and their own budget problems perhaps they were effectively constrained from borrowing more than they actually did, or perhaps interest rates in the capital markets were too high to borrow. However, these governments would not have had to go to the capital markets to increase their net borrowing. They could have increased their net borrowing by drawing down, or at least not increasing, their holdings of financial assets. As a matter of accounting, net borrowing equals the net increase in financial liabilities less the increase in financial assets. An increase in net borrowing occurs when the net acquisition of financial assets is smaller than the net increase in liabilities.

In fact, the Flow of Funds data from the Federal Reserve shows that the counterfactual increase in net borrowing would have been quite likely even if there were borrowing constraints. According to the latest annual data (September 16, 2012), during the first two years of ARRA, from 2008 to 2010, net borrowing by state and local governments fell by about \$92 billion, while their net increase in liabilities rose by \$55 billion and their net acquisition of financial assets rose

by \$147 billion (92=55-147). Thus, as a whole, state and local governments added substantially to their financial assets as ARRA grants came in. Apparently, they saved much of that new grant money.

For net borrowing to have increased in the counterfactual compared with history, state and local governments could simply have not increased their acquisition of financial assets in the counterfactual by as much as they actually did.. Even without increasing their liabilities, the state governments could have increased their net borrowing. Hence, the counterfactual of more net borrowing with ARRA, as in Table 7, seems quite plausible.

4. Comparison with Initial Estimates of Government Purchases

The total impact that ARRA has had on government purchases can be obtained by combining federal purchases with state and local purchases. The BEA data on the impact of ARRA on federal purchases from Table 1 show that total increase in federal government purchases from ARRA was between 0.1 and 0.2 percent of GDP during 2009 and 2010. Our counterfactual simulations estimate that state and local government purchases could actually have been smaller as a result of ARRA with a total negative net effect.

The forecasts of economists in and out of government in early 2009 of the likely effect of ARRA on government purchases were much larger than 0.1 to 0.2 percent of GDP, let alone the possible negative effect. Cogan, Cwik, Taylor and Wieland (2010) assumed that ARRA would raise total government purchases by .47 percent of GDP by the second quarter of 2009 and by .77 percent by the second quarter of 2010 (see the February 2009 working paper version of the published paper). Hall (2009, Table 6) citing the Congressional Budget Office (CBO), assumed that ARRA would raise total government purchases by .49 and .73 percent of GDP in calendar

years 2009 and 2010, respectively, which is very close to the assumption used by Cogan, Cwik, Taylor and Wieland.

In making such predictions, economists analyzing the effect of ARRA assumed that the federal grants to state and local governments would generate a larger increase in purchases than what actually occurred. Romer and Bernstein (2009) assumed in January 2009 that 60 percent of grants would go to purchases, stating that “One dollar of state fiscal relief is assumed to result in \$0.60 in higher government purchases.” Cogan, Cwik, Taylor and Wieland (2010) used the same 60 percent conversion factor from grants to purchases. CBO did not explicitly state a conversion factor from grants to purchases, but CBO analysis (see March 2009 estimate in Elmendorf (2009)) applied a government purchases multiplier to grants which was the same size as the multiplier applied to federal purchases in the case of infrastructure spending and 70 percent of the federal purchases multiplier in the case of government consumption, implying a grant-to-purchases conversion of between 70 and 100 percent, which is even greater than 60 percent. As stated above, Hall (2009) cites CBO as a source for the effect of ARRA on government purchases. Table 8 summarizes the differences between these initial estimates and the estimates from this paper assuming that the change in purchases at the federal level are zero rather than negative.

Table 8. Comparison with Initial Estimates of the Multiplicand
 (Change in G as a percent of GDP assuming no change at the state and local level)

	<u>Quarterly</u>	
	Initial (CCTW)	Actual
2009Q2	.47	.01
2010Q2	.77	.15
	<u>Annual</u>	
	Initial (Hall, CBO)	Actual
2009	.49	.05
2010	.73	.15

These initial estimates were based largely on guess-work since there are no reliable empirical estimates of how state and local governments respond to the receipt of temporary federal grants. But, by the summer of 2009 it was becoming clear that these initial estimates were far too high; government purchases were not contributing to the recovery as much as the initial estimates predicted. Cogan, Taylor, and Wieland (2009) reported that nondefense government purchases contributed less than 1 percentage points to the 5.4 percentage point real GDP growth improvement from the first to the second quarter of 2009. The low response rate of government purchases to ARRA is likely the principal reason for the difference between the initial estimates of the ARRA's impact and what actually happened.⁵

5. Previous Experience with Countercyclical Stimulus Grants to the States

Our results are strikingly similar to those found by Gramlich (1978, 1979) in his influential empirical studies of state and local government finances and in particular the impact

⁵ Romer and Bernstein and Cogan, Cwik, Taylor, and Wieland (2010) also assumed that a one-quarter lag between the transfer to state and local governments and the increase in purchases by these governments.

of the Carter Administration's 1977 countercyclical stimulus program. The 1977 program attempted to stimulate aggregate economic output by providing federal funds to state and local governments in the form of grants for countercyclical revenue sharing (CRS), local public works projects, and public service employment (PSE).

Using quarterly data from 1954-1977, Gramlich estimated the separate impact of each type of grant on state and local purchases. He found that revenue sharing grants had only a negligible impact and concluded that "not much of a macro-stimulation case could be made for CRS". He found that federal grants for public works, by delaying locally-financed projects, actually reduced state and local purchases and thus appeared "to have effects that are perverse." Finally, he found that PSE grants had only a short-run impact that dissipated rapidly with time, "leading to no impact of PSE on total expenditures after four quarters". These findings led Gramlich to conclude "that the general idea of stimulating the economy through state and local governments is probably not a very good one".

6. Policy Implications

These empirical findings as well as the similar previous findings of Gramlich (1979) have important implications about the evaluation, design, and feasibility of countercyclical stimulus programs.

First, because in the U.S. federal system, states and localities make decisions about their own government budgets, it is essential to take account of their behavioral responses in assessing the efficacy of federal transfers as a tool for macro economic stimulus. As our work and the earlier work of Gramlich (1979) demonstrates, the federal government has only limited ability to affect state and local budget decisions in particular ways, especially over a short period of time

when money is fungible and the timing of projects can be postponed or grants can substitute for capital borrowing. The implication is not that the stimulus programs should be even bigger or should be designed better, but rather that such programs are inherently limited by these feasibility constraints.

Second, when assessing the efficacy of providing macroeconomic stimulus transfers to state and local governments, the composition of the transfers matters. We estimate that because the Medicaid grants contained provisions that require state and local governments to maintain benefits and eligibility rules, the grants actually reduced state and local government purchases. The initial evaluation of ARRA failed to account for this and assumed instead that each dollar of grants—whether Medicaid or non-Medicaid—would increase state and local purchases by between 60 cents and a dollar.

Third, when analyzing policy proposals, knowledge gained from prior experiences and from empirical and theoretical studies of those experiences is invaluable. But if the knowledge is discarded or forgotten then it obviously cannot have a constructive influence on analysis or decision making. Preserving this historical knowledge in a readily usable and understandable form for future generations of policy analysts who will face their own economic crises deserves more emphasis in schools, research institutes, and government agencies.

7. Conclusion

In this paper we have examined the effect of the American Economic Recovery Act of 1999 on government purchases of goods and services using new data provided by the Commerce Department. Considering both the federal and the state and local sector, we find that the effects of ARRA on government purchases to be remarkably small despite the large overall size of

ARRA. It appears that the ARRA grants were allocated to transfer payments, such as Medicaid, and to reducing net borrowing by state and local governments rather than to increasing government purchases. Debates about the size of the government purchases multiplier are thus of less practical importance in the case of ARRA than many may have thought because the multiplicand is so small. Basic economic theory implies that temporary increases in transfer payments have a much smaller impact on GDP than government purchases. The counterfactual hypothesis that government purchases would have been even worse without ARRA does not seem plausible based on contemporaneous data or historical experience.

These results are quite similar to those of Gramlich (1979) in his studies of comparable countercyclical stimulus programs more than three decades ago. Experience from the 1977 stimulus package and from the 2009 stimulus package shows that grants to state and local governments do not necessarily result in increases in government purchases. The general policy implications are that when evaluating or designing such programs economists should factor in the reality of past experiences with similar programs and take account of the behavior of state and local governments as well as federal government agencies, recognizing that incentives and disincentives built into the programs affect that behavior.

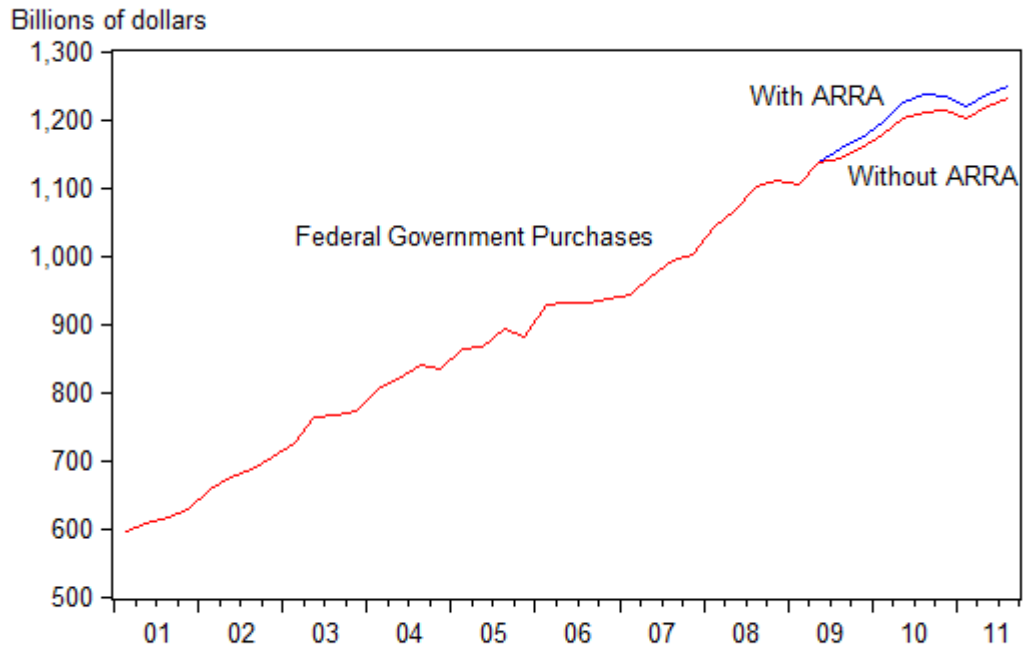


Figure 1. Effect of ARRA on Federal Government Purchases

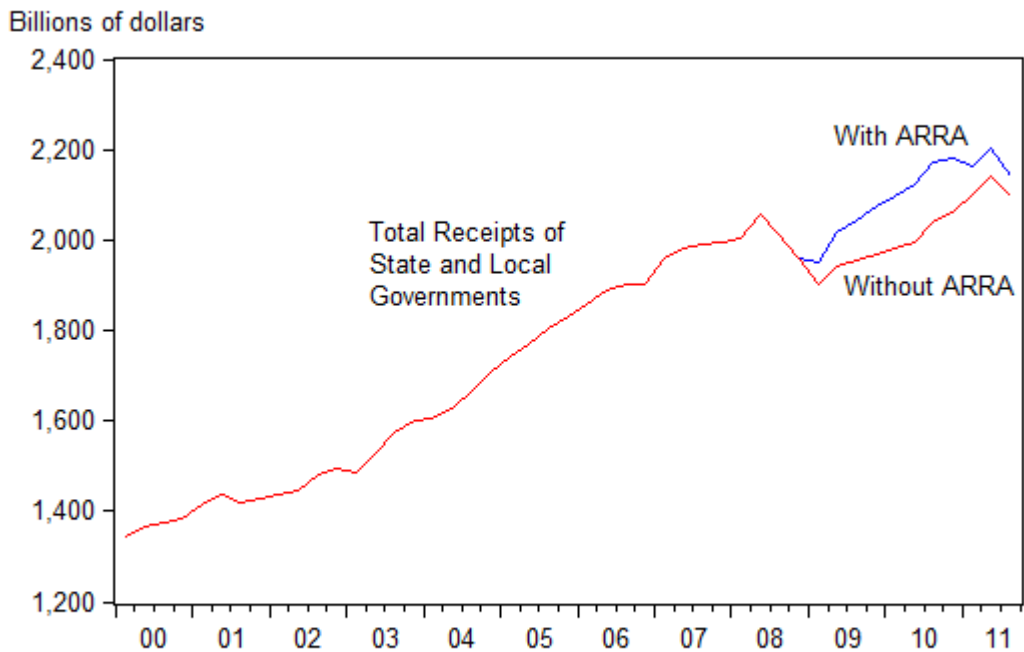


Figure 2. Effect of ARRA on Receipts of State and Local Governments

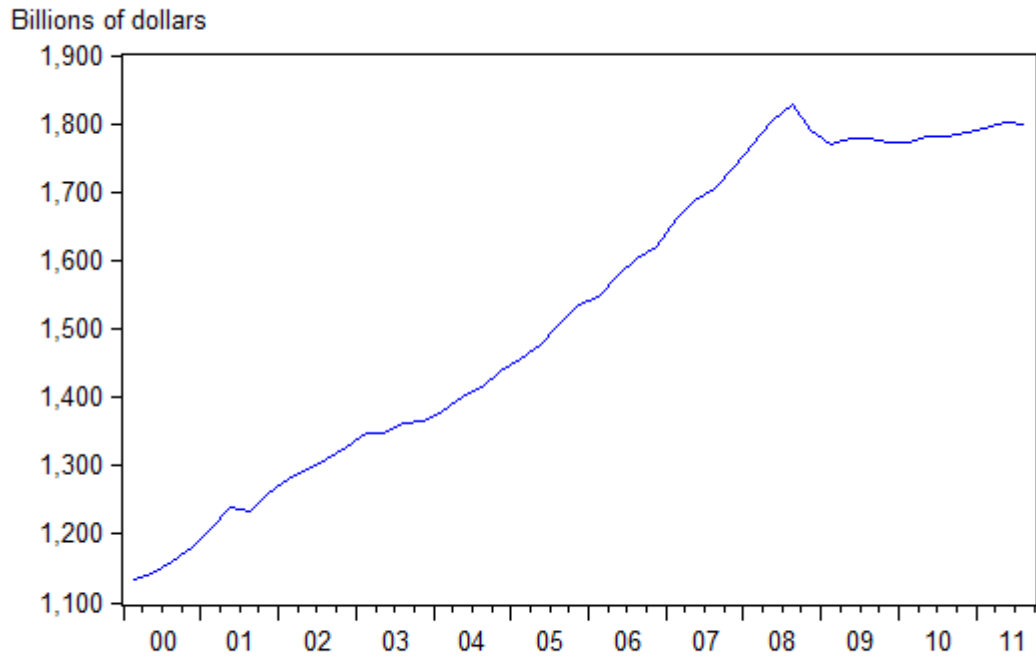


Figure 3. State and Local Government Purchases: 2000Q1 - 2011Q3

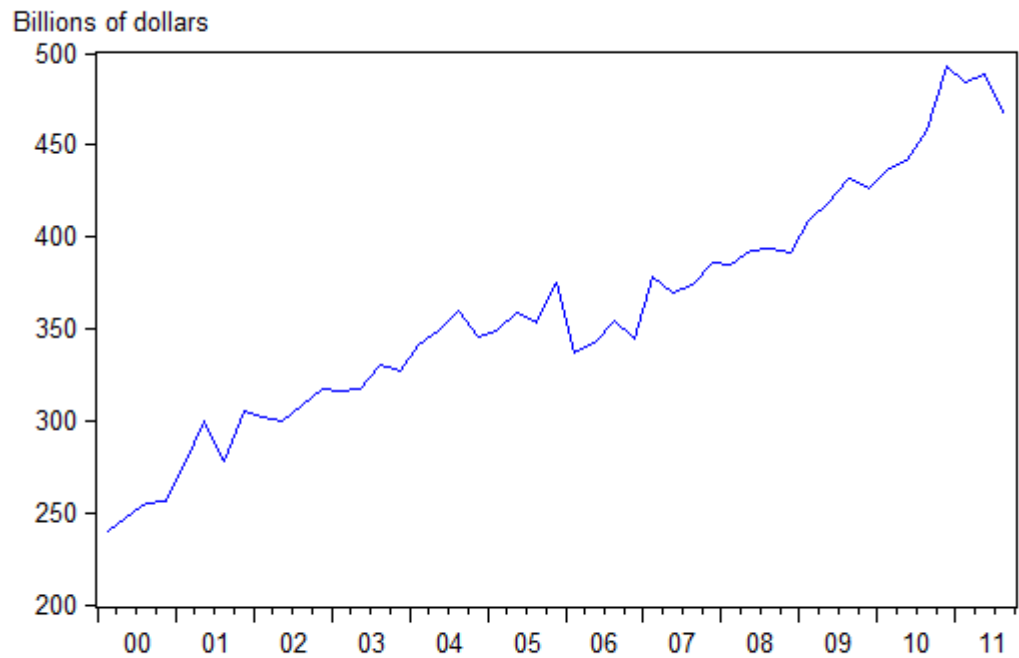


Figure 4. State and Local Government Expenditures Other Than for Purchases of Goods and Services: 2000Q1 - 2011Q3

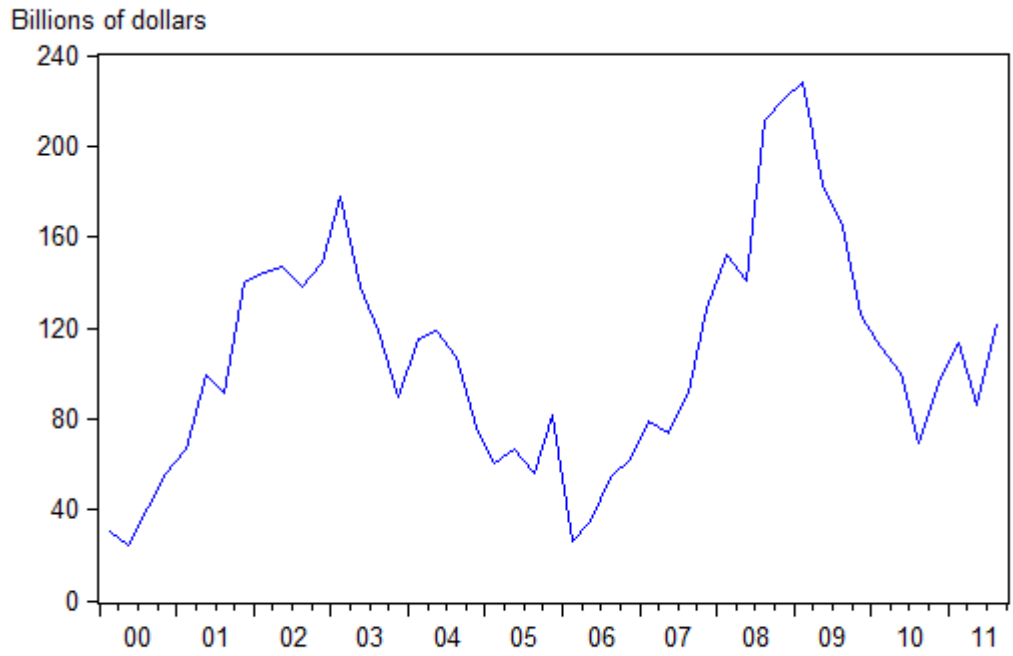


Figure 5. Net Borrowing by State and Local Governments: 2000Q1 - 2011Q3

References

- Coenen, Guenter, Chris Erceg, Charles Freedman, Davide Furceri, Michael Kumhof, René Lalonge, Douglas Laxton, Jesper Lindé, Annabelle Mourougane, Dirk Muir, Susanna Mursula, Carlos de Resende, John Roberts, Werner Roeger, Stephen Snudden, Mathias Trabandt, Jan in't Veld (2011), "Effects of Fiscal Stimulus in Structural Models," *American Economic Journal Macroeconomics*, forthcoming
- Cogan, John F., Tobias Cwik, John B. Taylor, and Volker Wieland (2010), "New Keynesian versus Old Keynesian Government Spending Multipliers," *Journal of Economic Dynamics and Control*, Volume 34, No. 3, March 2010, pp. 281-295. Revised version of Stanford Institute of Economic Policy Research Discussion Paper No, 08-030, February 2009
- Cogan, John F., John B. Taylor, and Volker Wieland (2009), "The Stimulus Didn't Work." *Wall Street Journal*, September 17.
- Christiano, Lawrence J., Martin Eichenbaum, Charles L Evans (2005), Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy, *Journal of Political Economy* 113, 1-45.
- Christiano, Lawrence, Martin Eichenbaum, and Sergio Rebelo (2011) *Journal of Political Economy*, Vol. 119, No. 1, pp. 78-121. Revised version of Northwestern University working paper, August 2009
- Drautzburg, Thorsten, and Harald Uhlig, (2010), "Fiscal Stimulus and Distortionary Taxation," University of Chicago, January 2010.

- Eggertsson, Gauti (2010) "What Fiscal Policy is Effective at Zero Interest Rates," in *Macroeconomics Annual*, Daron Acemoglu, Michael Woodford (Eds) National Bureau of Economic Research, Vol. 25
- Elmendorf, Douglas (2009), Letter to Charles Grassley on the Impact of the American Recovery and Reinvestment Act of 2009, March 2, 2009.
- Erceg, Christopher J. and Jesper Linde (2009), "Is There a Fiscal Free Lunch in a Liquidity Trap?" Federal Reserve Board, April 2009.
- Gramlich, Edward M. (1978) "State and Local Budgets the Day after it Rained: Why is the Surplus So High?" *Brookings Paper on Economic Activity*, No. 1, pp. 191-216.
- Gramlich, Edward, M. (1979) "Stimulating the Macro Economy Through State and Local Governments," *American Economic Review*, Vol. 69. No. 2, May 1979.
- Hall, Robert E. (2009), "By How Much Does GDP Rise If the Government Buys More Output?" *Brookings Papers on Economic Activity 2:2009*, pp. 183-250, also NBER Working Paper No. 15496, November 2009.
- Newey, Whitney and Kenneth West (1987). "A Simple Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix," *Econometrica*, 55, 703–708.
- Romer, Christina and Jared Bernstein (2009), "The Job Impact of the American Recovery and Reinvestment Plan," January 8, 2009.
- Woodford, Michael (2010), "Simple Analytics of the Government Expenditure Multiplier, Columbia University, June 2010.