WHAT THE GOVERNMENT PURCHASES MULTIPLIER ACTUALLY MUTIPLIED 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 new data from the Bureau of Economic Analysis and considering developments at both the federal and the state and local level, we find that the government purchases multiplicand through the 2nd quarter of 2010 has been only 2 percent of the $862 billion American Recovery and Reinvestment Act (ARRA) of 2009. This increase in government purchases has occurred mainly at the federal level. While states and localities received substantial grants under ARRA, state and local governments have not increased their purchases of goods and services. Instead they reduced borrowing and increased transfer payments. These findings explain why, regardless of the size of a government purchases multiplier, changes in government purchases have had no material effect on the growth of GDP since the time ARRA was enacted. The implication is not that ARRA has been too small, but rather that it failed to increase government consumption expenditures and infrastructure spending as many had predicted from such a large package. A consideration of the counterfactual event that there had not been an ARRA supports the hypothesis that state and local government borrowing would have been higher and purchases would have been about the same in the absence of ARRA.

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The debate about 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 January 2009, Romer and Bernsten (2009) released a paper showing that the multiplier was large and that the stimulus package would have a large effect. Then, in February, Cogan, Cwik, Taylor, and Wieland (2009) responded with a paper arguing that the models used by Romer and Bernstein (2009) were not representative of modern research, and that if one used so-called new Keynesian rather than old Keynesian models, the multiplier was much smaller; they illustrated their results by evaluating ARRA with a representative modern model.[1]

These papers were followed by a series of papers using new Keynesian models, including Christiano, Eichenbaum, and Rebelo (2009), 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. In the meantime, old Keynesian models—with the larger multipliers— continued to be used in policy debates, as exemplified in the paper by Blinder and Zandi (2010), and disputes over the impact of ARRA continued.

Missing from this research is an empirical examination of what the government purchases multiplier has actually multiplied in the case of ARRA—that is, the change in government purchases due to ARRA. The purpose of this paper is to examine this change in government purchases, both at the federal and at the state and local level. We use a new data series provided by the Bureau of Economic Analysis on the effects of ARRA on federal government purchases and on grants to state and local governments.

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[1] Cogan, Cwik, Taylor and Wieland (2009) focused on the Smets-Wouters (2009) model which has features similar to the Christiano, Eichenbaum and Evans (2005) model and to other rational expectations models with sticky prices going back to Taylor (1993).

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 also consider counterfactuals, trace where the money went, and estimate time-series regressions of the relationship between ARRA grants and state and local government purchases. 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.

1.   Definitions and Aggregate Data on Government Purchases

As Hall (2009) and others have emphasized the government purchases multiplier that has generated so much debate recently is the change in GDP associated with a change in government *purchases.* 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 national income and product accounts (NIPA), which is reported quarterly. 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.[2] 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.

The Bureau of Economic Analysis (BEA) has been providing 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. The latest data used in this paper go through the second quarter of 2010.

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 therefore 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. 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.

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

2.   Effect of ARRA on Federal Government Purchases

The effect of ARRA on Federal government purchases has been very small through the second quarter of 2010. Of the total $862 billion in the ARRA stimulus package, the amount allocated to federal government purchases was $7.9 billion in 2009 and $10.1 in the first half of 2010 according to the BEA. The portion allocated to infrastructure (gross investment) at the federal level was $0.9 billion in 2009 and $1.5 billion in the first two quarters of 2010. Thus, of the total $862 billion, 0.3 percent has been spent on federal infrastructure projects.

Figures 1, 2, and 3 put these effects of ARRA in recent historical perspective. They show the ARRA effects compared with total federal government purchases from the year 2000 to the second quarter of 2010. The figures show federal government purchases with and without the effect of ARRA. Figure 1 shows total government purchases and Figures 2 and 3 show consumption and gross investment respectively. The data are reported at annual rates and the ARRA effects are stated at annual rates.

ARRA federal government purchases, federal government consumption, and federal gross investment as a share of their respective totals are shown in Table 1 for each quarter since ARRA was passed. The impact of ARRA on federal purchases and each of its two components reaches one percent in the third quarter of 2009, one quarter after the recession officially ended. The biggest increase in the share also occurs in the third quarter of 2009 and then is relatively flat. This pattern is also apparent in Figures 1, 2 and 3.

Finally, Figure 4 shows the time path of federal government purchases and all other parts of ARRA as a share of GDP. By the second quarter of 2010 the overall ARRA package was a sizable 2.5 percent of GDP, but purchases were only 0.12 percent of GDP; the infrastructure part

was only about 0.03 percent of GDP. The small amounts could not be a material part of the

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

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

	Federal Government Purchases	Federal Government Consumption	Federal Gross Investment
2009Q1	0.00	0.01	0.00
2009Q2	0.12	0.13	0.07
2009Q3	1.36	1.33	1.54
2009Q4	1.25	1.35	0.63
2010Q1	1.54	1.56	1.37
2010Q2	1.86	1.80	2.20

3.   Effects of ARRA on State and Local Government Purchases

A key feature of the ARRA is that it provides 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)

				Share	of	GDP
	Total	Medicaid	Other	Total	Medicaid	Other
2009Q1	49.4	48.9	0.5	0.35	0.35	0.00
2009Q2	73.4	39.1	34.3	0.52	0.28	0.24
2009Q3	90.3	38.4	51.9	0.64	0.27	0.37
2009Q4	102.8	38.9	63.9	0.72	0.27	0.45
2010Q1	106.1	40.7	65.4	0.73	0.28	0.45
2010Q2	126.3	38.9	87.4	0.87	0.27	0.60

Table 2 shows the amount of ARRA grants, expressed in annual rates and as a percentage of GDP. Except for the first quarter of 2009, a majority of the grants are for areas other than Medicaid. The total grants to state and local governments quickly rise to 0.7 to 0.8 percent of GDP by the 3rd quarter of 2009. Although ARRA grants are small relative to GDP, they are potentially a source of stimulus in addition to federal purchases.

ARRA grants are part of total receipts or aggregate income of the state and local government sector. Figure 5 shows total receipts with and without the ARRA grants. As of the second quarter of 2010, these ARRA grants were equal to 7 percent of total state and local government income with Medicaid equal to 2 percent and other grants equal to 5 percent of total income.

The Budget Constraint for State and Local Governments

The question we wish to address is the effect of these grants on government purchases at the state and local level. For this we must model how state and local governments respond to these grants. The question is 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 variables[3] refer to the state and local sector in the aggregate:

G_t = government purchases

E_t = total expenditures other than government purchases

L_t = net lending or net borrowing (-)

R_t = total receipts other than ARRA grants

A_t = ARRA grants

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[3] 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 33 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.

Then the budget constraint facing state and local governments is

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

The key question is how much an increase in ARRA grants A_t results 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 6 shows the pattern of state and local government purchases from 2008 to the second quarter of 2010. One critical fact stands out in this figure: state and local government purchases declined sharply in the fourth quarter of 2008 and have remained remarkably flat since then. There is no noticeable increase in government purchases since the beginning of the ARRA grants. As of the second quarter of 2010, they are still below the level reached in the fourth quarter of 2008.

The timing and magnitude of these income and spending changes are put in a more precise quantitative perspective in Table 3. The table's first row shows the *change* in state and local government receipts, excluding the receipt of ARRA grants, from the 2nd quarter 2008 level. We have chosen to use this quarter as the starting point for the analysis rather than the official starting date of 2007Q4 because 2008Q2 is the point in time in which receipts reached their peak. The recession appears to have had a delayed effect on state and local finances. From the official recession's beginning to the 2nd quarter of 2008, state and local revenues grew at an

annual rate of 5.2 percent; faster than its 4.9 percent growth in the year leading up to the

recession's onset.   As the data in row 1 show, state and local receipts, after reaching their peak,

declined sharply through the first half of 2009; they began to rebound during the latter half of

2009, and climbed back to their 2008 peak level by the beginning of 2010.

Table 3. Change in Receipts and Purchases of Goods and Services from 2008Q2 Level
(Billions of dollars at annual rates)

	2008Q3	2008Q4	2009Q1	2009Q2	2009Q3	2009Q4	2010Q1	2010Q2
Receipts ex ARRA	-3.8	-34.9	-74.3	-71.8	-44.3	-19.8	-1.7	-1.8
Purchases	24.6	-13.4	-35.9	-25.1	-26.2	-30	-27	-20.5
ARRA grants ex Medicaid	0	0	0.5	34.3	51.9	63.9	65.4	87.4
Receipts ex Medicaid	-3.8	-34.9	-74.2	-37.5	7.6	44.1	63.6	85.6

The change in state and local government purchases from their level in the 2nd quarter of

2008 is presented in row 2. Government purchases show a sharp reduction beginning in late

2008 and early 2009 and no appreciable rebound thereafter. The lack of rebound in purchases

occurs despite the receipt of ARRA grants. The ARRA grants are shown in row 3 and exclude

Medicaid grants, reflecting the assumption that Medicaid grants are not fungible. The non-

Medicaid ARRA grants begin as a trickle in the first quarter of 2009 and flow into state and local

governments in increasingly larger amounts as time progresses. By the first two quarters of

2010, the non-Medicaid ARRA grants reach $60-90 billion on an annualized basis. But, as Table 3 makes very clear, state and local government purchases show no response.[4]

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 constraint (equation 1) allows for only two other possibilities: higher expenditures on "non-purchase" activities and lower borrowing. Figures 7 and 8 provide some indication of each of these alternatives.

Figure 7 shows that state and local government "non-purchase" expenditures have kept growing without any slowdown. The pace of their growth appears to have picked up since the ARRA grants began.

The data in Table 4 confirm these graphical observations. Row 1 shows the change in non-purchase expenditures from its level in the second quarter of 2008 (when state and local revenues peaked) to each subsequent quarter. Non-purchase expenditures rise at an almost unbroken rate and, by the second quarter of 2010, they are 17 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, non-purchase expenditures begin their sharp rise at precisely the same time as state and local governments receive their first installment of ARRA grants (shown in row 2).

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[4] 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.

Table 4 Change in Receipts and Non-Purchase Expenditures from 2008Q2 Level (Billions of dollars at annual rates)

	2008Q3	2008Q4	2009Q1	2009Q2	2009Q3	2009Q4	2010Q1	2010Q2
Non-Purchases	0.9	0.6	14.4	19.9	35.2	32.7	42.8	67.2
ARRA grants	0	0	49.4	73.4	90.3	102.8	106.1	126.3

Figure 8 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.

The data in Tables 3 and 4 are combined in Table 5 to show the behavior of total state and local net borrowing and its relation to ARRA receipts during the current recession. Row 1 shows total state and local expenditures. Row 2, 3, and 4 display state and local receipts excluding ARRA grants, ARRA grants, and total receipts, respectively. Row 5 shows net lending.

Table 5. Change in Receipts and Net Lending from 2008Q2 Level
(Billions of dollars at annual rates)

	2008Q3	2008Q4	2009Q1	2009Q2	2009Q3	2009Q4	2010Q1	2010Q2
Total Expenditures	26	-13	-22	-5	9	3	16	47
Receipts								
Receipts ex ARRA	-4	-35	-74	-72	-44	-20	-2	-2
ARRA Grants	0	0	49	73	90	103	106	126
Total Receipts	-4	-35	-25	2	46	83	104	125
Net Lending	-29	-22	-4	-7	37	80	89	78

In sum, an inspection of these data suggests that the ARRA grants to state and local governments were not associated with an increase in government purchases, but rather with an increase on other forms of government expenditures and reduced borrowing.

A Counterfactual

What would have happened to government purchases in the counterfactual event that there had not been an ARRA? It is certainly possible that state and local purchases of goods and services would have declined further than they have during the current recession. But a much more likely hypothesis is that that the states would have held government purchases at the levels actually observed during the recession and would have instead not increased net lending as they did during this period. We examine this hypothesis in two ways: one using contemporaneous data and the other using historical data.

The contemporaneous data amounts to a reasonableness test. The test can be described with the help of Table 6. The first column of Table 6 shows actual ARRA grants and the actual cumulative changes in purchases, non-purchase expenditures, and borrowing from their pre-

ARRA levels (4th quarter of 2008). From the 1st quarter of 2009 to the second quarter of 2010,

state and local governments received a total of $137 billion in ARRA grants. During this period,

these governments reduced their rate of borrowing compared to pre-ARRA levels by $105

billion. In the counterfactual absence of ARRA, a likely outcome is that state and local

governments would have instead held their borrowing rate at its pre-ARRA level. We show this

in the column labeled "counterfactual" in Table 6. Had they done so, they would still have been

able to finance a $20 billion increase in non-purchase expenditures over the period without

relying on ARRA grants. This counterfactual increase, also shown in Table 6, is about 40

percent of the actual increase and a 3.6 percent increase from the pre-ARRA level.[5] The

hypothesis that states, in the absence of ARRA, would have relied on a continuation of prior

borrowing rates to maintain the lion's share of their purchases of goods and services and finance

a slight increase non-purchases (mainly health and welfare programs) strikes us as quite

reasonable.

**Table 6. Total Changes in Budget Amounts from Pre-ARRA Levels: 2009Q1 to 2010Q2
(Cumulative Change from 2008Q4, Billions of Dollars)**

	Actual	Counterfactual
ARRA Grants	137	0
Purchases	- 21	-21
Non-purchase expenditures	52	20
Net Borrowing	-105	0

The historical test of the hypothesis that state and local government purchases would

have been the same without ARRA compares the behavior of state and local purchases in the

current recession to its behavior in previous recessions. Table 7 shows changes in state and local

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[5] The base used for this percentage calculation is the 2008Q4 rate of non-purchases spending continued for six quarters.

purchases as a percent of total state and local receipts for each post World War II recession. For

the current recession, the change is measured from the start of the recession to the most recent

quarter 2010Q2. This latter quarter is one year after the recession officially ended. For each

prior recession, the change is measured from the recession's official start date to one year after

its official end date.

The change in purchases relative to receipts is highly variable from one recessionary

period to the next; ranging from an increase of 8.8 percentage points in the 1953-54 recessionary

period to a decrease of 3.5 percentage points in the 2001 recessionary period. In seven out of the

ten prior post-World War II recessions, purchases decline relative to revenues. The average of

the ten prior periods is .28 percentage points. The current recessionary period is the largest

decline by a considerable margin and represents a post-WWII record. This decline, in our view

reflects the failure of ARRA grants to boost state and local purchases. Had there been no ARRA

grants, total receipts in 2010Q2 would have been $127 billion less (at an annual rate), and even if

state and local government purchases had not declined from their historical level, as a percent of

revenues these purchases would have declined by .9 percent, less than historical average change.

Table 7 Change in State and Local Purchases as a Percent of Total Receipts

Recession   Change

Recession	Change
1948-49	3.6
1953-54	8.8
1957-58	-0.4
1960-61	-0.7
1969-70	-2.1
1973-75	4.8
1980	-2.3
1981-82	-3.3
1990-91	-2.1
2000	-3.5
2007-09	-4.9

Why are State and Local Purchases Unresponsive to ARRA Grants?

The stark difference in the behavior of state and local purchases and non-purchases expenditures provides a possible explanation for the small effect of ARRA on purchases. While additional research is needed to form a strong conclusion, one likely explanation 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.[6] 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 (92 percent) of ARRA grants are accounted for by Medicaid. In the 2nd quarter of 2010, Medicaid grants still account for over 30 percent 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.

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[6] 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)

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:

$$G_t = a_0 + a_1 G_{t-1} + a_2 R_t + a_3 A_t \qquad\qquad (2)$$

$$E_t = b_0 + b_1 E_{t-1} + b_2 R_t + b_3 A_t \qquad\qquad (3)$$

$$L_t = c_0 + c_1 G_{t-1} + c_2 E_{t-1} + c_3 R_t + c_4 A_t \qquad\qquad (4)$$

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

$$L_t = R_t + A_t - a_0 - a_1 G_{t-1} - a_2 R_t - a_3 A_t \ - b_0 - b_1 E_{t-1} - b_2 R_t - b_3 A_t$$

$$= \ - (a_0 + b_0) - a_1 G_{t-1} - b_1 E_{t-1} + (1- a_2 - b_2)\, R_t \ + (1 - a_3 - b_3) A_t \qquad (5)$$

which implies the following identities:

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

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

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

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

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

We estimated equations (2), (3), and (4) by ordinary least squares over the period from 1969.1 to 2010.2. 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 8 along with the estimated first-order auto-regressive coefficient (ρ) of the estimated residuals.

Observe 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 negligible impact on total state and local expenditures. Indeed, there is a very large and significant effect of ARRA grants on net lending. The coefficient on ARRA grants is nearly 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 that all of the estimated coefficients in the net lending equation are very close to those implied by the estimated coefficients in the government purchases and non-purchase expenditures equations using the above identities. In particular, the sum of the impact of the ARRA grants across the three equations sums to about one.

Table 8. 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 - 2010.2. In the parentheses are t-statistics computed from Newey-West (1987) estimated standard errors

<div align="center">Dependent Variable</div>

	G	E	L
Constant	3.646	-2.51	2.113
	(3.5)	(-2.2)	(1.0)
G(-1)	0.862	------	-0.860
	(15.4)		(-12.20)
E(-1)	------	0.873	-0.750
		(19.7)	(-10.71)
R	0.125	0.028	0.819
	(2.7)	(3.15)	(13.4)
A	-0.110	0.098	0.985
	(-2.2)	(3.23)	(13.2)
R^2	0.99	0.99	0.95
ρ	0.25	-0.42	-0.13

The framework described in equations (2)-(4) can be augmented to test the aforementioned hypothesis that state and local purchases failed to respond positively to ARRA

because the conditions attached to ARRA Medicaid grants diverted revenues that would have otherwise been used to finance purchases of goods and serves. The regressions presented in Table 9 provide such a test. The specification is identical to the specification presented in Table 8, except that ARRA grants are split into two components: Medicaid grants (M) and all other ARRA grants (N). Note that the same coefficient identities shown in equation (10) for A are implied for the coefficients on M and N in the augmented equations.

Table 9. Estimated regression coefficients for the equations for government purchases (G), non-purchases expenditures (E), and net lending (L), splitting the effects of ARRA grants into Medicaid grants (M) and non-Medicaid grants (N). Sample 1969.1 - 2010.2. In the parentheses are t-statistics computed from Newey-West (1987) estimated standard errors.

	Dependent Variables		
	G	E	L
Constant	3.396	-2.507	2.564
	(3.3)	(-2.1)	(1.2)
G(-1)	0.882	-------	-0.882
	(16.2)		(-11.8)
E(-1)	------	0.873	-0.743
		(19.6)	(-11.1)
R	0.108	0.028	0.835
	(2.4)	(3.1)	(13.1)
M	-0.469	0.105	1.353
	(-2.7)	(1.1)	(5.0)
N	0.106	0.094	0.761
	(2.5)	(1.1)	(8.7)
R^2	0.99	0.99	0.95
ρ	0.23	-0.42	-0.24

The government purchases regression gives a reasonably clear picture of the impact of ARRA. Consistent with our hypothesis, there is a large negative and statistically significant effect of Medicaid grants on state and local purchases. Holding non-ARRA state revenues constant, each additional dollar of ARRA Medicaid grants reduces government purchases by about 50 cents. Non-Medicaid ARRA grants, on the other hand, have a much smaller positive effect; the sum of the coefficients on the ARRA Medicaid variable and the ARRA non-Medicaid variable equals -.36 and is significantly different from 0 with a standard error of .15. This result suggests that the negative impact of total ARRA grants found in Table 8 is not just the coincidence that states and localities happened to be reducing their purchases of goods and services for reasons unrelated to ARRA just as the ARRA grants were beginning to flow-in.

Looking over at the net lending equation in Table 9, however, we see evidence that the estimated coefficient on Medicaid grants in the purchases equation probably implies too large of a negative impact on purchases. In the net lending equation the coefficient on ARRA Medicaid grants exceeds one, which is implausibly high, implying that each dollar of ARRA Medicaid grants reduced state and local borrowing by more than one dollar. In addition the Medicaid grant coefficient in the net lending equation is nearly twice the size of the non-Medicaid ARRA coefficient; because Medicaid grants are less fungible than other grants, we would have expected the opposite relationship. A smaller positive impact of M in the lending equation would suggest a smaller negative impact of M in the purchases equation. Finally we note that in the non-purchases regression in Table 9 the coefficients on the ARRA Medicaid grants and the non-Medicaid ARRA grants are *jointly* statistically significant (based on an F-test), which is consistent with the finding in Table 8, though they are not significant individually as indicated by the t-tests.

4.   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 purchases to have been remarkably small for the first six quarters of the program despite the large overall size of ARRA. It appears that the ARRA grants were allocated to transfer payments, such as Medicaid, and to increasing net lending by state and local governments rather than to government purchases. Basic economic theory implies that temporary increases in transfer payments have a much smaller impact than government purchases. The counterfactual hypothesis that spending would have been even worse without ARRA does not seem plausible based on contemporaneous data or historical experience.

While a more definitive examination will be possible after all the data are in, these empirical findings already have important implications.

First, they suggest that the debate over the size of the government purchases multiplier is overshadowed in the case of ARRA by the small magnitude of what the multiplier actually multiplies. To illustrate this we show in Figure 9 the estimates for government purchases under ARRA which we used in Cogan, Cwik, Taylor, and Wieland (2009) along with the estimates for the first six quarters of ARRA derived here, assuming that there has been no increase in purchases at the state and local level. Following the rule of thumb used in the government, in the earlier paper we assumed that 60 percent of the grants would results in an increase in government purchases. While our original estimates of the impact of ARRA purchases reported in Cogan,

Cwik, Taylor and Wieland (2009) were much smaller than Romer and Bernstein (2009), the actual impact has been even smaller than we estimated.

Second, the findings help explain the apparent puzzle that the very large $862 billion ARRA stimulus package resulted in such a small contribution of changes in government purchases to changes in real GDP since the ARRA program began. Figure 10 shows the small contribution of changes in government purchases at the Federal and state and local level to the growth rate of real GDP during the recession and the recovery. The explanation of course is that government purchases changed very little in contrast to much larger changes in government expenditures.

Third, the findings raise questions about the feasibility of such countercyclical stimulus programs. In the federal system, the states and localities make decisions about their own government purchases and the federal government has only limited ability to affect these 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 program was too small, but rather that such programs are inherently limited by these feasibility constraints.
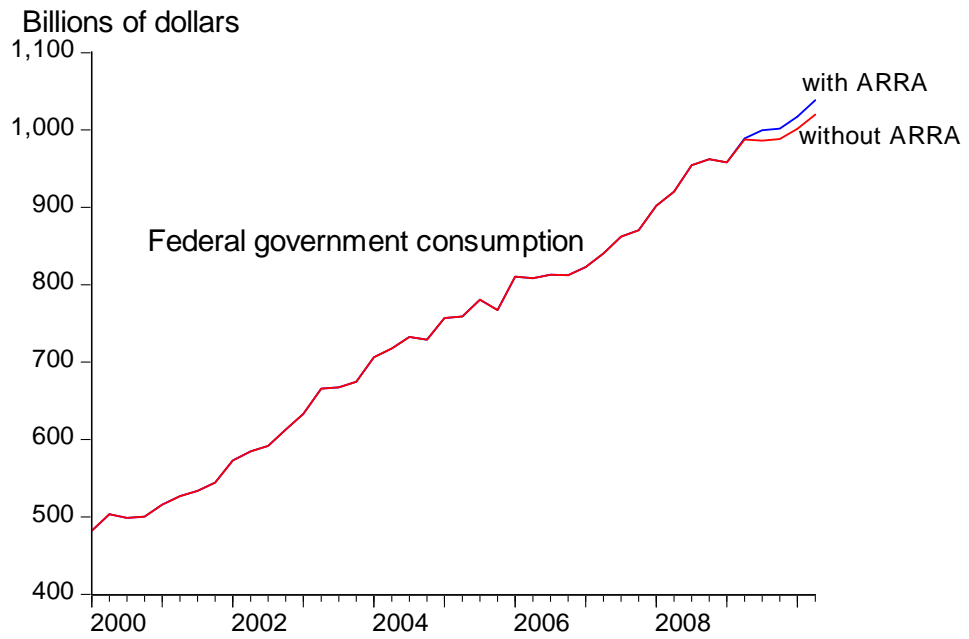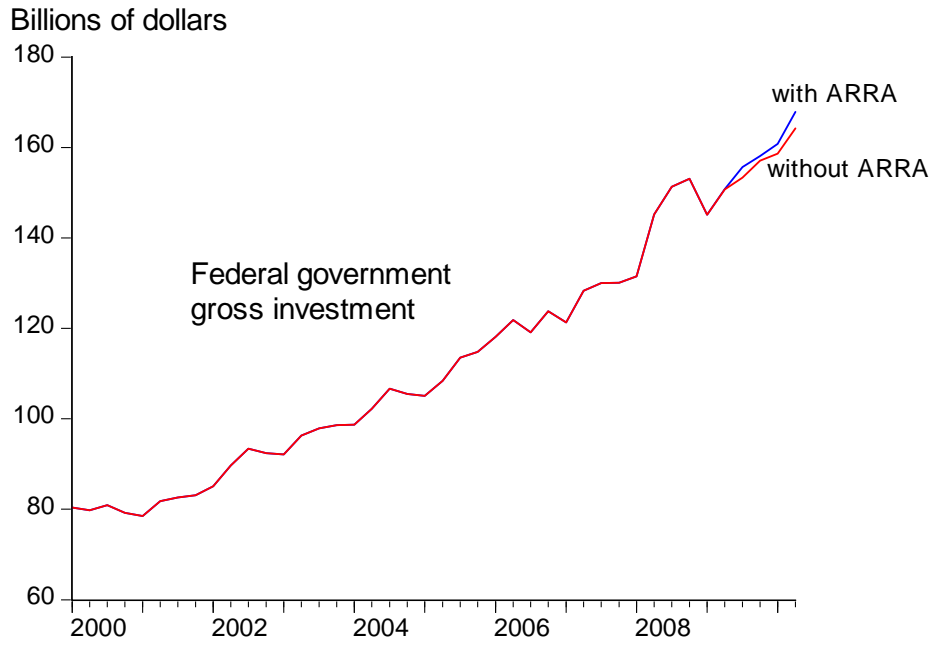
Billions of dollars

With ARRA

Without ARRA

Federal Government Purchases

Figure 1

Billions of dollars

with ARRA

without ARRA

Federal government consumption

Figure 2

Billions of dollars

Figure 3

Percent
of GDP

Figure 4

25

Billions of dollars

with ARRA grants

Total Receipts
State and Local
Governments

without ARRA grants

Figure 5

Billions of dollars

State and local
government purchases

Figure 6

Billions of dollars

Expenditures other than purchases by
state and local governments

Figure 7

Billions of dollars

Net Lending or borrowing (-)
by state and local governments

Figure 8

Percent of GDP

Figure 9

Percent

Figure 10

Appendix: Flow of Funds in the State and Local Sector

An examination of the Federal Reserve's flow of funds data for the state and local sector sheds additional light on the responses of the states and localities to the ARRA grants. The figure below shows "net financial investment," the difference between the net acquisition of financial assets and the net increase in liabilities. Financial liabilities consist mostly of municipal securities (largely long-term), though there is a small amount of trade payables. Observe that net financial investment fell from the beginning of the recession, but then started increasing, especially in 2009. Net financial investment rose by $106 billion (from -$151 billion to -$45 billion) from 2008.4 to 2010.2.

The figure also shows "net lending or net borrowing" data from BEA for the same period (see Figure 8 for earlier years). The two series are identical in theory, but because "net financial investment" is measured from changes in financial assets and liabilities and "net lending or net borrowing" is measured from income and spending data, the two series are not identical in practice. The difference between them is the sector discrepancy. During this period the sector discrepancy is fairly constant so both series tell the same story. (In 2006 the discrepancy was much larger).
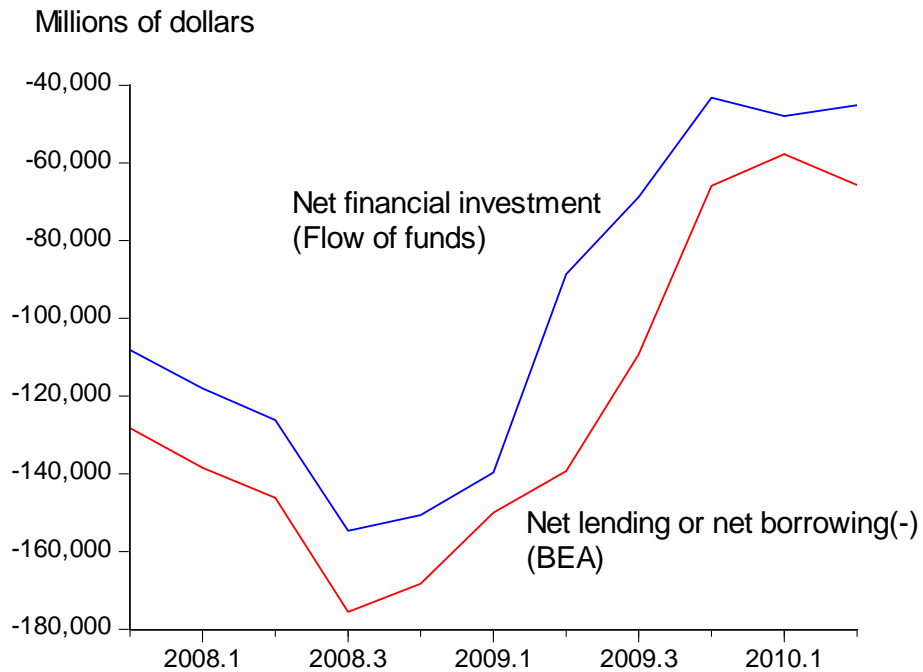
Millions of dollars

Figure A.1

How did the increase in net financial investment break down into changes in financial assets compared to changes in financial liabilities? As shown in the next Figure the net acquisition of financial assets rose much more rapidly in 2009 than did the increase in financial liabilities. The net acquisition of financial assets rose by $97 billion from 2008.4 to 2010.2 (from -$135 billion to $-38 billion) while the net increase in liabilities fell by $7 billion over the same period (from $15 billion to $8 billion). In other words, the increase in net financial investment as the ARRA grants were received was largely due to a larger rise in the acquisition of financial assets than in the increase in liabilities.

This is additional evidence in favor of the hypothesis that it would have been quite feasible and plausible for states and localities to reduce their net lending if there had not been an ARRA. If there had been no ARRA the states might not have increased their acquisition of financial assets during this period (While there is a sharp decrease in both series in the 2010.2,

net financial investment did not change much, so the story is very similar if you go through 2010.1).
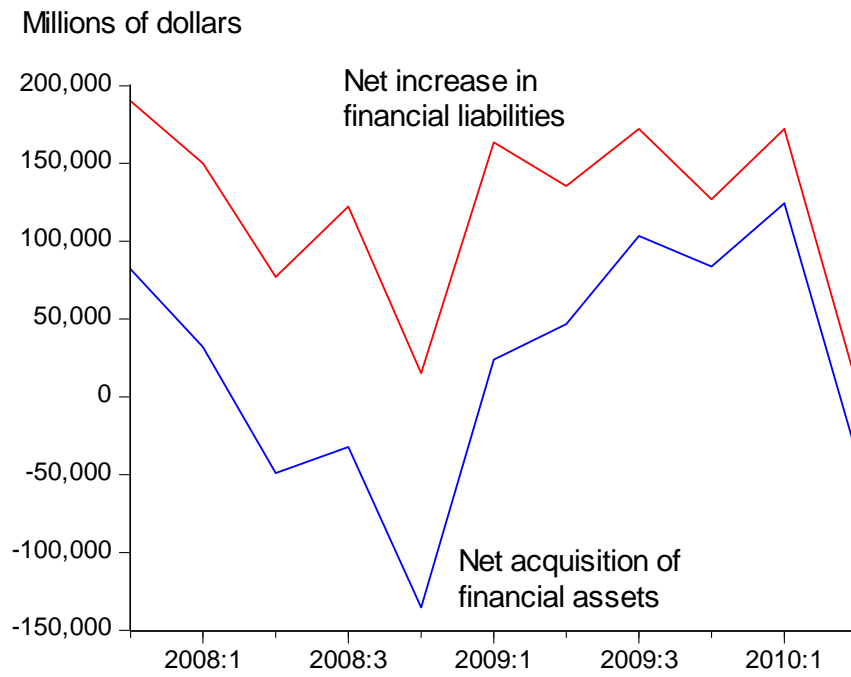
Millions of dollars

Figure A.2

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