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# Was the American Recovery and Reinvestment Act an Economic Stimulus?

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**Abstract**  The American Recovery and Reinvestment Act (ARRA) of 2009 envisaged a fiscal stimulus of approximately \$800 billion, the largest in American history. Chodorow-Reich et al. (2012a) show that the state fiscal relief that was part of this stimulus increases employment. The other objective of ARRA was to "promote economic recovery". We therefore examine its effect on states' economic growth. Since the stimulus each state received is endogenous to a state's economic environment, ordinary least squares underestimates the effect. This endogeneity problem is addressed by using a state's pre-recession Medicaid spending level to instrument for the ARRA fiscal relief each state receives. We find that the ARRA state fiscal relief has indeed had a positive effect on gross state products.

## Introduction

As stated by the 11th U.S. Congress in 2009. "The purposes of this Act include the following:

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(1) To preserve and create jobs and promote economic recovery.

…

(5) To stabilize State and local government budgets, in order to minimize and avoid reductions in essential services and counterproductive state and local tax increases." 111th Congress (2009)

The American Recovery and Reinvestment Act (ARRA) of 2009 is one of the main achievements of the Obama administration (Flores 2015; Von Drehle 2016). The Act envisaged the largest fiscal stimulus in American history of approximately $800 billion. Two purposes of ARRA are to "to preserve and create jobs" and "promote economic recovery" after the Great Recession. Chodorow-Reich et al. (2012a) show that ARRA met the first objective. In this paper, we discuss the second objective by looking at ARRA expenditures and the development in economic activity since ARRA was signed into law by President Obama in early 2009.

In our discussion of ARRA, another main feature of the Act is its purpose to "stabilize State and local government budgets". The ARRA was indeed designed "to dampen counterproductive tax increases or budget cuts" by providing state fiscal relief (CEA 2014, Chapter 3). Of the ARRA expenditures, a substantial $143 billion was intergovernmental transfers to state and local governments (CEA 2014, Chapter 3), the largest part of it by increasing the federal matching grants for states' Medicaid expenditures (Federal Medical Assistance Percentage [FMAP] outlays).

We make use of the fact that the ARRA can be seen as a natural experiment. Expenditure levels differ per state, and this allows us to check whether states that received more due to ARRA have reached more favorable changes in their economic activity. The increases in the federal matching grants for states' Medicaid expenditures indeed differ substantially. These grants were paid out quickly and states reported that this money avoided reductions in services (GAO 2009; NASBO 2008). This enables a cross-section econometric strategy to estimate the effects of intergovernmental transfers on economic activity.

A problem with the analysis is that ARRA spending may depend on a state's economic situation. States which were hit harder and/or which were recovering more slowly might have received more state fiscal relief in the form of FMAP outlays. An ordinary least squares (OLS) estimation of the relationship between the size of the stimulus and its effect on the economy might therefore understate this effect. We address this endogeneity problem following Chodorow-Reich et al. (2012a) by using Medicaid transfers in 2007 as an instrument to isolate the part of the stimulus that is not related to economic circumstances after the crisis. The ARRA stimulus a state received also depended on these 2007 pre-recession transfers, and the identification strategy is to consider the cross-state variation in stimulus spending that results from pre-recession differences in Medicaid transfers.

We use gross domestic product (GDP) at the state level and gross state product (GSP) as a measure of economic activity. The differences in real state growth rates are large. For example, Michigan's GSP decreased by 9.1% in 2009, while Alaska saw an increase of 7.7%. We show that the additional federal Medicaid transfers had a positive effect on economic activity that was statistically significant and economically substantial. This positive effect was robust over time.

Our focus on the effects of economic activity, rather than on employment as in the above-mentioned papers, is not only motivated by the fact that it is one of the two objectives explicitly stated in ARRA (employment and economic activity), but also by claims made by politicians for example, the then-House minority leader John Boehner, (falsely) predicted that "direct aid to the states is not going to do anything to stimulate our economy."

There is a large volume of literature discussing the economic impact of the ARRA. For a survey see Council of Economic Advisers (2014). Four papers use a similar approach as Chodorow-Reich et al. (2012a), based on cross-state variation to study the stimulus impact of intergovernmental aid, each of them solving endogeneity problems in a different way. Conley and Dupor (2013) find evidence that ARRA saved jobs in the public sector but produce no evidence the ARRA created jobs in the private sector. Chodorow-Reich et al. (2012a), Feyrer and Sacerdote (2011) and Wilson (2012) find a positive effect of ARRA on employment, which is consistent with our result. Carlino and Inman (2016) find similar positive effects using a structural vector auto regression approach, while Leduc and Wilson (2017) show that ARRA grants did not crowd-out state government highway spending. Finally, Seligman (2012) evaluates the way state and local finances are supported. These papers, however, do not show that ARRA's state fiscal relief has a positive effect on GSP growth, as we argue in this contribution.

## Methodology

We estimate the effect of Federal Medical Assistance Percentages (*FMAP*) outlays on the change in economic activity (*GSP*) in a state, *s*, given state specific control variable(s) (*X*) and disturbance terms ($\varepsilon$), using the following linear model:

$$\left(GSP_{2009;s}/N_{2009,s} - GSP_{2008,s}/N_{s,2008}\right) = \beta_0 + \beta_1 \frac{FMAP_s}{N_{s,2008}} + \beta_2 X_s + \varepsilon_s. \quad (1)$$

Following Chodorow-Reich et al. (2012a), we normalize all relevant variables by the states' number of individuals ($N_{s,\,2008}$) 16 years and older.

Equation 1 could be estimated with OLS if the FMAP outlays and the disturbance terms would be independently distributed. Since the outlays depend on the increase of a state's unemployment, among other factors, and thus on a state's economic activity, this is very unlikely. This endogeneity problem is circumvented by using 2007 Medicaid spending normalized with a state's 16-and-older population as an instrument in a two-stage least squares (2SLS) estimation procedure. Additionally, we account for the effects of a series of control variables that may influence GSP growth or 2007 Medicaid spending. We discuss these control variables in more detail in the next section.

## Data

The descriptive statistics of the dependent, explanatory, instrumental, and control variables are given in Table 1.

## Dependent Variables

Data on GDP by state and economic growth are from the Bureau of Economic Analysis (BEA).[1] In the BEA reports, GSP levels are given in millions of chained dollars. In the standard specification we consider the increase in GSP in 2009 compared to 2008, $(GDP_{2009;s}/N_{2009,s} - GDP_{2008;s}/N_{2008,s})$, normalized by the states' 16-and-older population as estimated by the Bureau of Labor Statistics from the U.S. Census Bureau data.

The ARRA was signed into law in February 2009. We nonetheless consider GSP growth for the whole of 2009, instead of the period from February 2009 to February 2010. The first reason to do so is that discussions on this law in the freshly-elected Congress started in late 2008, so there might have been some anticipation effects justifying this choice. The other reason is a more practical one as the BEA reports available for this period only provided yearly data.

When we consider how the effects of FMAP outlays evolve over time, we also take into account how GSP per capita developed over the years 2010 to 2015. That is, we subsequently consider $(GDP_{2010;s}/N_{2010,s} - GDP_{2008;s}/N_{2008,s})$, $(GDP_{2011;s}/N_{2011,s} - GDP_{2008;s}/N_{2008,s})$, and so on. Finally, in the specification in which we estimate the effect of the FMAP outlays on economic growth, we replace the dependent variable in Eq. 1 with the revised figures on states' percentage GSP growth rates in 2009 reported by BEA (2013).

## Explanatory Variable

Data on the explanatory variable *FMAP outlays* are from the U.S. Recovery Accountability and Transparency Board. The FMAP outlays are from February 2009 to the end of June 2010, normalized by a states' 16-and-older population in 2008. Data on these outlays are taken from Chodorow-Reich et al. (2012b).

## Instrumental Variable

To circumvent potential endogeneity problems in the analysis, *2007 Medicaid spending*, normalized by the states' 16-and-older population in 2007, is used as an instrumental variable. The Medicaid data originate from the CMS (2008), and the population figures are from BLS (2009a).

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[1] GSP 2008 from BEA (2012), GSP 2009 and 2010 from BEA (2013) in millions of chained 2005 dollars; GSP 2011 from BEA (2015), GSP 2012 to 2015 from BEA (2016) in millions of chained 2009 dollars, divided by 1.13 to correct for the difference between 2005 and 2009 dollars.

   Population figures for each of the years 2007 to 2015 are taken from BLS (2009a, b, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017), for the year 2016 from BLS (2017).

**Table 1** Descriptive statistics

|  | Mean | Median | SD | Min. | Max |
|---|---|---|---|---|---|
| Dependent variables: |  |  |  |  |  |
| GSP Growth 2008 → 2009 | −2.00 | −2.14 | 1.91 | −5.66 | 5.64 |
| GSP Growth 2008 → 2010 | −1.52 | −1.43 | 2.07 | −7.51 | 4.04 |
| GSP Growth 2008 → 2011 | −1.39 | −1.01 | 2.87 | −10.48 | 5.05 |
| GSP Growth 2008 → 2012 | −1.04 | −0.78 | 4.63 | −11.22 | 19.88 |
| GSP Growth 2008 → 2013 | −1.32 | −0.67 | 4.78 | −13.49 | 19.36 |
| GSP Growth 2008 → 2014 | −0.80 | −0.22 | 4.98 | −12.94 | 22.11 |
| GSP Growth 2008 → 2015 | −0.27 | −0.46 | 4.67 | −11.02 | 19.23 |
| (normalized by population in respective years) |  |  |  |  |  |
| %GSP Growth 2009 | −0.27 | −0.40 | 3.07 | −9.10 | 7.70 |
| Explanatory variable: |  |  |  |  |  |
| FMAP outlays (normalized by 2008 population) | 251 | 236 | 90 | 104 | 508 |
| Instrumental variable: |  |  |  |  |  |
| 2007 Medicaid Spending (normalized by 2007 population) | 1348 | 1243 | 455 | 642 | 2883 |
| Control variables: |  |  |  |  |  |
| % 2005 to 2007 average employment in manufacturing | 11.03 | 11.00 | 4.28 | 1.40 | 20.30 |
| 2004% vote share Kerry | 46.52 | 47.02 | 10.38 | 26.00 | 89.18 |
| 2007% union share | 11.16 | 10.40 | 5.49 | 3.00 | 25.20 |
| GDPpc2008 ($1000) | 49.20 | 46.28 | 17.20 | 31.91 | 154.89 |
| Population 2008 (millions) | 4.57 | 3.30 | 5.09 | 0.41 | 27.67 |

Data for the analysis were obtained from BEA (2012, 2013, 2014, 2015, 2016), BLS (2009a, b, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017), Chodorow-Reich et al. (2012b)

## Control Variables

We use control variables capturing regional or between-state differences that might affect states' economic dynamics and Medicaid characteristics. These control variables at least partially capture the effects that indicate more liberal states (2004 *percentage vote share Kerry* – the share of votes cast for Senator Kerry in the 2004 presidential election) or states with a higher degree of unionization (2007 *percentage union share*, [BLS 2009b]) have larger Medicaid programs and more social security spending, which influences not only the instrumental, but also the dependent and explanatory variables. We also control for *GDPpc2008* (the 2008 GSP [BEA 2012] normalized by the state's population 16-and-older [BLS 2010]). The other control variables are *% 2005 to 2007 average manufacturing* (the share of the population in the manufacturing sector, averaged over 2005 to 2007, [Chodorow-Reich et al. 2012b] and *Population 2008*, the states' 16-and-older population in 2008 (BLS 2009a). Finally, we include regional dummies representing the division used by the U.S. Census Bureau.

**Table 2**  First-Stage Regressions

|                                                                    | (1)                   | (2)                    |
|--------------------------------------------------------------------|-----------------------|------------------------|
| Instrumental variable:                                             |                       |                        |
| 2007 Medicaid Spending (normalized by 2007 population)             | 0.18*** (0.01)        | 0.14*** (0.01)         |
| Control variables:                                                 |                       |                        |
| 2004% vote share Kerry                                             |                       | 1756.53** (702.13)     |
| 2007% union share                                                  |                       | 3753.81** (1501.26)    |
| GSPpc2008                                                          |                       | −235.55 (302.41)       |
| 2005 to 2007 average % manufacturing                               |                       | 627.01 (1750.51)       |
| Population 2008                                                    |                       | 1.51 (0.94)            |
| Regional dummies                                                   |                       | X                      |
| Intercept                                                          | 6248.75 (15,968.50)   | −92,113.59 (45,501.12) |
| Observations                                                       | 51                    | 51                     |
| $R^2$                                                              | 0.84                  | 0.93                   |
| $\overline{R}^2$                                                   | 0.83                  | 0.90                   |

The dependent variable is FMAP outlays normalized by 16-and-older population. The instrumental variable is also normalized by states' 16-and-older population. Standard errors are in parentheses. Source: Own calculations using data from BEA (2012, 2013, 2014, 2015, 2016), BLS (2009a, b, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017), Chodorow-Reich et al. (2012b)

***Significant at the 1% level **Significant at the 5% level *Significant at the 10% level

## Results

### First-Stage Regressions

The results of the first-stage regressions are shown in Table 2. Note that all relevant variables are normalized by the states' 16-and-older population. Since we have used more recently revised data for some of the variables, the estimates differ slightly from those presented in Chodorow-Reich et al. (2012a), but the interpretation of the estimates does not change qualitatively. Note that the estimations are precise (high $R^2$s), significant (the estimated coefficients for the instrumental variable are statistically significant even at the 0.01 significance level), and robust when adding control variables.

### Second-Stage Regressions

The second-stage regression results are presented in Table 3 (Specification 5 is discussed in the next subsection). Specifications 1 and 2 are the OLS estimates, and Specifications 3 and 4 are the 2SLS estimates of Eq. (1). A comparison indicates

**Table 3** Second-Stage Regressions

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Explanatory variable: | | | | | |
| FMAP outlays (normalized by 2008 population) | −0.39 | 1.14*** | 0.15 | 1.61*** | 2.24*** |
|  | (0.30) | (0.41) | (0.33) | (0.48) | (0.79) |
| Control variables: | | | | | |
| 2004% vote share Kerry | | −0.15*** | | −0.17*** | −0.25*** |
|  | | (0.03) | | (0.03) | (0.06) |
| 2007% union share | | −0.08 | | −0.11*** | −0.17 |
|  | | (0.07) | | (0.08) | (0.13) |
| GSPpc2008 | | −0.00 | | −0.00 | 0.03 |
|  | | (0.01) | | (0.01) | (0.02) |
| 2005 to 2007 average % manufacturing | | −0.21** | | −0.20** | −0.30*** |
|  | | (0.08) | | (0.08) | (0.14) |
| Population 2008 | | −0.00*** | | −0.00*** | −0.00** |
|  | | (0.00) | | (0.00) | (0.00) |
| Regional dummies | | X | | X | X |
|  | −1.65** | 6.56*** | −2.39*** | 6.41*** | 8.10*** |
|  | (0.80) | (2.24) | (0.88) | (2.28) | (3.80) |
| Intercept | | | | | |
| Observations | 51 | 51 | 51 | 51 | 51 |
| Estimation | OLS | OLS | 2SLS | 2SLS | 2SLS |

For Models 1–4, the dependent variable is GSP per capita growth from 2008 to 2009. For Model 5, the dependent variable is percentage growth in 2009. Standard errors are in parentheses. Source: Own calculations using data from BEA (2012, 2013, 2014, 2015, 2016), BLS (2009a, b, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017), Chodorow-Reich et al. (2012b)

***Significant at the 1% level **Significant at the 5% level *Significant at the 10% level

that the OLS estimates indeed underestimate the effect of FMAP outlays, pointing out, as mentioned earlier, that the effect of an increase in a state's unemployment, and a decrease in state's economic activity, biases the OLS estimates downwards.

The effect of FMAP outlays on economic activity in Specification 4 is precisely estimated, with a *p*-value (not reported in the table- equal to 0.0019. The estimated coefficient indicates that an increase of 1 in FMAP outlays normalized by states' 16-and-older population, led to a 1.61 increase in normalized GSP in 2009. This is, however, a lower bound of the effect of the FMAP outlays on GSP, as it does not take into account the potential effects of the stimulus on economic activity beyond 2009. We discuss the durability of state fiscal relief in the next subsection. This comprehensive specification also gives the most accurate estimate for the fiscal multiplier, an estimate of 1.61, which is at the lower end of the range of 1.5 to 2.1 of the multipliers found in empirical studies that are mentioned in CEA (2014, p. 146).

State fiscal relief will have a "direct" and an "indirect" effect on a state's economic growth. The direct effect consists of the states that can avoid spending cuts and layoffs, while its indirect effects depend on how the nongovernment-related sectors are affected. Chodorow-Reich et al. (2012a, p. 132) show that the effects on both the gains in the governmental and nongovernment-related sectors were substantial.

## Durability

In the previous subsection we presented the estimates of the effect of the FMAP outlays on economic activity in 2009. We now turn to the effects beyond 2009, that is, using Specification 4, we subsequently consider the effect of the FMAP outlays on the change in economic activity (normalized by states' 16-and-older populations) from 2008 to 2010, from 2008 to 2011, from 2008 to 2012 and so on. The estimates of these effects are presented in Fig. 1, in which the solid line is connecting the FMAP outlays coefficients and the dashed lines represent the 95% confidence interval.

Figure 1 shows that the positive effect of the stimulus remained statistically significant until 2012, that is, long into the first term of Barack Obama. Moreover, the estimated positive effects are increasing until 2012. Interestingly, however, not only the statistical significance, but also the positive trend of the positive effects of the stimulus changes after 2012. Firstly, it indicates that, for efficiency reasons, it is important to consider a short time period when estimating the effects of a policy measure (in this case the effects in 2009), as disturbances accumulate over time, making the estimates less precise. Secondly, it may indicate that the positive effect of FMAP outlays on economic activity at the start of the Obama presidency did not last longer than his second term as a president of the U.S.

## Economic Growth

So far, following Chodorow-Reich et al. (2012a), we analyzed the effects of FMAP outlays, normalized by states' 16-and-older population, on the changes in GSP, again normalized by states' 16-and-older population. In this subsection we change the dependent variable into economic growth to provide further evidence that the ARRA worked as an economic stimulus. The estimation results are reported as Specification (6) in Table 3.

The estimation of the effect of the FMAP outlays on GSP growth is again precise with a $p$-value (not reported in the table) equal to 0.0077. The estimated coefficient
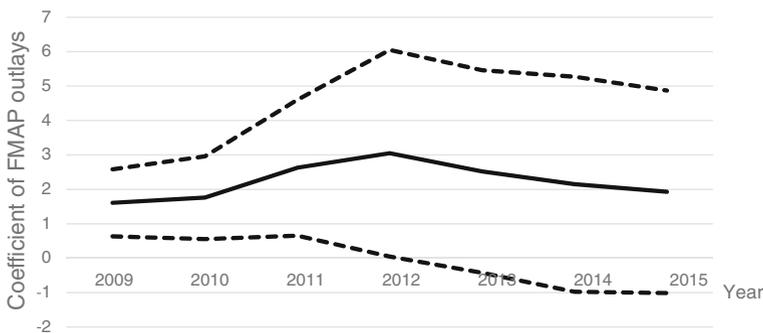


Fig. 1 Second-Stage FMAP outlays coefficients. Note: This figure shows the second stage FMAP normalized by 2008 population 16-and-older outlays coefficients, using Specification (4), where the dependent variable is change in GSP per capita 16-and-older between 2008 and the year indicated on the horizontal axis. The dashed lines represent the 95% confidence interval. Source: Own calculations using data from BEA (2012, 2013, 2014, 2015, 2016), BLS (2009a, b, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017), Chodorow-Reich et al. (2012b)

indicates that an increase of 1 in FMAP outlays normalized by states' 16-and-older population, led to a 2.27% increase of GSP growth in 2009, a result that shows that the state fiscal relief in the form of FMAP outlays met ARRA's purpose to "promote economic recovery".

## Conclusion

Chodorow-Reich et al. (2012a) note that the countercyclical efficacy of intergovernmental transfers are questionable since states could simply use the money to "bolster their rainy day funds", which would have no immediate impact on employment or GSP growth. They find, however, a positive effect of state fiscal relief on employment figures. We extended this analysis by taking GSP growth into consideration and show that the ARRA also has a significant influence on GSP. States can use additional transfers to prevent tax increases and budget cuts, saving jobs and avoiding further GSP contraction, without the delays usually accompanying public expenditure programs. Thus, our results further strengthen by Chodorow-Reich et al. (2012a) that countercyclical intergovernmental transfers can be a quick and cost effective way of alleviating the negative effects of economic downturns.

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