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What determines the Employment Impact of Stimulus Spending?

A Study of the 2009 American Recovery and Reinvestment Act

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Abstract:
This thesis investigates the factors that influence the employment impact of stimulus spending in the context of the 2009 American Recovery and Reinvestment Act (ARRA). The analysis is based on state-level data and employs interaction terms estimated via OLS/IV. Empirical evidence for a significant positive employment impact of ARRA and two influencing factors is provided: The employment impact is 30% higher in states with a one standard deviation higher level of per capita unemployment and 20% lower in states with a correspondingly higher level of household debt. Other factors such as imports or state debt are not found to have an impact.

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1. Introduction

Fiscal multipliers and the accompanying employment impact have been the subject of fierce debate ever since their introduction in the 1930s in the midst of the Great Depression. There is a substantial literature both in favor and against the existence of multiplier effects on fiscal spending and no general consensus on the topic has been reached within the mainstream of economics. While the scientific base for multipliers is not undisputed, governments the world over pursued substantial stimulus measures designed to boost domestic demand and combat unemployment during the 2008-9 financial crisis[1].

The $840 billion American Act for Recovery and Reinvestment (ARRA) stimulus was enacted by the U.S. Congress in February 2009 and consisted $558 billion in additional federal government spending and $282 billion in tax cuts. The cross-state allocation of stimulus spending relied mainly allocation formulas but also aimed at providing extra relief for the states worst hit by the recession. The high level of transparency of ARRA, data on which can be found in great detail on the website recovery.gov, offers the unique opportunity to investigate not only the efficiency of fiscal policy but also the factors it is influenced by.

This thesis will expand the literature on fiscal policy by studying the factors which influenced the employment impact[2] associated with ARRA spending across the 50 U.S. states. The model used is based on the methodology introduced by Wilson (2011) and relies on the analysis of state-level data via an instrumental variable model including interaction terms estimated by the Limited Information Maximum Likelihood estimator. Studying the effects of differing fiscal policy within a monetary union with a common monetary policy and exchange rate regime has the advantage of holding these factors constant and allowing for a more precise study of the fiscal policy itself[3].

Given the cross-sectional methodology, the employment impact estimated in this thesis is *local* by construction. Comparisons between local and national impacts are not straightforward because the local effects could be either higher or lower than the national ones: Local effects refer to the individual states characterized by at least partially mobile production factors, thus implying a lower stimulus impact[4]. However, local impact estimates tend to be higher because they are estimated as *unfunded,* federal taxes being the same across all states and differencing out. Thirdly, monetary policy can be viewed as more accommodative for states, also increasing the effect of stimulus spending (Nakamura & Steinsson, 2011). Since this thesis focuses on investigating factors influencing the employment impact of fiscal spending and not primarily the size of the employment impact, approaches at accurately mapping local to national impacts will not be pursued[5].

[1] For example the US, Japan, Germany, China, South Korea and Russia (Aizenman & Jinjarak, 2010)
[2] Number of Jobs created per million Dollar of government stimulus
[3] Ilzetzki, Mendoza, & Vegh (2010) find that loose monetary policy and fixed exchange rate regimes have a positive influence on the impact of fiscal policy.
[4] This notion is studied later on but no such effect is found, likely caused by the imprecise measurement of interstate mobility
[5] For a thorough discussion, see Nakamura and Steinsson (2011)

This thesis is structured as follows: Chapter 2 reviews the literature on multipliers and the employment impact of fiscal policy, chapter 3 discusses ARRA in greater detail and Chapter 4 discusses the model used. Chapter 5 provides a thorough discussion of the empiric results and chapter 6 formulates a summarizing conclusion.

2. Literature Review

This chapter summarizes the existing literature on fiscal multipliers in general and employment effects in particular. Since the fiscal multiplier and the employment impact of fiscal stimulus spending are closely related concepts and due to be affected by the same factors, the discussion of literature will precede the review of job creation literature. The focus lies on factors that influence fiscal multiplier and/or employment impacts and on studies of the employment impact of ARRA.

2.1. Theoretical Foundation and empirical Evidence for Fiscal Multipliers

This thesis builds on the rich literature in the field of fiscal policy rooted in Keynesian economics characterized by sticky wages and/or sticky prices. The concept of a fiscal multiplier was first introduced by Richard Kahn, a student of Keynes', in 1930 who suggested this multiplier effect under the conditions that there was spare capacity in the economy, accommodating monetary policy, and stable wages remained. Keynes himself published a series of newspaper articles on the subject only in 1933 but included fiscal multipliers as key to the role of government in his seminal work "The General Theory of Employment, Interest and Money" (Snowdon & Vane, 2005).

The fiscal multiplier directly derived from the IS/LM model reads as follows (y being GDP, g government spending, s the savings rate, c the consumption rate, and t the tax rate). This basic expression already shows one key factor impacting the multiplier: The multiplier is positively correlated with the marginal propensity to consume.

$$\frac{\Delta y}{\Delta g} = \Delta g * \frac{1}{s + c * t} = \Delta g * \frac{1}{1 - c * (1 - t)}$$

From a Keynesian perspective, fiscal policy increases overall GDP through increasing aggregate demand: The government´s initial stimulus purchase of goods and services adds to the income flow of households

and private companies which, in turn, increase their own consumption. This additional consumption then starts this cycle anew which continues until reaching equilibrium.

The existence and size of fiscal multiplier has been the subject of a long running debate between economists: While a multiplier larger than 1 is relatively widely accepted among Keynesian economists, proponents of neoclassical economics are much more doubtful of a multiplier´s existence and size[6].

Empirical studies have so far not brought this argument to a conclusion but provide evidence for both sides. While research based on vector auto regressions (VAR) models tends to find relatively large fiscal multipliers, studies employing the Ramey-Shapiro narrative approach find only small multiplier effects [7]. Ramey (2011) traces the differing results between these two approaches to differences in timing and shows that the VAR approach misses the anticipatory negative effect of spending increases on consumption.

While differing modeling approaches and underlying assumptions explain some of the differences between the empirical findings on fiscal multipliers, these results are also likely due to the inexistence of a single fiscal multiplier (Corsetti, Meier, & Müller, 2010). Fiscal multipliers are dependent the nature of the stimulus and the surrounding environment in which extra government spending is effectuated.

Spilimbergo, Symansky, and Schindler (2009) sum up that fiscal multipliers are high when "leakages" are small, monetary conditions are accommodative and the additional fiscal expense is sustainable. "Leakage" describes the share of the stimulus that is not spent on domestic consumption. It is low if the marginal propensity to consume is high, the marginal propensity to import is low and Ricardian Equivalence does not hold, i.e. households do not completely incorporate future tax increases. Accommodative monetary conditions exist when the central bank does not (need to) increase nominal interest rates in order to contain inflation following fiscal expansion and/or the exchange rate is fixed.

Another factor key to the size of the fiscal multiplier is the degree to which private consumption and investment are "crowded out" via higher prices: While an increase in prices in itself leads to lower private consumption and investment, it may additionally trigger an interest rate hike by the central bank and thus exert further negative influence on the private sector. The determining factor for the size of the "crowding out" effect is commonly understood to be the amount of spare capacity present in an economy (Nakamura & Steinsson, 2011): The higher spare capacity, the lower the inflationary response to a rise in government spending and the higher the multiplier[8].

[6] See for example Barro (2009)

[7] Both SVAR and the Ramey-Shapiro approach rely on time series data in order to estimate time-constant fiscal multipliers, they differ critically in how government spending shocks are identified: The VAR method generally imposes an "identification restriction" and then contrasts observed government spending with estimated expected government spending. The Ramey-Shapiro method pursues a narrative/investigative approach to directly estimate spending shocks/increases from official documents and news reports (Ramey, 2011).

[8] Gordon and Krenn (2010) find for example that binding capacity constraints in some industries at the end of 1941 lead to a decrease in the fiscal multiplier from 1.8 at the end of Q2 1941 to 0.88 at the end of Q4 1941.

Using a VAR model and data relating to 44 countries between 1960 and 2007, Ilzetzki, Mendoza, and Vegh (2010) provide empirical evidence for significantly differing multipliers. While they find multipliers of up to 2.5 for government investment in high-income countries, they note that multipliers differ notably when grouping the economies by openness or level of government debt: A high degree of openness and a government debt burden of more than 60 percent are found to impact the fiscal multiplier negatively. Auerbach and Gorodnichenko (2011) use a regime-switching SVAR model and find additionally that fiscal policy is significantly more effective during recessions that expansions.[9]

While most discussion of multipliers centers on the discussion of GDP multipliers, the focus on this thesis will be on the factors influencing the employment impact of stimulus spending, i.e. the determinants of the number of jobs saved or created per million dollars of stimulus spending.

2.2.Previous Research on the Employment Impact of Fiscal Spending

According to the Council of Economic Advisors (2010), there are three different categories of jobs created by stimulus spending: Direct jobs are jobs created/retained by the primary contractors' in order to fulfill increased government orders. Indirect jobs are jobs resulting from the increasing order volume for the primary contractors' subcontractors. Induced jobs are the employment effect resulting from the increased earnings of the workers who hold newly created direct or indirect jobs.

There are a number of studies which analyze the employment impact of fiscal spending and more specifically the effect of ARRA.

The paper most relevant to this thesis is the study by Wilson (2011) on the effect of ARRA: He employs an instrumental variable approach using factors from ARRA's allocation formulas as instruments across the 50 U.S. states in order to estimate that one million dollars of ARRA spending created or saved 10.2 jobs. He concludes that ARRA had a significant employment impact and created/saved 2.0 percent of total nonfarm employment by February 2010. The methodology used by Wilson is used in a modified version for the research purpose of this paper and will be discussed in greater detail in chapter 4.

Chodorow-Reich et al. (2011) investigate the employment effects of the 88 billion dollar federal aid to state government for Medicaid spending. They employ an instrumental variable approach as well and originally propose instrumenting this part of ARRA through pre-ARRA Medicaid spending. Since Medicaid spending varied significantly between the states before ARRA, this instrument can be rightly seen as exogenous. This instrument is incorporated in both Wilson's paper (2011) as well as this thesis. Applying the described methodology, they find that one million of this federal relief creates 38 jobs, 32 of which outside the government, health and education sectors. Wilson, estimating much lower employment effects, analyses this seemingly high estimate and finds no evidence for this effect. He attributes this difference in him including different control variables and accounting for all of ARRA spending.

[9] There are a number of papers such as Corsetti, Meier, & Müller (2010) which arrive at the same conclusion

Feyrer and Sacerdote (2011) follow a cross-sectional methodology as well and estimate that, across all categories of spending, 5.8 jobs are created by one million dollars of spending. By applying Okun's law, they map this estimate to a fiscal multiplier of 1.06, an estimate lower than the 1.6 used in the design of ARRA (Romer & Bernstein, 2009). Their instrument for ARRA relates to the political economy of fiscal spending and consists of the mean seniority of a state's delegation in the House of Representatives. While they do not report any information on first-stage regressions and do not elaborate on the strength of their instrument, there is reason for concern about the weakness of the instrument and the resulting downward bias for the estimates: The allocation of most ARRA spending was rule-based so that political considerations should have played a minor role. Wilson (2011) investigates a number of political variables and consequently finds none suitable as an instrument.

Nakamura and Steinsson (2011) use a panel-data on military procurement spending across regions and employ an instrumentation strategy based on the differential effects of military buildups and drawdowns per state. The applied methodology is similar to the one employed in this paper in that they use a sample across the different U.S. states, thus effectively holding the monetary policy and exchange rate regime constant. They estimate a multiplier on per capita employment of 1.28-1.39 for the change in per capita government spending as a share of per capita GDP[10]. Interestingly, they additionally find that the employment impact of government spending is higher (1.85) during "high slackness" periods. However, due to the small number of business cycles covered, this effect was not estimated statistically significantly. Nonetheless, their results indicate that government spending can have a substantial employment impact which may be even higher during periods of large spare capacity. While direct comparisons between the quantitative estimates are difficult[11], the qualitative relationship between spare capacity and the efficiency of fiscal spending is studied in this thesis as well.

The study of Fishback and Kachanovskaya (2010) is of special relevance in that the employment effects of fiscal stimulus during a time of significant stress are investigated. Using a state-level data set for the great depression between 1930 and 1940 and employing panel-data methods for their analysis, they find that government spending had only a marginal impact on employment numbers. This is surprising because the theoretical considerations and empirical results presented in section 2.1 would point towards a high fiscal multiplier and therefore a strong impact on employment during this time period.

This paper investigates how regional differences in these factors influence the job creation impact of a given amount of stimulus spending.

[10] I.e. a 1 percent increase in defense spending's share of per capita GDP leads to a 1.28-1.39 percent increase in per capita employment

[11] Given the various levels of government, i.e. local, state and federal, it is not clear which number should be used as a base to estimate the change from. The extraordinary circumstances relating to state budgets also make an apt mapping difficult.

3. The American Recovery and Reinvestment Act

The American Recovery and Reinvestment Act (ARRA) was enacted by U.S. Congress in February 2009 and encompasses an estimated $840 billion in fiscal stimulus spending and tax benefits (recovery.gov, 2011): $558 billion (66%) were accounted for by federal spending ($274 billion via contracts, grants, and loans; $284 billion via entitlements), $282 billion (34%) came in form of tax revenue reductions. While these government expenditures are certainly substantial, Aizenman and Pasricha (2010, p. 7) find that ARRA has *"mostly compensated for the negative state and local stimulus associated with the collapsing tax revenue and the limited borrowing capacity of the states"* but not resulted in a large net stimulus after taking these factors into account.

Data on ARRA´s spending components is publicly available in great detail at its official website www.recovery.gov and is reported in two different ways: One dataset is compiled from the reports of the stimulus spending recipients and a second dataset is constructed from the weekly reports of the federal agencies through which fiscal spending is channeled. Since the first dataset only covers roughly half of ARRA spending and is prone to reporting errors and corrections by recipients, the second dataset covering the whole of ARRA spending will be used for analysis. In combination with the publicly available law (Public Law 111 – 5), this wealth of data allows a more detailed analysis in comparison with other fiscal stimuli.

In keeping with the methodology of Wilson (2011), this thesis will focus on the spending parts and exclude Department of Labor (DOL) spending because of a lack of suitable instruments[12] (recovery.gov, 2011). All data on ARRA spending in this thesis will therefore refer to ARRA spending excluding DOL.

The cross-sectional methodology applied in this thesis also requires that spending is allocated to a specific state. Roughly 10% of ARRA spending does not fulfill this requirement and is therefore excluded from the analysis.

The process of spending ARRA funds consists of three distinct stages: Fist, the availability of funds is announced by the respective agency[13], secondly, the funds are obligated to a specific project and recipient, and thirdly, funds are paid out after the (partial) completion of a project.

As pointed out in Wilson (2011), the measure to most likely have the most direct effect on job creation is ARRA obligations: Private contractors are thought to make their hiring decisions at the start of a project, i.e. at the point of time funds are obligated. While the announcement date of funds may be relevant for the hiring decisions of state and local governments, this aspect will not be investigated because the primary subject of interest in this thesis is the impact on private employment and historical data on announcements is not available.

[12] DOL spending accounted for 14% or $66.5 billion of total ARRA obligations through the end of March 2011

[13] A small amount of funds are not announced before they are obligated. Most of these funds pertain to projects that had already started before ARRA´s enactment and were then expanded or had their financing changed

4. Model Specification & Data

This thesis will employ a cross-sectional methodology across U.S. states akin to Wilson (2011) for the study of factors influencing the employment impact of ARRA. In an extension of Wilson (2011), interaction terms will be added to account for the factors influencing the effectiveness of stimulus spending across states.

Wilson's (2011) study relies on a cross-sectional methodology across the 50 U.S. states for the period between February 2009 and February 2010/March 2011. In order to account for the probable endogeneity of ARRA spending, Wilson's instrumentation strategy uses the key statutory factors from ARRA's allocation formulas for the three departments accounting for roughly 80 percent of ARRA spending. Specifically, the spending of the Department of Transportation, the Department of Education, and the Department of Health and Human Services are instrumented. Control variables relating to past change in and level of employment, past personal income growth, the tax benefits resulting from ARRA and the past housing price developments are used.

In comparison to international panel studies, using a cross-sectional approach limited to the federal states of the U.S. excludes possibly confounding factors such as the monetary policy and the exchange rate regime. This allows a more exact analysis of the factors investigated. Additionally, the various country-specific flavors of fiscal stimulus within the context of 2008-9 crises make meaningful comparisons across countries especially difficult.

Limiting the sample to one government spending shock furthermore greatly simplifies the identification problem. Given the specific circumstances of ARRA, the possible anticipation of stimulus spending also seems to have had only a minor impact (Wilson, 2011). This is a major advantage of the applied methodology because identifying the correct point in time when government spending was anticipated is critical to the correct estimation of the effects of fiscal policy (Ramey, 2011).

4.1.Model Selection

This thesis sets out to analyze the interactions between a number of explanatory variables and the estimated employment effects based on cross-sectional data relating to ARRA. Given the relatively small sample size of the 50 U.S. states and the endogeneity issues between the explanatory variable ARRA spending and the employment outcome, the selection of an appropriate econometric setup is a challenging endeavor in itself.

This thesis will modify and expand the approach introduced by Wilson (2011) in order to capture possible interaction effects with the employment impact of ARRA. Specifically, an OLS model with interaction terms will be used to screen a range of variables before confirming the most important findings with an instrumental variable model.

Both OLS and IV methods for the sample at hand are somewhat imperfect: OLS coefficient estimates are potentially biased towards zero because the allocation of ARRA spending to states was partially based on current economic performance, thus leading to endogeneity. The IV-GMM approach by Wilson (2011) accounts for endogeneity and potentially heterogeneous error terms, but failed in a number of runs using this sample data when including endogenous interaction terms: Not only is the econometric fit of the first stage regressions very sensitive to the inclusion of additional instruments accounting for the interaction term but there is also a high likelihood of colinearity in the endogenous variables after instrumentation: Since the instruments for the interaction terms are just a product of the original instruments and the centered variable of interest, the instrumented interaction term reflects for some factor mainly the variation in the stimulus expense variable. If this is the case, the colinearity issue after the first-stage regressions leads to unstable coefficient estimates and skewed standard errors.

The mitigation of the problems associated with the IV approach is only partially possible: Using the Limited Information Maximum Likelihood estimator (LIML) instead of the Generalized Method of Moments (GMM) estimator addresses the IV-GMM's sensitivity towards additional instruments (Stock, Wright, & Yogo, 2002) but is still vulnerable towards colinearity after instrumentation. According to Greene (2002), the LIML estimator performs well in small samples with many over identifying restrictions.

A similarly general solution to the problem of colinearity is unfortunately not available. This thesis will draw on the estimated coefficients and their correlation matrix to determine if the LIML estimator is feasible by screening for coefficient "jumps" and high correlation. Since this process is somewhat arbitrary, the IV-LIML model will not be used for the analysis of the broad set of factors but rather the confirmation of the most striking findings.

For the main part of this thesis, OLS is used to investigate interaction effects because it does not suffer the colinearity issues of the IV approach. Comparing the two methods for a model without interaction terms, the downward bias for the OLS coefficients is apparent but not very strong. Since the main focus of this thesis is not the employment impact itself but rather the influencing factors, this bias is considered acceptable.

Estimation results for the model without interaction term are presented in column (1) of Table 3. Given that the downward bias for the model without interaction terms is significant but still manageable, the bias for the model with interaction terms should be manageable as well. Specifically, since the focus of this thesis are the factors influencing the employment impact, the critical assumption for this approach to be valid is that the endogeneity of ARRA spending should bias both the coefficients on ARRA spending and the interaction term proportionally. This assumption is later shown to be reasonable[14].

While this approach will allow detecting strong interaction effects, it must be noted that failing to reject the null hypothesis of no influence could also be due to the endogeneity problematic and weaker interaction effects may go undetected.

[14] Refer to table 5

4.2.General Model Description

There are two different analytical methods used in this thesis:

OLS

For the main analysis of factors influencing the employment impact, the following model with interaction terms will be estimated via OLS:

$$Y_i = \alpha + \beta_1 S_i + \beta_2[(C_i - \bar{C}) * (S_i - \bar{S})] + \beta_3 * C_i + \boldsymbol{X_i\Gamma} + \varepsilon_i$$

Instrumental Variable estimation via LIML

The variables identified as relevant using OLS are further examined by estimating the following model via IV-LIML[15]:

$$Y_i = \alpha + \beta_1 S_i + \beta_2[(C_i - \bar{C}) * (S_i - \bar{S})] + \beta_3 * C_i + \boldsymbol{X_i\Gamma} + \varepsilon_i$$

$$S_i = \delta_0 + \lambda_0 Y_i + \delta_3 C_i + \boldsymbol{X_i\Theta} + \boldsymbol{Z_i}\Phi + \upsilon_i$$

$$[(C_i - \bar{C}) * (S_i - \bar{S})] = \delta_1 + \lambda_1 Y_i + \delta_3 C_i + \boldsymbol{X_i H} + \boldsymbol{Z_i I} + \eta_i$$

Y_i is the change in per capita private employment between February 09 and February 10

S_i is the cumulative ARRA spending per capita (excl. Department of Labor) in state i until February 10

$[(C_i - \bar{C}) * (S_i - \bar{S})]$ is the interaction term between ARRA spending and a characteristics of state i

C_i is the factor whose interaction with the employment impact of ARRA is of interest

Z_i is a vector of instruments for S_i and $[(C_i - \bar{C}) * (S_i - \bar{S})]$

X_i is a vector of 4 control variables

i denotes the U.S. state (i = 1, …, 50)

[15] The LIML estimator is consistent for normal and non-normal error distributions (Hayashi, 2000)

Interpretation of coefficients

Given the inclusion of interaction terms for the variables of interest ($C_{i,T}$) in the regression, the interpretation of the coefficients requires special care. The key coefficients for this thesis are β_1 and β_2, the coefficients for the effects of ARRA spending and the interaction term on the change of per capita private employment. Since the dependent variable is calculated by subtracting per capita private employment in February 2009 from that in February 2010, effects pertaining to population movements do not influence results.

Within the setup used, the one-year employment impact of ARRA spending (S_i) is:

$$M_{ARRA} = \frac{\mathbf{\Delta} Y_i}{\mathbf{\Delta} S_{i,T}} = \beta_1 + \beta_2 * (C_i - \bar{C})$$

β_1 describes the number of jobs created per $1 million of ARRA spending when the variable of interest is equal to its average, i.e. if $C_i = \bar{C}$.

β_2 is the coefficient for the impact of the variable of interest on the job creation

Since the C variables are of different measurement units than the S variable, the analysis in chapter 5 of β_2 will focus on $\beta_2 * \sigma_{C_i}$, i.e. β_2 multiplied with the standard deviation of C_i . This measure should be interpreted as the in-/decrease of the employment impact when the variable of interest positively deviates by one standard deviation from its mean.

Sample period

The sample period analyzed is the period between the enactment of ARRA in February 2009 until February 2010. This period length is chosen because the one-year employment impact is of special interest in the literature (Wilson, 2011) and the effects of ARRA are most clearly discernible in this period which accounts for the bulk of overall ARRA spending. Given the small sample size and the large economic fluctuations during this time period, a longer sample period would obscure interaction effects.

4.3. Dependent Variables, Control Variables & Instruments

Dependent & explanatory variables

Change in employment

The main measure used to gauge employment refers to the change in seasonally adjusted per capita private nonfarm employment between February 2009 and February 2010. Private employment is computed as total nonfarm employment minus local, state and federal employment. The data is published by the Bureau of Labor Statistics (BLS) within the Current Employment Statistics (CES) programs and draws on a payroll survey of over 400.000 businesses.

Private employment is used for two reasons: Primarily, research on employment effects is focused on the creation of private sector jobs because the number of public sector jobs that can be created follows straightforward from the amount of stimulus spending available. Secondly, employment dynamics arguably differ significantly between the public and private sector so that including public sector employment would distort results downwards[16].

ARRA spending

As discussed in chapter 3, there are three different measures for ARRA spending which mostly differ on timing: ARRA funds announcements, obligations, and actual payments. This thesis will use ARRA obligations as its spending measure because it is most relevant to private employment and was found to have the greatest predictive power by Wilson (2011). Department of Labor (DOL) spending was excluded because of the strong endogeneity between the unemployment benefits accounting for the majority of DOL ARRA spending and the dependent variable change in employment. Spending that was not allocated to a specific state was excluded as well. The data was collected from the agencies reports for the end of February 2010 published on recovery.gov.

[16] E.g. public sector employment is heavily dependent on the budget and reacts more sluggishly to changing economic conditions

Control variables

The composition of the set of control variables follows the paper of Wilson to ensure comparability. Specifically, X_i is a vector of 4 control variables and the variable of interest C_i :

Past employment growth & initial level of employment

Following Blanchard and Katz (1992), lagged employment growth and the initial level of employment are included as controls variables. Both variables relate to private per capita employment and were constructed using data from the Bureau of Labor's Current Employment Statistics (CES) and scaled by population estimates from the Census Bureau.

Specifically, the change in employment is calculated for the time period between December 2007 and February 2009 in order to reflect the impact of the financial crisis on the employment situation in the respective states and initial employment refers to private per capita employment in February 2009, the month of ARRA´s enactment.

2005-2006 change in 3-year trailing average of personal income per capita

The change in 3-year trailing average of personal income per capita is included in the regression following Wilson (2011) in order to account for possible mean convergence effects between the different states. It seems also likely that states which disproportionally from the credit bubble during the business cycle upswing of the mid-2000s would fall hardest during the 2008-9 crisis.

ARRA tax benefits

While the focus of this thesis is on the analysis of the impact of stimulus spending within the context of ARRA, it is nonetheless necessary to control for the substantial tax benefits which were also part of ARRA. Since no state data on these benefits is disclosed, per capita tax benefits are estimated following the methodology used by Wilson (2011) who adapted the Center for Budget and Policy Priorities' method. The state-level impact of both the "Making Work Pay" (MWP) tax cut and the increase of income thresholds for the Alternative Minimum Tax (AMT) are estimated by allocating cost estimates from the Council of Economic Advisors (2010) to the individual states according to a state's national share of beneficiaries. Data for the allocation of MWP was sourced from the IRS and AMT benefits were allocated based on data from the Tax Policy Center. For a more detailed description see Wilson (2011).

Since this variable is only an estimate and does not take the sizable tax credits for businesses into account, the coefficients describing its impact should be interpreted cautiously.

Table 1 provides summary statistics for dependent, explanatory and control variables.

Table 1: Dependent, Explanatory & Control Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Feb09-Feb10 Chg. Private Empl.	50	-0.0147	0.0045	-0.0273	-0.0050
ARRA obligations ($M)	50	0.0008	0.0002	0.0006	0.0017
2005-6 Change of 3yr PI average	50	0.0007	0.0010	0.0001	0.0061
Tax Benefits ($M)	50	0.0006	0.0001	0.0004	0.0009
Private Employment Feb09	50	0.3680	0.0351	0.3072	0.4361
Dec07-Feb09 Chg. Private Empl.	50	-0.0224	0.0100	-0.0541	-0.0028

Instruments

The choice of instruments for ARRA spending follows mainly Wilson's (2011) instrumentation strategy: ARRA spending is instrumented through the central statutory factors in the allocation formulas of the agencies with the largest share of total ARRA spending (excl. DOL). This approach is particularly appropriate because a large share of ARRA spending (excl. DOL) was accounted for by a small number of agencies and their spending was largely allocated to the states based on formulas relating to exogenous factors.

Contrary to Wilson who uses spending of the Department of Transportation (DOT), the Department of Education (ED), and the Department of Health and Human Services (HHS), this thesis only uses HHS and DOT. This slight change is done in order to avoid weak instrumental variable bias resulting from the limited explanatory power of ED spending and the additional instruments necessitated by the inclusion of the interaction term[17].

The instrument Health and Human Services (HHS) spending is based on the allocation formula for the $87 billion State Fiscal Relief Fund meant which temporarily increased the reimbursement of state Medicaid expense. The instrument used is equal to 6.2% of the 2007 fiscal year per capita Medicaid spending per state.
Department of Transportation (DOT) spending is instrumented via the factors determining the funding of the Surface Transportation Program which relate to a state's highway network, highway usage, tax income and Federal Highway Administration funding.

While an effort was made to construct these instruments from the underlying data, the somewhat imprecise description of the specific data and methods used on Wilson's part made these values with a correlation of only 0.89 too imprecise. Therefore, the data used for all the calculations is data directly provided by Mr. Wilson and will be publicly available in the, as yet unpublished, newest version of his paper. A more detailed discussion of the construction and validity of these instruments can be found in the current version of Wilson's paper (p.14-16, 2011).

[17] See Stock, Wright, and Yogo (2002)

Given that the included interaction term relates to a possibly endogenous variable, it needs to be instrumented for as well. For these instruments, the approach suggested by Wooldridge (2002, pp. 121-122) is pursued, i.e. the centered variable of interest is multiplied with the original instruments.

$$Z_{INT1_i} = (C_i - \bar{C}) * Z_{DOT_i}$$

$$Z_{INT2_i} = (C_i - \bar{C}) * Z_{HHS_i}$$

4.4.Interaction Terms

Based on chapter 2, it is clear that there are a variety of factors that may influence the impact of stimulus expense. The methodology of this thesis is consciously set up to exclude the effects of a number of these factors such as monetary policy and exchange rate regime in order to allow for the more accurate analysis of others.

Per capita household debt

One factor that is likely to have a strong negative impact on the marginal propensity to consume and therefore the employment impact of fiscal spending is household net wealth. Sousa (2009, p. 19) finds empirical evidence for exactly this impact and additionally notes that "consumption seems to be very sensitive to financial liabilities". This means specifically that when household (net) wealth is low, additional stimulus income is likely to go towards increasing household wealth instead of consumption. While Ilzetzki, Mendoza, and Vegh (2010) find evidence for a negative effect of high government debt on the fiscal multiplier, the effect of private debt has not yet been studied.

This thesis will close this gap by analyzing the effects of per capita household debt, mindful of the uncertainties in measuring household wealth, on the employment impact of ARRA spending. One problem related to including household debt in the regression is that its main component mortgage debt may correlate with other unobserved factors impacting the economy. Non-housing related debt, e.g. student and car loans, will therefore be used in order to avoid any such problems. The data used refers to per capita household debt in 2008 as estimated by the Federal Reserve Bank of New York Consumer Credit Panel

Spare capacity

The original justification for the use of fiscal stimulus is the existence of spare capacity in the private sector. Fiscal stimulus should have the largest effect in situations when there is substantial spare capacity because the "crowding out" of private sector consumption and investment is less pronounced.

While there is no single measurement for spare capacity, there are a number of ways of estimating it: One may measure the deviation from trend growth, use a structural formula for potential GDP (e.g. a Cobb-Douglas function) and then measure the deviation, conduct surveys with businesses or measure factor (under-) utilization. For reasons of data availability, consistency with the model and simplicity of approach, this thesis will pursue the fourth approach and measure labor force utilization both by the change in per capita private employment and per capita unemployment between December 2007 and February 2009[18]. Using data on per capita unemployment instead of the unemployment rate avoids downward bias due to the changing size of the labor force. The specific period is chosen because most states were close to equilibrium employment in Dec 2007 and it is reasonable to assume that there was only little spare capacity at that point in time. Using a contemporaneous measure for spare capacity furthermore has the advantage of being applicable in policy making.

The specific data is sourced from the BLS's CES and is also is included in all regressions as a control variable. The scaling of the variable relating to employment (instead of unemployment) is conscious since it is not impacted by effects such as voluntary unemployment or the changing size of the labor force.

Marginal Propensity to Consume

The marginal propensity to consume (MPC) is another key factor for the size of the employment impact of fiscal spending: Since a high MPC increases the percentage of any extra stimulus income that pushes demand, the employment impact is increasing in MPC. While the theory on MPC is clear, observability and stability over time are a serious issue: The MPC is inherently unobservable and not necessarily stable over time. In addition, there is a scarcity of MPC estimate on a state-level: Luengo-Prado and Sørensen (2004) estimate MPC as the covariance of changes in income and changes of consumption over the variance of changes in income using data for the period between 1964 and 1998. Since this MPC by measure refers to a time period in the not so recent past, the fairly strong assumption of long-term intertemporal stability of MPC is required.

Given the potential for intertemporal changes in the MPC, a new measure is calculated based on more recent data on state sales taxes and personal income: In a first step, state-level per capita retail sales are estimated following Zhou (2008) by dividing state sales tax receipts through the state sales tax rate and population for the years 2003 to 2008. In a second step, the change yearly elasticity of per capita retail sales to per capita personal income is calculated. Then, the average is taken after dropping the highest

[18] when including the change in unemployment, the control variable change in employment is dropped because of a high correlation of -0.75

and lowest observations. This measure is much more recent then the one by Luengo-Prado and Sørensen (2004) but suffers the same fundamental weakness: The MPC may fluctuate quite significantly over time. Given the strains on household income resulting from the financial crisis, this instability may have been reinforced.

$$MPC_{retail,t} = \frac{\frac{\Delta\, retail\ sales_{t,t-1}}{retail\ sales_t}}{\frac{\Delta\, p.c.income_{t,t-1}}{p.c.income_t}}$$

Comparing the values estimated via this method with empirical estimates, they seems roughly in line with the results of Parker, Souleles, Johnson, and McClelland (2011) who find a spending response of 50-90% for the 2008 economic stimulus payments. The variability of the estimated MPC via the method above does however seem somewhat excessive.

State debt

State finances may have an impact of the household reactions to increase income from stimulus spending by influencing the expectations of economic actors: State debt can be interpreted as the present value of future tax increases[19] and therefore lead to the same effects as private sector debt. Another possible channel through which state debt may influence the employment impact is the fiscal sustainability of stimulus[20]: Since at least part of ARRA was channeled through state agencies, the sustainability of this extra spending depends crucially on the state of state finances. The specific variable used is the value of per capita state debt in 2008 sourced from the Census Bureau.

Marginal Propensity to Import (MPI)

Trade may influence stimulus effects in two ways: The purchase of imports may lead to the "leakage" of stimulus, i.e. extra income resulting from stimulus spending is being spent in another state, thereby decreasing the effectiveness of stimulus spending. Exports on the other hand may lead to the "import" of stimulus induced extra income from other states, thus resulting in a positive employment reaction to other states stimulus receipts. Due to the diluted nature of the second effect, this thesis will only investigate the effect of imports on ARRA´s employment impact.

Ilzetski, Mendoza and Vegh (2010) group economies by openness (measured as the sum of exports and imports divided by GDP) and find that the fiscal spending multiplier in open economies is smaller than in

[19] This insight is key to the Ricardian Equivalence Theorem (Barro R. J., 1989)
[20] Barro and Redlick (2009) find higher fiscal multipliers for spending increases considered permanent

closed ones. This thesis will therefore seek to discern if this relationship holds for individual U.S. states as well.

An analysis of the marginal propensity to import is complicated by the fact that this factor is not observed and therefore needs to draw upon an estimate. Mindful of the other variables construction, this thesis will use the per capita dollar amount of imports as proxy. The data used for this proxy relate to the value of interstate trade between U.S. states and stem from the 2007 Commodity Flow Survey (CFS) published by the Bureau of Transportation (following Nakamura & Steinsson (2011)). The CFS is a survey of shipping companies published every five years containing information regarding the value, destination and origination of shipments.

This measure is limited in that it does not account for trade in services and is only published every five years. While excluding the trade in services may bias results, should it be correlated with trade in goods, no more comprehensive dataset is available. The timing of the last CFS is also fortunate in that it repots trade just before the start of the financial crisis.

$$per\ capita\ imports = \frac{Value\ of\ total\ incoming\ shipments_{2007} - intrastade\ shipments_{2007}}{population_{2007}}$$

Labor market flexibility

While the before factors have focused on the demand side of the economy, differences on the supply side may also influence ARRA's employment impact. In general, labor market flexibility may impact the employment impact of fiscal policy positively through the ability and willingness of firms to create new jobs in response to demand shocks induced by stimulus spending (Di Tella & MacCulloch, 2004). However, since this thesis measures the effect on the overall employment change and not job creation, labor market flexibility may also have negative impact on employment in that it allows for a faster adjustment of labor force to change economic conditions.

Given that labor market flexibility is inherently unobservable, a number of proxies are employed:

A state's per capita union membership may contain information on the ability of a state´s firms ability to downward adjust workforces easily and therefore also their willingness to increase them when demand exceeds expectations. Given that union membership in the U.S. is, with a mean of 11.5% across states, generally low, this effect may not be discernable. However, since strong unions are likely to influence labor market regulations in a way profiting all workers, union membership may nonetheless serve as a valid indicator. The specific values used were estimated by Hirsch, Macpherson, and Vroman (2001) and refer to each state's the percentage of nonagricultural workers who are union members.

Another proxy based on the same rationale is the minimum wage which was legally binding in 45 of the 50 states in 2008. Analogously to the union variable, it is assumed that a higher minimum wage

corresponds to a higher degree of labor market regulation. The data is source from the Department of Labor; in case minimum wages differ by sector, the average is taken.

The third proxy thought to measure the same concept is taken from the report "Freedom in the 50 States" by Ruger and Sorens (2009) and refers to the "freedom of workers". The index scores states on their labor regulations, e.g. the existence of a "right to work" law, the minimum wage, and a number of employee protection laws.

Population density

Another factor that may influence the employment impact of fiscal spending is the states' population density. It correlates strongly with urbanization and there are a number of reasons for expecting a different reaction of rural and urban states to stimulus spending: The economic performance of rural areas is lower than that of urban areas, rural areas exhibit lower productivity, the work force in rural areas in on average lower educated, and the industry in rural areas is skewed towards agriculture, construction, and manufacturing (Porter, Ketels, Miller, & Bryden, 2004).

Table 2: Interaction terms

Variable	Obs	Mean	Std. Dev.	Min	Max
Per Capita Non-housing household debt ($K)	50	10.54	0.913	8.69	12.39
Dec07-Feb09 Chg. Private Empl.	50	-0.02	0.01	-0.05	-0.00
Dec07-Feb09 Chg. Unempl.	50	0.016	0.0056	0.0047	0.02833
MPC (LPS)	50	0.39	0.191	-0.17	0.81
MPC (retail)	44	0.83	0.586	-0.38	3.21
MPI – Per Capita Imports ($K)	50	23.60	5.221	8.47	34.93
Per Capita state debt ($1000)	50	7.67	2.427	3.74	14.49
Union membership	50	11.50	5.802	3.5	24.9
2008 Minimum Wage ($)	50	5.85	2.213	0.00	8.07
Mercatus work freedom Index	50	0.13	1.526	-2.97	2.36
Population density	50	74.61	99.774	0.47	455.76

5. Analysis of the Empirical Results

5.1.Empirical Results

While the specific coefficients on the various variables are presented in Tables 3 through 6, the key findings can be summarized as follows: Non-housing related household debt is found to have an economically and statistically significant negative effect on the employment impact of ARRA. Change in Unemployment as a measure for spare capacity has a positive and statistically significant influence on the employment impact of ARRA spending. Other factors such as a state's union membership or per capita imports are not found to impact the employment impact of ARRA.

Excluding all factors which may impact the employment impact of fiscal spending and including only the control variables, the employment impact is estimated at 11.69 with a standard error of 3.47. This result is consistent with Wilson (2011) and a report of the Congressional Budget Office (2011).

Table 3: OLS & IV-ISLM results for change in private employment and household debt

	(1)		(2)		(3)	
estimator	**OLS**	**LIML**	**OLS**	**LIML**	**OLS**	**LIML**
ARRA obligations ($M)	**11.69**	**20.85**	**13.33**	**24.48**	**15.58**	**20.78**
Std. error	**3.43**	**5.52**	**5.13**	**7.80**	**3.55**	**5.15**
Dec07-Feb09 Chg Private Employment			**0.16**	0.08		
			0.06	0.08		
Interaction term			-140.29	-517.03		
			324.23	436.91		
Non-housing household debt					0.00	**0.00**
					0.00	**0.00**
Interaction term					**-3.98**	**-4.37**
					2.05	**2.35**
2005-6 Change of 3yr PI average	**-2.11**	**-3.04**	**-2.19**	**-3.10**	**-1.84**	**-2.33**
	0.62	**0.76**	**0.65**	**0.78**	**0.58**	**0.65**
Tax Benefits ($M)	3.94	3.14	3.54	1.87	3.99	3.42
	4.91	4.98	5.05	5.06	4.62	4.44
Private Employment Feb09	-0.01	0.00	-0.01	0.00	-0.01	-0.01
	0.02	0.02	0.02	0.02	0.02	0.01
Dec07-Feb09 Chg Private Empl.	**0.17**	0.09			**0.15**	**0.11**
	0.06	0.07			**0.05**	**0.06**
Constant	**-0.02**	**-0.03**	**-0.02**	**-0.03**	-0.01	-0.01
	0.01	**0.01**	**0.01**	**0.01**	0.01	0.01
R squared	0.50	0.42	0.50	0.44	0.61	0.59
First Stage F - ARRA spending		14.78		18.18		10.99
First Stage F – Interaction term				17.59		14.46
Mean VIF			2.14		1.62	

Bold coefficients are statistically significant at the 10% level or lower

Table 4: OLS & IV-ISLM Results for the Change in Unemployment

	(4)		(5)	
estimator	**OLS**	**LIML**	**OLS**	**LIML**
ARRA obligations ($M)	**15.64**	**25.75**	**22.25**	**30.29**
Std. error	**3.34**	**4.85**	**4.30**	**5.58**
Dec07-Feb09 Chg Unemployment	-0.11	-0.02	-0.08	-0.03
	0.10	0.11	0.10	0.10
Interaction term			**1094.4**	**1742.6**
			477.99	**601.05**
2005-6 Change of 3yr PI average	**-2.57**	**-3.53**	**-2.67**	**-3.13**
	0.66	**0.75**	**0.63**	**0.65**
Tax Benefits ($M)	5.53	3.32	3.74	1.77
	5.39	5.61	5.21	5.10
Private Employment Feb09	0.00	0.01	0.00	-0.01
	0.02	0.02	0.02	0.02
Constant	**-0.03**	**-0.04**	**-0.03**	**-0.04**
	0.01	**0.01**	**0.01**	**0.01**
R squared	0.42	0.30	0.48	0.40
First Stage F - ARRA spending		14.87		19.73
First Stage F – Interaction term				16.63
Mean VIF	1.40		1.74	

Bold coefficients are statistically significant at the 10% level or lower

Household Debt

Per capita non-housing household debt is found to have a statistically significant and economically meaningful negative impact on the employment impact (OLS β_2 = -3.98 , p = 0.06). In a state with a one standard deviation higher per capita debt, the employment impact is only 11.95 per million dollar or 19% lower than average (refer to table 5).

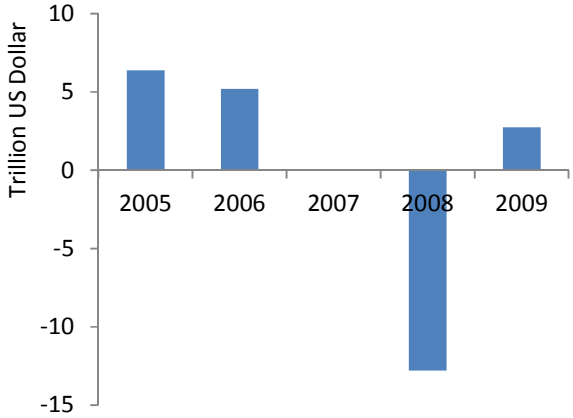
Given that the measure used for debt is the per capita amount of debt that is unrelated to housing[21] it is unlikely that the measured effect is due to colinearity. A mean VIF of 1.62 also gives no reason for concern. Deviating from the baseline specification and including the 2003-7 change in housing prices does not change the results in a meaningful way.

Household debt impacts the effectiveness of stimulus spending negatively via the *net wealth effect*: A high debt burden induces households to use additional income for debt reductions instead of consumption, thus lowering the MPC.

[21] i.e. mortgage debt and home equity line of credit debt are excluded

While it is generally accepted that net wealth[22] has a positive impact on consumption, the influence on the MPC is less clear. Specifically, this argument rests on the hypothesis that the properties of MPC differ between outside-of-equilibrium and equilibrium states. Contrary to the common view[23] which holds that households with a low net worth have a higher MPC than households with high net worth, a study of Shapiro and Slemrod (2009) finds empirical evidence to the contrary:

Figure 1: Change in Household Net Wealth



Source: Federal Reserve

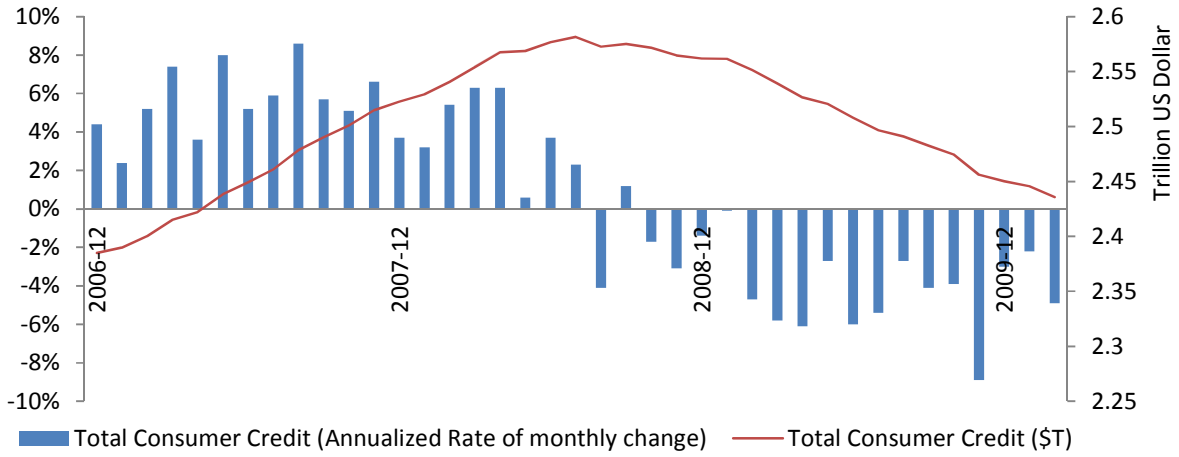
They survey recipients of the 2008 tax rebates, enacted by the Bush administration as a response to the 2008-9 crisis, and find that "*low income individuals were particularly likely to use the rebate to pay off debt*" (p.2), i.e. increase net wealth. The authors hypothesize that these low-income, liquidity constrained households do not follow the theoretical prediction of high consumption spending because they foresee that they will likely be liquidity constrained in the future as well. Thus, they rather improve their balance sheet than increase current consumption. Since Shapiro and Slemrod's study is based on survey data collected just one year before ARRA and for the same crisis, it is likely that the same behavioral patterns hold true for ARRA spending as well. The authors specifically suggest that *"the impetus to save a windfall [income increase] might be even stronger now"* (p.11).

Precautionary savings may also contribute to the observed result: Guerrieri and Lorenzoni (2011) show that a tightening of credit conditions for households leads to higher savings: Credit-constrained households are forced to delever and unconstrained households build up reserves because there is less credit available for responding to possible future shocks. Since high debt is likely to be connected to tighter credit conditions higher debt would therefore lead to a lower MPC. Figure 2 shows that credit conditions did indeed tighten substantially.

[22] There is a general consensus that household wealth has a significant impact on household consumption, see Sousa (2009) for an overview of the literature

[23] See for example Spilimbergo, Symansky, and Schindler (2009) and Eggertsson and Krugman (2010)

Figure 2: U.S. Consumer Credit: Dec 2006 – Feb 2010



Source: Federal Reserve

Spare Capacity

The results for the impact of spare capacity, measured by the change in per capita employment between December 2007 and February 2009, agree with the theoretical prediction that higher spare capacity increases the effectiveness of fiscal policy. For OLS the β_2 is estimated with -140.29, however the p value of 0.66 is very low. Applying the instrumental variable approach, β_2 increases to -517.03 and the p value reaches 0.23. While the interaction effect of the change in employment is still not statistically significant, applying the IV approach substantially improved its statistical relevance. Given the small sample size of only 50 states and the limited sample period, estimating interaction effects with statistical precision is difficult.

Using the change in per capita unemployment between December 2007 and February 2009, the positive impact of unemployment on the efficacy of ARRA spending is strongly positive and statistically significant (β_2 = 1094.4, p = 0.03). These coefficients translate into a 28% higher employment impact in a state with a one standard deviation higher change in unemployment per capita (refer to table 5). Since one control variable, the change in employment, is dropped because of colinearity, results are reported separately in table 4.

These results concur with the theory outlined in chapter 2 and confirm the tentative results of Nakamura and Steinsson (2011). They find the same directional effect for the fiscal multiplier, but cannot estimate it with statistical significance.

Comparing the results from the OLS and IV-LIML regressions for private employment and household debt, the assumption of a small bias for the OLS results made in chapter 4 is born out: While the coefficients do differ for the two estimation methods, relating the interaction effect to the average effect shows that the downward bias of OLS is manageable (refer to table 5): While the OLS bias for household debt and the change in unemployment is negligible, the OLS bias for the change in employment is about 50%.

Table 5: Comparison OLS/IV-LIML results

	σ	$\beta_{1,OLS}$	$\beta_{1,IV-LIML}$	$\beta_{2,OLS}$	$\beta_{2,IV-LIML}$	$\frac{\beta_{2,OLS} * \sigma}{\beta_{1,OLS}}$	$\frac{\beta_{2,IV} * \sigma}{\beta_{1,IV}}$
Chg in employment	0.0100	13.33	24.48	-140.29	-507.03	-0.11	0.21
Chg in unemployment	0.0056	22.24	30.29	1094.41	1742.56	0.28	0.32
Household debt	0.9130	15.58	20.78	-3.98	-4.37	-0.23	-0.19

These results confirm the selected approach of relying on OLS for the investigation of a broad range of factors possibly influencing the employment impact of ARRA.

Marginal Propensity to Consume

Both factors examined work through the MPC and a finding that would support the reasoning outlined above would be that the MPC was not stable across time. While conclusively investigating this matter is outside the scope of this paper, the impact of two static MPC measures on ARRA's employment impact is investigated. Since the theoretical foundation for a positive impact of the MPC on the effectiveness of fiscal stimulus is very solid, failing to find an impact of MPC on the ARRA's effectiveness casts doubt not on the underlying theory but on the information content of the MPC measures used. Specifically, failing to detect a positive impact of MPC on the ARRA's employment impact provides tentative evidence that the static MPC measures used don't reflect the actual MPC and that the actual MPC fluctuates significantly over time. This would allow for the wealth effect and other effect having a significant impact on the MPC.

The empirical results from the analysis do not provide evidence for an impact of either MPC measure on the employment impact of ARRA: The MPC measure estimated by Luengo-Prado and Sørensen (2004) based on 1960-1998 data does not have a significant impact on the multiplier and the point estimate is negative (β_2 = -19.09 , p = 0.18). Since the MPC' effect is without doubt positive, this result implies that this measure for MPC is actually not a good proxy for the MPC during 2009-10. The second measure based on retail sales' income elasticity between 2004 and 2008 is found to have a positive impact on ARRA's employment impact in the baseline specification (β_2 = 10.85, p = 0.08). However, this value seems to results from colinearity with the change in personal income variable and the result does not hold up to the exclusion of the control variables.

Given that there is no evidence for a positive effect of the two static MPC measures on the fiscal policy effectiveness, the solid theoretical backing for this effect implies that these measures do not reflect the MPC in 2009-10. The MPC seems to be not constant over time but rather vary substantially, driven by factors such as the net wealth effect.

State Debt

Estimating the effects of per capita state government debt on the ARRA's employment impact, one does not find a statistically significant effect (β_2 = -0.79 , p = 0.31). While this finding could be seen to conflict with Ilzetzki, Mendoza, and Vegh (2010) who find that government debt has a decisive negative impact on fiscal multipliers, a careful examination of the theory behind fiscal multipliers discourages this view: Government debt influences the multipliers via the agents' perception of the increase in government spending's sustainability and the potential for a contraction of government spending in the near future (Spilimbergo, Symansky, & Schindler, 2009). Both these rationales apply at best partially in this case: ARRA was always planned to be only a temporary measure and even though some ARRA funds were channeled through state governments, the ultimately source of the stimulus funds was known to be the federal government. Any future spending reductions relating to ARRA spending would occur on a federal level.

Another reason for the measured insignificance of state debt is that this analysis excludes state and local government employment, the part of employment which could be reasonably expected to be most directly impacted by a high state debt level through direct employment cuts.

Marginal Propensity to Import

The coefficient for the per capita amount of import, the proxy for the marginal propensity to import used, is not statistically significant when including all the control variables (β_2 = -0.12, p = 0.89). This is probably due to the difficulty in measuring the marginal propensity to import discussed before. An indication that the MPI actually does have a negative impact on the effectiveness of fiscal spending[24] is that in the model without control variables, the import variable is found to have a statistically significant negative impact on the employment impact.

Labor market flexibility

Investigating the effect of labor market flexibility as measured by a state´s workers' share of union membership, no effect on private employment change is found (β_2 = -0.55 , p = 0.14). Other measure for

[24] This effect is well grounded in theory and has been shown empirically by Ilzetzki, Mendoza, & Vegh (2010)

labor market flexibility such as the level of a minimum wage in 2008 and the Mercatus Center's work freedom index are not found to be statistically different from zero.

However, using the net change of private employment, i.e. jobs lost subtracted from jobs created, may obscure two counteracting effects: A higher share of union membership and the labor friendly state legislation may on the one hand impede new job creation resulting from extra stimulus income and on the other hand hinder the firing of workers in general. Given the small data sample available, these two effects may not be able to be differentiated out completely. Given that the point estimate for the interaction term is negative and its p value of 0.14 fairly close to statistical significance at the 10% level, there seems to be some indication for a negative effect of union membership.

Population density

The last variable analyzed is a state's population density. Contrary to the empirical evidence for the field of monetary policy (Francis, Owyang, & Sekhposyan, 2011), the empirical results show no impact of population density on the employment of ARRA spending (β_2 = 0.03, p =0.41).

Table 6: OLS results for other factors

	(1)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ARRA obligations ($M)	**11.69**	**12.12**	**22.28**	**19.11**	**11.77**	**15.96**	**12.67**	**11.66**	**11.96**
Std. error	**3.43**	**3.32**	**4.39**	**4.68**	**3.61**	**4.64**	**5.44**	**4.56**	**3.52**
MPC (LPS)		**-0.01**							
		0.00							
Interaction term		-19.09							
		14.07							
MPC (retail)			0.00						
			0.00						
Interaction term			**10.85**						
			5.99						
State debt ($K)				0.00					
				0.00					
Interaction term				-0.78					
				0.76					
MPI - Imports ($K)					0.00				
					0.00				
Interaction term					-0.12				
					0.86				
Union membership						0.00			
						0.00			
Interaction term						-0.55			
						0.36			
2008 Minimum Wage ($)							0.00		
							0.00		
Interaction term							-0.38		
							2.99		
Mercatus workfreedom index								0.00	
								0.00	
Interaction term								0.08	
								2.21	
Population density									0.00
									0.00
Interaction term									0.03
									0.03
2005-6 Chg of 3yr PI average	**-2.11**	**-1.96**	**-2.91**	**-2.81**	**-2.10**	**-2.36**	**-2.17**	**-2.12**	**-2.00**
	0.62	**0.61**	**0.64**	**0.67**	**0.69**	**0.65**	**0.68**	**0.64**	**0.64**
Tax Benefits ($M)	3.94	7.32	3.78	9.28	4.48	5.35	5.01	3.59	3.11
	4.91	5.01	4.49	5.69	5.28	5.82	5.59	5.83	8.42
Private Employment Feb09	-0.01	-0.03	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Dec07-Feb09 Chg Private Empl.	**0.17**	**0.15**	0.09	**0.13**	**0.16**	**0.16**	**0.16**	**0.17**	**0.18**
	0.06	**0.06**	0.06	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**
Constant	**-0.02**	-0.01	**-0.03**	**-0.03**	**-0.02**	**-0.02**	**-0.02**	**-0.02**	**-0.02**
	0.01	0.01	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
R squared	0.50	0.56	0.64	0.56	0.50	0.53	0.50	0.50	0.51
Mean VIF		1.56	1.58	2.24	1.57	1.95	2.39	1.85	2.16

Bold coefficients are statistically significant at the 10% level or lower

5.2. Discussion

The employment impact by ARRA estimated in this thesis agree with theories which postulate that fiscal expansion during crisis time can have a significant labor market impact in times of crisis, supporting the results of Wilson (2011) , Nakamura and Steinsson (2011) and Chodorow-Reich et al. (2011) and the rationale of ARRA itself. Since the employment impact estimated is to be interpreted as unfunded and stems from a time of very accommodative monetary policy, the results do not necessarily contradict studies which estimate small or zero fiscal multipliers across a longer time horizon[25].

Finding that per capita household debt has a negative effect on the effectiveness of ARRA is revealing in that it shows that the private sector was crucial to the efficacy of ARRA and is critical for fiscal policy more generally. ARRA was found to be roughly 20% less effective in states with a one standard deviation higher per capita household debt. Since the 2008-9 crisis was widely describe as a "balance sheet recession", this finding does not come as a surprise but emphasizes the importance of taking local area conditions into account when designing fiscal stimulus programs.
Current literature on fiscal policy had so far only found evidence for an effect of government debt on the fiscal multiplier; this thesis expands the literature by providing empirical results for the effects of household debt on ARRA's employment impact. In contrast with the findings by Ilzetzki, Mendoza, and Vegh (2010) who find that fiscal multipliers are negatively affected by the government debt to GDP ratio after reaching the threshold of 60%, the findings of this thesis point to private household debt having an effect independent of certain thresholds.

The results in regard to the impact of unemployment on the employment impact are interesting in that they confirm the theoretical prediction of high spare capacity leading to more effective fiscal policy and quantify the impact: In a state that experienced a one standard deviation higher change of per capita unemployment from equilibrium, the impact of ARRA spending on job creation is found to have been roughly 30% higher than average. Interesting to note is that it is not a model using per capita unemployment that provides these results, but a model using the change in per capita unemployment. This implies that it is crucial to distinguish between true spare capacity and structural unemployment, simply using the unemployment as a measure for spare capacity is imprecise.

From a policy perspective, the results confirm the common understanding that fiscal stimulus is most effective in areas with the highest degree of spare capacity. Policy makers should also incorporate information on the balance sheet situation of households and firms into the decision making process for stimulus spending, allocating relatively more spending to areas with a high degree of private per capita debt.

[25] For example Barro and Redlick (2009)

5.3. Limitations

The chief limitations of this thesis are the short sample period and the small overall sample size. A broader sample would allow a more detailed investigation of the influencing factors, possibly making the use of a model with two interaction terms feasible. Future research should consider using county or congressional district level data for analysis.
Another limitation stemming from the data is the dearth of cross-state data on the (net) worth of households; this complicates measuring the impact of the wealth effect on the effect of ARRA.
Additionally, given the unique situation of the U.S. economy in 2009-10, it is not self-evident that the findings of this thesis hold for other countries and time periods. A study investigating the same factors in a different country at a different point in time could support the case for the universality of the presented results.

6. Conclusion

This thesis investigates factors impacting the employment impact of stimulus spending via a combination of OLS and IV-LIML models based on cross-sectional data for the 2009 American Act for Recovery and Reinvestment (ARRA). While OLS is used to screen a broad range of factors, the IV approach is used to investigate the key findings. This approach reflects concern for possible colinearity after instrumentation while accounting for the endogeneity between stimulus expenditure and economic conditions via instruments based on the exogenous allocation factors from ARRA's distribution formulas for the most important findings.

The two key findings of this thesis are the following: Unemployment is shown to have a strong, statistically significant positive effect on the employment impact of ARRA, resulting in a 30% higher employment impact for states with an employment ratio one standard deviation higher than average. Household debt is found to have a significant negative impact, a one standard deviation higher household debt leading to a 20% lower employment impact. The overall employment impact of the ARRA was consistently estimated to be positive and significant.
Other factors such as per capita imports or two direct measures for the marginal propensity to consume (MPC) are not found to have an impact on the effectiveness of ARRA. The latter effect is likely due to the intertemporal instability and the inherent difficulty in measuring the MPC.

For economic policy making, the results of this thesis confirm the effectiveness of fiscal stimulus during times of economic crisis. The regional allocation should be guided by the recent rise in per capita unemployment and the level of household debt: In order to obtain the same employment effect, comparatively more stimulus spending should be allocated to areas with a higher debt burden or a lower spike in unemployment. If an equal employment impact across regions is appropriate is left to the discretion of the policymaker.

Further research should investigate if these results hold in other countries and time periods as well and employ models and access sample data that allow for the study of several influencing factors. A different promising direction for the better understanding of the multiplier is the development of more accurate, and possibly contemporaneous, measures of the MPC. Of special interest is the empirical investigation of the effects of precautionary saving and liquidity constraints. A valid measure could not only guide future research but the conduct of fiscal policy itself.

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