Does Federal Expenditure Promote Growth in the Recipient Counties?

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Based on a unique dataset from the Consolidated Federal Fund Report, we measure the return of 15 types of federal expenditure on county growth. We control for the endogeneity of public spending and find that overall expenditure promotes growth. Accounting for the significant difference in the growth dynamics of the metropolitan and non-metropolitan counties, we conclude that, in the latter, supporting farmers, rural areas and health fosters growth while programs for the poor and education reduce it. We also discover that traditional measurements of human and physical capital suffer from a selection bias when trying to proxy public spending.

Keywords: Economic Growth, Government Spending, Cross-section.

JEL Codes: H11, H50, H61, O47

The commitment of the US federal government to promote regional development dates back to Franklin Roosevelt's 1935 Rural Development Assistance Program. It has now grown to a point where the large majority of federal departments and agencies participate in development efforts and a substantive amount of the federal budget (around $188 billion/year according to Drabenstott [2005]) is devoted to it. Yet, the literature does not offer ample estimations of the impact of public spending on regional growth and the few analyses that exist do not come to an unanimous outcome. Indeed, following the early contributions of Ratner (1983) and Aschauer (1989) at the national level, Munnell and Cook (1990), Garcia-Milà and Mcguire (1992) estimate a positive elasticity of the stock of state and local public capital on the states' output, while other studies essentially conclude to a non-significant impact of public capital on output or productivity (Garcia-Milà et al. 1996; Evans and Karras 1994; Holtz-Eakin 1994) or even to a negative one (Moomaw et al. 2002). Similarly, the conclusions on the impact of public spending on regional income growth are highly heterogeneous. On the one hand, Holtz-Eakin (1993), Vohra (1996), Garofalo and Yamarik (2002), Yamarik (2006, 2011) find a positive elasticity of the per capita income growth with respect to physical capital (between 12-33%) and human capital (between 13-32%). On the other hand, Shioji (2001) finds a significant but negative impact of human capital on state growth while physical infrastructures (streets and highways, sewage, utilities) have a positive one. Holtz-Eakin and Schwartz (1995) conclude to a significant but negative elasticity of public capital on growth while Lall and Yilmaz (2001) find that public capital accumulation and human capital formation do not contribute to increasing the speed of convergence across states once temporal and regional factors are considered. The only policy they recommend is promoting labor mobility. More recently, Higgins et al. (2009) conclude also to a negative impact of government intervention on growth when measured by the share of employment in federal, state and local government.

Beyond the usual differences in econometric specifications (time period, endogeneity of public and human capital, cross-section vs. panel data model, fixed effect model or not, etc.) Garcia-Milà and Mcguire (1992) recognize that the consistency and the reliability of the estimates, hence the quality of the conclusions, suffer from the types of variables used to proxy for public investments. For instance, the literature commonly uses estimated elasticities of the stock of human capital in a Cobb-Douglas framework to provide recommendations on future public investments in education, even when the two are not necessarily correlated (Dall'erba and Llamosas-Rosas 2014a, 2014b) for two reasons. First, it is widely accepted that more public spending in education does not guarantee an increase in the local labor force, as newly graduated pupils move in search of work opportunities (Tamura 1991; Shioji 2001; Garcia-Milà and Mcguire 1992). Second, *actual* government spending for education encompasses some aspects, such as training for workers, spending for research or technology transfer through extension programs that are disregarded in the

measurement of human capital stock. In addition, Weber (2000) and Barro (1990, 1991) highlight the difficulty to identify what public investments in education actually lead to human capital formation. Similar concerns exist in the literature that focuses on government spending, taxes and growth in a cross-country framework (Levine and Renelt 1992; Slemfor 1995; Bergh and Henrekson 2011).

At the regional level in the US, the empirical contributions of Garcia-Milà and Mcguire (1992), Holtz-Eakin (1993), Nizalov and Loveridge (2005) rely on actual government spending on public services such as spending on streets and highways, sanitation, sewage and education, but their selection of investments corresponds to the industrial recruiting strategy that dominated the regional development landscape over the 1950s to early 1980s (Drabenstott 2006). It does not embrace the full portfolio of public programs available for regional development purposes today, more especially in distressed areas. At the same time, some contributions have focused specifically on federal programs for such areas but, as in the previous literature, they do not come to an agreement. For instance, Haughwout (1999), Glasmeier and Wood (2005) and Partridge and Rickman (2007) support the continuation of the Economic Development Administration programs to the poor areas. However, the review of economic development policies performed a few years earlier by Isserman (1994) concludes that federal development strategies in the poor counties have been inefficient. Markusen and Glasmeier (2008), Drabenstott (2005, 2008) and Bartik (2004) also find that US regional policies are inefficient and recommend more emphasis on human capital than infrastructures, stopping expensive and wasteful smokestack chasing, better coordination across federal departments and agencies, more long-term programs (such as the Appalachian Regional Commission), a more varied set of eligibility requirements and better performance evaluation standards.

This paper re-examines the role of government spending on the economy of the recipient areas. This is a critical time to perform this task. Increasing competition at the international level obliges governments to help their most advanced regions maintain their competitive edge, yet they also have obligations to those left behind, more especially when stuck in a poverty trap for decades (Partridge and Rickman 2007) because of their incapacity to cope with increasing concentration of economic activities in more developed places (Krugman 1992; Fujita et al. 2001). In addition, the intensity of the political and academic debates that surrounded the Obama administration stimulus package implemented in 2009 reflects that, with current deficit levels, identifying what government programs provide the largest returns has become a necessity.

As such, this paper offers, for the first time in the literature, an econometric estimation of the impact of the *actual* amounts of *all* federally-funded development programs on the growth rate of the US counties. Based on an extensive dataset from the Consolidated Federal Funds Report of the Census, we identify 2,350 place-based and people-based development programs supported by the federal government and classify them by recipient county and by objective. This exhaustive list presents several advantages. First, it reflects the diversity of development programs available to the government and avoids the use of proxies or the focus on one federal agency only. Second, transfer payments are included in our analysis

because their share in government spending has increased steadily since the 1970's (Weber 2000) and their recipients are not necessarily located in poor counties (hence the difference between place- and people-based programs). Transfers affect the marginal rate of substitution between work and consumption and are seen as reducing the reward to work (Barro 1990; Weber 2000). Several contributions have found them to be counter-productive (Blanchard and Perotti 2002; Romero-Ávila and Strauch 2008) or to have no significant impact on growth (Lindert 1996). On the other hand, in the light of the harmful effects of social inequality on growth (Alesina and Rodrik 1994; Persson and Tabellini 1994), one can argue that transfer payments are growth-enhancing. Sala-i-Martin (1992) and Bénabou (1996) confirm this assumption. We revisit this conundrum in this paper but we do it at the county-level.

Yet another advantage of our rich dataset is to identify what programs are the most/the least efficient. Based on the original work of Drabenstott (2008), we organize federal spending according to 15 categories including, among others, support to education and training, health, housing and the unemployed, and compare their relative capacity to promote growth. This classification allows us to advocate for ending the "one-size-fits-all" approach of development policies (Stough 2003; Taylor and Plummer 2011). This traditional way of conceptualizing economic development offers nothing more than the same programs applied to most places across the country when, instead, federal policies ought to be designed on the specific socio-economic characteristics of the recipients of development efforts. While the goal of some of these programs, such as transfers, is not primarily to support growth, we believe that a clear estimation of their relative returns on a common metric, growth, is essential now that the current level of federal government's budget deficit is greater than ever. In addition, we believe they should not be studied independently from other public programs, as they all are part of federal expenditures. In order to prove this point, we complement our approach with an estimation based on public investments in human and physical capital only as they are traditionally used in the literature that estimates the efficiency of government intervention (Munnell and Cook 1990; Garcia-Milà and Mcguire 1992; Garcia-Milà et al. 1996; Shioji 2001). Our results will demonstrate the bias that characterizes the latter studies due to missing public programs.

Finally, we also measure the sensitivity of our results to public spending classified by the agency or department that channel them. This exercise allows us to estimate the return generated by each of them and to uncover which ones, such as USDA, are committed to one specific goal (support to farmers and rural areas in this case) or spread their efforts to many objectives. It is important to point out that our estimates do not account for the rise in taxes that accompany public spending. Indeed, there is not guarantee that federal spending in one county is matched by an increase in federal, state or local taxes in the same county. Obviously, this type of spatial mismatch does not take place at the national level (see, among others, Blanchard and Perotti 2002; Barro and Redlick 2011).

In order to provide more insights into the role of government expenditure on county growth, the remainder of this paper is structured as follows: section 1 describes the expected impact of public spending in the neoclassical and endogenous growth frameworks

briefly as it has already been well documented in the literature. Instead, section 1 focuses on listing the set of assumptions and associated econometric models that will be tested. The description of the data and of their basic statistics appears in section 2. We use a county-level cross-section model in which growth is measured over 2000-2007, i.e. before the economic crisis. A county-level approach allows us to get consistent estimates even when we rely on a large set of structural variables and include heterogeneity in the form of metropolitan and non-metropolitan counties. Section 3 presents and discusses the regression results both at the aggregate and at the disaggregate levels (by program and by funding agency). Finally, the last section summarizes our findings and offers some concluding remarks.

1. Theory, econometric models and assumptions to be tested

The lack of empirical evidence to clearly support public policies, notably those aimed at promoting economic development in lagging regions, reflects how neoclassical and endogenous growth theories differ in the impact they expect from such policies. Indeed, according to the neoclassical growth theory (Solow 1956; Barro and Sala-i-Martin 1991; Mankiw et al. 1992) government spending will stimulate the speed at which per capita income converges towards its steady-state, but it will not affect its steady-state level. This result is due to the underlying assumption of decreasing marginal returns to capital. Only the exogenous growth rate of technological progress affects long-term growth in this framework. In contrast, the endogenous growth theory à la Barro (1990), Lucas Jr. (1988) and Romer (1986) brings endogenous returns to scale to the fore. Hence when government spending finances new reproducible capital, it enters the production function and stimulates both short-term and long-term growth. However, even in an endogenous framework, the net growth effect is increasingly dampened by the rise in taxes associated with government spending and the size of transfer payments (Barro 1990; Slemfor 1995; Blanchard and Perotti 2002).

We measure the effects of public expenditures on growth in the frame of a conditional neoclassical β-convergence model à la Mankiw et al. (1992)[1]. Because its development has been widely documented in the literature, we present directly the variant of the growth regression that we obtain by fitting to the cross-section data the equation:

$$(1) \qquad \left(\frac{1}{T}\right)\left(\ln(y_T) - \ln(y_{t_0})\right) = \alpha + \beta X_{t_0} + \gamma \frac{1}{T-t_0}\sum_{t_0}^{T} Gov + \varepsilon$$

with $\varepsilon \sim N(0,\sigma_\varepsilon^2 I)$

[1] In spite of its criticism Durlauf and Quah (1999), Temple (1999), Durlauf et al. (2005), the β-convergence model is still the most popular model in the empirical growth literature.

Where *y* is the real per capita income and *X* is a set of variables explaining the structural steady state at the beginning of the evaluation period (it includes the initial level of income). These conditional variables allow us to explain differences in the growth performances across counties and ensure that any inference about the role of federal spending, noted *Gov,* is robust. The subscripts indicate the time period. Since the dependent variable and public spending are measured at the same time period and since public investments are a function of the recipient area's income, we must adopt an instrumental approach. This simultaneity problem of public investments has been highlighted first by Caselli et al. (1996) and later on by, among others, Garcia-Milà et al. (1996) and Dall'erba and Le Gallo (2008) in a regional context as well as Burnside and Dollar (2000) and Brückner (2013) in an international context. These authors deal with the endogeneity problem by IV techniques, but the relevance and exclusion restriction of the instruments chosen are never without criticism (Deaton 2010; Temple 1999). It is particularly true in a growth equation since there is such a large amount of variables that affect growth[2], hence leaving few chances to identify variables highly correlated with the endogenous variables but not with the omitted variables (Temple 1999). In the absence of a "news" variable as used recently in Ramey (2011) and Barro and Redlick (2011) to estimate the role of defense spending, we rely on instruments from the political economy literature (Fleck 1999, 2001; Grossman 1994) among others. They will be described at the end of section 2.

In order to mitigate the role of federal spending on the counties' growth dynamics, we investigate four additional assumptions. The models associated to each of them appear below and use g_t instead of $\left(\frac{1}{T-t_0}\right)\left(\ln(y_T) - \ln(y_{t_0})\right)$ for the average per capita income growth rate. The first assumption to be tested is the presence of decreasing marginal returns in the expected impact of federal spending, as brought to the fore in the neoclassical growth theory. In that purpose, we add a quadratic term as follows:

$$g_t = \alpha + \beta X_{t_0} + \gamma \frac{1}{T-t_0}\sum_{t_o}^{T} Gov + \delta\left(\frac{1}{T-t_0}\sum_{t_0}^{T} Gov\right)^2 + \varepsilon \quad (2)$$

with $\varepsilon \sim N(0,\sigma_\varepsilon^2 I)$

While consideration for this type of threshold effect is popular in the literature focusing on aid and growth or poverty at the international level (see, among others, Burnside and Dollar 2000; Collier and Dollar 2002; Rajan and Subramanian 2008), it has been relatively less explored at the subnational level.

The second assumption we intend to test and comes, again, from the literature on the effectiveness of international aid is the conditionality of the returns of public investments to

[2] Durlauf and Quah (1999) identify more than 90 variables that have been used in cross-country growth models.

the characteristics of the recipient area. This hypothesis has been explored at the subnational level by Ederveen et al. (2006) and Esposti and Bussoletti (2008) when measuring whether the effectiveness of European regional development policies is conditional on the institutional quality, decentralization level and human capital stock of the recipient regions respectively. As such, we add an interaction terms to model (2) as a way to measure the difference in elasticity of federal investments depending on the wealth of the recipient county. We chose this variable rather than any other variable because the neoclassical growth theory indicates clearly it affects growth, hence it also affects the way in which federal spending is used productively:

$$(3) \qquad g_t = \alpha + \beta X_{t_0} + \gamma \frac{1}{T-t_0} \sum_{t_0}^{T} Gov + \delta \left(\frac{1}{T-t_0} \sum_{t_0}^{T} Gov\right) * \ln\left(y_{it_0}\right) + \varepsilon$$

with $\varepsilon \sim N(0,\sigma_\varepsilon^2 I)$

Third, another issue to commonly deal with in a regional context is the potential presence of heterogeneity taking the form of heteroskedasticity and/or structural change in our sample. If present, the former problem leads to inefficient estimates while the latter problem is more serious. If a structural change is present but is not accounted for or is treated improperly, it corresponds to a problem misspecification that generates biased and inconsistent estimates Greene (2011, chap. 7 and 11). Applied to the question of regional growth dynamics, heterogeneity leads to convergence clubs, each being composed of a group of economies of which initial conditions are similar enough to converge towards the same steady-state. However, for the sample as a whole, convergence clubs indicate the presence of multiple, locally-stable equilibriums which imply long-term differences in the steady-states the regional economies are converging to (Durlauf and Johnson 1995). The presence of convergence clubs has already been documented in the US (Higgins et al. 2006; Higgins et al. 2009). For instance, if heterogeneity is present in the form of a structural change between two groups in conjunction with heteroskedasticity, model (1) becomes:

$$(4) \qquad g_t = \alpha_1 D_1 + \beta_1 D_1 X_{t_0} + \gamma_1 D_1 \frac{1}{T-t_0} \sum_{t_0}^{T} Gov + \alpha_2 D_2 + \beta_2 D_2 X_{t_0} +$$

$$\gamma_2 D_2 \frac{1}{T-t_0} \sum_{t_0}^{T} Gov + \varepsilon$$

with $\varepsilon \sim N(0,\sigma_{\varepsilon_i}^2 I)$

where D_1 and D_2 are dummy variables that stand for group 1 and group 2. Model (4) allows for the convergence process to differ across groups. In addition, $\sigma_{\varepsilon_i}^2$ indicates that the error variance is not constant across error terms.

Finally and fourth, we distinguish between different kinds of public investments in order to get more insights into the actual role of the federal development programs. While the

current literature only offers a handful of such programs, such as education, transportation, sanitation, sewage (Munnell and Cook 1990; Garcia-Milà and Mcguire 1992; Garcia-Milà et al. 1996; Shioji 2001), we classify them according to 15 types of public spending axes. Their definition as well as the description of the rest of our dataset is provided in the next section. Mathematically, such a model is written as follows:

$$(5) \qquad g_t = \alpha + \beta X_{t_0} + \sum_{j=1}^{15} \gamma_j \frac{1}{T-t_0} \sum_{t_0}^{T} Gov_j + \varepsilon$$

with $\varepsilon \sim N(0, \sigma_\varepsilon^2 I)$

2. Data

Our models are estimated on the 3,076 counties of the conterminous United States. A county-level approach allows us to obtain precise estimates even when using the full set of conditioning variables and accounting for heterogeneity (see section 3). In addition, it matches the geographical units at which federal grants are allocated Hall (2010a). Our dependent variable is the growth rate of personal income (less contributions for government social insurance), based on data collected from the Bureau of Economic Analysis (BEA). All the monetary variables are in real 2008 U.S. dollars. The set of conditional variables included in the matrix *X* above (models 1-5) captures interregional differences in the labor market, production structure and socio-economic factors. They are all measured at the beginning of the evaluation period and are fairly standard in the growth literature. They are the initial per capita income (based on BEA data), human capital measured as the percentage of the population 25 years old or more with 13 or more years of formal education (based on Census Bureau data), road density (length of roads over population) that acts as a proxy for the stock of public capital. Data come from the Topologically Integrated Geographic Encoding and Referencing (TIGER) database of the Census Bureau.

We control for the industrial structure of each county and for the possibility of adverse shocks to sector-specific output affecting regions differently by capturing the share of employment in each of the following sectors: agriculture, manufacturing, professional scientific and technical services. Their data come from the Census Bureau based on the North American Industry Classification System. Such variables have been used by numerous authors including Barro and Sala-i-Martin (1991) for similar purposes. As common in the literature, we also include the unemployment rate of which data come from the U.S. Bureau of Labor Statistics. We control for some of the ethnic and social characteristics of the local population by accounting for the percentage of households headed by females and the percentage of minority in the county's population from the Census Bureau. A significant amount of literature and statistical evidence indicates that demographics have a direct impact on the local level of income (Levernier et al. 2000; Blank 2005; Rupasingha and Goetz 2007). For instance, the 2007 U.S. Census Bureau statistics give poverty rates above

the national average of nearly 30% for single female household. Hence counties with a larger share of individuals matching these characteristics should experience lower growth rates.

We investigate the role of the size of private businesses with data from the County Business Patterns from the Census Bureau. More precisely, we calculate the percentage of businesses with less than 500 employees. The U.S. Small Business Administration uses this threshold to qualify small businesses. The underlying idea is to test whether regions dominated by large branch plants or firms are likely to be more or less competitive than regions dominated by many smaller establishments. For instance, Acs and Armington (2004) conclude that establishments' size has a positive effect on employment growth across US Labor Market Areas.

Basic statistics (mean, minimum, maximum and standard deviation) for all the above data are reported in table 1 below. They are presented for the whole sample as well as for the metro- and non-metropolitan counties as the empirical analysis reported in the next section will indicate that a Chow test rejects the null hypothesis that their coefficient estimates are significantly the same. Table 1 confirms common knowledge about the differences in income, population characteristics and industrial structure between metro- and non-metropolitan counties.

(INSERT TABLE 1 HERE)

Finally, our data on average per capita federal spending over 2000-2007 come from a single data source, the Census Bureau Consolidated Federal Fund Report (CFFR), to guarantee uniform variable definitions. To our knowledge, only Serrato and Wingender (2011) have used the same database to study the role of federal spending on the economy, although on other outcomes than growth. CFFR data represent actual expenditures and obligations as the federal expenditures do not account for loans and insurance programs. Spending is classified across 2,538 programs, across federal departments and agencies and by county. Overall, it represents 5.9 millions data. However, we only use 1,860 programs (or 2.9 millions data) in our definition of federal spending. Their selection starts with the set of federally-funded development programs reported by Drabenstott (2005) for the 2000-2004 period. He offers, to our knowledge, the only succinct list of regional development programs (they focus on specific areas such the Delta region or the Appalachia) and broad-based programs such as research, technology transfer or the delivery of electricity that "spur the national economy but not necessarily the economy of any particular region" (Drabenstott 2005). However, we broaden his list because we deal with a longer period and add transfer payments to our definition of federal expenditure programs.

In order to assess the relative efficiency of our 1,860 federal programs, we classify them into 15 strategic categories defined according to the programs' main purpose or main recipients as follows: education and training, telecommunication, transportation, energy, technology, research, environment, health, housing, support to small business, support to

farmers and rural areas, support to low-income workers and the poor, support to retirees, support to the unemployed and support to minority. Because the name used to describe each program in CFFR is not always clear, we rely on the Catalog of Federal Domestic Assistance for a description of the program's purpose.

The 421 federal programs that are not used above are grouped in a category called "other". It includes a large variety of programs devoted primarily to defense, but also to the judicial system, hazard mitigation, homeland security, procurement contract, government employees' salary, etc.[3]. The purpose of this category is twofold. First, it allows us to test the role of these programs as they mostly represent government purchases and the literature has already highlighted that they may play a role on regional growth. For instance, Higgins et al. (2009) find that the number of government employees acts negatively on growth while Gold (1990) and Barro and Redlick (2011) conclude that defense spending promotes it. Second, we make use of these data to avoid a missing variable bias as they are still counted as expenses or obligations in the federal budget.

Several elements about our database are worth mentioning. First, grants that are redistributed by the state are often allocated first to the county where the state capital is located Hall (2010a). If the database does not indicate clearly what actual recipient counties the funds are then dispatched to, they are removed from the analysis. Second, the database only reports the purpose or the people who receive funds by county. As a result, government investment, government consumption and transfer payments are imbedded into the 15 categories described earlier. For instance, spending for education and training counts long-term government investments (program 84.172: Construction, Reconstruction and Renovation of Academic Facilities) and government consumption (program 45.164: Promotion of the Humanities – Public Programs). Similarly, support for the poor encompasses usual transfers such as food stamps (program 10.551) and the school breakfast program (10.553) but also Community Development Block Grants (14.218) that increase the stock of capital as they provide water, sewer and more especially housing facilities to low- and moderate income people. Third, many agencies and departments have similar socio-economic development goals. For instance, investments in human capital are not the exclusivity of the Department of Education. Up to 27 other agencies and departments have programs for various types of educational institutions (such as K-12, tribal colleges, special education institutions, higher education institutions), educational grants, workers' training and retraining programs, spending for museums and libraries as well as technical assistance and technology transfer through extension programs of various stripes. Fourth, while nearly 30% of the programs can easily be allocated to one of our 15 development axes (for instance, Program 20.FAR - Federal Railroad Administration Programs), the rest is allocated equally across two development axes based on the program's definition. For instance, the funding associated to Program 10.001: "Agricultural

[3] The complete dataset is available from the authors upon request.

research – Basic and Applied Research", is split between "research" and "support to farmers and rural areas" equally.

The basic statistics of our classification are reported in table 2 below. They show clearly that programs for health purposes (mostly Medicaid and Medicare) and for the retirees (mostly Social Security payments) dominate the landscape of federal expenses. Support for the poor and the low income (such as supplemental security income, food stamps and housing assistance) comes next. Transportation, assistance to farmers and education represent other well-endowed axes of spending, although to a lower degree. We also note the large amount of government spending in the category "other". Most of it is made of spending for defense purposes, procurements contracts and government employees wages. Because education and transportation are primarily supported by the state to which a county belongs, their share of federal spending is lower than other categories. State spending is not part of our analysis because we are not aware of a single, homogenous, dataset that provides county-level data of state spending by program. Note also that the negative values reported for some years and very few counties reflect pre-2000 federal commitments that were not fully spent over 2000-2007. Also, towards the end of our period, some data reflect a federal commitment when the actual expenses take place after 2007. In the absence of more accurate data, we decide to minimize the role of these two effects by averaging spending over 2000-2007.

(INSERT TABLE 2 HERE)

Before moving on to the estimation results in the next section, some explanations about the treatment of endogeneity of federal spending is in order. The political economy literature focusing on the Great Depression provides us with some guidance with regards to the choice of political data to be used as instruments. We measure them at the time of the 1992, 1996 and 2000 presidential elections, both individually and, when possible, as an average. They are 1) the voter turnout (Fleck (1999) highlights how public funding is used to seek support from high turn-out counties); 2) the percentage of votes for the Democrat party (Grossman (1994) sees it as an important predictor of federal monies flow); 3) swing votes, i.e. the gap between democrats and republicans (Fleck (2001) shows that counties with a greater number of swing voters are supposed to receive more benefits); 4) the political alignment between a county and the party of the elected president (in the belief that federal authorities are inclined toward allocating more funds to counties that share the same political alignment, Grossman [1994] , Snyder and Levitt [1995]). As usual in the literature, we also consider the lag of federal funds. We use here the 1993-1999 period, i.e. from the first year of available CFFR data to the year before the evaluation period.

All combinations of at least two instruments were tested and a selection was made based on the performance on three tests commonly used to identify under-identification (the Kleibergen-Paap test), weak instrument (the Kleibergen-Paap rk statistic accompanied by the "rule-of-thumb" suggested by Staiger and Stock [1997]) and over-identification (the Hansen J statistic). Their statistics are reported at the end of the following tables. The final

set of instruments implemented in this paper are: 1) the average share of Democrat vote by county over 1992-2000; 2) a Political alignment dummy variable with a value equal to 1 if the county and the state it belongs to voted in majority for the President-elect in each of the 1992-2000 elections and 0 otherwise; 3) a time lag measured as the average value of federal funds over 1993-1999.

3. Estimation results

A. Overall government spending

We turn now to measuring the returns of the overall allocation of federal spending and start with the estimation of model (1) of which results are displayed in columns 1-4 of table 3. The results presented are based on OLS (columns 1-2), 2SLS with the IV presented above (columns 3-4) and with two different sets of programs to measure spending (15 categories vs. 3 categories: education, transportation and telecommunication). The variance inflation factor indicates multicollinearity is not an issue here[4]. All the results of table 3 are based on White's heteroskedasticity-consistent errors as a Breusch-Pagan test indicates the error terms are not homoscedastic (p-value <1%). Note that clustering the error terms by the state or the eight Bureau of Economic Analysis economic regions the counties belong to does not lead to any significant difference[4], hence only the results based on an unknown form of heteroskedasticity are displayed here. All the results are consistent across specifications, although the 2SLS approach is the only one to provide unbiased and consistent estimates. Our variable of interest, federal spending, is found to generate a return of around 6.71×10^{-4}, i.e. a $ 1,000 increase in federal spending per capita leads to a 0.067% increase in long-term annual growth. Note that this coefficient is significant only when all 15 programs are considered. Indeed, spending limited to human and physical capital (education, transportation and telecommunication) does not lead to a significant impact in any of our specifications, a result previously suggested by Lall and Yilmaz (2001), Nizalov and Loveridge (2005), Garcia-Milà et al. (1996). We believe it comes from omitting other forms of federal spending. We could also argue that the period upon which growth is estimated is too short for the full impact of federal spending to take place. However, due to a lack of anterior data, this hypothesis cannot be tested formally. The type of spending one evaluates has thus serious implications on our conclusions with regards to the capacity of the federal government to stimulate growth. Interestingly, we also find that the spending that focuses on none of our socio-economic development axes (category "other") generates a significant impact, although its magnitude is smaller than for federal spending. The difference is significant (p-value = 0.016).

Significant convergence takes place across counties at an implied speed of 1.87% (or an half-life of 37 years), i.e. not very far from what Barro (2012) describes himself as the "2%

[4] Complete results available from the authors upon request.

iron-law" with reference to the large number of studies which find such a convergence rate across countries and regions. The rest of the conditioning variables displays the expected results. When we test the role of a quadratic effect on federal spending (model 2 and columns 7 and 8), the direct effect and the squared term are not significant. As such, these results do not allow us to detect any non-linear impact of public expenditure. The sign, magnitude and significance level of all the other conditional variables are similar with those found previously in the literature. We thus turn to estimating whether the effect of federal spending is conditional upon the level of income of the recipient county (model 3 and columns 5-6). We find that neither the direct nor the interaction effect is significant. In conclusion, table 2 indicates that overall federal spending leads to a significant growth effect independently of the level of income of the recipient county and of the level of spending.

B. Overall spending and heterogeneity

Previous results are based on the assumption that all counties converge towards the same steady-state conditional to some variables. Yet, several previous contributions have highlighted the presence of a structural change in the growth dynamics across counties and states. For instance, Higgins et al. (2006) and Higgins et al. (2009) justify a structural change as a way to model government activities that differ across parts of the country and use subsamples made of metropolitan and non-metro counties. In addition, Hall (2010b) indicates that for each dollar of federal grant, the match requirement is a greater burden in non-metropolitan counties. Their relatively small population means that the cost of building infrastructures and operating public projects is bore by a small local tax base. Moreover, their metropolitan counterparts surpass them in terms of economies of scale, grant selection capacity and management competence, which results in lesser distortion in local spending priorities (Hall 2010b). As a result, we test whether the role of our conditional variables varies between counties that belong to a metropolitan area (around 27% of them) and those that do not (73%). We rely on the Census Bureau definition of metropolitan areas (areas with a core urban area of 50,000 or more population).

The results by 2SLS are reported in table 4 below. A significant (at 1%) Chow test indicates that the convergence dynamics are different across non-metropolitan and metropolitan counties. The first group has a speed of convergence of 2.26% and half-life of 31 years while the second group, the metropolitan counties, shows a smaller degree of convergence with a half-life of 89 years. The estimated impact of federal spending leads to similar conclusions than in table 3 in that it significantly impacts growth only when the 15 development programs are considered. We do not find any statistical difference between the growth effect among the metropolitan and the non-metropolitan counties.

(INSERT TABLE 3 HERE)

We also find that the conditioning variables in the non-metropolitan areas act very similarly than in the overall group (column 3 of table 4). However, when it comes to the metropolitan

counties, several variables display a different pattern. Education, employment in farming, in professional activities and the share of female head of household do not have a significant role anymore. Education and the share of professional employment are homogeneously high across metropolitan areas, hence we do not find enough variability to capture any effect on growth. Farming employment has the expected result since metropolitan areas have such a limited participation in this sector. Finally, we believe that the non-significant impact of the percentage of females head of household suggests that metro areas offer better work opportunities for this demographic group.

(INSERT TABLE 4 HERE)

C. Analysis of the components of federal spending

Tacking stock of the results so far, the conclusion is that federal government spending for economic development is effective at promoting growth, independently of the type of county (metropolitan vs. non-metropolitan) or level of income. However, the story cannot be that simple. The choice of the development axe that needs to be implemented in the recipient area is, in our opinion, the most difficult but also the most indispensable task federal agencies and departments have to face. As mentioned by Munnell (1992): "Aggregate results, however, *cannot* be used to guide actual investment spending". As such, we focus here on estimating whether the types of development strategies that have been selected across recipient counties have been able to significantly promote their growth. It is also a way to analyze which development strategies are the most/the least effective, i.e. lead to the highest/lowest returns. A significant Chow test indicates that the difference between metro and non-metropolitan counties is still significant.

Table 5 displays the estimated impact of each of the 15 socio-economic development programs defined in section 2 (columns 1-2) as well as the estimates for each of the 3 types of physical and human capital (columns 3-4). Since the semi-elasticities of the other conditioning variables are similar to those of table 4, they are not reported here.

(INSERT TABLE 5 HERE)

Spending for health promotes growth significantly in both metro- and non-metropolitan counties, a result that confirms our expectations as well as recent findings by Reeves et al. (2013) on government spending and growth across European countries. Several publications such as Wheeler (1980), Fogel (1994), Bloom et al. (2001), Rivera and Currais (2003) have already highlighted the significant and positive role of health on living standards, human capital accumulation, labor productivity and, in turn, on higher income growth.

We find that support for the low income and the poor leads to a negative return on growth, which confirms numerous contributions that focus on transfers and growth (see, among others, Barro 1990; Weber 2000; Blanchard and Perotti 2002) as well as the fact that the program recipients are located in low growth counties. The marginal effect in metropolitan

areas is greater than the marginal effect in non-metropolitan areas, which we interpret as a reflection of the greater degree of convergence (this program allocation is inversely proportional to per capita income) across metro- than non-metropolitan areas (Higgins et al. 2006).

We find two additional axes with a negative growth effect in the non-metropolitan areas, namely support for environment and spending for education (in the 3 program case only). Environmental programs are allocated to small, low-density, rural counties that experience very limited economic activities. While the result on education confirms previous contributions (e.g., Shioji 2001), we believe it is driven by a selection bias. Indeed, federal programs supporting education are mostly allocated to poor counties (Dall'erba and Llamosas-Rosas 2014b) where the average education level is low and local funding is scarce. In the absence of data on local and state spending for education across all US counties, we cannot evaluate the capacity of federal funding to complement the former and a state-level analysis is left for future research. Last but not least, spending for farmers and rural areas is found to act positively and significantly on growth in non-metropolitan counties. The largest share (41%) of support for farmers is made of program 10.450 named "crop insurance". It represents a federal subsidy on the insurance premiums farmers pay to private insurance companies to reduce the production losses due to unexpected natural events (e.g. drought, tornado). Beyond the increased participation in insurance programs and the reduced financial risks, Key et al. (2006) show that the federal crop insurance program reduces the farmer's incentives to allocate labor to off-farm activities[5] and, because of specialization, promotes economic efficiency. A positive relationship between farm income variability and off-farm labor supply is also found in Mishra and Goodwin (1998). When it comes to the impact of transportation, its non-significant coefficient is not surprising. Indeed, both theoretical (Fujita et al. 2001) and empirical (Boarnet 1998; Kelejian and Robinson 2005) contributions have highlighted that financing transportation is not necessarily growth-enhancing because it favors agglomeration in core regions.

We complement the results of table 5 with a classification based on agencies instead of specific programs because federal funding is channeled through these departments and agencies. In that purpose, the *main* goal of each agency is matched with one of the axes of socio-economic development above and 100% of the agency's programs are allocated to it. For instance, all the funding of the Department of Health and Human Services is allocated to health, even though some of its programs support the low income, provide day care assistance, etc. Four axes do not have a matching agency or department (telecommunication, technology, low income and the poor, minority), hence we remove them. For the others, the matching agency appears below the name of each axe of spending and at the bottom of table 6.

[5] In farms producing more than $100,000 of output only. The inverse effect takes place in farms producing less than $25,000 but they also receive less assistance (Key, Roberts, and O'Donoghue, 2006)

We expect the results between the two types of classification to be consistent for the axes of development that rely almost entirely on the funding of one agency, such as support to farmers and rural areas by the USDA. On the other hand, we believe that the axes supported by several agencies, each with multiple goals, will have a different impact on growth. The net effect is difficult to predict as it depends on the relative size of the programs funded across the two classifications and their allocation across counties. In short, table 6 provides an analysis of the relative efficiency of the federal agencies and departments in promoting county growth, no matter how focused they are on their main objective. We are not aware of any previous contribution that has attempted this exercise.

Three axes of development display similar results across the two classifications, namely support to farmers in non-metropolitan counties since it is almost entirely funded by USDA; support to education in non-metropolitan counties, a result we have already interpreted in table 5; and support to energy in metropolitan counties, although the negative impact of the latter is not significant in table 5. While most of the Department of Energy's funding goes to supporting research and development, of which impact on growth may take longer than our study period, around 18% of it is devoted to "weatherization assistance for low-income families" (program 81.042), a type of transfer expected to impact growth negatively (see table 5). We also find that the category "other" still displays a significant although very small (0.02-0.05) return across all specifications. Moreover, our results indicate that support for health, as measured by all the programs of the Department of Health and Human Services, does not have a significant impact on growth. It comes from the support this department provides to low-income families and the retirees. The latter two axes of development are counter-productive according to table 5, although only the former displays a significant coefficient.

(INSERT TABLE 6 HERE)

4. Conclusions

Neither theory nor the empirical literature comes to an unanimous conclusion on the expected impact of government intervention on regional growth. Without an objective assessment of the impact of public spending, even the programs that are counter-productive may persist. The goal of this paper is to remedy to this gap. The question is not only of interest from an academic perspective, but also on practical terms. Indeed, partly because of a lack of evaluation of past development efforts, the American Recovery and Reinvestment Act (ARRA) the Obama administration implemented in 2009 was the topic of intense debates in the academia, the policy-arena, the media and the general public. Since then, only a very limited number of contributions have attempted to measure its effect on the economy (Fair 2010; Congressional Budget Office 2010).

This paper contributes to the discussion by relying on the unique, largely unexplored, Consolidated Federal Fund Report dataset of the Census Bureau which gives us access to the

county-level allocation of every federal development programs. Following the pioneering work of Drabenstott (2005), we identify the programs which are devoted to socio-economic development purposes and classify them according to 15 types of development axes ranging from investments for education, transportation, health, support to farmers and rural areas, to the low-income families and the unemployed. We control for heteroskedasticity and the endogenous nature of federal spending by using a set of instruments drawn from the political economy literature. Our estimates do not find any tradeoff between economic growth and government intervention. Indeed, our results indicate that federal spending leads to an average, significant, return of around 0.07% on the recipient counties growth and that this impact is similar in metropolitan and non-metropolitan counties. We also find that spending does not significantly stimulate growth when we focus on programs devoted to human and physical capital only (as in, e.g., Garcia-Milà and Mcguire 1992; Holtz-Eakin and Schwartz 1995), raising the issue that traditional measurements of public capital are a poor proxy for the actual role of government spending in promoting growth (Garcia-Milà and Mcguire 1992; Weber 2000; Barro 1990, 1991). We believe that, in addition, the estimation of their impact on growth suffers from a missing variable bias as they constitute only a small percentage of the actual public expenditures. For instance, they disregard programs such as defense that are found growth-enhancing in our study (they are the major part of our category "other") or in other contributions (e.g., Barro and Redlick 2011).

While it is good news to see federal intervention as an engine of growth, the most difficult decision for the government is actually choosing what development axe(s) to support. In the non-metropolitan counties, we find that support for health and for the farmers should be supported (returns of 0.01 and 0.03 respectively) whereas transfer programs devoted to the poor and low income families act negatively on growth as suggested in the literature. Support to education significantly reduces growth in a model that focuses on human and physical capital spending only, which is the way many previous contributions evaluate government spending. This result confirms previous contributions such as Shioji (2001) that rely on a similar model and explain its results through migration of newly graduates in search of better job opportunities. However, this finding should be considered with caution as education does not impact growth significantly when estimated among a larger set of government programs. We test the sensitivity of our results to a classification by agency and department as federal spending is channeled through them and many contribute simultaneously to several axes of socio-economic development that, in some cases, have opposite effects on growth. We find that the USDA is the only department to promote growth significantly.

Our results recommend a more innovative and place-tailored implementation of future public spending programs as they identify which ones are the most efficient in promoting economic growth in the recipient areas. The federal government ought to follow this approach if it wants to achieve greater growth at the least cost, improve how its activities are carried out and justify its choosing of future development strategies. Yet we recognize that our conclusions are dependent on the objective we have chosen here, hence we cannot righteously advocate for an elimination of the programs that reduce growth or have no

significant impact on it. Indeed, their estimated return could be very different if one had chosen other laudable objectives such as supporting employment, labor productivity or reducing social inequalities.

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Table 1—Descriptive Statistics, (County Characteristics)

Variable	Type	Mean	Min.	Max.	S.D.
Growth 2000-2007	Metro	0.009	-0.021	0.098	0.010
	Non-Metro	0.013	-0.034	0.100	0.012
	Total	0.012	-0.034	0.100	0.012
ln(Personal Income)	Metro	3.552	2.868	4.670	0.223
	Non-Metro	3.312	2.535	4.528	0.182
	Total	3.377	2.535	4.670	0.221
% Tertiary Education	Metro	0.499	0.208	0.843	0.108
	Non-Metro	0.399	0.169	0.854	0.100
	Total	0.426	0.169	0.854	0.112
% Farmer Employment	Metro	0.003	0.000	0.091	0.007
	Non-Metro	0.012	0.000	0.413	0.025
	Total	0.010	0.000	0.413	0.022
% Manuf. Employment	Metro	0.178	0.004	0.595	0.109
	Non-Metro	0.208	0.000	0.944	0.156
	Total	0.200	0.000	0.944	0.145
% Professional Employment	Metro	0.042	0.004	0.416	0.031
	Non-Metro	0.026	0.000	1.000	0.036
	Total	0.030	0.000	1.000	0.035
% Unemployment	Metro	0.038	0.014	0.155	0.013
	Non-Metro	0.046	0.015	0.174	0.017
	Total	0.043	0.014	0.174	0.016
% Small Business	Metro	0.978	0.952	1.000	0.008
	Non-Metro	0.985	0.907	1.000	0.010
	Total	0.983	0.907	1.000	0.010
Roads Density	Metro	4.162	0.414	27.025	3.074
	Non-Metro	2.167	0.410	16.521	0.746
	Total	2.708	0.410	27.025	1.937
% Minorities	Metro	0.143	0.009	0.710	0.131
	Non-Metro	0.116	0.000	0.948	0.162
	Total	0.123	0.000	0.948	0.154
% Female Head of Family	Metro	0.163	0.070	0.446	0.050
	Non-Metro	0.143	0.022	0.437	0.059
	Total	0.149	0.022	0.446	0.058

Source: Author calculations based on data from Census Bureau, BEA and Dept. of Labor.

Table 2—Descriptive Statistics (Federal Funds 2000-2007)

Variable	Type	Mean	Min.	Max.	SD
Total 15	Non-Metro.	6.294	1.295	24.324	2.100
	Metro.	4.728	0.885	16.716	1.770
	Total	5.870	0.885	24.324	2.132
Others	Non-Metro.	1.975	-5.468 (2)	34.610	2.303
	Metro.	2.781	0.315	126.822	6.357
	Total	2.193	-5.468	126.822	3.865
Education and Training	Non-Metro.	0.170	0.011	4.212	0.257
	Metro.	0.194	0.010	3.669	0.286
	Total	0.177	0.010	4.212	0.265
Telecommunication	Non-Metro.	0.000	0.000	0.022	0.001
	Metro.	0.000	0.000	0.005	0.000
	Total	0.000	0.000	0.022	0.001
Transportation	Non-Metro.	0.306	-0.078 (9)	8.825	0.496
	Metro.	0.174	0.001	2.111	0.163
	Total	0.270	-0.078	8.825	0.435
Energy	Non-Metro.	0.009	0.000	0.348	0.013
	Metro.	0.007	-0.001 (2)	0.174	0.012
	Total	0.008	-0.001	0.348	0.013
Technology	Non-Metro.	0.001	0.000	0.240	0.007
	Metro.	0.002	-0.024 (5)	0.087	0.007
	Total	0.001	-0.024	0.240	0.007
Research	Non-Metro.	0.008	-0.001 (5)	1.274	0.054
	Metro.	0.042	-0.000 (2)	1.562	0.132
	Total	0.017	-0.001	1.562	0.084
Environment	Non-Metro.	0.087	-0.000 (1)	4.524	0.218
	Metro.	0.016	-0.001 (3)	0.393	0.039
	Total	0.068	-0.001	4.524	0.190
Health	Non-Metro.	2.730	0.242	18.683	1.039
	Metro.	2.072	0.185	9.077	0.888
	Total	2.551	0.185	18.683	1.042
Housing	Non-Metro.	0.046	-0.002 (2)	1.820	0.067
	Metro.	0.070	0.000	3.156	0.141
	Total	0.052	-0.002	3.156	0.094
Support to Businesses	Non-Metro.	0.002	0.000	0.328	0.009
	Metro.	0.003	0.000	0.388	0.020
	Total	0.002	0.000	0.388	0.013
Farmers and rural areas	Non-Metro.	0.473	0.000	12.532	1.049
	Metro.	0.035	0.000	0.968	0.062
	Total	0.354	0.000	12.532	0.917
Low income and the poor	Non-Metro.	0.422	0.033	5.319	0.290
	Metro.	0.376	0.033	3.055	0.260
	Total	0.409	0.033	5.319	0.283
Retirees	Non-Metro.	1.982	0.325	4.099	0.518
	Metro.	1.678	0.217	3.955	0.487
	Total	1.899	0.217	4.099	0.528
Unemployed	Non-Metro.	0.037	-0.026 (1)	2.041	0.082
	Metro.	0.049	0.001	1.602	0.125
	Total	0.040	-0.026	2.041	0.096
Minority	Non-Metro.	0.024	-0.011 (1)	2.428	0.113
	Metro.	0.011	0.000	0.188	0.019
	Total	0.020	-0.011	2.428	0.097

Notes: $ 1,000 per capita (measured in 2008 value).

Source: Author calculations based on the CFFR, Census Bureau.

* The negative values reflect pre-2000 federal commitments that were not fully spent over 2000-2007. The number of counties in that situation appears in parenthesis.

Table 3—OLS/2SLS Robust (White) Equations 1-3

	1- OLS 15 programs	2- OLS 3 programs	3- 2SLS 15 programs	4- 2SLS 3 programs	5- 2SLS + squared 15 programs	6- 2SLS + squared 3 programs	7- 2SLS + interaction 15 programs	8- 2SLS + interaction 3 programs
Selected Federal Spending Programs	7.51×10^{-4}***	7.25×10^{-4}	6.71×10^{-4}***	2.84×10^{-5}	0.002	0.016	0.008	-0.212
	(0.000)	(0.001)	(0.000)	(0.001)	(0.003)	(0.018)	(0.017)	(0.274)
Other Federal Spending	3.42×10^{-4}**	4.34×10^{-4}***	2.30×10^{-4}**	3.30×10^{-4}***	2.32×10^{-4}**	2.98×10^{-4}***	2.47×10^{-4}**	1.07×10^{-4}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ln(Personal Income)	-0.019***	-0.019***	-0.019***	-0.019***	-0.018***	-0.018***	-0.007	-0.050
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.028)	(0.040)
% Tertiary Education	0.022***	0.020***	0.022***	0.020***	0.024***	0.016***	0.022***	0.027***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)	(0.003)	(0.010)
% Female Head of Family	-0.019**	-0.017**	-0.020**	-0.018**	-0.022**	-0.031*	-0.020**	-0.047
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.017)	(0.008)	(0.037)
% Farmer Employment	-0.027***	-0.028***	-0.028***	-0.030***	-0.027***	-0.032***	-0.024*	-0.056
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.012)	(0.013)	(0.037)
% Manuf. Employment	-0.015***	-0.016***	-0.015***	-0.016***	-0.015***	-0.014***	-0.015***	-0.021***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.006)
% Unemployment	-0.031**	-0.029*	-0.030*	-0.027*	-0.036*	-0.041*	-0.039	0.0027
	(0.016)	(0.015)	(0.015)	(0.015)	(0.020)	(0.022)	(0.027)	(0.045)
% Minorities	0.013***	0.013***	0.014***	0.014***	0.014***	0.015***	0.013***	0.029
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.020)
Small Business	0.146***	0.155***	0.148***	0.157***	0.140***	0.172***	0.146***	0.134**
	(0.028)	(0.028)	(0.027)	(0.028)	(0.032)	(0.033)	(0.028)	(0.060)
% Professional Employment	0.017**	0.014**	0.019***	0.016**	0.019***	0.015**	0.018**	0.019**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)
ln(Roads Density)	-0.002**	-0.002**	-0.002**	-0.002***	-0.002**	-0.001	-0.001*	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Income Interaction							-0.002	0.063
							(0.005)	(0.081)
Squared Federal Spending					-9.68×10^{-5}	-0.005		
					(0.000)	(0.005)		
Constant	-0.075***	-0.083***	-0.077***	-0.083***	-0.076***	-0.104***	-0.117	0.045
	(0.029)	(0.030)	(0.029)	(0.030)	(0.029)	(0.038)	(0.095)	(0.179)
Observations	3076	3076	3076	3076	3076	3076	3076	3076
Adjusted R-squared	0.273	0.27	0.272	0.268	0.273	0.0319	0.268	-0.168
Under ID Kleibergen – Paap$^{\mp}$			212.8 (0)	69.49 (0)	23.1 (0)	6.041 (0.048)	12.88 (0.001)	2.532 (0.282)
Weak ID Kleibergen-Paap rk Wald F statistic			902.5	49.57	5.804	1.52	3.265	0.635
Hansen J statistic$^{\mp}$			1.03 (0.598)	0.972 (0.615)	0.772 (0.380)	0.0147 (0.904)	0.785 (0.376)	0.0242 (0.876)
Log Likelihood	9817	9811	9814	9805	9818	9376	9807	9087
AIC	-19608	-19596	-19602	-19584	-19608	-18724	-19586	-18146

BIC	-19530	-19518	-19524	-19506	-19524	-18640	-19502	-18062

Notes: Dependent Variable: ln(growth 2000-2007). Average over 2000-2007 per capita federal government spending. Monetary variables are in real 2008 dollar. Robust standard errors are in parentheses.

Source: Author calculations.

$^{\mp}$: p-value in parenthesis.

*** Significant at the 1 percent level, ** Significant at the 5 percent level.,* Significant at the 10 percent level.

Table 4—2SLS Robust (White) Equation 4

VARIABLES	(1) 15 Programs Metropolitan	(2) 15 Programs Non-Metropolitan	(3) 3 Programs Metropolitan	(4) 3 Programs Non-Metropolitan
Selected Federal Spending Programs	$5.22x10^{-4}$**	$6.03 x10^{-4}$***	$-3.11 x10^{-5}$	$-4.46 x10^{-4}$
	(0.000)	(0.000)	(0.001)	(0.001)
Other Federal Spending	$1.71 x10^{-4}$*	$2.63 x10^{-4}$*	$1.99 x10^{-4}$*	$4.38 x10^{-4}$***
	(0.000)	(0.000)	(0.000)	(0.000)
ln(Personal Income)	-0.0078**	-0.023***	-0.0075**	-0.023***
	(0.003)	(0.003)	(0.003)	(0.003)
% Tertiary Education	-0.006	0.030***	-0.007	0.029***
	(0.006)	(0.004)	(0.006)	(0.004)
% Female Head of Family	-0.0082	-0.022**	-0.0023	-0.021**
	(0.014)	(0.010)	(0.014)	(0.009)
% Farmer Employment	-0.017	-0.024**	-0.019	-0.025**
	(0.053)	(0.010)	(0.053)	(0.010)
% Manuf. Employment	-0.025***	-0.012***	-0.027***	-0.013***
	(0.004)	(0.002)	(0.004)	(0.002)
% Unemployment	0.057**	-0.051***	0.061**	-0.051***
	(0.029)	(0.018)	(0.028)	(0.018)
% Minorities	0.022***	0.011***	0.021***	0.012***
	(0.004)	(0.003)	(0.004)	(0.003)
Small Business	0.256***	0.126***	0.248***	0.128***
	(0.043)	(0.032)	(0.043)	(0.032)
% Professional Employment	0.038	0.015**	0.036	0.013**
	(0.025)	(0.007)	(0.026)	(0.006)
ln(Roads Density)	-0.002*	-0.002**	-0.002	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.212***	-0.043	-0.203***	-0.043
	(0.044)	(0.034)	(0.045)	(0.034)
Observations	834	2,242	834	2,242
Adjusted R-squared	0.317	0.264	0.315	0.262
Under ID Kleibergen – Paap[∓]	54.94 (0.000)	22.38 ($5.44 x10^{-5}$)	27.32 ($5.04 x10^{-6}$)	51.51 (0.000)
Weak ID Kleibergen-Paap rk Wald F statistic	161.5	70.71	26.03	33.04
Hansen J statistic[∓]	2.724 (0.256)	0.826 (0.662)	4.422 (0.110)	0.635 (0.728)
Log Likelihood	2796	7085	2795	7082
AIK	-5566	-14144	-5564	-14138
BIC	-5505	-14070	-5503	-14064

Notes: Dependent Variable: ln(growth 2000-2007). Average over 2000-2007 per capita federal government spending. Monetary variables are in real 2008 dollar. Robust standard errors are in parentheses.

Source: Author calculations.

[∓]: p-value in parenthesis.

*** Significant at the 1 percent level, ** Significant at the 5 percent level., * Significant at the 10 percent level.

Table 5—2SLS Robust (White) Equation 5

VARIABLES	(1) 15 Programs Metropolitan	(2) 15 Programs Non-Metropolitan	(3) 3 Programs Metropolitan	(4) 3 Programs Non-Metropolitan
Education and Training	0.008	-0.001	-0.001	-0.003**
	(0.008)	(0.002)	(0.002)	(0.001)
Telecommunication	-3.798	-1.224	-1.951	-0.559
	(4.246)	(2.664)	(3.826)	(2.525)
Transportation	0.001	0.001	0.004	0.001
	(0.006)	(0.002)	(0.005)	(0.001)
Energy	-0.051	-0.036		
	(0.071)	(0.024)		
Technology	-0.202	0.099		
	(0.163)	(0.099)		
Research	-0.004	-0.008		
	(0.005)	(0.011)		
Environment	-0.023	-0.007*		
	(0.037)	(0.004)		
Health	0.007***	0.001**		
	(0.002)	(0.001)		
Housing	0.022	0.008		
	(0.017)	(0.008)		
Support to Businesses	0.076	0.003		
	(0.093)	(0.278)		
Farmers and rural areas	0.007	0.003***		
	(0.018)	(0.001)		
Low income and the poor	-0.014*	-0.003**		
	(0.007)	(0.001)		
Retirees	-0.002	-0.001		
	(0.002)	(0.001)		
Unemployed	-0.011	0.004		
	(0.009)	(0.006)		
Minority	-0.072	-0.002		
	(0.057)	(0.006)		
Others	$1.2x10^{-4}$	$3.04\ x10^{-4}$**	$2.07\ x10^{-4}$*	$4.67\ x10^{-4}$***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	834	2,242	834	2,242
Adjusted R-squared	0.275	0.260	0.312	0.266
Log Likelihood	2779	7086	2794	7090
AIK	-5504	-14118	-5558	-14150
BIC	-5376	-13964	-5487	-14064

Notes: Dependent Variable: ln(growth 2000-2007). Average over 2000-2007 per capita federal government spending. Monetary variables are in real 2008 dollar. Robust standard errors are in parentheses.

Source: Author calculations.

*** Significant at the 1 percent level, ** Significant at the 5 percent level., * Significant at the 10 percent level.

Table 6—2SLS Robust (White) Equation 5, Agency-Based Classification

VARIABLES	(1) 11 Programs Metropolitan Dummy Interaction	(2) 11 Programs Non-Metropolitan Dummy Interaction	(3) 2 Programs Metropolitan Dummy Interaction	(4) 2 Programs Non-Metropolitan Dummy Interaction
Education and Training (Dept. of Education et al.†)	0.015	-0.009**	-0.002	-0.004***
	(0.019)	(0.004)	(0.002)	(0.001)
Transportation (Dept. of Transportation)	0.002	0.001	0.004	0.001
	(0.006)	(0.002)	(0.005)	(0.001)
Energy (Dept. of Energy)	-0.085**	0.067		
	(0.038)	(0.086)		
Research (National Science Foundation, NASA)	-0.005	-0.002		
	(0.008)	(0.003)		
Environment (EPA et al.†)	-0.014	-0.003		
	(0.026)	(0.002)		
Health (Dept. of Health and Human Services)	0.002	0.001		
	(0.002)	(0.001)		
Housing (Dept. of Housing and Urban Development)	-0.004	0.004		
	(0.007)	(0.005)		
Support to Businesses (Dept. of Commerce et al.†)	0.000	-0.017		
	(0.027)	(0.026)		
Farmers and rural areas (USDA)	0.002	0.001***		
	(0.006)	(0.000)		
Retirees (Social Security Administration et al.†)	0.000	0.000		
	(0.001)	(0.001)		
Unemployed (Dept. of Labor)	-0.022	0.010		
	(0.021)	(0.007)		
Others	3.20×10^{-4}***	2.95×10^{-4}**	1.95×10^{-4}*	4.72×10^{-4}***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	834	2,242	834	2,242
Adjusted R-squared	0.281	0.267	0.318	0.27
Log Likelihood	2780	7094	2797	7095
AIC	-5514	-14142	-5566	-14162
BIC	-5405	-14011	-5500	-14082

Notes: Dependent Variable: ln(growth 2000-2007). Average over 2000-2007 per capita federal government spending. Monetary variables are in real 2008 dollar. Robust standard errors are in parentheses.

†: Agencies classification (not shown): ***Education***: Department of State, Bureau of Educational and Cultural Affairs, National Endowment for the Humanities, Smithsonian Institution Academy Program, Corporation for National and Community Service, Department of Education, Harry S. Truman Scholarship Foundation, National historical publications and records grants, Corporation for National and Community Service; ***Housing***: Department of Housing and Urban Development; ***Retirees***: Railroad Retirement Board, Pension Benefit Guaranty Corporation, Social Security Administration; ***Support to Businesses***: Department of Commerce, Appalachia Regional Commission, Small Business Administration, Agency for International Development; ***Environment***: Department of the Interior, Environmental Protection Agency.

Source: Author calculations.

*** Significant at the 1 percent level, ** Significant at the 5 percent level., * Significant at the 10 percent level.