Measuring the Efficiency of States to Convert Government and Private Expenditures into Jobs

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Abstract

We evaluate the efficiency with which the 50 U.S. states convert public and private spending into jobs. We use a Data Envelopment Analysis model in which the states are the decision-making units; federal, state, private sector spending are the inputs; and jobs is the output. We find that 38 percent of states are efficient. However, there is considerable variation in efficiency, suggesting that the effect on job creation depends on where the money is spent. We find that high population states more likely to be efficient than low population states, while states located in the Southeast region are less likely to be efficient relative to states located elsewhere. We find that states with higher proportions of their workforce in the Professional and Business Services, Government, or Education and Health Services super-sectors are less likely to be efficient relative to states with lower proportions of their workforce in these super-sectors.

Keywords: Data Envelopment Analysis, Government Efficiency, State Funding

1. Introduction

Perhaps the most pressing economic issue facing the United States since the start of the current economic slowdown is job creation. Reduced tax revenue due to unemployment is a contributing factor in the federal deficit crisis and was a central issue in the recent presidential election campaign. It is widely recognized that spending – both public and private –creates jobs and the federal stimulus package of 2009 was implemented following this logic.

In this paper, we investigate the extent to which the effect of spending on job creation depends on where the spending takes place. Specifically, for example, does increased spending in a large industrial state have different impacts relative to spending in smaller rural states? Does the location of the state or the composition of jobs within a state influence the effects of spending? The results can assist economic forecasters to estimate more accurately the future impacts of proposed federal and state spending plans on jobs.

To address these questions, we evaluate the efficiency with which each of the 50 states converts public and private spending into jobs.

We use a Data Envelopment Analysis (DEA) model in which the states are the decision-making units (DMUs), federal, combined state and local, and private sector spending are the three inputs, and jobs is the sole output.In addition, the model provides the returns-to-scale status of each state. This is important because, all else equal, we would expect a greater marginal return on federal expenditures in states that are operating in the increasing returns-to-scale region as opposed to the decreasing returns-to-scale region.

We then construct a logistic regression model that identifies how state efficiency depends on the region of the country in which the state lies (Andrews and Swanson, 1995; Garrett et al., 2007), the population of the state (Dye, 1980), and the composition of the state's workforce across super-sectors, as defined by the Bureau of Labor Statistics (Luce, 1994). This model permits us to discern the characteristics of efficient states. In particular, it allows us to identify super-sectors that are associated with higher levels of job creation.

Policy makers can use the DEA model to evaluate the national effects of a given stimulus proposal on total jobs. Suppose that a stimulus proposal calls for specified increases in federal expenditures for each of the 50 states. Each state will respond to its own expenditure increase with growth in jobs. The nature and extent of the response will depend on (1) the amount of stimulus money the state receives, (2) the efficiency with which the state converts inputs, including federal expenditures, into jobs (which depends on the location of the state, its population, and the composition of jobs within the state, as we shall show), and (3) the returns-to-scale status of the state. The first is specified by the terms of the stimulus proposal; the second and third are provided by the model.

We begin with a review of the relevant literature followed by a description of our methodology and our data sources. We then present the results of our analysis and conclude with a discussion of our findings.

2. Literature Review

The literature linking public spending and economic growth traces it roots to Aschauer's (1989) study demonstrating a significant positive relationship between public expenditure and national private sector output. Regarding state and local spending, a positive relationship has been found between spending and employment for forty years (Fleming, 1973; Lin, 1994). Additionally,Rumberger(1983) found that government spending generated over a third of civilian employment in 1980. Goss and Philips (1994) found a positive relationship between state spending in areas of higher education, infrastructure and economic development and employment opportunities. Garcia-Mila and McGuire (1992) also found that state expenditures, disaggregated by infrastructure and education, were positively related to state economic output, though the relationship was stronger for education spending. Helms (1985) found that state and local expenditures targeted primarily at public services and infrastructure resulted in economic growth, including employment. Local government expenditures, measured separately from state spending, have also been found to have a positive relationship to employment (Dalenberg and Partridge, 1995). Deller and Lledo (2002) found that higher levels of county and municipal spending on infrastructure lead to increased economic growth in Wisconsin. More recently, Wilson (2012) examined the employment impact of the 2009 American Recovery and Reinvestment Act (federal stimulus program). He found a strong correlation between stimulus spending within each state and that state's subsequent employment growth.

State and local spending has been operationalized using total state expenditures (Dye, 1980), infrastructure expenditures (e.g., transportation improvements) (Srithongrung, 2008), and program expenditures (e.g., education) (Evans and Karras, 1994). In our study, we measurecombined state and local spending using total expenditures, whether for infrastructure or program support. Fisher (1997) provides an extensive review of the literature in this area.

This study contributes to the literature by addressing the state-by-state efficiency of expenditures in producing jobs. As pointed out by Holtz-Eakin (1994) and others, government expenditures mayalso create a drag on the economy by crowding out private investment (Taylor and Brown, 2006), raising taxes to cover the expenditures (Helms, 1985), or decreasing expenditures in other areas of the budget. Consequently, state policy makers must limit expenditures to avoid thesenegative effects.

2.1 DEA

We trace the mathematical development of DEA to Charnes et al. (1978) who built on the work of Farrell (1957) and others.

The procedure has been applied in such diverse fields as health care (Sherman 1984, Nunamaker 1983, Sexton et al. 1989), education (Bessent et al. 1982), electricity production (Fare and Primont 1984), criminal justice (Lewin et al. 1982), recreation (Rhodes 1982), strip mining (Byrnes et al. 1984), and public financing for pupil transportation (Sexton et al. 1994). The technique is well documented in the management science literature (Charnes et al. 1979, Forsund et al. 1980, Sexton 1986, Sexton et al. 1986), and it has received increasing attention as researchers have wrestled with problems of efficiency measurement, especially in the services and nonmarket sectors of our economy. Anderson (2004) and Emrouznejad (2004) have each provided a web site with extensive bibliographies of over 1,000 articles that document the theoretical development of DEA and its broad range of application. Tavares (2002) and Emrouznejadet al. (2008) both provide a comprehensive bibliography of the DEA literature.

3. Methodology

DEA is a linear programming-based methodology that has proven to be a successful tool in efficiency measurement. It is particularly well suited for efficiency evaluation when we measure the efficiency of the economic producers along multiple dimensions.

DEA differs from other types of efficiency measurement, such as regression analysis or stochastic frontier analysis, in that it is a nonparametric approach. DEA empirically identifies the best producers by forming the efficient frontier based on observed indicators from all producers. We refer to the producers as decision-making units (DMUs). Consequently, DEA bases the resulting efficiency scores and potential efficiency improvements entirely on the actual performance of other DMUs, free of any questionable assumptions regarding the mathematical form of the underlying production function. Instead, DEA simply assumes that any weighted average of observed DMUs is feasible. This means that the efficient frontier formed by DEA will be a conservative estimate of the true production function in the sense that a DMU will not need to change as much to reach the DEA efficient frontier as it would to reach the true production function. On the other hand, DEA is an extreme point method and therefore is sensitive to unusual observations or large data errors. On balance, many analysts view DEA as preferable to other forms of efficiency measurement.

3.1 Application of DEA to States

We use the DEA methodology to evaluate the relative efficiency of each state as it converts expenditures from public and private sources to jobs. We identify the states as the DMUs. The inputs are (1) wages and salaries paid by private sector firms, (2) combined expenditures by state and local governments, and (3) expenditures by the federal government in the state. The outputisthe number of jobs in the state. We assume variable returns to scale (VRS) to allow for the possibility that the efficiency of a state may depend on its size. We use an output orientation since the objective of the analysis is to determine the maximum possible number of jobs in each state given the values of the three inputs.

The DEA model identifies those states whose outputs cannot be exceeded by any weighted average of other states. Such states define the efficient frontier. For those states not on the frontier, the model identifies a target state that uses no more of each input and produces as many jobs as does the given state. Specifically, for each input: Input in target state ≤ Input in the given state, and, for jobs: Jobsin target state ≥ Jobsin the given state.
The target state is a hypothetical state whose inputs and output are weighted averages of states on the efficient frontier. Consider Figure 1, in which we present a simple VRS DEA model with only one input (expenditures) and only one output (jobs). States A through E are on the efficient frontier because there is no state, or weighted average of states, that lies both above and to the left of any of these states. Now consider State F, which has $350 billion in expenditures and 1,240,000jobs. State C lies both above and to the left of State F, meaning that State C has lower expenditures ($300 billion) and has more jobs (1,800,000). Thus, State C is one possible target state for State F.

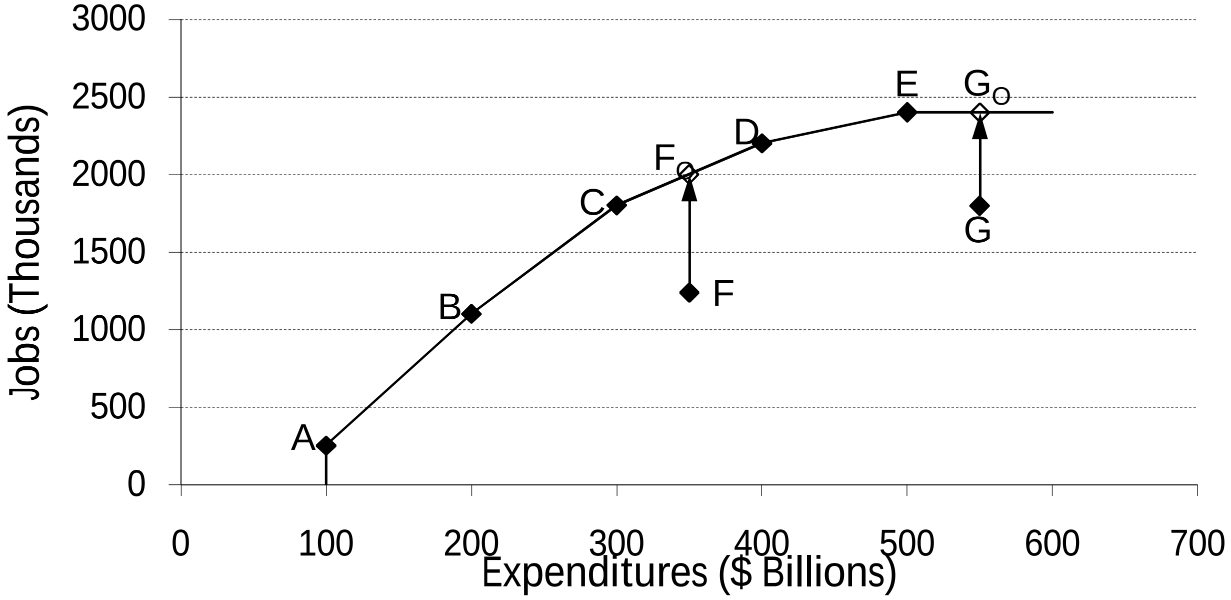

Figure 1: Simple Output-Oriented DEA Example with One Input and One Output and VRS

SinceState F is interested in increasing its number of jobs without reducing its expenditures, it would choose its target state as the point on the frontier that lies directly above it (F_O), corresponding to $350 billionin expenditures and 2,000,000jobs. We refer to this point as its output-oriented target state. While there is no state located at that point, we can imagine a hypothetical state that is a weighted average of States C and D. A fundamental assumption of DEA is that it is possible for a state to operate with inputs and outputs that are the weighted average of any number of states, and therefore this point would be a feasible target state for State F.

Now consider State G, which has $550 billion in expenditures and 1,800,000 jobs. While our logic says that State G could move to the point G_O, which has $550 billion in expenditures and 2,400,000 jobs, in fact it could also reduce its expenditures to $500 billion and still produce 2,400,000 jobs, as does State E. Thus, State E would be the target for State G. This example illustrates the concept of *input slack*.

3.2 DEA Mathematical Formulation

We now present the linear programming formulation of the DEA model. Let *n* be the number of states in the data set. Let X_{ij} be amount of input *i* consumed by State *j*, for *i* = 1, 2, 3 and *j* = 1, 2, …, 50. Let Y_j be the number of jobs produced by State *j*, for *j* = 1, 2, …, 50.

We are now ready to present the output-oriented DEA model for State *d*, *d* = 1, 2, …, 50. We must solve one such linear programming model for each state.

$$Max\theta_d \tag{1}$$

subject to

$$\sum_{j=1}^{50} \lambda_j X_{ij} \leq X_{id} for i = 1, 2, 3 \tag{2}$$

$$\sum_{j=1}^{50} \lambda_j Y_j \geq \theta_d Y_d \tag{3}$$

$$\sum_{j=1}^{50} \lambda_j = 1 \tag{4}$$

$$\lambda_j \geq 0 \ for j = 1, 2, \dots, 50 \tag{5}$$

$$\theta_d \geq 0 \tag{6}$$

We observe that setting $\lambda_d = 1$, $\lambda_j = 0$ for $j \neq d$, and $\theta_d = 1$ is a feasible, but not necessarily optimal, solution to the linear program for State*d*. This implies that θ_d^*, the optimal value of θ_d, must be greaterthan or equal to 1.

The optimal value, θ_d^*, is the *overall inverse efficiency* of DMU *d*, which represents one plus the proportion by which State *d* can increase its jobs. For example, if $\theta_d^* = 1.25$, then State *d* can increase its jobs by 25% without increasing any of its three expenditures. We refer to $E_d^* = 1/\theta_d^*$ as the *overall efficiency* of State *d*. Thus, if $\theta_d^* = 1.25$, then $E_d^* = 0.80$ and we can say that State *d* is 80% efficient overall.

The left-hand-sides of Equations (2) and (3) are weighted averages, because of Equations (4) and (5), of the inputsand output, respectively, of the 50states. At optimality, that is with the λ_j replaced by λ_j^*, we call the left-hand-sides of Equations (2) and (3) the *target inputs*and *target output*, respectively, for State*d*.

Equation (2) implies that each target input will be less than or equal to the actual level of that input inState*d*. Similarly, Equations (3) implies that the target output will be greater than or equal to the actual output level inState*d*.

Equation (4) ensures that the weights sum to one and allows us to interpret the target inputs and target output as weighted averages of the corresponding quantities inState*d*'s reference states, that is, those states for which $\lambda_j > 0$. In DEA terminology, this constraint indicates that the production process is VRS, meaning that the productivity effect of an additional unit of an input may differ with the size of the state.

Thus, the optimal solution to the linear program for State*d* identifies a hypothetical target stated^* that, relative to State*d*, (a) consumes the same or less of every input and (b) produces the same or more of the output. Moreover, the objective function expressed in Equation (1) ensures that the target stated^*producesjobs that are increased as much as possible.

We define the *output factor efficiency* of State *d*as the ratio of the actual output value to the target output value. Specifically, the output factor efficiency for jobs is

$$E_d^{Output} = \frac{Y_d}{\sum_{j=1}^{50} \lambda_j^* Y_{rj}}$$

The output factor efficiencyfor State *d*reveals the efficiencies of the state with respect to job creation. For example, if the jobs factor efficiency of State *d*equals 0.75, then State*d* has produced only 75% of the jobs produced by its target state.

We define the *input factor efficiency* of State *d* for each input as the ratio of the target input value to the actual input value. Specifically, the input factor efficiencies for wages and salaries paid by private sector firms (s = 1), expenditures by the state and local governments (s = 2), and expenditures by the federal government in the state (s = 3) are

$$E_{sd}^{Input} = \frac{X_{sd}}{\sum_{j=1}^{50} \lambda_j^* X_{sj}} fors = 1, 2, 3$$

The input factor efficiencies for State *d* reveal the efficiencies of the state with respect to each input. For example, if the federal expenditures factor efficiency of State *d* equals 0.9, then State *d* can produce the same number of jobs with only 90% of the federal expenditures that it currently receives.

We then modify the model by eliminating constraint (4) and recomputing all the efficiency scores. This has the effect of changing the returns-to-scale assumption from variable to constant. The overall inverse efficiency score of a state computed under constant returns to scale (CRS)would always be greater than or equal to that computed under VRS. The *scale efficiency* of a state is the ratio of the state's overall inverse efficiency score under VRS to its overall inverse efficiency score under CRS.Low scale efficiency indicates that the marginal effect of expenditures in the state on the state's job creationis considerably different (higher or lower) from the average effect of expenditures in the state on job creation. If the sum of the lambdas (the left-hand side of equation (4)) is less than one at optimality, then the state is operating under increasing returns to scale; conversely, if the sum of the lambdas is greater than one at optimality, then the state is operating under decreasing returns to scale. If the sum of the lambdas is equal to one at optimality without the constraint, then the state is operating under constant returns to scale and its scale efficiency equals one.

3.3 Logistic Regression Model

We follow the DEA with a logistic regression model for the purpose of better understanding the characteristics of the states that are associated with their efficiency.

The dependent variable in the logistic regression model equals one if the state is on the efficient frontier, and equals zero if the state is not on the efficient frontier. The potential independent variables are the region of the country in which the state is situated (represented by 8 binary variables), the population of the state (in millions), and the composition of the state's workforce across the 10 super-sectors defined by the Bureau of Labor Statistics (expressed as percentages of the state's total workforce).

The eight regions of the country are: Far West, Great Lakes, Mideast, New England, Plains, Rocky Mountain, Southeast, and Southwest. The ten super-sectors are: Mining, Logging, and Construction; Manufacturing; Trade, Transportation, and Utilities; Information; Financial Activities; Professional and Business Services; Education and Health Services; Leisure and Hospitality; Other Services; and Government. Only variables whose coefficients were statistically significant at the 5% level were retained in the model.

3.4Data

Weobtain data on federal expenditures in each state from the U.S. Census Bureau(http://www.census.gov/prod/2009pubs/cffr-08.pdf, Table 1), state and local expenditures in each state from the U.S. Census Bureau, 2008 Annual Surveys of State and Local Government Finances (http://www.census.gov//govs/estimate/historical_data_2008.html), and private expenditures in each state from the U.S. Bureau of Economic Analysis (http://www.bea.gov). We obtain data on jobs from the Bureau of Labor Statistics (http://www.bls.gov/data/). All data are for the calendar year 2008.

4. Results

Table 1 shows the jobs efficiency score and jobs inverse efficiency score of each state, the latter of which indicates the extent to which the state could increase jobs given its levels of spending. We observe that 19states have jobs efficiency scores equal to one, indicating that they are on the efficient frontier.

Table 1: Job Efficiency, Job inverse Efficiency,and Input Factor Efficiencies of each state.

State	Jobs		Input Factor Efficiencies		
	Efficiency	Inverse Efficiency	Wages and Salaries	Federal Expenditures	State and Local Expenditures
California	1.000	1.000	1.000	1.000	1.000
Delaware	1.000	1.000	1.000	1.000	1.000
Illinois	1.000	1.000	1.000	1.000	1.000
Indiana	1.000	1.000	1.000	1.000	1.000
Iowa	1.000	1.000	1.000	1.000	1.000
Minnesota	1.000	1.000	1.000	1.000	1.000
Mississippi	1.000	1.000	1.000	0.698	0.787
Missouri	1.000	1.000	1.000	1.000	1.000
Nevada	1.000	1.000	1.000	1.000	1.000
New Hampshire	1.000	1.000	1.000	1.000	1.000
North Dakota	1.000	1.000	1.000	1.000	1.000
Ohio	1.000	1.000	1.000	1.000	1.000
South Dakota	1.000	1.000	1.000	1.000	1.000
Texas	1.000	1.000	1.000	1.000	1.000
Utah	1.000	1.000	1.000	1.000	1.000
Vermont	1.000	1.000	1.000	1.000	1.000
West Virginia	1.000	1.000	1.000	1.000	1.000
Wisconsin	1.000	1.000	1.000	1.000	1.000
Wyoming	1.000	1.000	1.000	1.000	1.000
North Carolina	0.998	1.002	0.995	1.000	1.000
Arkansas	0.995	1.005	1.000	0.824	1.000
Virginia	0.994	1.006	0.850	0.673	1.000
Florida	0.991	1.009	1.000	0.976	0.906
Montana	0.990	1.010	1.000	1.000	0.833
Kentucky	0.986	1.014	1.000	0.539	0.923
South Carolina	0.985	1.015	1.000	0.749	0.838
Oklahoma	0.983	1.017	1.000	0.790	1.000
Alabama	0.979	1.021	1.000	0.626	0.915
Idaho	0.976	1.025	1.000	1.000	1.000
Nebraska	0.975	1.026	1.000	1.000	0.947
Pennsylvania	0.975	1.026	1.000	0.855	0.992
Tennessee	0.973	1.028	1.000	0.679	0.986
Kansas	0.961	1.041	1.000	1.000	1.000
New York	0.948	1.055	0.949	1.000	0.859
Louisiana	0.940	1.064	1.000	0.682	0.749
Colorado	0.929	1.076	0.889	1.000	1.000
Maine	0.929	1.076	1.000	1.000	0.935
Georgia	0.927	1.079	1.000	1.000	1.000
Michigan	0.922	1.085	1.000	0.932	1.000
Oregon	0.904	1.106	1.000	1.000	0.942
New Jersey	0.900	1.111	0.958	1.000	0.921
New Mexico	0.895	1.117	1.000	0.815	0.845
Arizona	0.880	1.136	1.000	0.774	0.980
Maryland	0.829	1.207	0.970	0.866	1.000
Massachusetts	0.824	1.214	0.901	1.000	1.000
Washington	0.823	1.215	1.000	0.969	0.973
Rhode Island	0.820	1.219	1.000	1.000	0.918
Connecticut	0.791	1.265	0.857	1.000	1.000
Hawaii	0.756	1.322	1.000	0.998	1.000
Alaska	0.683	1.464	1.000	1.000	0.539

Table 1 also shows the input factor efficiencies for each input for each state. In an output-oriented model, an input factor efficiency score less than one indicates slack in the corresponding input constraint and therefore implies that the state can decrease its use of that input while meeting its target number of jobs. For example, Mississippi is efficient with respect to jobs but it can reduce its federal expenditures to 69.8% of its current level and it can reduce its state and local expenditures to 78.7% of its current level while maintaining its current number of jobs. Maryland, on the other hand, can increase jobs by 20.7% while simultaneously reducing wages and salaries by 3% and federal expenditures by 13.4%.

Table 2 shows the results of a logistic regression model in which the dependent variable equals one if the state lies on the efficient frontier. The independent variables with statistically significant coefficients in the model are (1) the Southeast regional variable, (2) population, and (3) three variables that measure the percentage of total employment within the state in specific super-sectors (Professional and Business Services, Government, and Education and Health Services).The P-value of the deviance equals 0.7911 indicating that there is no evidence that the model fails to fit the data well.

Table 2: Logistic Regression Model for the Probability of Lying on the Efficient Frontier

Predictor Variable	**Coefficient**	**Standard Error**	**Coefficient/SE**	**P-Value**
Constant	47.3281	19.0184	2.49	0.0128
Prof and Business Services	-1.61113	0.58054	-2.78	0.0055
Government	-1.07693	0.47266	-2.28	0.0227
Education and Health Services	-0.81599	0.37914	-2.15	0.0314
Southeast Region	-3.09475	1.28778	-2.40	0.0163
Population (Millions)	0.17321	0.09235	1.88	0.0607
Deviance P-Value of deviance	36.23 0.7911			
Degrees of freedom	44			
Convergence criterion of 1.000E-07 met after 7 iterations				
Cases Included 50		Missing Cases 0		

Table 3 shows the classification table for the estimated logistic regression model. We see that the model correctly classifies 12 of the 19 efficient states (63.2%) and 26 of the 31 inefficient states (83.9%); overall, the model correctly classifies 38 of the 50 states (76.0%) of the states.

Table 3: Classification Table for the Estimated Logistic Regression Model

	Predictions		
Actual	**Not on Frontier**	**On Frontier**	**Total**
Not on Frontier	26	5	31
On Frontier	7	12	19
TOTAL	33	17	50
Proportion of states not on frontier correctly classified			26/31 (83.9%)
Proportion of states on frontier correctly classified			12/19 (63.2%)
Overall proportion correctly classified			38/50 (76%)

Table 4 shows the odds ratios for each independent variable in the model.To illustrate, consider two hypothetical states – State A and State B – that are identical in all respects except that the percentage of employed people who work in the Professional and Business Services super-sector in State Bis one percentage point higherthan that in State A. Then the odds of State B lying on the efficient frontier is 20% of State A's odds of lying on the efficient frontier. Similar statements may be made about the percentage of employed people who work in the Government super-sector (34% of State A's odds of lying on the efficient frontier) and in the Education and Health Services super sector (44% of State A's odds of lying on the efficient frontier).

In addition, if State A is not located in the Southeast region and State B is, then the odds of State B lying on the efficient frontier is 5% of State A's odds of lying on the efficient frontier.

Finally, if State B's population exceeds that of State A by one million, then the odds of State B lying on the efficient frontier is 19% higher than State A's odds of lying on the efficient frontier.

Table 4: Odds Ratios for the Logistic Regression Model

Predictor Variables	95% C.I. Lower Limit	Odds Ratio	95% C.I.Upper Limit
Prof and Business Services	0.06	0.20	0.62
Government	0.13	0.34	0.86
Education and Health Services	0.21	0.44	0.93
Southeast Region	0.00	0.05	0.57
Population (Millions)	0.99	1.19	1.43

We determine the returns-to-scale status of each state's target by re-solving the DEA model without constraint (4). If the optimal sum of weights (lambdas) is greater than (equal to, less than) one, then the state's target is operating on the IRS (CRS, DRS) portion of the frontier. Table 5 presents the sums of lambdas for each state. We note that 36 of the 50 states (70%) operate under DRS, while 8 states (18%) operate under IRS, and 6 states (12%) operate under CRS.

Table 5: Sum of Lambdas for Each State Using CRS. A Sum Less Than 1 Indicates IRS, Equal to 1 Indicates CRS, and Greater Than 1 Indicates DRS

State	Sum of Lambdas	State	Sum of Lambdas
Wyoming	0.444	Wisconsin	2.275
Vermont	0.494	Kansas	2.283
New Hampshire	0.698	New Mexico	2.433
North Dakota	0.766	Colorado	3.291
Rhode Island	0.817	Virginia	3.773
Montana	0.908	Connecticut	3.965
Alaska	0.919	Missouri	4.269
Maine	0.972	Louisiana	4.571
Nevada	1.000	Indiana	4.952
South Dakota	1.000	Kentucky	5.280
Utah	1.000	Washington	5.356
Delaware	1.000	Alabama	5.388
Texas	1.000	Arizona	5.479
Iowa	1.000	North Carolina	5.540
Idaho	1.012	Tennessee	5.905
Nebraska	1.337	Ohio	6.020
Hawaii	1.661	New Jersey	6.279
West Virginia	1.885	Georgia	6.649
Oklahoma	2.726	Massachusetts	7.313
Mississippi	3.035	Michigan	7.341
South Carolina	3.239	Maryland	8.592
Illinois	3.244	Pennsylvania	11.219
Arkansas	2.170	Florida	13.258
Oregon	2.179	New York	15.353
Minnesota	2.230	California	28.624

5. Discussion and Conclusions

We find that 19 of the 50 states (38%) are efficient, meaning that, for these states, there is no evidence that they could create more jobs with the current levels of private and government spending. However, there is considerable variation in efficiency, suggesting that the effect on job creationdepends on where the money is spent.

Specifically, we find that high population states are more likely to be efficient than low population states while states located in the Southeast region are less likely to be efficient relative to states located elsewhere. We also find that the characteristics of the state's job market also influence efficiency. Specifically, states with higher proportions of their workforce in the Professional and Business Services, Government, or Education and Health Services super-sectors are less likely to be efficient relative to states with lower proportions of their workforce in in these super-sectors.

In principle, the 4 states that operate under IRS and are efficient under the VRS model(Delaware, Wyoming, Vermont, and North Dakota) are the most preferred states to receive stimulus funds if the purpose of the additional inputs is to create jobs. The second most preferred states are the 6 states that operate under CRS and are efficient under the VRS model (Iowa, New Hampshire, South Dakota, Wisconsin, Nevada, and Utah). The third most preferred states are the 9 states that operate under DRS and are efficient under the VRS model (West Virginia, Minnesota, Mississippi, Ohio, Indiana, Illinois, Missouri, California, and Texas).

We use data from a single year, rather than multiple years, because jobs in a given year must be supported by expenditures in that same year. We chose the year 2008 because it was at that time that the federal government was formulating its stimulus package, including decisions about the distribution of stimulus money across the states.

We do not propose that future stimulus packages be structured based entirely on efficiency. There are many other issues to consider, such as political acceptability and the need for the stimulus to be national in its scope. However, the model does allow policy makers to estimate the impact of a particular stimulus proposal on job creation, assuming that states will continue at their current efficiency level.

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