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A RANKING OF STATE GOVERNMENTS' EFFICIENT USE OF EXPENDITURES TO ENCOURAGE SMALL FIRM BIRTHS

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ABSTRACT

We assume state governments are rational in their budgeting behavior. If this is true, then it is intuitive that they would allocate their expenditures so as to receive the maximum possible benefit for the least cost. Within the parameters of this study, we assume state governments work to receive the maximum number of firm births for the least amount of expenditure. Using regression analysis, we attempt to determine common state government expenditures that indirectly promote firm birth. We then employ non-parametric efficiency testing to rank states by their relative efficiency in using the significant expenditures to promote firm births. The regression results reveal three positive and significant expenditures in determining small firm birth, while relative efficiency rankings based on the use of these target expenditures indicate how states compare to their peers in terms of efficient expenditure use.

INTRODUCTION AND BACKGROUND

It is not an earth-shattering revelation that state governments consistently work to attract new businesses to their states and to retain businesses currently operating within their borders. In his 2005 state address, Indiana Governor Mitch Daniels was quoted as saying "Government does not create jobs; it only creates conditions that make jobs more or less likely." Soon after this statement was made, Indiana replaced its Department of Commerce with the Indiana Economic Development Corporation (IEDC) with the goal of developing and retaining businesses within the state. Kentucky has also taken similar measures to demonstrate a commitment to economic development through the establishment of the Cabinet for Economic Development. This cabinet serves a purpose very similar to that of the IEDC, with both entities working to foster the formation and retention of small- and large-scale firms alike. In their 2001 study, Goetz and Freshwater suggest that states' increased attention to firm births is appropriately

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focused, since the economic development policies adopted by states are increasingly considered significant influences of economic development patterns.

State governments appear to be greatly concerned with their ability to encourage firm births. Researchers have increasingly credited firm births with advances in technological innovation, job creation, and as a result, regional economic growth and development (Schumpeter, 1934; Birch, 1981; Kirchhoff and Philips, 1988; Reynolds and Maki, 1990; Davidsson, Lindmark and Olofsson, 1994; Reynolds, 1994; Luger and Koo, 2003). Because firm expansions create jobs and consequently promote regional economic growth, studies such as these have touched on the heightened emphasis. In their 1988 study involving firm births and expansions, Kirchhoff and Phillips revealed that from 1976 to 1984 firm births accounted for nearly three times more new job creations than expansions. Given that firm births were found to be responsible for approximately 74% of new job creation, the state governments' focus on fostering firm births appears reasonable.

The literature related to state economic development policy appears to be centered on the nature of the programs states incorporate to foster business development (Bartik, 1991; Isserman, 1994; Bradshaw and Blakely, 1999). Birley (1986) indicates that governments at all levels integrate strategies to foster entrepreneurial activity and firm birth, while Baumol (2002) contends that both politicians and practitioners are aware of the significance of entrepreneurship in spurring new employment and innovation. Third-party organizations such as the Corporation for Enterprise Development (CFED) are also concerned with economic development, and rank the business climates of states relative to their peers in their *Development Report Card for States*. This report evaluates each state's economy, along with many other elements the CFED considers to be essential factors in economic development.

As actions by state governments and the relevant literature suggest, the conditions state governments can influence to spur economic development within their states is a key concern. Developing such policy, however, is no simple task. The difficulties in doing so are essentially two-fold. First, it is particularly difficult for state governments to accurately pinpoint the conditions they can influence regarding firm births versus those beyond their control. Second, it is potentially very complicated for states to accurately determine their relative efficiency in using target expenditures to promote firm births, which in turn, stimulates the state economy. Although difficulties do arise with such an investigation due to variability in firm formation throughout the US, these issues may be mitigated to the degree that an analysis can be conducted with confidence.

Each year the US Census Bureau collects and reports dynamic data regarding firm births, deaths, expansions, etc. This data reveals that during the years 1999-2003, the contiguous US averaged approximately 727,500 total firm birth establishments each year. Births of small firms, defined as having fewer than 500 employees, constitute 86% of that total–approximately 625,650 firm births per year. Very small firms, which in this instance are businesses employing 1-4 people, on average account for 60% of total firm births each year during the same time period (US Census Bureau). This data demonstrates that small business firm births constitute the majority of total firm births each year in the contiguous US; thus, small firm births are the focus of this study.

This analysis is unique from previous studies of firm births, which have typically looked at the programs and strategies of governments in promoting business development. We contend that through the allocation of common expenditures state governments can indirectly affect several factors: education level of workforce, health of workforce, transportation, etc. We attempt to determine specific target expenditures, which exhibit a positive and significant effect on firm births in the 48 contiguous states. In addition, we

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also analyze the relative efficiency of state governments in allocating those target expenditures found to significantly impact small firm births. The expenditure factors hypothesized to affect firm births over the 1999-2002 time horizon are evaluated using a time fixed effects regression. To evaluate the relative efficiencies of state governments in promoting firm births, we employ nonparametric efficiency testing via linear programming methods.

In the development of this two-step approach, knowledge is gained regarding both the actions state governments can take to foster small firm births and the efficiency of state governments in allocating the target expenditures over time relative to other states. Such information provides state governments with critical tools through which they may make more insightful and informed decisions regarding their attempts at economic development. To summarize, this study provides a useful and accessible benchmarking tool to state governments, the use of which will allow them to discover how they rank in comparison to their peers in getting the most firm births from their expenditures.

METHODOLOGY

If we assume state governments are rational decision-makers in the economic context (Altfeld, 1984; Heckathorn and Maser, 1987; Dahlberg and Lindstrom, 1998; Matheson, 1998), then it is intuitive that they would appropriate funds so as to receive the maximum possible benefit for the least expenditure cost. To define the parameters of this study we suggest that states operate under a production function, in which specific inputs (budget expenditures) are used to obtain an output (firm birth). We first determine the expenditure inputs that significantly influence firm birth from the inputs under consideration. We then test the productive efficiency of states in employing the positive and significant expenditures. In such an instance, productive efficiency informs the state as to whether more firm

birth output could be achieved given the observed expenditure inputs (Farrell, 1957). In his 1957 study, Farrell indicates that through measuring the productive efficiency of industries, critical inferences may be drawn and applied for economic theorists and policymakers alike. Extending this analysis to the state government level should present similarly important conclusions.

Econometric or mathematical programming approaches are most often adopted in measuring productive efficiency. The implementation of a mathematical programming approach is commonly referred to as Data Envelopment Analysis (DEA) (Charnes, Cooper, and Rhodes, 1978). One advantage of utilizing DEA is that it enforces minimal assumptions on the functional form of the production function used to describe the technology for transforming inputs into the desired outputs (Färe, Grosskopf, and Lovell, 1985).

Productive efficiency testing methods are both applicable and understandable to individuals in a multitude of fields (i.e., economics, finance, business, public policy, etc.) (Farrell, 1957). To demonstrate this point, efficiency testing techniques have been employed in studies spanning from agricultural production and productive efficiency (Shafi and Rehman, 2000; Fletschner and Zepeda, 2002; Nin, Arndt, and Preckel, 2003; Helfand and Levine, 2004) to efficiency of federal budget projections (Campbell and Ghysels, 1995) to financial portfolio analyses (Sengupta, 1989; Sengupta, 2003; Wang, 2002).

DEA applied to production efficiency of farms in the agricultural economics literature has generally employed a two-stage analysis. Typically within the first stage, technical and cost efficiency measures are calculated. Then in the second stage of the analysis, the calculated measures of technical and cost efficiency are regressed on a set of characteristics pertaining to the farm or farmer (Rios and Shively, 2005). In the context of our study, the two-stage analysis is

reversed. We first regress the expenditure inputs (independent variables) on the firm birth output (dependent variable) for the forty-eight contiguous states during the 1999-2002 time period. Once the positive and significant influences of firm birth are determined, we then employ those target expenditures in a productive efficiency test. The rationale behind reversing this common practice is to ensure that the target expenditures included in the efficiency test are in fact positive and significant influences of firm birth.

Although a thorough literature review yielded no studies in which an identical problem is tested, previous studies do exist in which regression methods are used to determine significant factors affecting firm birth (Bartik, 1985; Goetz and Freshwater, 2001; Lee et al., 2004; Singh-Knights, Smith, and Budumuru, 2006). We take this sort of analysis one step further, however, by analyzing the relative efficiency of each state in using the significant inputs to produce the firm birth output. This latter step provides states with increased insight into how they compare to their peers in terms of efficiently allocating expenditures to reach the optimal firm birth level.

Measuring Significant Expenditure Inputs and Relative Productive Efficiency

The time fixed effects regression model for firm birth is as follows:

(1) *Firm_Birth$_{it}$ = β_0 +δ_0 yr1$_t$ +δ_1 yr2$_t$ +δ_2 yr3$_t$ +β_1Education$_{it}$ +β_2Health$_{it}$ +β_3Highways$_{it}$+β_4Policeit+β_5Natural_ Resources$_{it}$+β_6Parks_and_Recreation$_{it}$ +a$_i$ +u$_{it}$, t =1,2,3,4.*

Table 1 provides variable definitions for the above fixed effects regression model. Nonparametric efficiency testing is employed in the second stage of the analysis to determine the relative efficiency of states in generating the firm birth output through allocation of expenditure inputs. In

determining the technical efficiency index of the states in our sample during the 1999-2002 time period, we solve the following linear programming problem.

$$\underset{u,\lambda^1,...,\lambda^K}{\text{Maximize}}\ u$$

$$\text{Subject to}: \sum_{t=1}^{T} \sum_{k=1}^{K} u_k^t \lambda_k^t \geq u$$

$$\sum_{k=1}^{K} x_{ki}^t \lambda_k^t \geq x_{ki}^T$$

$$\sum_{k=1}^{K} \lambda_k^t = 1, \quad \lambda_k^t \geq 0$$

Where u is the maximum technically feasible firm birth level per capita, u_k^t represents the number of firm births per capita within the kth state in time period t; x_{ik}^t denotes expenditures per capita on the ith input used by the kth state in time period t; and λ_k^t is the weight assigned to the kth state in time period t in forming a convex combination of the input vectors. The index of technical efficiency calculated using this approach is the ratio between the observed level of firm births per capita in the state being tested (u^0) and the optimal level of firm births per capita (u). Firm birth rates and expenditures are expressed in per capita form to prevent both large and small outliers from distorting the efficiency test results; thus, preventing overly predictable results.

The linear programming approach employed in this technical efficiency analysis employs a number of assumptions. The basic underlying assumption in technical efficiency testing is that all firms have access to identical technology. In terms of state governments, this suggests that policy-makers are privy to the same information andknowledge (i.e., technology) to distribute their expenditures, which indicates states produce firm births along the same production function. In other words, states produce an output (firm birth) given their inputs (expenditures) and technology. Other assumptions made within the analysis are

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Table 1 - Variable Definitions for Fixed Effects Model

Dependent Variable

Firm_Birth$_{it}$ — Number of firm births

Explanatory Variables

yr$_t$ — Year dummy

Education$_{it}$ — State government expenditures on education

Health$_{it}$ — State government expenditures on healthcare

Highways$_{it}$ — State government expenditures on highways

Police$_{it}$ — State government expenditures on police

Natural_Resources$_{it}$ — State government expenditures on natural resources

Parks_and_Recreation$_{it}$ — State government expenditures on parks and recreation

a$_i$ — Unobserved, time-constant

Factors Affecting Firm Birth

u$_{it}$ — Idiosyncratic error

Where: i = state under consideration
t = time period under consideration

free disposal of inputs and outputs and convexity of the set of inputs and outputs. For a detailed treatment of these assumptions, please refer to Preckel, Akridge, and Boland (1997). Non-constant returns to scale are also assumed. If we did not employ this assumption, the constraint that requires the λ'_k variables to sum to one would be relaxed, which would allow us to scale each observed input/output vector by any positive amount (Preckel, Akridge, and Boland, 1997). In short, the assumption regarding non-constant returns to scale accounts for the limited nature of state budgets by constraining the technology set. If state governments behave rationally, some form of dependence between state gover-nment expenditures across time should be present; thus, we assume that a sequential production set exists. Assuming otherwise would indicate that each year states essentially "start all over again" and do not employ any knowledge gained in previous years in the decision-making process (Nin, Arndt, and Preckel, 2003). The efficiency index calculated via this linear programming approach reveals the ratio between the actual number firm births within each state and the optimal number of firms births corresponding to its expenditure levels. States with an efficiency index equal to one are technically efficient in time period t; whereas, states with an efficiency index of less than one are not technically efficient. The lower the efficiency index value for a respective state, the less technically efficient it is relative to its counterparts. An efficiency index of less than one tells us that relative to other states, the state under consideration could have theoretically received additional firm births for the amount allocated to each of the target expenditures.

DATA

All data considered in this analysis were obtained from the US Census Bureau. Data related to firm birth were procured from the Statistics of US Businesses section, while data pertaining to state government expenditures were obtained from the State Government Finances section. Our analysis considers panel data of small firm births and

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state government expenditures in the forty-eight contiguous states from 1999-2002.

The total small firm births variable was selected as the dependent variable for the regression analysis and as the output for the nonparametric efficiency test. The six independent expenditures variables were either taken from the literature or arrived at intuitively. Since human capital has been shown to be a determining factor of firm birth and entrepreneurship throughout the literature (Evans and Leighton, 1990; Goetz and Freshwater, 2001; Armington and Acs, 2002; Lee, Florida, and Acs, 2004), we expect expenditures in education to pose a positive effect on firm birth. To our knowledge, the remaining expenditure factors selected as independent variables have not been previously addressed in the firm birth literature.

The other expenditure factors expected to have an indirect effect on small firm birth are healthcare, highways, police protection, natural resources, and parks and recreation expenditures. Healthcare expenditures provide a proxy for a healthier and subsequently more productive workforce. Highway expenditures serve as an indicator of ease of mobility through road condition improvements. Police protection represents a measure of the state security, while natural resource expenditures are intended to denote an increased opportunity for new firms through increased environmental endowments. Parks and recreation expenditures indicate the presence of many leisure activities, which provide a pleasant place to live and work. Expenditures on parks and recreation may also account for tourism or other entertainment-related opportunities within the state.

Although we consider the selected expenditures to be important influencers of firm birth, they are certainly not the only determining factors. Since the expenditures in the regression model were selected endogenously, it is likely that endogeneity issues exist. As an example, we will lay out a hypothetical situation in which increased police expenditures exert a negative effect on firm birth. In such a situation, it is highly doubtful that simply increasing police expenditures would lead to fewer firm births within a state. Instead, such a result would be indicative of a deeper underlying issue, such as a high crime rate. Short of creating an instrumental variable to control for the crime rate using a two-stage least squares method, or constructing a random experiment in which state governments "randomly" assign more police to areas and then monitor the results, this is the most suitable analysis for the data. Although an endogeneity issue likely exists, our model presents a rather straightforward method through which state governments can indirectly promote firm birth through everyday expenditures and progress in their goal of further developing states' economies.

RESULTS

The regression analysis was conducted using STATA 9 (2006). Results from three regression analyses are displayed in Table 2. The results of the ordinary least squares regression indicate that four variables (education, highways, police protection, and natural resources expenditures) are significant at the 1% level. Healthcare and parks and recreation expenditures are significant at the 5% level. Although significant at the 1% level, police protection expenditures negatively affect firm birth.

Further analysis of the ordinary least squares regression indicated the presence of heteroskedasticity within the model. White's robust standard errors were used in conducting the regression again to correct the standard errors for heteroskedasticity of unknown form. After correcting the standard errors, four expenditure variables retained their signs and significance: education, highways, police protection expenditures, and natural resources. Education, highways, and police protection expenditures retained their significance at the 1% level, while natural resources expenditures decreased slightly in

significance to the 5% level.

Due to the panel, state-level nature of the data, the fixed effects regression model is the most appropriate regression technique. The fixed effects model assists in accounting for unobserved heterogeneity, which in part will account for omitted variables (Wooldridge, 2002). Year dummies were included in the model, along with the six original independent input variables. When these independent variables were regressed on firm birth, the original expenditure inputs retained their respective signs and levels of significance from the previous regression. Education, highways, police protection, and natural resources expenditures maintained significance across the three regression models. As noted previously, police protection exhibited a negative effect on firm birth; thus, it is excluded from the efficiency testing portion of the analysis.

It was expected that police protection expenditures would serve as an indicator for security of a particular state. We hypothesized that this variable would exhibit a positive impact on firm birth, since a safer and more secure environment would be an attractive characteristic for new businesses. This analysis indicates, however, that the opposite is the case. State crime rankings, which were calculated from six major crimes for the year 2000, were procured from the Morgan Quitno Press (2000). Once this data was obtained, the crime rankings associated with the states were regressed on police protection expenditures. Results from this simple analysis suggest that higher crime rankings explain a significant portion of higher expenditures on police protection. Thus, the result obtained in the original re-gression analysis is intuitive. Higher police expe-nditures, fueled by a higher crime rate, deter firm births within a state. Due to this finding, the expenditure variable for police protection was excluded from the efficiency test segment of the analysis. Although the re-sult regarding this variable was contrary to o-ur original belief, the insight we gained from this result is a valuable component of the regression analysis.

Although healthcare and parks and recreation were significant in the original OLS analysis, these two variables did not retain significance across the more robust models. Since states do not generally provide healthcare for small business owners, it may not serve as a specific driver of firm birth. Healthcare may stimulate general population growth, but may not entice small businesses to locate within the state. It is also possible that sufficient healthcare is typically accessible for those participating in firm birth; thus, it is not a significant motivating factor.

It was hypothesized that the parks and recreation variable would indicate increased access to leisure activities, which would provide a more pleasant living and working environment for small business owners. Although increased expenditures on parks and recreation may create a more pleasant living and working environment, it is not a significant factor in the promotion of small firm births. Parks and recreation expenditures could indicate increased opportunities for the vacation/tourism industry, but perhaps do not spur firm births overall within the state. Additionally, it is possible that parks and recreation expenditures do not adequately represent the leisure opportunities available within the state, thus having no affect on small firm births.

The efficiency indices from the non-parametric efficiency testing analysis were determined using the Generalized Algebraic Modeling System (GAMS, 2006). States exhibiting the highest levels of efficiency have an efficiency index at or near one. Table 3 displays efficiency index results averaged across the four-year time period for the forty-eight contiguous states. The states are ranked in descending order of their average efficiency index over the four-year time period. As stated previously, the most efficient states are those with efficiency indices at or near one. Wyoming, Colorado, New York, Montana, and Florida are the five

Table 2 - Linear Regression Results for the Birth of Small Firms

	No Fixed Effects	With Robust Standard Errors	Time Fixed Effects
Constant	-1127.358	-1127.358	100.670
	(-2.60)**	(-2.50)**	(0.18)
Education	0.000697	0.000697	0.000688
	(5.97)**	(3.34)**	(3.42)**
Health	0.001406	0.001406	0.001335
	(2.22)*	(1.43)	(1.36)
Highways	0.004114	0.004114	0.004267
	(8.22)**	(5.11)**	(5.44)**
Police	-0.008979	-0.008979	-0.009393
	(-3.32)**	(-2.63)**	(-2.86)**
Natural	0.007037	0.007037	0.007140
Resouces	(5.25)**	(2.31)*	(2.35)*
Parks and	0.006929	0.006929	0.007770
Recreation	(2.04)*	(1.37)	(1.58)
R-Squared	0.9439	0.9439	0.9473

Note: The Breusch-Pagan test indicated the presence of heteroskedasticity in the no fixed effects model.

* Indicates significance at the 5% level

** Indicates significance at the 1% level

Table 3 - Nonparametric Efficiency Test Results for the Forty-Eight Contiguous States Ranked by Average Efficiency Index (1999-2002)

Rank	State	Average	Rank	State	Average	Rank	State	Average
1	Wyoming	0.991	18	Virginia	0.803	35	Arkansas	0.643
2	Colorado	0.991	19	Massachusetts	0.790	36	New Mexico	0.642
3	New York	0.987	20	Georgia	0.788	37	North Dakota	0.633
4	Montana	0.967	21	California	0.777	38	Alabama	0.603
5	Florida	0.964	22	Texas	0.758	39	Indiana	0.602
6	Nevada	0.917	23	Rhode Island	0.722	40	Louisiana	0.593
7	Oregon	0.887	24	Oklahoma	0.719	41	Michigan	0.579
8	South Dakota	0.866	25	Nebraska	0.713	42	Ohio	0.578
9	Idaho	0.865	26	Illinois	0.711	43	Wisconsin	0.574
10	New Hampshire	0.863	27	Connecticut	0.698	44	Iowa	0.570
11	Utah	0.860	28	Minnesota	0.685	45	Pennsylvania	0.546
12	New Jersey	0.843	29	Missouri	0.683	46	Mississippi	0.542
13	Maine	0.836	30	Kansas	0.674	47	Kentucky	0.525
14	Delaware	0.836	31	North Carolina	0.672	48	West Virginia	0.503
15	Vermont	0.821	32	South Carolina	0.666			
16	Washington	0.811	33	Tennessee	0.649			

most efficient states on average, while Iowa, Pennsylvania, Mississippi, Kentucky, and West Virginia are the least efficient. The five least efficient states exhibit an efficiency index of less than 0.60 in all four years.

Rankings such as those in Table 2 provide states with the ability to gauge their performance and benchmark themselves in comparison to their peers. We compare the expenditure values and firms birth levels of Arizona and New Mexico, ranked 17th and 36th respectively, in 1999. Intuitively we would expect these two Southwestern states to have similar expenditures and firm birth rates per capita. Although Arizona and New Mexico exhibit a very similar firm birth rate per one thousand people, 2.44 and 2.19 respectively, they have notably different efficiency indices. In 1999, Arizona had an efficiency index of 0.877, while New Mexico had an efficiency index of 0.654.

As mentioned above the firm birth rate per capita is similar for these two states, yet, in 1999 New Mexico spent more per capita in each significant expenditure category than Arizona. In per capita terms, New Mexico outspent Arizona 1.62 times on education, 1.57 times on highways, and approximately 2.16 times on natural resources. Even when we measure expenditure per firm birth rather than per capita, New Mexico still spent 1.81 times more on education, 1.76 times more on highways, and 2.42 times more on natural resources in 1999.

The results of this portion of the analysis and the comparisons these results allow one to make between and among states can provide an extremely useful benchmarking tool to state governments. In assessing the efficiency of state governments in fostering firm births from target expenditures, we discovered that some states are consistently efficient, while others are consistently inefficient. When analyzed over time, such results can provide states important insight as to areas in which they can improve and the other states they can look to for guidance.

DISCUSSION, IMPLICATIONS, AND CONCLUSIONS

We attempted to answer two major questions in our undertaking of this analysis. Can state governments use ordinary expenditures to promote firm birth, and how can they use this analysis to better understand where they stand in terms of using those expenditures? The accessibility and usefulness of the methodology and the results of this analysis combine to provide a great deal of progress in answering these two questions. Results of the regression portion of the analysis indicate that state government expenditures on education, highways, and natural resources positively and significantly affect the birth of small firms, while police protection expenditures negatively and significantly impact firm birth. Not surprisingly, the results from the analysis indicate that an educated population, good transportation infrastructure, and protection of natural resources indirectly promote firm births within states.

The efficiency test portion of the analysis gives tangible application to the regression results by ranking states in order of their efficiency in using the positive and significant target expenditures to promote firm birth. The efficiency test indicates that at the very most, 15% of states get the maximum "bang" for their target expenditure "buck" in any given year of the analysis. From 1999-2002 at least 10% and as many as 23% of states descend to an efficiency of 0.60 or less.

One would generally expect states with higher populations and larger budgets to excel in efficiently fostering firm births through their expenditures. In expressing expenditures and firm births in per capita form, we have eliminated obvious results spurred by large outliers, such as New York, Texas, and California. Several smaller states in terms of population, such as Wyoming, Colorado, and Montana are among the most efficient in terms of their average efficiency indices. The discernible results this analysis

provides may assist more efficient states in better evaluating what they can do to remain efficient, while governments of inefficient states may gain valuable insight from comparing their expenditure policies to those of their more efficient peers.

One of the key contributions of this study is the methodology we employ. State governments will not only gain valuable insight from our results, but can also extend our methods to test other factors relevant to them well beyond the factors of firm birth. State and local governments can utilize nearly any data they currently have to apply this methodology to matters of direct importance to them. For example, New Mexico may be interested in their efficiency in attracting big business in comparison to neighboring states. The methodology applied in this analysis provides state governments with the flexibility to benchmark their efficiency regarding a number of relevant growth factors relative to other states.

Although the target expenditures explored in this study certainly cannot encompass all elements through which state governments indirectly promote firm births, our results supply pertinent and useful benchmarks for state policymakers, and allow them additional knowledge regarding other states that may serve as models of efficiency. States of all sizes, firm birth rates, and population levels occupy the top spots for most efficient on the list, which means that most states can likely find a similarly populated state to look to in terms of efficient expenditure use.

Despite the useful and interesting results we received and the accessible nature and flexibility of our methodology, there are several limitations to our study. As mentioned previously, the expenditures chosen for this analysis are clearly not the only factors that pose an indirect effect on firm birth. They are, however, available to the public, and as the regression results demonstrate, these expenditures do a fair job of capturing effects on firm birth. The data has limitations in itself, since sole

proprietorships are not captured in this particular dataset collected by the U.S. Census Bureau. Unfortunately, this omission does not allow us to consider a very important segment of small firm births.

In addition, there are several other factors beyond expenditures that could potentially add interesting results to this model. One element that could provide some interesting results in the future is to integrate corporate tax rates across states. Several studies have looked at the relationship between business location decisions and state tax rates within the US (Bartik, 1985; Papke, 1991; Carlton, 1983; Schmenner, 1978, 1982). These studies, however, have dealt with tax rates in terms of firm relocation and establishment birth in the manufacturing industry, which does not necessarily imply a relationship between small firm births in all industries and state tax structures. Further, incorporating corporate income taxes would complicate comparisons across states, since many states operate under a tiered corporate tax rate system. However, if these difficulties can be mitigated, corporate tax rates within states could possibly lend some interesting results.

It is often difficult for state governments to gauge their relative progress in promoting firm births. This study serves as an important first step in helping states gain further insight into the factors influencing firm birth and their relative efficiency in using those factors. The efficiency testing analysis can be extended to items well beyond the scope of firm birth. State governments can use efficiency testing to determine their relative efficiency in obtaining a desired output through specific expenditures inputs. For example, suppose policymakers in Kentucky want to know how they stack up against other states in terms of using education expenditures to generate constituents obtaining a post-secondary degree. Such a methodology as the one employed in this study could first measure those factors, both within and outside governmental control affecting the achievement of a post-

secondary degree by constituents. Then those positive and significant factors within the control of state government could be employed in an efficiency test analysis to compare Kentucky to other states.

This methodology could also be extended to explore efficiency by NAICS code to determine if expenditures have varying effects on firm birth in different industry categories. That analysis would provide insight into whether firm birth in particular industries, such as food processing or steel manufacturing, are affected more than others by state government expenditures. In addition, small business development entities may be able to use this methodology to determine their relative efficiency in promoting small firm success, where the number of small firms surviving past some time or financial threshold serves as the output. Efficiency testing analysis is an extremely useful tool, which can provide tangible and understandable results in a variety of fields to both practitioners and academics alike.

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