Getting the Most Bang for the Buck: An Analysis of States' Relative Efficiencies in Promoting the Birth of Small Firms

by

Whitney Peake and Maria Marshall
Purdue University

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Whitney Peake and Maria Marshall, Purdue University,
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Purpose

New business starts have economic and social value to communities and are often a goal of state economic development efforts. States would like to foster an environment that can nurture business births; however, analysis of the impact of their expenditures on business births is limited. This study evaluates the impact of various state expenditures on business births and gives states a benchmark for comparison with other states.

Overall Findings

State expenditures do affect the number of business births, particularly investments in human capital and roads. The study also found states with larger populations tended to be more efficient than states with small populations in supporting business births with their expenditures.

Highlights

- State expenditures on education, highways, and natural resources positively affected business births. To a lesser extent, so did state expenditures on healthcare, parks, and recreation.
- California, New York, and Florida were the most efficient states with respect to expenditures leading to business births, while North Dakota, New Mexico, and West Virginia were the least efficient.
- Individual states' efficiency levels with respect to expenditures and business births tended to be stable over the period studied, 1999 to 2002.
- Police expenditures were found to be a response to higher crime rates rather than an indicator of providing a safer business environment.
- Future research could incorporate industry and tax details at the state level.

Scope and Methodology

The researchers used economic models to test the impact of state expenditures for education, healthcare, highways, police, natural resources, and parks and recreation on establishment births. The efficiency measurement method of Data Envelopment Analysis was used, so expenditure inputs were regressed on business births from 1999 to 2002. Then the significant inputs were put into an efficiency test for the 48 states in the continental United States. States were ranked by their average efficiency index.

Data on business births were taken from the U.S. Census Bureau's Statistics of U.S. Businesses. (This data source is partially funded by the Office of Advocacy.) State government expenditures were also obtained from the Census Bureau.

This report was peer-reviewed consistent with Advocacy's data quality guidelines. More information on this process can be obtained by contacting the director of economic research at **advocacy@sba.gov** or (202) 205-6533.

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Abstract

Firm birth has recently been an important topic for many state governments. However, ways in which state governments can influence firm births are not obvious, and their efficiency in fostering firm births in comparison with their peers is even less so. Focusing on the birth of small U.S. firms, regression analysis and non-parametric efficiency testing are employed to determine both the expenditures state governments can target to promote firm birth and their relative efficiency in utilizing these expenditures. The relative efficiency tests provide insight as to how states compare with their peers in terms of efficient target expenditure use.

1. Executive Summary

Economic development through firm birth has recently been a topic of importance for many state governments. The factors state governments can use to actively influence firm births, however, are not obvious, and their efficiency in employing these factors relative to other states is even less so. Since small firms on average constituted 86 percent of all establishment births in the contiguous United States from 1999 to 2003 (U.S. Census Bureau), this study employs regression analysis to examine state government expenditures that may positively and significantly affect the birth of small firms. Technical efficiency testing is then used to determine states' relative efficiencies in promoting firm birth through their allocation of those significant expenditures.

Results indicate that state government expenditures on education, highways, and natural resources positively affect the number of firm births in the 48 contiguous states. The efficiency testing portion of the analysis reveals California, New York, Florida, Colorado, and Texas were the five most efficient states on average, while Kentucky, Iowa, North Dakota, New Mexico, and West Virginia were the least efficient.

The findings and methods of this study provide increased insight in decision-making at many different levels. The results of this analysis will assist state governments in determining where they stand relative to their peers in fostering the birth of small firms through efficient expenditure allocation. This provides evidence as to states' strengths and weaknesses regarding expenditure selection in promoting firm birth relative to other states. In addition, the methods employed here may be expanded to entirely different subjects in the small business and entrepreneurship world. This study presents a powerful tool for analysis, which yields results that give increased insight to practitioners, academics, and policymakers.

2. Introduction and Background

Over the past century, firm births have been increasingly credited for advances in technological innovation, job creation, and consequently regional economic growth and development (Schumpeter, 1934; Birch, 1981; Kirchhoff and Phillips, 1988; Reynolds and Maki, 1990; Davidsson et al., 1994; Reynolds, 1994; Luger and Koo, 2005). The contributions listed above are not sufficient in themselves to merit the attention firm births have received over firm expansions, since firm expansions likewise create jobs and subsequently promote regional growth. In their 1988 study Kirchhoff and Phillips discovered that from 1976 to 1984, firm births accounted for 74 percent of new job creation, while expansions were responsible for only the remaining 26 percent. With firm births creating nearly three times as many jobs as expansions, the focus placed on fostering firm birth by local and state governments appears warranted.

State governments have made promoting firm birth and the retention of businesses a major topic of interest since firms births are often considered a significant indicator of a state's performance in terms of fostering business development. Birley (1986) contends that governments at all levels have incorporated strategies to foster entrepreneurial activity and firm birth. Baumol (2002) also asserts that both politicians and practitioners are keenly aware of the significance of entrepreneurship in spurring new employment and innovation.

In response to the apparent importance of entrepreneurship, states have placed a great deal of emphasis on their ability to promote state economic development through firm birth and retention. For example, Kentucky has created a Cabinet for Economic Development, which provides information to both businesses considering relocation to Kentucky and to entrepreneurs who are considering starting a business in the state. Indiana has also been making changes with regard to promoting business development and retention. In February 2005, Indiana replaced its Department of Commerce with the Indiana Economic Development Corporation (IEDC). The focus of this new government entity is to develop and retain businesses within Indiana, while also attracting new businesses to the state. Goetz and Freshwater (2001) suggest the attention to firm births within states is appropriately placed, since the economic development policies adopted by states are increasingly viewed as significant influences on economic development patterns.

Indiana Governor Mitch Daniels is quoted as saying, "Government does not create jobs; it only creates conditions that make jobs more or less likely." Both the literature and private organizations seem to agree that states do indeed exert at least some degree of influence on entrepreneurial decision-making (Goetz and Freshwater, 2001). Organizations such as the Corporation for Enterprise Development (CFED) rank the business climate of states relative to their counterparts. Their *Development Report Card for States* provides both individuals and government officials with an evaluation of each state's economy, along with other dimensions the CFED considers essential in economic development. The literature related to state economic development policy also appears centered on the nature of the programs states incorporate to further promote business development (Elsinger, 1988; Foster, 1988; Bartik, 1994; Isserman, 1994; Bradshaw and Blakely, 1999).

One of state governments' key concerns is the conditions they can influence to make jobs more or less likely within their respective states. The difficulty in formulating such policy, however, is twofold. The first difficulty lies in pinpointing the conditions affecting firm births that state governments can influence, as opposed to those conditions beyond their control. Second, it is extremely tricky for states to assess their efficiency in using these determinants to further expand business development and the economy. The problem in determining relative efficiency stems from the variability in firm formation throughout the U.S. These issues, however, may be mitigated to the extent that an analysis of both areas can be conducted with some degree of confidence.

Examination of U.S. Census data regarding firm births reveals that during the period 1999 to 2003, the 48 contiguous states have averaged approximately 727,500 total firm births per year. On average, small business firm births make up 86 percent of that total over the same period, when a small business is defined as one having fewer than 500 employees (U.S. Census Bureau). Figure 1 illustrates the average percentage of small business firm births each year during that five-year period. Sole proprietorships and very small firms, businesses with 1-4 employees, represent the majority of firm births over this time, accounting for 60 percent of firm births on average each year. Table 1 displays the five-year average for each firm birth size category included in the census data. These results indicate that small firm births constitute the majority of firm births in the contiguous U.S. Since the majority of firm births are those of small firms, this study specifically focuses on what governments can do to facilitate the birth of small firms.

This analysis takes a somewhat different approach in determining the factors state governments can affect. Our contention is that through their selection of expenditures, state governments can indirectly affect a great number of factors – education level and health of workforce, transportation, etc. The purpose of this study is to determine specific state government expenditures that positively affect firm births in the 48 contiguous states and the relative efficiency of state governments in appropriating the expenditures that do indeed influence the birth of small firms. Expenditure factors affecting firm births over a four-year time horizon will be evaluated via panel regression methods. In assessing the state governments' relative efficiencies in promoting firm births, nonparametric efficiency testing will be employed through linear programming techniques. Through this two-step approach, it is hoped that some insight may be gained as to (1) what actions governments can take to promote the birth of small firms and (2) how efficient state governments are at employing these significant factors over time relative to other states. Through gaining a deeper understanding of both the expenditures that affect firm births and their relative efficiency in using those expenditures, state governments will be able to make more insightful and informed decisions regarding their attempts at state economic development. In short, this study will provide a useful tool in which states can discover how they rank in comparison with their counterparts in efficiently using their expenditures to foster firm births.

3. Methodology

Essentially productive efficiency indicates whether more output can be received given the observed inputs (Farrell, 1957). In this analysis, we test whether more firm births (output) can be achieved considering the observed expenditures (inputs). Farrell also asserts that through measuring the productive efficiency of an industry, key implications may be discovered and applied by economic theorists and policymakers alike. Efficiency measurement is most often applied using either an econometric or a mathematical programming approach, and implementation of the latter approach is often referred to as Data Envelopment Analysis, or DEA (Charnes et al., 1978). An advantage of using DEA is that it employs minimal assumptions about the functional form of the production function that describes the technology for producing output from inputs (Färe, et al., 1985). Farrell (1957) suggests that productive efficiency testing techniques are applicable and understandable to individuals in many different fields, i.e., economic statisticians, businessmen, and government officials. These efficiency testing methods have been used in studies ranging from financial portfolio analyses (Sengupta, 1989; Sengupta, 2003; Wang, 2002) to agricultural production or productive efficiency (Shafiq and Rehman, 2000; Fletschner and Zepeda, 2002; Nin et al, 2003; Helfand and Levine, 2004) to efficiency of federal budget projections (Campbell and Ghysels, 1995).

A unique application of the approach described above is employed in our study. Expenditure inputs represent the technology set and the output resulting from this set of inputs is firm birth. DEA applied to the production efficiency of farms has employed a two-stage analysis. In the first stage, technical and cost efficiency measures are calculated via DEA. The second stage consists of regressing the calculated measures of technical and cost efficiency on a set of characteristics specific to the farm or farmer (Rios and Shively, 2005). In this study, the two-stage analysis will be reversed. First, the expenditure inputs will be regressed on the firm birth output for the 48 contiguous states from 1999 to 2002. Then the significant inputs will be employed in an efficiency test.

Although no studies have been found in which an identical problem is tested in the literature, previous studies of like nature utilize regression methods to determine significant factors affecting firm birth (for example: Bartik, 1985; Goetz and Freshwater, 2001; Lee et al., 2004). Since this is state-level data over a four-year time horizon, a fixed effects regression model is an appropriate panel regression method (Wooldridge, 2003).

After the significant inputs are determined through the fixed effects regression analysis, the relative efficiency of each state in using the significant inputs to produce firm births is assessed through technical efficiency testing methods. This second step will give states insight as to where they stand in comparison with other states in promoting firm births through expenditures.

3.1 Measuring Significant Inputs

The fixed effects model for firm birth is as follows:

$$\begin{aligned}(1)\quad & \text{Firm\_Birth}_{it} = \beta_0 + \delta_0 yr1_t + \delta_1 yr2_t + \delta_2 yr3_t + \beta_1\text{Education}_{it} + \beta_2\text{Health}_{it} \\ & + \beta_3\text{Highways}_{it} + \beta_4\text{Police}_{it} + \beta_5\text{Natural\_Resources}_{it} + \beta_6\text{Parks\_and\_Recreation}_{it} + a_i + u_{it}, \\ & \text{t} = 1,2,3,4\end{aligned}$$

Where the dependent variable Firm_Birth_{it} represents the number of firm births in state i during time period t, and the variable yr_t is a dummy variable representing the year. The $\beta_n x_{it}$ variables represent the independent expenditure variables employed by the model, where: $\beta_1\text{Education}_{it}$ represents state government expenditures on education in state i during time period t, $\beta_2\text{Health}_{it}$ represents state government expenditures on healthcare in state i during time period t, β_3Highways$_{it}$ represent state government expenditures on highways in state i during time period t, β_4Police$_{it}$ represents state government expenditures on police in state i during time period t, β_5Natural_Resources$_{it}$ represents state government expenditures on natural resources in state i during time period t, and β_6Parks_and_Recreation$_{it}$ represents state government expenditures on parks and recreation in state i during time period t. The variable a_i captures all the unobserved, time-constant elements affecting Firm_Birth$_{it}$, and u_{it} denotes the idiosyncratic error.

3.2 Measuring Relative Efficiency of States in Using Significant Inputs

In the second stage of the analysis, nonparametric efficiency testing is used to determine the relative technical output efficiency of states in fostering firm births (output) through the appropriation of expenditures (inputs). To determine the technical efficiency of the states within our sample over the four-year (1999-2002) time horizon, we solve the following linear programming problem:

(2)

$$\begin{aligned}
&\underset{u,\lambda^1,\ldots,\lambda^K}{\text{Maximize}}\ u \\
&\text{Subject to}: \sum_{t=1}^{T}\sum_{k=1}^{K} u_k^t \lambda_k^t \geq u \\
&\sum_{k=1}^{K} x_{ki}^t \lambda_k^t \geq x_{ki}^T \\
&\sum_{k=1}^{K} \lambda_k^t = 1, \quad \lambda_k^t \geq 0
\end{aligned}$$

where u is the maximum firm birth level that appears to be technically feasible, u_k^t represents the firm births of the k^{th} state in time period t, x_{ik}^t denotes the expenditures on the i^{th} input used by the state whose efficiency is being tested in time period t, and λ_k^t is the weight assigned to the

k^{th} state in time period t in forming a convex combination of the input vectors. The index of technical efficiency calculated via this approach is the ratio between the observed level of firm births in the state being tested (u^0) and the optimal level of firm births (u).

The basic assumption underlying technical efficiency testing is that all firms have access to the same technology. Other assumptions we make in order to conduct the analysis are 1) free disposal of inputs and outputs and 2) convexity of the set of inputs and outputs (Preckel, Akridge and Boland, 1997). Additional assumptions were also made to provide a more realistic analysis. Non-constant returns to scale are assumed. If constant returns to scale were assumed, the constraint that requires the weights (λ_k^t) to sum to one would be relaxed. This would allow us to scale each observed input/output vector by any positive amount (Preckel et al, 1997). In short, non-constant returns to scale account for the limitations of state government budgets by restricting the technology set. The existence of a sequential production set is also assumed, since if state governments behave rationally, some form of dependence between state government expenditures across time should exist. To assume otherwise would suggest that states essentially "start over" every year and do not employ any prior knowledge in their decision-making processes (Nin et al, 2003).

4. Data

Data for the study pertaining to firm birth were obtained from the U.S. Census Bureau, Statistics of U.S. Businesses, and data associated with state government expenditures were obtained from the U.S. Census Bureau, State Government Finances Section. This analysis considers panel data involving small firm births (firms with fewer than 500 employees) and state government expenditures of the 48 contiguous states from 1999 to 2002, yielding a total of 192 observations.

Since the focus of this study is firm births, small firm birth was selected as the dependent variable and output. The six independent expenditure variables and inputs for the regression and nonparametric efficiency testing analyses were obtained from the literature and through intuition. Education as a form of human capital has long been shown as a factor of firm birth and entrepreneurship (Evans and Leighton, 1990; Goetz and Freshwater, 2001; Armington and Acs, 2002; Lee et al, 2004). It is expected that expenditures in education would have a positive effect on firm birth. To our knowledge, the remaining expenditure factors chosen as independent variables have had little to no exposure in the literature.

The factors other than education expected to demonstrate an effect on small firm birth are healthcare, highways, police protection, natural resources, and parks and recreation expenditures. Healthcare expenditures serve as a proxy for indirectly providing a healthier, more productive workforce. Highway expenditures represent increased ease of mobility with improved road conditions. Police protection serves as an indicator for security of the state. The expenditures of funds on natural resources are believed to denote increased opportunity for new firms through greater environmental endowments. Expenditures on parks and recreation represent the ability to provide more leisure activities for workers, thus providing a more pleasant place to live and work. In addition, parks and recreation expenditures may account for tourism or other business opportunities within the state.

These expenditures are not the only factors that exert an effect on firm births. Other factors obviously also play a role. Endogenous issues likely exist within the regression model, since the included expenditures were selected endogenously. For example, suppose that increased police expenditures have a negative correlation with firm birth. It is doubtful that simply increasing police expenditures would cause fewer firms to locate in an area. This is indicative of a deeper underlying issue, such as a high crime rate. Short of a random experiment in which state governments "randomly" assign more police to areas in order to observe the result, or creating an instrumental variable to control for crime rate in a two-stage least squares context, this is the most appropriate analysis for the data. Despite this endogeneity issue, the model does a fair job of explaining a rather simple way in which state governments may indirectly promote firm birth and work toward further developing their state's economy.

5. Results and Discussion

5.1 Results from Regression Analysis

Results for the regression analysis were obtained through STATA 9 (2006), and are displayed in Table 2. The first model appearing in Table 2 is simply a linear regression. The results of the no fixed effects ordinary least squares regression indicates that education, highway, police, and natural resource expenditures are significant at the 1 percent level. Healthcare and parks and recreation expenditures are significant at the 5 percent level. Police protection expenditure is the only independent variable yielding a negative effect on firm birth.

A Breusch-Pagan test was conducted, which indicated that heteroskedasticity was present. To correct the standard errors for heteroskedasticity of unknown form, White's robust standard errors were used to conduct the regression again. Four variables retained their significance: education, highways, police expenditures, and natural resources. Education, highways, and police protection expenditures are significant at the 1 percent level, while natural resources expenditures are significant at the 5 percent level.

Fixed-effect models can assist in accounting for unobserved heterogeneity, accounting in part for omitted variables. Year dummies were created, and the six original independent inputs, along with the year dummies, were again regressed on firm birth. The independent variables retained their signs and respective levels of significance.

Four of the independent expenditure variables, education, highways, police protection, and natural resources maintained their significance across the three regression models. Police protection, however, had a negative effect on firm birth; thus, it will not be included in the efficiency testing analysis. Although it was initially expected that expenditures for police protection would provide a safer, more secure state for residents and businesses, it appears this is not the case. State crime rankings, calculated from six major crimes for the year 2000, were obtained from the Morgan Quitno Press (2000). Crime ranking of the state was then regressed against police expenditure. It was found that increased crime ranking significantly explained a portion of higher police expenditure. With this in mind, it would then be expected that an increased crime rate, leading to increased spending in police protection, would in fact yield fewer firm births in a state. For this reason, police protection expenditures were excluded for the efficiency test portion of the analysis. The insight gained from this variable, however, is a valuable component of the regression analysis portion of the study.

5.2 Results of the Nonparametric Efficiency Test

The efficiency index calculated reveals the ratio between the observed level of firm births in the respective state and the optimal level of firm births for its expenditure levels. Results with an efficiency index equal to one indicate that the state is technically efficient in time period t; whereas an efficiency index of less than one indicates the state is not technically efficient. The lower the reported value of the index, the less technically efficient the respective state. Technical inefficiency indicates that the state could theoretically have received more output for inputs used, i.e., more firm births given the allocation of expenditures, when evaluated relative to the other states.

Results for the nonparametric efficiency testing analysis were calculated using GAMS -- the Generalized Algebraic Modeling System (2006), and are displayed in Tables 3 and 4. The most efficient states are those with an efficiency index at or near one. The results for the 48 contiguous states from 1999 to 2002 are found in Table 3. Both California and New York efficiently use their expenditures across all four years. Florida demonstrated efficiency during three years, and was near efficiency in 2000. Some states, such as Oregon and Utah, are efficient in the first year, but then suffer a drastic reduction in their efficiency indices from 2000 to 2002.

States were ranked in order of average efficiency for those four years and are shown in Table 4. Those states that are most efficient have efficiency indices at or near one. Those considered most inefficient have efficiency indices near or below 0.50. The most inefficient states tend to be consistently inefficient. Kentucky, Iowa, North Dakota, New Mexico, and West Virginia are the most inefficient states, exhibiting an efficiency index of less than 0.50 all four years. Although Vermont and Mississippi are not considered the most inefficient in the first year, their efficiency index values are very near the threshold for most inefficient.

Such rankings provide states with the ability to better understand where they stand in comparison to their counterparts. For example, consider the different efficiency rates in 1999 of New Hampshire and West Virginia, which are 1.0 and 0.393, respectively (Table 3). Their firm birth rates are similar as seen in Figure 2, separated by only 141 firm births. Their population levels are also similar. New Hampshire has a population of 1,235,786, while West Virginia has a population of 1,808,344. However, their efficiency indices are very different. New Hampshire is ranked ninth, and West Virginia is ranked forty-eighth as the most inefficient state (by average efficiency index value). Figure 3 displays New Hampshire and West Virginia target input expenditures for 1999. Although the firm birth rate in West Virginia is only slightly higher by 141 firms, the amount of target expenditure dollars per firm is higher than that of New Hampshire in every case. Table 5 illustrates that West Virginia spends 3.25 times as much on education, nearly 2.2 times as much on highways, and approximately 3.6 times as much on natural resources per firm birth. Even when this is considered on a per capita rather than per firm birth level, West Virginia still spends more in each category than New Hampshire.

In assessing the efficiency of states in using the expenditure inputs to receive firm birth outputs, it was discovered that some states are consistently more efficient than others are across time and some states are consistently more inefficient than other states across time. The efficiency test results can be further analyzed as above to indicate where individual states stand when compared with their peers.

6. So What?

This study contributes to the small business world on two levels through its findings and methods: (1) with the results of this study and (2) by providing a unique method of analysis, which will prove useful in the future. The regression analysis demonstrates that state governments' expenditures on education, highways, and natural resources positively affect the birth of small firms. The efficiency test then indicates which states are relatively more efficient and inefficient in promoting firm births via the aforementioned positive and significant expenditures. This analysis provides state governments with the ability to benchmark themselves to their peers, ultimately determining their relative strengths and weaknesses. This method can also be used by small business development entities to determine their relative efficiency in promoting the success of small firms, with the number of firms surviving past some threshold as the output. The methods employed in this study can also be applied to entirely different subjects in the small business and entrepreneurship area, which provides a powerful tool for analysis—yielding results that give increased insight to state governments, practitioners, and academics.

7. Conclusions and Future Research

Results from the regression analysis indicate three expenditures positively and significantly influence the births of small firms: education, highways, and natural resources. This is not to say that other factors are unimportant; however, conscientious appropriation of these expenditures may further state governments' cause in promoting firm birth and subsequently economic development within their state.

Efficiency tests indicate that a small percentage of states -- at most 17 percent -- get the most "bang" for their expenditure input "buck" during any given year. Across the time horizon considered here, there are at least 10 percent and as many as 23 percent of states falling into the most inefficient category in any given year, where most inefficient is designated by an efficiency index of 0.50 or less. It is important for states to understand how they rank compared with their counterparts. This may assist efficient states in understanding what they can do to remain efficient in promoting firm birth. In addition, governments of inefficient states may gain some valuable insight from researching expenditure policies in the more efficient states.

Several elements could potentially add interesting results to this model. An important component that may be added to the model is corporate tax rates across states. Since business location decisions are at times driven by tax rates, this is an element for which future studies will want to account (Bartik, 1985). The difficulty in considering corporate tax rates lies in the characteristic that some states operate under a tiered corporate tax rate system, making a crosscomparison of states tricky. Perhaps in the future, this difficulty can be overcome, and an important element in the firm birth decision can be included in the regression and possibly efficiency testing analyses. Another interesting addition to the current model would be a comparison between gross expenditures, as was considered in this study, and per capita target expenditures. This element would give more insight to population effects on expenditures, potentially providing some very interesting results, in contrast to the results received in this analysis.

In addition, future research could further delve into efficiency by industry to determine whether expenditures affect firm births differently, depending on industry categories. This would help us to understand if particular industries, such as agriculture or manufacturing, are affected more than others are by state government expenditures.

This study serves as an important step in helping states understand both the factors influencing firm birth and their relative efficiency in using such factors. Applying efficiency testing to rank the states in terms of significant input use to receive an output or outputs, can be expanded to items other than firm birth. For example, this approach can assist governments at any level in determining the relative efficiency of their budget allocations in obtaining a desired output, e.g., number of constituents obtaining a post-secondary degree, number of constituents receiving government assistance, etc. This method could also be extended for use by small business development entities to determine their relative efficiency in promoting the success of small firms, with the number of firms surviving past some threshold as the output. As our study demonstrates, this is an extremely useful tool, which can provide tangible and understandable results to both practitioners and academics in many fields.

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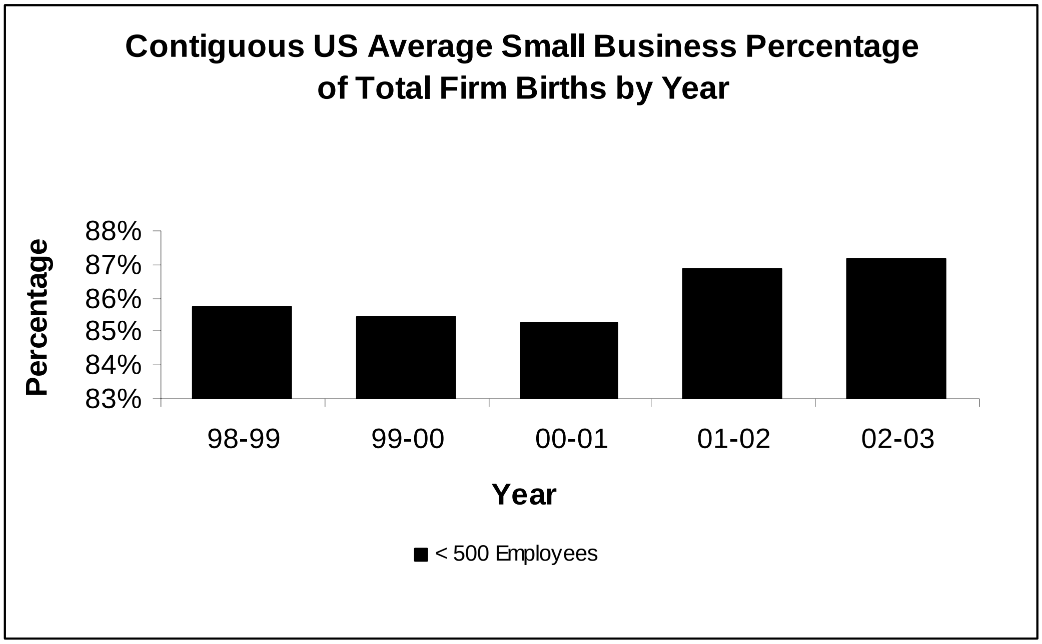
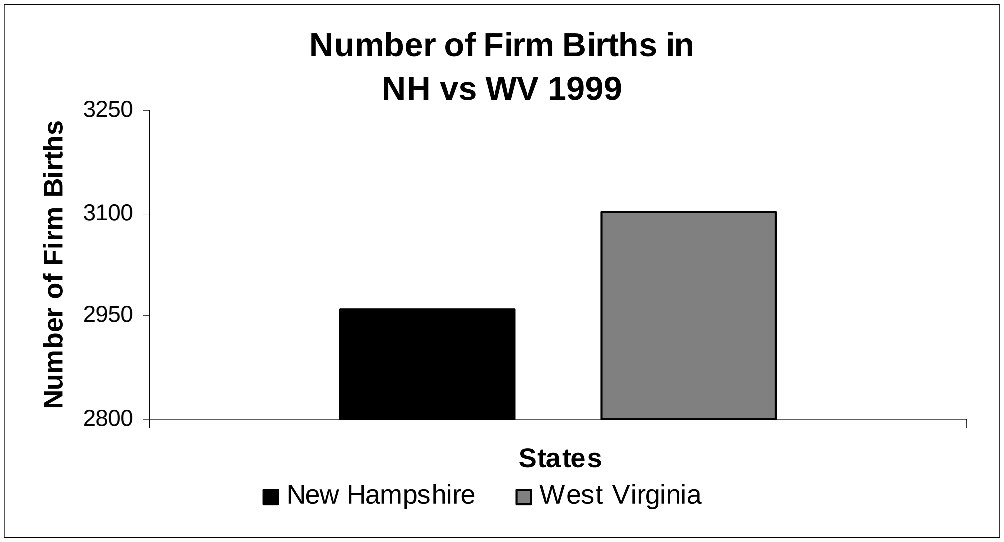
Figure 1. Contiguous United States average small business percentage of total firm births by year



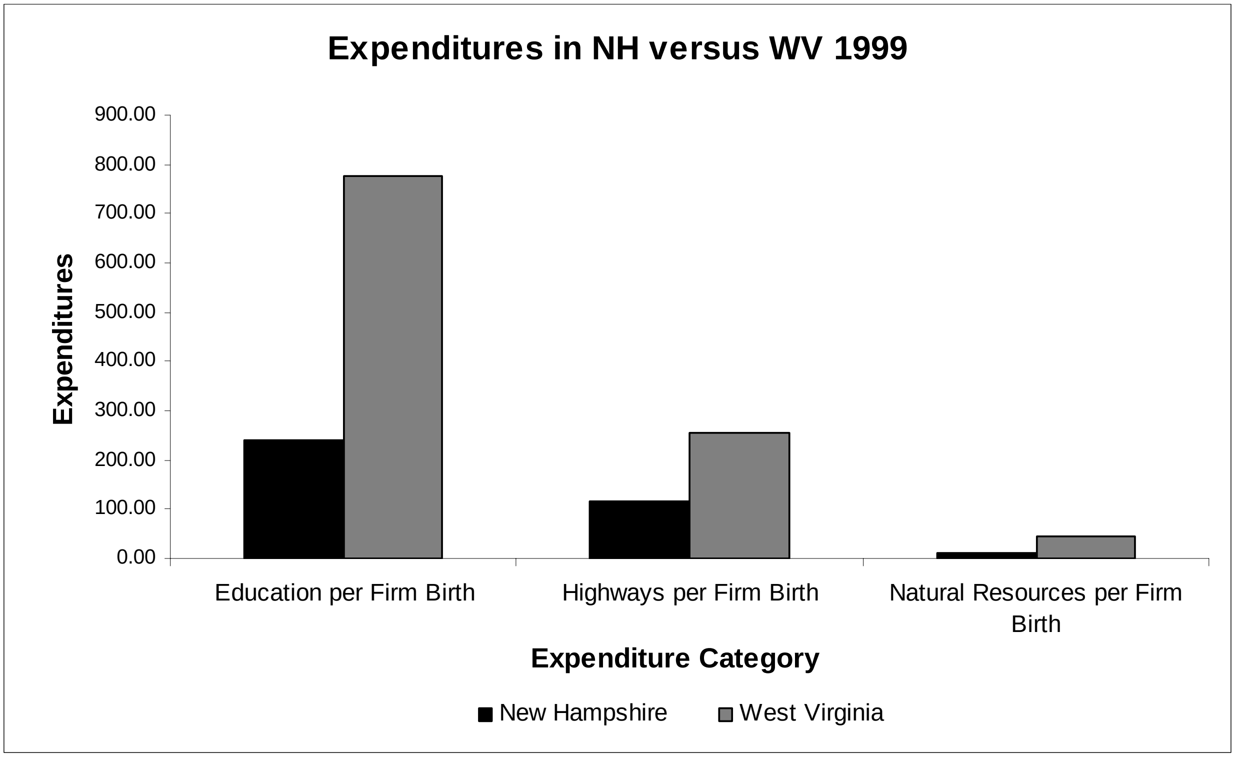
Source: U.S. Census Bureau

Figure 2. Firm birth comparison for New Hampshire and West Virginia, 1999



Source: U.S. Census Bureau

Figure 3. Target expenditure comparison for New Hampshire and West Virginia, 1999



Source: U.S. Census Bureau

Table 1. Five-year average of percentage of firm births by firm size category (1999-2003)

Firm size: number of employees	**1-4**	**5-9**	**10-19**	**20-99**	**100-499**	**500+**
Percentage of total firms births	60%	11%	5%	5%	4%	14%

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 Resouces	0.007037	0.007037	0.007140
	(5.25)**	(2.31)*	(2.35)*
Parks and Recreation	0.006929	0.006929	0.007770
	(2.04)*	(1.37)	(1.58)
R-Squared	0.9439	0.9439	0.9473

Note: 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 48 contiguous states 1999 to 2002

State	**Year**				
	1999	2000	2001	2002	Average
Alabama	0.653	0.556	0.517	0.544	0.568
Arizona	0.911	0.818	0.786	0.777	0.823
Arkansas	0.581	0.553	0.471	0.483	0.522
California	1.000	1.000	1.000	1.000	1.000
Colorado	1.000	0.980	0.943	0.977	0.975
Connecticut	0.769	0.692	0.648	0.607	0.679
Delaware	0.582	0.566	0.527	0.527	0.551
Florida	1.000	0.963	0.998	1.000	0.990
Georgia	0.858	0.818	0.785	0.770	0.808
Idaho	0.723	0.654	0.651	0.740	0.692
Illinois	0.860	0.775	0.715	0.731	0.770
Indiana	0.599	0.535	0.526	0.625	0.571
Iowa	0.453	0.414	0.384	0.441	0.423
Kansas	0.522	0.523	0.518	0.559	0.531
Kentucky	0.478	0.440	0.400	0.436	0.439
Louisiana	0.578	0.530	0.577	0.597	0.571
Maine	0.833	0.735	0.616	0.739	0.731
Maryland	0.671	0.623	0.597	0.588	0.620
Massachusetts	0.988	0.930	0.776	0.788	0.871
Michigan	0.549	0.503	0.492	0.529	0.518
Minnesota	0.571	0.521	0.526	0.544	0.541
Mississippi	0.518	0.434	0.462	0.484	0.475
Missouri	0.715	0.693	0.608	0.746	0.691
Montana	0.685	0.673	0.676	1.000	0.759
Nebraska	0.815	0.559	0.617	0.655	0.662
Nevada	1.000	0.870	0.837	0.893	0.900
New Hampshire	1.000	0.751	0.781	0.873	0.851
New Jersey	0.961	0.904	0.769	0.779	0.853
New Mexico	0.440	0.393	0.400	0.414	0.412
New York	1.000	1.000	1.000	1.000	1.000
North Carolina	0.652	0.573	0.565	0.586	0.594
North Dakota	0.408	0.388	0.420	0.450	0.417
Ohio	0.622	0.568	0.536	0.565	0.573
Oklahoma	0.924	0.534	0.498	0.550	0.627
Oregon	1.000	0.714	0.769	0.778	0.815
Pennsylvania	0.673	0.598	0.562	0.641	0.619
Rhode Island	0.754	0.734	0.650	0.849	0.747
South Carolina	0.743	0.584	0.552	0.586	0.616
South Dakota	0.711	0.639	0.641	0.694	0.671
Tennessee	0.743	0.657	0.637	0.698	0.684
Texas	0.929	0.882	0.914	0.976	0.925
Utah	1.000	0.541	0.573	0.625	0.685
Vermont	0.610	0.479	0.447	0.483	0.505
Virginia	0.739	0.711	0.661	0.759	0.718
Washington	0.712	0.698	0.668	0.663	0.685
West Virginia	0.393	0.379	0.415	0.390	0.394
Wisconsin	0.546	0.498	0.470	0.519	0.508
Wyoming	0.536	0.497	0.567	0.616	0.554
Average	0.729	0.648	0.628	0.672	0.669
Standard Deviation	0.188	0.173	0.165	0.173	
Minimum	0.393	0.379	0.384	0.390	0.394

Table 4. States ranked by average efficiency index 1999 to 2002 in ascending order

Rank	State	Average
1	California	1.000
2	New York	1.000
3	Florida	0.990
4	Colorado	0.975
5	Texas	0.925
6	Nevada	0.900
7	Massachusetts	0.871
8	New Jersey	0.853
9	New Hampshire	0.851
10	Arizona	0.823
11	Oregon	0.815
12	Georgia	0.808
13	Illinois	0.770
14	Montana	0.759
15	Rhode Island	0.747
16	Maine	0.731
17	Virginia	0.718
18	Idaho	0.692
19	Missouri	0.691
20	Washington	0.685
21	Utah	0.685
22	Tennessee	0.684
23	Connecticut	0.679
24	South Dakota	0.671
25	Nebraska	0.662
26	Oklahoma	0.627
27	Maryland	0.620
28	Pennsylvania	0.619
29	South Carolina	0.616
30	North Carolina	0.594
31	Ohio	0.573
32	Indiana	0.571
33	Louisiana	0.571
34	Alabama	0.568
35	Wyoming	0.554
36	Delaware	0.551
37	Minnesota	0.541
38	Kansas	0.531
39	Arkansas	0.522
40	Michigan	0.518
41	Wisconsin	0.508
42	Vermont	0.505
43	Mississippi	0.475
44	Kentucky	0.439
45	Iowa	0.423
46	North Dakota	0.417
47	New Mexico	0.412
48	West Virginia	0.394

Table 5. Target expenditure dollars per firm birth for New Hampshire and West Virginia, 1999.

	Education per Firm Birth	Highways per Firm Birth	Natural Resources per Firm Birth
New Hampshire	238.80	117.01	12.24
West Virginia	775.9935505	253.3169945	44.1393099