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USA – Innovation Index: A State - Level Proposal

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ABSTRACT

We propose an open-access innovation index for the U.S. states. This index was built by classifying into four core areas the twelve more important indicators, inputs, and outputs, that are widely accepted in the literature as the most relevant for measuring innovation. We consider the indicators aggregated in the areas of human capital and business environment as the inputs that create knowledge and influence the promotion of innovation, while those in areas of engagement and efficiency as the outputs that are all those outcomes and improvements related to the innovation process. As an example of potential uses of our index, we ran a basic econometric experiment using the economic growth rate as the dependent variable. Despite the results being qualitatively consistent with the literature, we suggest further research using our index and other methodologies. We included in the appendix the overall index score and ranking from 2000 to 2015.

KEYWORDS

Innovation; Innovation Index; Innovation Ranking; USA; State Level

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1. Introduction

Many authors use the term "new" to describe innovation since it suggests the application of something never seen before to create a new product or service, or to improve existing ones. Ridley (2020) cites Nobel Prize-winning Edmund Phelps who defines innovation as "a new method or new product that becomes a new practice somewhere in the world" (p.4). For this paper, we define innovation as any process that applies new ways, changes, ideas, materials or elements, relations or combinations, modifications, perspectives, or processes, to bring a new product or service, or to modify existing ones to create an improved product or service (Schumpeter, 2005[1932]; Knox, 2002; Henderson & Lentz, 1995; and Boer & During, 2001).

The importance of innovation has been emphasized by many scholars. Ridley (2020) says "Innovation is the most important fact about the modern world, but one of the least understood" (p. 4). McCloskey (2018) explains that innovation is the habit of applying new ideas and its purpose is to increase living standards. When and where did humans start to innovate? These are still unanswered questions. Probably ancient Mesopotamians around 4200-4000 BC with the invention of the wheel. But we cannot forget older innovations like the stone tools created more than 2 million years ago by Homo Abilis (Encyclopedia Britannica, 2022). Concerning this, Ridley (2020) explains that there is not a particular moment in history that can be pinpointed as the first occurrence of innovation. Notwithstanding, he thinks the most important instance of innovation was "somewhere in north-west Europe, sometime around 1700… achieved by somebody or somebodies (probably French or English)" (p.13). The author is referring to the invention of the "first controlled conversion of heat to work, the key breakthrough that made the Industrial Revolution possible if not inevitable" (Ridley, 2020: 13). Innovation has played a fundamental role through the years by creating new episodes, or eras, in the economic history of human beings and improving their living standards.

However, measuring innovation is quite complicated because it could be measured as a managerial process following Schumpeter (2005) or through a generalized index. This paper proposes the use of a metric that captures changes in innovation and the inputs and outputs related to the process of innovation. In the United States (U.S.), there is no state-level, open-access index, easily accessible by the public and researchers. There are some indexes like the one offered by Indiana University which contain county, metro area, or district-level data. The Indiana Business Research Center at Indiana University publishes Innovation Index 2.0. It is calculated using five core indexes (three based on inputs and two outputs). The index uses 3,110 counties as primary geography, and aggregates 383 Metro Areas, and 393 Economic Development Districts. However, it is not available at the state level. Another index is the Global Innovation Index from Cornell University, which includes the innovation score for 131 countries and is comprised of 80 different indicators: political environment, education, infrastructure, and business sophistication, among others. As with the previous index, it is not available for the U.S. at the state level. Conversely, Bloomberg's U.S. Innovation Index is at a state level. However, the index is private, and thus its methodology is unknown.

As a result, we propose an open-access index that includes the most important indicators related to innovation and follows a similar and widely used methodology for the construction of indexes such as that of The Economic Freedom of the World published by the Fraser Institute. By adapting the methodology of the Global Innovation Index by Cornell University, we designed a State-Level Innovation Index for the U.S. and used 12 indicators grouped in the areas of human capital, business environment, engagement; and efficiency. Then, we use this innovation index to compare innovation levels among the 50 states and their impact on the state rates of economic growth.

2. The Innovation Index

2.1. Index construction

The overall US-Innovation Index is based on 4 core areas, of which two are based on innovation inputs and two are based on innovation outputs. These 4 core areas comprise the 12 most important indicators, inputs, and outputs, that are relevant for measuring innovation. Figure 1 shows how our innovation index is built.

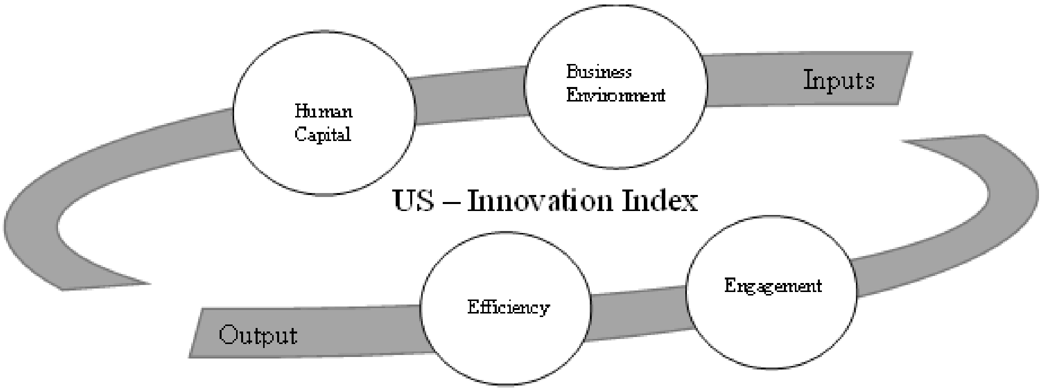

Figure 1. The US – Innovation Index

The inputs are those indicators that measure the creation of knowledge and factors that influence the promotion of innovation. We aggregated these inputs in Area 1 and Area 2:

• Area 1 - Human Capital: This area aggregates indicators that represent the extent to which a state provides associate's level training in Science, Engineering, and Technology (SET) fields, as well as the percentage of students with high scores on the Advancement Placement Calculus exam. The sub-areas (or indicators) are 1a) Science & Engineering (S&E) degrees intensity —the percentage of bachelor's, master's, and doctoral degrees in the fields of S&E awarded in a state. 1b) Associate's Degrees in S&E per 1000 Individuals; 1c) Associate's Degrees in Tech per 1000 Individuals; and 1d) High Scores on the Advancement Placement Calculus (percentage of Students).

• Area 2 – Business Environment: This area aims to measure the incentive to innovation through an adequate business environment. It aggregates the following indicators: 2a) R&D Intensity, Governmental R&D expenditures as a share of the GDP; 2b) Business performed R&D intensity, the businesses' investment in their R&D activities as a share of the GDP; 2c) Establishments on Science, Engineering and Technology (SET) intensity, state's business establishments that are classified as being part of industries with high employment in SET occupations as a percentage of the total businesses of the state; 2d) Venture Capital Investment Deals on SET intensity, the extent to which companies with SET employment in a state receive venture capital investments.

We considered as outputs all those outcomes and improvements related to the innovation process. All outputs are aggregated in Areas 3 and 4:

• Area 3 – Engagement: The education and business environment can determine the level of innovation in a state, however, without a labor market that retains the workforce there, it is difficult to incentivize higher levels of innovation. For this reason, this area measures the capacity of offering jobs in SET areas. Engagement could be understood as labor market friendliness with SET workers. The indicators that it comprises are 3a) Science and Engineering Workforce, the concentration of scientific and technical jobs relative to the state's total workforce; 3b) Employment in SET, the extent to which a state's workforce is employed in industries with high employment SET occupations.

• Area 4 – Efficiency: We understood that measuring the efficiency of innovation could be difficult because sometimes many innovations are never promoted or patented. However, we used the most common and accepted indicators for efficiency or measures of innovation. This area comprises: 4a) Academic articles on Science and Engineering, the volume of peer-reviewed articles published per 1,000 academic science, engineering, and health (SEH) doctorate holders is an approximate measure of their contribution to scientific knowledge; 4b) Patent intensity, the proportion of US patent granted over the total population of the state.

2.2. Calculating the Index

Using the indicators mentioned above, we compute the value of each area as follows: i) for each indicator we estimate the score based on the maximum value of the respective year. ii) The area value is the average of all available indicator scores, which means that if an indicator is not available for a specific year, the area is just the average of the other scores. Equation 1 represents the computation of the area for state *i* at year *t* when all indicators are available:

$$area_{w_{it}} = \frac{\sum_{j=1}^{n}\left(\frac{\sum_{i=1}^{T} ObsValue_{it}}{max\,ObsValue} \cdot \phi\right)_j}{n} \quad (1)$$

Where ObsValue refers to the value of the j indicator used to estimate the value of area w, ϕ is a parameter used to convert the obtained value on a scale of 10, and n is the number of available indicators. Dividing by the maximum observed value allows us to account for any exogenous shock that could have impacted the indicators throughout the period. Following this, each sub-indicator is ranked considering the highest value of the year and not a pre-defined value. Finally, our innovation index is the average of all available area values. Equation (2) represents how we obtain the overall innovation index score when values for all areas are available:

$$Innov_{it} = \frac{area_1 + area_2 + area_3 + area_4}{4} \quad (2)$$

All areas have the same weight to avoid subjectivity in the determination of weights. However, as this dataset will be open-access, researchers can calculate overall index scores based on area weights justified by their own research needs. Our index ranges from 0 to 10, where 10 indicates the highest level of innovation. Appendix 1 shows state rankings according to estimates of the overall Innovation Index for the period 2000 – 2015[1].

3. Using the US - Innovation Index: A basic econometric example

Scholars have widely investigated the implications of innovation on many different variables, such as firm performance (Chen, 2017), cultural dimensions (Prim et al, 2016), sustainability (Maier et al, 2020), and commercialization (Abdul Razak et al, 2014), among others. However, in the economics literature, there is still an open debate and some contradictory results about the relationship between innovation and economic growth. Most of the empirical evidence shows that there is a positive relationship between innovation and economic growth (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005; Adak, 2015; Braconier, 2000; Law, Sarmidi, & Goh, 2020; Pala, 2019; Pece, Simona, & Salisteanu, 2015).

In this section, we conducted an econometric experiment with our index. The purpose of the experiment is to show that there might be a relationship between innovation and economic growth at the U.S. state level. It is of paramount importance that we point out that the intention of our paper is not to investigate the relationship between innovation and economic growth. We could have selected any other variable, but we chose economic growth because of the availability of the data. Considering this, we expected to get positive and statistically significant coefficients in the estimations. However, negative or even non-statistically significant results would not indicate that there is something wrong with our index. That is, it could be possible, as discussed in the economic growth literature, that such a relationship is negligible.

[1] The full data of the innovation index and ranks (for 2000 to 2015) is available upon request to the corresponding author.

3.1. Data Analysis

We used a panel of 800 observations covering the period of 2000 - 2015 and encompassing all 50 states of the United States. Summary statistics and sources are reported in Table 1. We grouped the states into quartiles ranging from "least innovative" to "most innovative". Figure 2 shows the average growth rates for the states included in each quartile. The states in the least innovative group grew 0.034 percentage points less than those in the most innovative group.

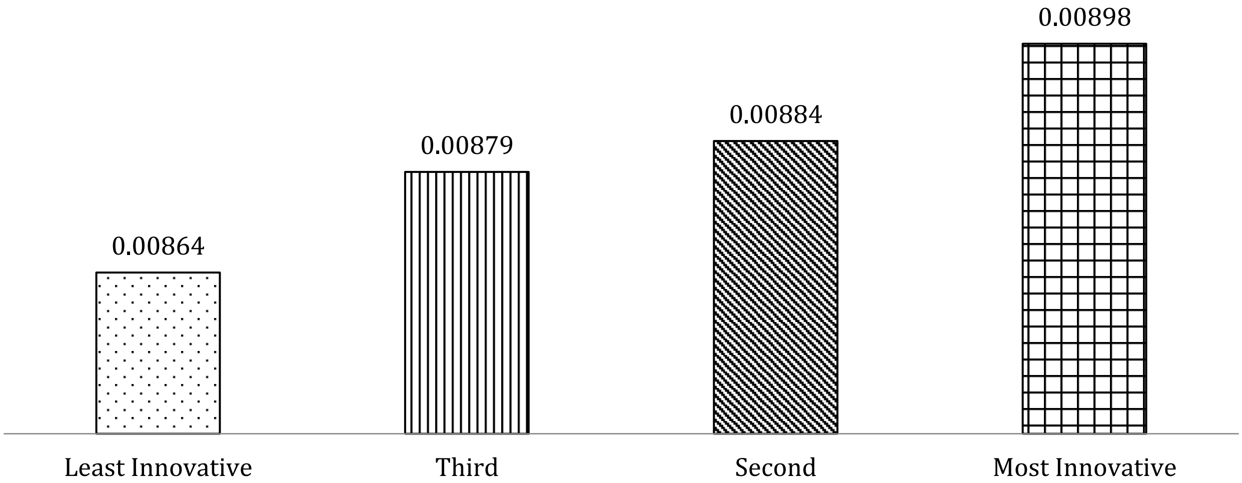

Figure 2. Economic growth rate by Level of Innovation 2000-2015

Table 1. Sources and summary statistics.

Variable	Description	Source	Mean	S.D	Min.	Max.
y	Real GDP per capita growth rate	Federal Reserve of St. Louis	0.00869	0.0258	-0.0943	0.1963
Innov	Innovation Index	Own estimations	3.64456	1.01588	1.58319	7.30829
EFNA	Economic Freedom North America	The Fraser Institute	5.98	0.95	3.54	8.07
White_int	Proportion of Not Hispanic White People as a portion of the total population	U.S. Census Bureau	0.734145	0.149124	0.229223	0.966237
Polit_gov	Dummy variable Republican Governor (1), Non-Republican (0)	Statista.com	NA	NA	0	1

Notes: The Republican Governor is a qualitative variable and does not have numerical descriptive statistical measures.

3.2. The Experiment

We estimated the effect of innovation on growth following this basic specification:

$$y_{it} = \beta_0 + \beta_1 innov_{it} + \beta_z Z_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \tag{3}$$

Where y is the real GDP per-capita growth rate, *innov* stands for innovation index, Z is a vector of control variables that includes Economic Freedom of North America overall score (EFNA), non-Hispanic Whites as a share of the total population (White_int), and a dummy variable to indicate the governor's political ideology (Polit_gov). If the governor is a Republican it takes a value of 1, otherwise, it is 0. α and λ are region and time-fixed effects, and ε is the error term, respectively. Sub-indexes i and t stand for state and time.

Considering that our model in equation (3) is quite static, and following the literature on economic growth, we lagged the innovation index and included a 1-year lag of our dependent variable on the right-hand side. The following equation includes these more robust estimations:

$$y_{it} = \beta_0 + \beta_1 Innov_{i(t-1)} + \beta_2 y_{i(t-1)} + \beta_z Z_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \tag{4}$$

3.3. Results

Table 2 reports the results of our econometric experiment. The estimated effect of our innovation index is statistically significant in all specifications. In the static version of our experiment (equation (3)), the innovation index is statistically significant at least at the 5% level with a coefficient of around 0.003, meaning that for each additional point of the innovation index, the state exhibits an increase of 0.3 points in its economic growth rate. If we move to columns 2, 4, and 6, where our model is dynamic and includes the lag of the dependent variable, results show that for each additional point of the innovation index that any state had in the previous year, it exhibits an additional 0.2 points of economic growth in the current year.

Table 2. Relationship between the US-Innovation Index and Economic Growth.

	Dependent Variable: Economic Growth Rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Innov	0.0027***		0.0025**		0.0031***	
	(0.001)		(0.001)		(0.001)	
EFNA	0.0025**	0.0017*	0.0025**	0.0016	0.0013	0.0009
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
White_int	0.0171***	0.0113*	0.0125*	0.0102	0.0105**	0.0074
	(0.006)	(0.006)	(0.007)	(0.006)	(0.005)	(0.005)
Polit_gov	0.0027	0.0028	0.0023	0.0027	0.0011	0.0012
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$Innov_{t-1}$		0.0019**		0.0021*		0.0022**
		(0.001)		(0.001)		(0.001)
y_{t-1}		0.2080***		0.2060***		0.1307**
		(0.054)		(0.054)		(0.063)
Obs	800	750	800	750	800	750
R^2	0.031	0.073	0.035	0.074	0.313	0.337

*Notes: *** = 1% significance level; ** = 5% significance level; * = 10% significance level. Robust standard errors are in parentheses. The dependent variable is the same for all specifications. Columns 1, 3, and 5 represent equation (3), and columns 2, 4, and 6 represent equation (4). Columns 1 and 2 do not include fixed effects. Columns 3 and 4 include region-fixed effects. Columns 5 and 6 include regional and time-fixed effects.*

3.4. Implications of our findings

In this section, we conducted some basic econometric experiments to try to find any relationship between our index and a variable that has been widely studied in the economic literature. Our experiment and results do not attempt to contribute to the economic growth literature or conduct any economic policy analysis; they just demonstrate the potentiality of our index. The purpose of this paper is to introduce our index and the methodology behind it. Our intention is for the index to be published as an open-access dataset.

Although it was not our intention to draw policy implications from our basic experiment, we could suggest further research on the economic growth field using our index to understand, and possibly establish, the causality between these two variables. Such research should use advanced and robust econometric methodologies that could capture the dynamic in data with very low variability such as economic growth rates among the US states, as we found in this experiment (see the differences in the growth rates in Figure 2).

4. Conclusions

Considering that there are indexes that study innovation at the county or MSE levels in the U.S. and that there is a lack of studies at the state level, we propose an open-access straightforward innovation index that takes into account the most important innovation-related indicators. Although this article aims to propose such an innovation index for the US, we decided to run an econometric experiment to show the robustness of our index by studying how innovation has impacted state economic growth in the U.S. for the 2000 – 2015 period. We carried out an econometric analysis employing a variety of specifications, our findings account for the observed heterogeneity in the potential effects of economic growth triggers commonly used in the literature.

Consistent with findings in the literature, results indicate that innovation has a positive and statistically significant effect on real GDP per capita growth. Although economic freedom is an institutional variable that is commonly used as a positive trigger of growth, we found that with higher restrictive specifications (such as region and time fixed) it is not statistically significant. This could explain the case of states with low economic freedom but large growth rates, such as California. This state has ranked in the last quartile (less free) in the EFNA, but it is in the top 5 of the innovation indexes during all years of this study. California exhibits an average growth rate of around 1.71%, 0.84 percentage points above the national average. Lastly, our results suggest that our proposed innovation index seems to capture the widely accepted relationship between innovation and economic growth. However, further research should be conducted to analyze this finding.

Finally, this paper contributes to the literature on innovation by offering an open-access index. Our index, contrary to Indiana University's and Cornell University's indexes, is aggregated at the state level. We used the available data from twelve indicators that are the most relevant for creating a metric that captures changes in innovation. The experiment carried out in this paper allows us to conclude that researchers can use this index for further research given the relationship that our results show is consistent with the literature. However, it will be the work of other researchers to demonstrate the benefits and/or caveats of using this innovation index for the analysis of other variables.

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Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

Author contributions

Conceptualization: Rafael Acevedo; Investigation: Rafael Acevedo, Jose Mora, Jorge Romero-Habeych; Methodology: Rafael Acevedo; Formal analysis: Rafael Acevedo, Jose Mora; Writing – original draft: Rafael Acevedo, Jose Mora, Jorge Romero-Habeych; Writing – review & editing: Rafael Acevedo.

Appendix

A1. US Innovation Index – State-Level by Year, Overall Score, and Rank.

Year = 2000			Year = 2001			Year = 2002		
State/Province	Innov	Rank	State/Province	Innov	Rank	State/Province	Innov	Rank
Idaho	7.26584	1	Idaho	7.30829	1	Idaho	6.27912	1
Rhode Island	6.66504	2	Vermont	6.13817	2	Rhode Island	5.94731	2
Vermont	6.18658	3	Wyoming	6.04013	3	Vermont	5.88370	3
California	5.80693	4	Rhode Island	5.97913	4	Massachusetts	5.10854	4
Massachusetts	5.55892	5	New Hampshire	5.22473	5	California	5.08224	5
New Mexico	5.53953	6	California	5.12235	6	New Mexico	5.03092	6
Michigan	5.44260	7	New York	5.03284	7	New Hampshire	4.95759	7
Delaware	5.28373	8	Pennsylvania	4.86595	8	Wyoming	4.73326	8
New Hampshire	5.23634	9	Massachusetts	4.79836	9	Washington	4.70356	9
New Jersey	5.22352	10	Hawaii	4.79062	10	Pennsylvania	4.64197	10
Tennessee	3.16262	41	Louisiana	3.45333	41	Alabama	2.96857	41
South Carolina	3.10513	42	Alabama	3.36112	42	Tennessee	2.95229	42
Florida	2.89902	43	South Carolina	3.32311	43	Kentucky	2.87597	43
Alaska	2.89050	44	Kentucky	3.26738	44	Florida	2.81843	44
Louisiana	2.88061	45	Tennessee	3.21215	45	Alaska	2.75984	45
Kentucky	2.85157	46	Illinois	3.20968	46	Louisiana	2.70551	46
Mississippi	2.61015	47	Mississippi	2.82898	47	Mississippi	2.67277	47
Nevada	2.29366	48	Nevada	2.67857	48	Nevada	2.37949	48
Arkansas	2.28032	49	Georgia	2.56724	49	Georgia	2.35880	49
Georgia	2.26991	50	Arkansas	2.46247	50	Arkansas	2.20118	50
Year = 2003			Year = 2004			Year = 2005		
State/Province	Innov	Rank	State/Province	Innov	Rank	State/Province	Innov	Rank
Massachusetts	5.93046	1	Massachusetts	6.29793	1	Massachusetts	6.22743	1
California	5.64107	2	California	5.44040	2	California	5.46130	2
Rhode Island	5.20542	3	Rhode Island	5.35713	3	Rhode Island	5.36969	3
Idaho	5.01521	4	Washington	5.19286	4	Washington	5.03887	4
Washington	4.75803	5	Wyoming	5.14459	5	Vermont	4.68714	5
New Hampshire	4.48401	6	Vermont	4.92554	6	Idaho	4.49175	6
Vermont	4.44276	7	Idaho	4.77055	7	Maryland	4.45612	7
New Mexico	4.27058	8	New Mexico	4.61840	8	New Mexico	4.45333	8
Hawaii	4.24939	9	New Hampshire	4.55024	9	New Hampshire	4.37488	9
Minnesota	4.13737	10	Hawaii	4.43006	10	Michigan	4.32172	10
Florida	2.84020	41	Maine	2.82219	41	Tennessee	2.75163	41
Tennessee	2.66130	42	Tennessee	2.74782	42	Florida	2.73500	42
Alabama	2.63627	43	Alabama	2.60879	43	South Carolina	2.64757	43
Georgia	2.55507	44	Georgia	2.53405	44	Kentucky	2.52019	44
South Carolina	2.48108	45	Kentucky	2.51114	45	Alabama	2.45840	45
Kentucky	2.40415	46	Louisiana	2.49640	46	Georgia	2.42405	46
Louisiana	2.34981	47	South Carolina	2.49572	47	Louisiana	2.41392	47
Mississippi	2.30631	48	Nevada	2.30216	48	Nevada	2.25808	48
Nevada	2.07443	49	Mississippi	2.25132	49	Mississippi	2.21579	49
Arkansas	1.86775	50	Arkansas	1.88845	50	Arkansas	1.82562	50
Year = 2006			Year = 2007			Year = 2008		
State/Province	Innov	Rank	State/Province	Innov	Rank	State/Province	Innov	Rank
Massachusetts	6.18766	1	Massachusetts	6.39965	1	Massachusetts	6.33963	1
California	5.61009	2	California	5.65123	2	California	5.97798	2
Rhode Island	5.15597	3	Vermont	5.22879	3	Washington	5.46881	3
Washington	4.90953	4	Washington	5.15741	4	New Hampshire	4.90421	4
Vermont	4.60139	5	Rhode Island	4.70882	5	Vermont	4.87344	5
New Mexico	4.34861	6	New Mexico	4.43287	6	Rhode Island	4.82099	6
Idaho	4.30012	7	New Hampshire	4.41935	7	Idaho	4.54170	7
New Hampshire	4.20200	8	Idaho	4.33594	8	Michigan	4.52736	8
Virginia	4.16315	9	Wyoming	4.30168	9	Maryland	4.48496	9
Michigan	4.15798	10	Michigan	4.19571	10	Virginia	4.44203	10
South Carolina	2.50805	41	Kansas	2.53995	41	Florida	2.58633	41
Kentucky	2.49557	42	South Carolina	2.49341	42	Kentucky	2.52924	42
Florida	2.47967	43	Tennessee	2.48778	43	South Carolina	2.52684	43
Georgia	2.44213	44	Nevada	2.41702	44	West Virginia	2.52679	44
Alabama	2.37862	45	Georgia	2.39313	45	Nevada	2.52107	45
West Virginia	2.34145	46	Florida	2.38009	46	Georgia	2.50574	46
Nevada	2.22190	47	Alabama	2.29365	47	Alabama	2.50340	47
Louisiana	2.12349	48	Louisiana	2.17527	48	Louisiana	2.28915	48
Mississippi	2.11125	49	Mississippi	2.13077	49	Mississippi	2.19664	49
Arkansas	1.80072	50	Arkansas	1.68707	50	Arkansas	1.75048	50
Year = 2009			Year = 2010			Year = 2011		
State/Province	Innov	Rank	State/Province	Innov	Rank	State/Province	Innov	Rank
Massachusetts	6.24942	1	Massachusetts	5.85285	1	Massachusetts	6.38315	1
California	5.86163	2	California	5.35221	2	California	6.09154	2
Washington	5.81370	3	Washington	5.00574	3	Washington	5.50175	3
Vermont	4.89336	4	Vermont	4.65093	4	Vermont	4.82047	4
Arizona	4.66024	5	Maryland	4.17198	5	Arizona	4.69450	5

Maryland	4.46758	6	Arizona	4.13705	6	Minnesota	4.53001	6
Minnesota	4.37583	7	Rhode Island	4.09596	7	Maryland	4.36129	7
Connecticut	4.35185	8	New Mexico	3.87035	8	New Hampshire	4.27747	8
Wyoming	4.22668	9	Minnesota	3.86174	9	Michigan	4.26773	9
Rhode Island	4.21720	10	New Hampshire	3.85175	10	Connecticut	4.17164	10
South Carolina	2.45372	41	Montana	2.23785	41	Nebraska	2.48653	41
Nevada	2.43980	42	Nevada	2.23335	42	Alabama	2.45076	42
Georgia	2.43838	43	Georgia	2.18333	43	South Carolina	2.39354	43
Kansas	2.39000	44	Florida	2.16339	44	Georgia	2.34867	44
Kentucky	2.33456	45	Kentucky	2.15558	45	West Virginia	2.31962	45
Alabama	2.31510	46	Alabama	2.13308	46	Florida	2.28922	46
West Virginia	2.25384	47	West Virginia	1.97477	47	Kentucky	2.25707	47
Louisiana	2.08370	48	Louisiana	1.91972	48	Louisiana	2.15313	48
Mississippi	1.96277	49	Mississippi	1.88658	49	Mississippi	1.86922	49
Arkansas	1.78409	50	Arkansas	1.58319	50	Arkansas	1.74293	50

Year = 2012			Year = 2013			Year = 2014			Year = 2015		
State/Province	Innov	Rank	State/Province	Innov	Rank	State/Province	Innov	Rank	State/Province	Innov	Rank
Massachusetts	6.69359	1	California	6.82181	1	California	7.24398	1	California	7.24463	1
California	6.46598	2	Massachusetts	6.72582	2	Massachusetts	6.86917	2	Massachusetts	6.82031	2
Washington	5.93945	3	Washington	5.95633	3	Washington	6.11645	3	Washington	5.97442	3
Arizona	5.02094	4	Arizona	5.04370	4	Arizona	5.07342	4	Arizona	4.95361	4
Michigan	4.68021	5	Michigan	4.69683	5	Maryland	4.75638	5	New Mexico	4.76245	5
Vermont	4.58113	6	New Mexico	4.62482	6	Delaware	4.72659	6	Maryland	4.64791	6
Minnesota	4.56652	7	Minnesota	4.57538	7	New Mexico	4.65064	7	Michigan	4.51644	7
Delaware	4.40200	8	Vermont	4.55243	8	Michigan	4.65032	8	New York	4.51437	8
Oregon	4.38789	9	Delaware	4.51838	9	Oregon	4.56702	9	Minnesota	4.49889	9
Maryland	4.38217	10	Maryland	4.51502	10	Minnesota	4.54478	10	Delaware	4.48656	10
Oklahoma	2.63354	41	South Carolina	2.65280	41	South Carolina	2.78674	41	Alabama	2.80191	41
Alabama	2.53379	42	Alabama	2.63837	42	Alaska	2.78662	42	Tennessee	2.73087	42
West Virginia	2.46555	43	West Virginia	2.59423	43	Georgia	2.61772	43	West Virginia	2.64235	43
Alaska	2.44976	44	Alaska	2.54165	44	Hawaii	2.57923	44	Georgia	2.60435	44
Florida	2.42815	45	Georgia	2.51744	45	Louisiana	2.47115	45	Louisiana	2.59856	45
Georgia	2.42017	46	Florida	2.47542	46	Florida	2.46255	46	Mississippi	2.49069	46
Kentucky	2.40703	47	Louisiana	2.36696	47	Mississippi	2.43843	47	Florida	2.45795	47
Louisiana	2.36760	48	Kentucky	2.19088	48	West Virginia	2.37283	48	Hawaii	2.40226	48
Mississippi	2.14884	49	Mississippi	2.15065	49	Kentucky	2.30410	49	Kentucky	2.33353	49
Arkansas	1.82156	50	Arkansas	1.88705	50	Arkansas	1.88871	50	Arkansas	1.91782	50

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