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State-Level Variations in Open Source Policies

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1.0 Introduction

The open source software (OSS) model represents an alternative to traditional proprietary software usage. Yet relatively little is known about the conditions impacting policy related to OSS development, diffusion, and adoption. This paper explores the concept of a state-level open source index (SLOSI) to measure open source policy related initiatives at the state-level in the United States. One rationale for developing a SLOSI is to gauge how well a state's (political, economic, social, technological) environment relates to its OSS policies.

This metric readily lends itself to evaluating the political, social, and economic aspects of adoption of the OSS approach. The SLOSI provides a heuristic and common set of "tools" to help assess how OSS-related conditions vary from state to state. Such a metric can be especially useful in this context where indicators can be elusive. By its nature, open source technology defies easy measurement. Nonetheless, a diverse and creative set of proxy measures are identified and tested for validity. The formulation of the index addresses the conceptual complexities surrounding OSS as a product, as a production process, and even as an ideology. The index construction follows from (1) a thorough literature review on OSS in society; (2) interviews with expert informants and policymakers; (3) extensive data search and then collection; and (4) various robustness checks and efforts to estimate missing data. Our construction, by relying heavily on the published literature and on input from a community of OSS experts, fosters an inclusive development process akin to the open source development process itself. The empirical analysis of SLOSI values compares readily to variation in state-level OSS policy environments. The paper concludes with a discussion of the ways in which this new SLOSI can be used by those in the OSS industry, those researching OSS, and, potentially, by policymakers.

2.0 Background

A review of the literature finds that a number of studies examine open source adoption and policy at the national level. However, as is the case with many issues examined at a state level, the literature is scant on analysis at the sub-national level, especially with regard to actions of states within the U.S. Generally, economists have been at the forefront of much of the research into open source software adoption and deployment, many of whom are intrigued by what appears to be a distinct mode of technological development, innovation, and, especially, distribution. Lerner and Tirole (2005) suggest four questions/issues of interest to scholars studying open source software: 1) technological characteristics conducive to smooth open source development, 2) optimal licensing of open source, 3) the coexistence of open source and proprietary software, and 4) the potential for the open source model to be carried over to other industries (i.e. the portability of the "open source" concept).

Adoption at national level: Scholars have examined the adoption of open source by national governments, via policy mechanisms like regulatory approaches. By 2001, Peru, Brazil, Argentina, France, and Mexico all had measures pending that would mandate the use of free software[1] on government computers. Other national and local-level efforts were also taken up in

[1] Free software, or alternatively "free and open source software", (F/OSS, FOSS, or FLOSS), consist of programs are programs whose licenses give users the freedom to run the program for any purpose, to study and modify the program, and to redistribute copies of either the original or modified program (without having to pay royalties to

such countries as Germany, Spain, Italy, and Vietnam to establish official alternatives to the use of closed, proprietary software by government.

For many free software proponents, it was the seemingly uncontainable momentum of their movement and the sheer technical strength of free software itself—more than any particular local policy actions or activities—that were to credit for its global successes. However, Chan (2006) argues that Peru provides an alternative case to this market-forces explanation. The Peruvian national government became directly invested in the issue, and free software in that nation became an instrument to directly address limitations of the state and its relation to global markets. Through free software, stakeholders sought to refashion the state as a strengthened entity that could act independently from or in challenge to transnational corporate interests. Peru's legislative developments signaled a departure from a laissez-faire approach and reliance on outcompeting proprietary software on its merits and signaled at least some OSS advocates had other goals. When considering open source adoption at the national level, one key issue is the government's interests in pursuing this option versus those of other stakeholders who stand to benefit from such a decision.

Chae and McHaney (2006) examined an initiative announced by China, Japan, and South Korea in 2003 to promote open source software and platforms that favored non-Microsoft products such as Linux. When considering the reasons for this partnership and the nations' rationales for pursuing open source, the authors focused on, 1) geography, 2) similar languages and traditions, 3) security, 4) political and economic forces (e.g., a substitute for Microsoft), and 5) technological self-reliance. Particularly germane are East Asian countries where e-government initiatives are underway, as well as concern about the security and vulnerability of commercial software (e.g. South Korea's experience with the 2003 "SQL Slammer" worm). Related to such rationales for national adoptions is May's (2006) analysis, arguing that open source software adoption in sub-Saharan African nations can help curtail the costs and problems associated with closed software licenses and intellectual property rights issues.

*Public Sector Adoption and Public Policy Issues***:** An issue distinct from direct national adoption involves parsing the role public policy should (or even can) play in open source decisions. Whereas some governments have begun to *procure* open source software, others have actually channeled public funds to large-scale open source development projects. The distinction here, as made by Lee (2006), is that a nation that "considers" OSS signifies its desire to establish a level playing field within the public sector's IT procurement policies—such policy is not actually pro-OSS policy because it neither constitutes a government preference for OSS or means the government will choose it. However, when policy makers decide to "prefer" OSS over proprietary software, the decision is likely to be criticized as procurement discrimination by proprietary software developers. Lee argues that when making public policy decisions on open source, government users should taking into account society's long term interests, not just its interests as a consumer.

Other issues germane for policy makers include OSS's impact on e-government initiatives. While official discourse and government policy for non-proprietary software suggests that its introduction into government will bring more 'politics as usual' rather than

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previous developers). David A. Wheeler (2007-04-16), "Why Open Source Software / Free Software (OSS/FS, FLOSS, or FOSS)? Look at the Numbers!" [http://www.dwheeler.com/oss_fs_why.html]

democratization, Berry and Moss (2006) discuss circumstances in which the discourse and practice of non-proprietary software contribute to opening-up and democratizing e-government. OSS can protect and extend transparency and accountability in e-governments and offer scope for technology to be socially shaped by citizens and associations as well as by administrators and private interests. Simon (2005) and Seiferth (1999) also bring attention to political issues such as standards settings and open licensing that impact the public policy of open source.

*Subnational and State Level Policy Issues***:**

More locally than international and national policies concerning OSS, regional sub-national jurisdictions can promulgate their own OSS-related policies. Given the low costs with which OSS production processes can span political borders and geographic distance, OSS activity often operates on a national or global scale. Yet this "global" aspect of OSS activities does not preclude "local" policy responses – arguably it even encourages it. Local or regional governments may seek to tap into (global) OSS resources in order to enhance economic development with respect to other competing regions. They might also express different cultures or attitudes towards economic development, world markets, and technological innovation. Consider also the case of Extremadura, Spain (Alonso, et. al 2004) where the regional government decided to support development of free and open source software during the early 2000s. They did it against a background of political and philosophical concerns for the loss of community in a high-tech and scientific society. Following through, they argue that a techno-scientific policy may be judged on grounds other than straightforward economic benefit, such as community development. The variation in constituencies, interests, and economic conditions across localities fosters a diversity of local "policy experiments" with OSS. These might be seen as 'small stakes' or 'slipping under the radar' and thus might not be replicable on a larger (national or international) stage, but they nonetheless change the landscape in which OSS participants operate. National policies (e.g., Peru, China, Brazil) or local policies (e.g., Extremadura) often simultaneously invoke some principled stance towards capitalism or technology while simultaneously implementing economic development policies.

A brief overview of the policy process and implications at the national level can begin to inform and provide context for examination of state-level activity. As noted above, literature at the national level, whether examining policy or performing case studies, tends to identify a common core set of rationales for instituting a policy related to open source. These include:

Table 1 Policy Rationales

Rationale	**Literature Citation**
Security	Evans 2003, Ghosh 2002, Chae & McHaney 2006
Anti lock-in/independence	Ghosh 2002, Chae & McHaney 2006, Waters 2007
Ability to adapt to local language	Wong 2004
Cost savings	Evans 2003, Ghosh 2002, Waters 2007
Public goods, economic development	
Increased competition	Evans 2003
Reducing copyright infringement	Wong 2004
Transparency	Ghosh 2002
Ideological/Democracy	Evans 2003, Chan 2006, Berry & Moss 2006
Anti-corporate/anti-American backlash	Evans 2003

A quick glance at this condensed list from a small selection of the literature, open source would appear to be a public sector panacea.

Anti lock-in/independence, the ability to adapt to local language, and cost savings rationales are all criteria that should factor into any regular procurement decision and should be assessed on a case-by-case basis (Ghosh 2002, Chae & McHaney 2006, Waters 2007). These criteria are usual criteria in any procurement decision, of software or something else. A policy designed to correct for lack of awareness or misperception inherent in the procurement process indicates a policy reform of the procurement process itself rather than a policy about OSS per se.

Arguments related to public goods, economic development, increased competition, and reduced copyright infringement imply policies that impact actors other than the public sector. Economic development or workforce development may be a viable reason to institute some form of policy related to open source. Reasoning for increased competition verges on industrial policy. Reduction of copyright infringement may not be a concern, at the state level, in the United States. These three reasons have another commonality in that they each give rise to testable hypotheses. To date there has not been substantive study of these three areas to form a credible evidence base that would guide the crafting of policy trying to achieve these outcomes. The effectiveness of any policy claiming benefits in these regards remains unproven. Evans, in a study critical of government intervention into the software market via pro-open source policies, views many of the policies observed as a "desire to correct a perceived market failure" (Evans 2003, p. 378), bluntly put in the paper title, "a solution in search of a problem."

The idea of "transparency" of code fits a philosophical line of reasoning. For example, should the source code used in inherently public sector functions (e.g., tallying votes, computing taxes, forecasting weather, handling military communication) be available for public viewing or use? In some cases, policies have been proposed to address an ideological or geopolitical objective. Current and future open source policies have incorporated an anti-American justification, although something unlikely in the United States.

Reviewing the list of rationales, it becomes clear that many justifications are available, although their logical consistency, supporting evidence, or appropriateness as a state-level OSS policy is far less clear. When a state defends an existing policy or designs and enacts a new open source policy, policymakers would do well to define the problem that is being addressed or the opportunity that it is trying to fulfill. We delve into defining the problem or opportunity by looking at the basic responsibilities of the state.[2] All states procure software, run and partially fund research universities, provide education, and guide economic development. Some of the reasons for open source policy at the national level are also relevant to the major activities of states. (Lacking still, are clear definitions of the policy outcome, that is, the problem the policy should address, and the design of the policy instrument itself. These considerations are well beyond the scope of the current paper.)

Procurement/adoption:

Software is generally procured by state governments to carry out tasks. It therefore serves an ancillary, enabling purpose. Although there are no budgetary codes to specifically track money spent on open source in the public sector, the general size of state IT departments and expenditures can give some context. For example, appropriations for the Michigan

[2] Obviously, there are many more functions of a state than listed here; but there are the primary ones related to the scope of this paper.

Department of Information Technology budget totaled $378 million in FY 2006-07 (Michigan). On the expenditure side, Connecticut spent over $46 million on software, support, data and consulting services in FY2008 (Connecticut 2008). These expenditures would include proprietary software purchasing and licensing as well as spending on programmers and support for OSS.

There are many examples of adoption of open source by the public sector in areas like health care and traffic management systems (Darter 2006). *Adoption alone* does not necessarily constitute a policy favoring open source—adoption could be made through the normal course of procuring the best value software for a state's needed application. Another procurement might require by its contract terms that a specific type of open source software be acquired.

One organization formed in 2004 under the idea of promoting reuse among the public sector players in the U.S. was the Government Open Code Collaborative. It began with founding member agencies from Massachusetts, Rhode Island, Pennsylvania, Utah, Kansas, and West Virginia, and a handful of municipalities (Adelstein 2004). The initiative was short lived, however, and is no longer in existence.

Observed Policies:

Finally, we can begin to assess the actual policy instruments that carry out the open source policy and its rationale. Based on the extant literature and our initial data collection, observed policies or proposed and failed policies fall along a continuum from information gathering to what could be considered strong intervention. A typology of policies include:

- General Study/Use Study
- Pilot Project
- Notification of Permission to Procure/"Level Playing Field"/"Best Value"
- Guidance on How to Evaluate During Procurement
- Participation in institution[3]
- All Else Equal Preference
- Mandate Use of Open Standards
- Requirement/Mandate

3.0 Methodology and Data Collection

This section provides describes the approach and the methodology adopted in gathering the various data sets and web based assessment of the state policy adoption of OSS within the United States. Following a general literature review of the state of OSS on the US as well as the world, the next target was to achieve state-level information. Here a "brute force" approach was applied for all the fifty states present in the US, with the objective of obtaining as much information as possible with respect to OSS and the state level policy activities. In addition, we drew on material from the OSSI (http://www.oss-institute.org/) as well as Open Source Software Initiative (http://www.opensource.org/) to help provide important benchmarks.

[3] For example, ODF Alliance, OSSI, GOCC, Washington Open Source Software Alliance

A preliminary investigation reveals some information about the presence of OSS policies and activities across states. Following a number of Google searches using different keyword combinations, such as "Open Source Software" and "Policy", along with the name of a state, many states returned no results while few states gave multiple articles and policy documents. A handful of indicator variables were collected in August 2008 at the state level. The definitions for these variables are given in Appendix A. The indicator variables were all transformed into per-capita terms, using Census estimates of state populations circa July 2007. These variables capture the amount of OS activity in a state, scaled by the size of that state's population. The policy activity indicators were then classified into different categories. The categories were selected to capture different policy activity with regard to OSS. In the analysis that follows, the gross indicator of "policy activity" represents when state-level legislation or policy was *proposed*, whether it passed or not.

4.0 Analysis

The State-Level Open Source Index

A simple version of the state-level open source index (SLOSI) is constructed using several of the variables collected. The SLOSI is an aggregation of several key variables positively associated with OSS activity. To construct the SLOSI, each of the key variables is transformed into its rank (among states) and then these rank variables are summed. The SLOSI is then the state's rank of these summed values. Rank ordering transformations are used in order to mitigate potential biases from scale effects across the constituent variables. Future analyses will consider other transformations of (sub-index) indicators to examine the index sensitivity and theoretical advantages (see Ebert and Welsch 2004 for additional discussion). Table 2 presents each of the state's values for the SLOSI and its component variables. Larger ranks indicate higher "scores" or values (i.e., lower ranks are "worse").

Table 2: State Ranks for Assorted Indicators

state	SLOSI	OS in State	FF in Gov	Linux Jobs	OS Jobs	Linux Groups
Alabama	6	12	19	23	12	6
Alaska	36	49	32	5	19	49
Arizona	40	19	51	40	33	26
Arkansas	3.5	20	21	2	8	5
California	41.5	15	45	46	45	20
Colorado	37	30	13	47	46	27
Connecticut	44	25	46	39	37	28
Delaware	48	45	37	45	44	36
Florida	8	10	14	26	16	14
Georgia	32	36	5	36	35	30
Hawaii	16	46	2.5	11	20	24
Idaho	20	29	11	6	18	45
Illinois	21	4	12	34	43	23
Indiana	22	18	38	13	17	34
Iowa	33	28	40	10	28	39
Kansas	27	39	8	14	30	33
Kentucky	9	14	17	19	29	3

Louisiana	2	9	22	4	9	7
Maine	23.5	44	24	21	13	19
Maryland	38.5	21	15	49	47	32
Massachusetts	49	50	43	50	50	22
Michigan	12	11	26	17	11	29
Minnesota	34.5	23	44	38	32	12
Mississippi	3.5	22	7	7	3	17
Missouri	28.5	13	34	31	24	31
Montana	34.5	43	49	8	3	46
Nebraska	18	26	16	22	31	11
Nevada	28.5	33	20	28	27	25
New Hampshire	45	37	28	41	40	47
New Jersey	19	3	25	42	34	4
New Mexico	5	31	2.5	12	10	10
New York	41.5	41	30	44	41	15
North Carolina	14.5	1	2.5	35	42	21
North Dakota	30.5	35	36	20	3	40
Ohio	17	7	27	30	23	18
Oklahoma	11	16	23	9	6	35
Oregon	46	40	35	37	38	44
Pennsylvania	25	5	42	32	36	8
Rhode Island	26	32	47	29	14	1.5
South Carolina	13	2	31	25	26	16
South Dakota	30.5	34	33	16	3	48
Tennessee	1	8	10	15	7	9
Texas	10	6	6	33	25	13
Utah	50	38	48	43	39	50
Vermont	43	47	39	24	22	41
Virginia	38.5	27	50	1	49	37
Washington	47	48	9	48	48	43
West Virginia	14.5	24	2.5	18	15	42
Wisconsin	23.5	17	18	27	21	38
Wyoming	7	42	29	3	3	1.5

Table 2 presents low-ranking states (Tennessee, Louisiana, Arkansas, Mississippi), high-ranking states (Delaware, Massachusetts, Utah), and the states in between. Figure 1 shows the SLOSI mapped for the United States, with bright green states ranking highest on the SLOSI and bright red states ranked lowest. SLOSI rankings seem to reflect regional patterns, where southern states rank lower than northeastern states. There may be other patterns in the data as well. Table 3 displays pairwise correlations between the variables. The correlations between each pair of variables are quite small, with the exception of the correlation between the frequency of Linux and OS jobs posted to Monster.com. The other components to the SLOSI index contribute largely new information not already captured in the other variables.

Figure 1 – The SLOSI mapped for all United States

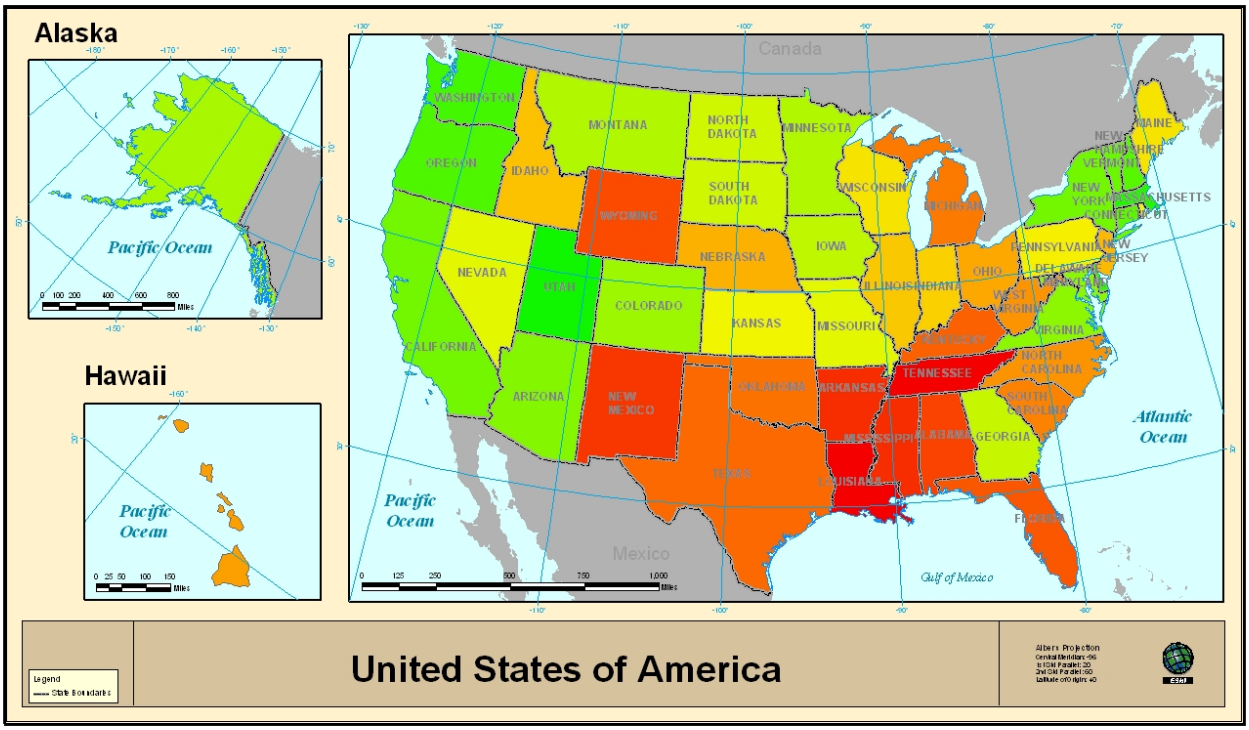

Table 3: Pairwise correlations

	OS in State	FF in Gov	Linux Jobs	OS Jobs	Linux Groups
OS in State	1				
FF in Gov	0.21	1			
Linux Jobs	0.06	0.17	1		
OS Jobs	0.07	0.15	0.75*	1	
Linux Groups	0.47	0.18	0.03	0.14	1

Policy Determinants

The *state policy* variable proxies for state-level policy activity concerning OSS. This binary indicator variable captures both enacted and proposed policies in recent years within each state. Figure 2 maps the *state policy* variable. The following analysis predicts the presence of state-level OSS policy activity using the SLOSI and other OSS indicator variables. Variables capturing additional OSS activity in a state (e.g., OS in State, Linux Jobs, OS Jobs, Linux Groups), the presence of software firms, and the SLOSI itself might all be expected to be positively associated with the presence of state OSS policy. Depending on whether those software firms are competitively disadvantaged by the OSS policy (perhaps because they produce proprietary software), however, the *Software Co.'s* variable might be negatively associated with OSS policy. Table 4 shows the set of data for the fifty states, where all variables except the *state policy* variable are measured as the state's rank.

Figure 2 – State OSS Policy map (Green = Policy Present; Red = Policy)

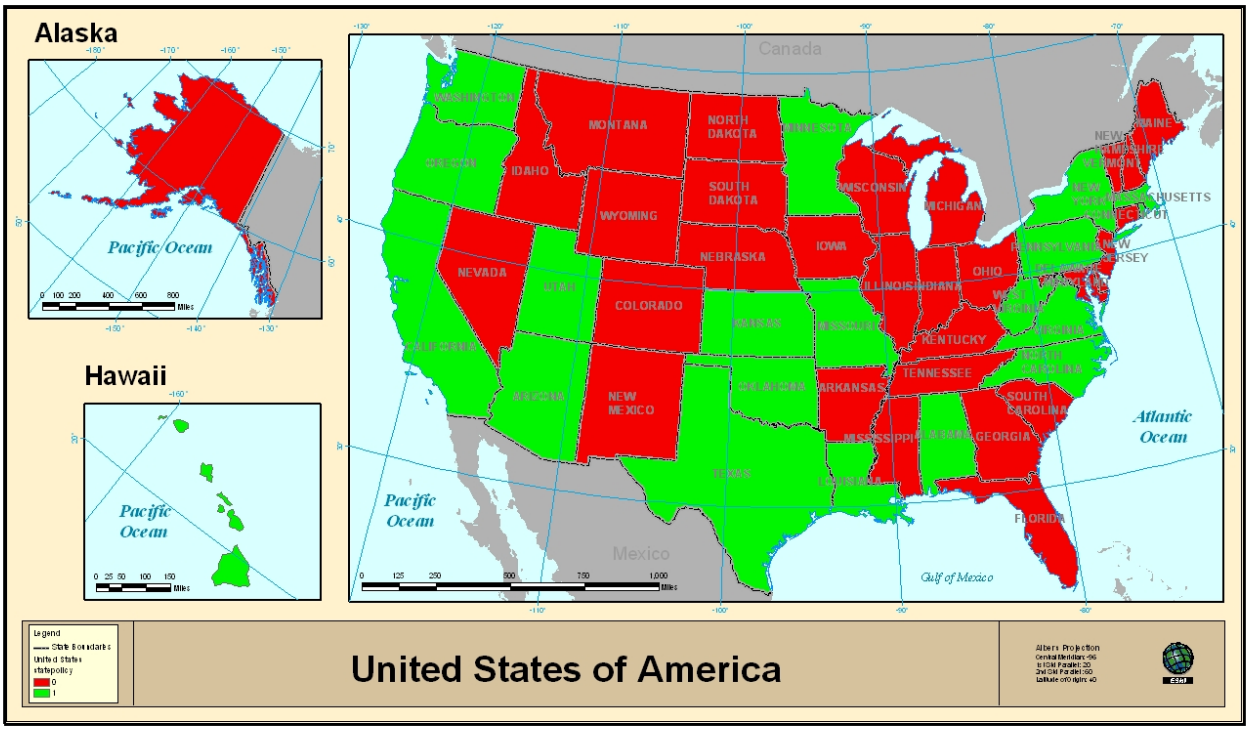

Table 4: State Ranks for Other OSS-Related Indicators

state	SLOSI	state policy	OS in Paper	OS in State	Linux Jobs	OS Jobs	Linux Groups	Software Co.'s
AL	6	1	4	12	23	12	6	11
AS	36	0	18	49	5	19	49	22
AZ	40	1	21	19	40	33	26	30
AK	3.5	0	4	20	2	8	5	5
CA	41.5	1	26	15	46	45	20	44
CO	37	0	40	30	47	46	27	48
CT	44	0	22	25	39	37	28	41
DE	48	0	20	45	45	44	36	37
FL	8	0	8	10	26	16	14	35
GA	32	0	27	36	36	35	30	33
HI	16	1	34	46	11	20	24	19
ID	20	0	4	29	6	18	45	28
IL	21	0	35	4	34	43	23	26
IN	22	0	14	18	13	17	34	9
IA	33	0	4	28	10	28	39	13
KS	27	1	25	39	14	30	33	18
KY	9	0	16	14	19	29	3	6
LA	2	1	9	9	4	9	7	3
ME	23.5	0		44	21	13	19	17
MD	38.5	0	33	21	49	47	32	42
MA	49	1	19	50	50	50	22	49
MI	12	0	12	11	17	11	29	25
MN	34.5	1	32	23	38	32	12	38
MS	3.5	0		22	7	3	17	1

MO	28.5	1	30	13	31	24	31	2
MT	34.5	0		43	8	3	46	20
NE	18	0	23	26	22	31	11	16
NV	28.5	0	31	33	28	27	25	31
NH	45	0		37	41	40	47	50
NJ	19	0	4	3	42	34	4	47
NM	5	0	13	31	12	10	10	29
NY	41.5	1	41	41	44	41	15	34
NC	14.5	1	11	1	35	42	21	27
ND	30.5	0		35	20	3	40	14
OH	17	0	4	7	30	23	18	23
OK	11	1	17	16	9	6	35	8
OR	46	1	37	40	37	38	44	40
PA	25	1	4	5	32	36	8	32
RI	26	1	36	32	29	14	1.5	24
SC	13	0	15	2	25	26	16	7
SD	30.5	0		34	16	3	48	10
TN	1	0	10	8	15	7	9	12
TX	10	1	28	6	33	25	13	36
UT	50	1	24	38	43	39	50	43
VT	43	0		47	24	22	41	39
VA	38.5	1	39	27	1	49	37	46
WA	47	1	38	48	48	48	43	45
WV	14.5	1		24	18	15	42	4
WI	23.5	0	29	17	27	21	38	21
WY	7	0		42	3	3	1.5	15

To estimate the relationship between these predictor variables and the OSS policy variable, several logit models are estimated. Models with a variety of indicator variables and nonlinear transformations of those variables are estimated, although the difference in the model fit across those transformations is not too remarkable. The basic results, shown in Table 5, are generally unchanged when the raw, per-capita version of the variables are used or additional (see Appendix A for variable definitions) or fewer covariates are included. The overall results – that the OSS indicator variables are very poor predictors of state level policy – is quite robust. Factors that might be expected to influence OSS policy, such as the number of software firms or Linux user groups, seem largely unrelated. Even the frequency of "open source" associated with the state in Google searches appears unrelated to *state policy*. The number of OS jobs in the state, however, exhibits a consistent and significant positive association with OSS policy. More OS jobs tend to be associated with greater likelihood (presence of) of OSS policy. This relationship is modest, however, and ought not be interpreted causally – OSS jobs may lead to more OSS policies and vice versa. Employment factors do seem to have an important role, as much as any of the other predictors, although it is safe to say that these obvious and easily measured variables perform very poorly in the logit model. The model fit is so low, with a pseudo R^2 of 0.08, that one could reasonably reject the entire model (as not predicting appreciably better than random chance).

Table 5: Logit Results (predicting *state policy*)

N	50	Wald chi2(4)	5.3
Pseudo R2	0.0784	Prob > chi2	0.2579
Log pseudolikelihood	-31.0116		
Variable (state-ranks)	**coef.**	**z**	**p-value**
OS in State	0.0080	0.33	0.741
OS Jobs	0.0661	2.05	0.041
Linux Groups	-0.0175	-0.68	0.497
Software Co.'s	-0.0289	-0.86	0.391
constant	-1.1649	-1.31	0.191

This weak relationship between the predictors and *state policy* is reinforced by the weak and insignificant correlation between SLOSI and *state policy*. Even though the SLOSI uses only some of the variables in the logit in Table 5, the different information does not improve the prediction of *state policy*.

Clearly, the SLOSI and OSS activity as measured here does not give much guidance as to which states have OSS policy activity and which do not. This could arise for several, not mutually exclusive reasons. First, the indicators of OSS activity might be poorly measured here. Alternative, better indicators for OSS activity might yield different results. Second, a theory that holds that 'more OSS activity should be associated with more OSS policy activity' may be naive. A more nuanced theory, which more explicitly accounted for the determinants of policy activity rather than just measures of gross OSS activity, might yield alternative hypotheses. For instance, a model of policy-setting in equilibrium might predict that OSS employment, use, and discussion are determined simultaneously with OSS policies. States may implement OSS policies as a response to a strong OSS lobby or in an attempt to develop OSS capacity where it was previously lacking. Both high and low values of the OSS indicators might rightly predict *state policy*, leaving the poor model fit in Table 5 an expected result of an ambiguous theoretical relationship.

5.0 Conclusions

The SLOSI should be considered a work in progress, and was devised as a tool to explore potential impacts of open source software and approaches at a sub-national level. However the true value of the tool lies in the use to which it can be put, and by extension in crafting policy and strategies for the advancement of open source interests, more broadly. With reference to open source software, a number of gaps appear along several dimensions, in the literature, in communication between different actors, as well as in the general awareness of what the OSS model represents. This lack of awareness was articulated recently by an industry observer (Asay, 2008) who noted that the assumption that "everybody knows about this stuff" could be a key barrier to the development of the open source approach, where passing familiarity with a concept or product leads to underestimation of its value, and the consequential free-riding could ultimately undermine the community and the desire to continue to develop in an open source approach.

Another gap, evident in the literature, appears between the proscriptive, business-oriented (or "practitioner"-oriented) literature on open source software and the scholarly literature on the same subject. In developing the SLOSI, we relied on a survey of the scholarly literature, as well as drawing upon the input from Red Hat Inc. and other open source experts in an earlier phase of the study, but a word is in order about the business and computer literature not used. Trade

publications and even mainstream periodicals such as *The Economist* have dedicated a great deal of attention to open source software, but such coverage typically based on anecdotal or tightly focused, short-term data to make broad assessments about open source. More often than not, such observations are used to speculate on the direction of open source, either positive or critical, depending on the viewpoint of the publication in question.

The empirical scholarly literature tended to use more rigorous methods to gather very specific data. One such example is Bonaccorsi, Giannangeli, and Rossi's (2006) survey of 146 Italian software firms to better understand OSS business models. While such methods tell the researchers a great deal about a specific topic, such findings are difficult to generalize from. Conversely, as mentioned, the generalized observations of the business and computer literature often lack needed data. What sets the SLOSI apart is its model that uses comprehensive state data to test some broad relationships. Still, there is a need for better data documenting open source software especially at the sub-national level.

Turning to policy considerations, at a national level, government commissions and agencies have proposed, and in some cases implemented, a variety of measures to encourage open source developers. For example, in the United States, the President's Information Technology Advisory Committee (2000) recommended direct federal subsidies for open source projects to advance high-end computing. A report from the European Commission (2001) also discusses support for open developers and standards. Many European governments have policies to encourage the use and purchase of open source software for government use. As is well known, governments can sponsor the development of individual open source projects. Economists have sought to understand the consequences of a vibrant open source sector for social welfare. Perhaps not surprisingly, definitive or sweeping answers have been difficult to come by. But if a tentative conclusion can be made, most analyses have concluded, based on limited data, that government support for open source projects is likely to have an ambiguous effect on social welfare.

The SLOSI uses indicators are a first attempt at parsing indicators that might impact a state's potential to adopt open source software. In many cases we relied on general economic and socio-demographic indicators, but where possible, we drew upon variables and associated data based on software and computing central to the focus of the SLOSI. While we feel that, as an index, the SLOSI provides an interesting "snapshot" of a country's open source potential it is worth noting that with better data collection both of independent indicators, as well as collecting state level policy data with a finer resolution—beyond the scope of the current project—the index could be improved in subsequent iterations.

But this should not be the end product of research in this area, we believe that there is more to be found out that would reorient (or inform in a different direction), our findings about public policy and OSS. In other words, the assumptions about OSS's liberating nature and positive implications for social welfare (made often by governments themselves) have not necessarily been observable when the (admittedly preliminary) research is done. We suggest that it is not necessary to accept such a nuanced and ambiguous view but propose that empirical research be supported that yields objective, generalizable observations. The initial empirical inquiry undertaken in this report suggests that simple (reduced-form) models that expect correlations between OSS activity and policy may be too naïve in a complex system that simultaneously gives rise to socio-economic conditions, OSS activity, and public policy.

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Appendix 1

Variable	Definition
state policy	1 if an OSS policy is proposed or enacted in a state, 0 otherwise. Policy activity was determined by Google searches of state websites for policy linked activity, legislative action or regulatory actions.
OS in Paper	Hits on Google on 8/14/08 of search [site:X.com "open source"], where X is the domain of the major newspaper in the state (as defined by http://www.burrellesluce.com/top100/2008_Top_100List.pdf) . For Georgia, this is [site:.ajc.com "open source"]
OS in State	Hits on Google on 8/14/08 of search [site:X.com "open source"], where X is the domain of the official state government site as given by http://www.usa.gov/Agencies/State_and_Territories.shtml. For Alabama, this is [site:.alabama.gov "open source"]
PDF in Gov	Hits on Google on 8/14/08 of search [site:X.com filetype:pdf], where X is the domain of the official state government site as given by http://www.usa.gov/Agencies/State_and_Territories.shtml. For Alabama, this is [site:.alabama.gov filetype:pdf]
Doc in Gov	Hits on Google on 8/14/08 of search [site:X.com filetype:doc], where X is the domain of the official state government site as given by http://www.usa.gov/Agencies/State_and_Territories.shtml. For Alabama, this is [site:.alabama.gov filetype:doc]
FF in Gov	Hits on Google on 8/14/08 of search [site:X.com "firefox"], where X is the domain of the official state government site as given by http://www.usa.gov/Agencies/State_and_Territories.shtml. For Alabama, this is [site:.alabama.gov "firefox"]
MSIE in Gov	Hits on Google on 8/14/08 of search [site:X.com "internet explorer"], where X is the domain of the official state government site as given by http://www.usa.gov/Agencies/State_and_Territories.shtml. For Alabama, this is [site:.alabama.gov "internet explorer"]
FFPDF ratio	Ratio of *FF in Gov* to *PDF in Gov*
Linux Jobs	Number of Monster.com search results on 8/14/08 for "Linux" as a keyword and the state as the state location. Other search fields left open.
OS Jobs	Number of Monster.com search results on 8/14/08 for "open source" as a keyword and the state as the state location. Other search fields left open.
Linux Groups	Number of Linux user groups (per http://www.linux.org/groups/usa)
Software Co.'s	Number of software companies (per http://www.manta.com/mb_33_G2_000/computer_software)