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Identifying peer states to assess technology-based economic development

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ABSTRACT

States often rely on 50-state "report cards" or indices to track their progress in technology-based economic development. Economic development agencies value these indices, published by independent consultancies, because they cut the costs of compiling data, compare states to one another and allow agencies to avoid charges of "cherry-picking" measures to serve their own purpose. The rankings of the states in these indices have appeal as they give policymakers and development agencies an idea of likely peer states and possible members of an aspirant group. Peers and aspirant groups provide a state with examples of alternative approaches to economic development, while allowing agencies to depict economic development activities in competitive terms for policymakers and legislators. Therefore, it is important that these comparisons be valid and, since the state's development policies affect the public, it is worthwhile for the citizenry to understand how agencies make these comparisons.

Although rankings are easy to understand, manipulating multiple measures to produce a single number (the ranking) can distort important differences between states. The present research addresses whether these rankings provide a reliable source for peer and aspirant groups. Analysis of two popular scorecards—the *State New Economy Index* and the *State Technology and Science Index*—shows that rankings provide only a broad picture of a state's relative standing. Clustering techniques based on self-organizing maps give a more refined view, better suited for policy analysis.

1. Introduction

1.1. The value of comparisons in technology-based economic development

Sub-federal governmental units such as states, provinces or municipalities can look to other units in order to build a story of how they are doing in technology-based economic development (TBED). In particular, language in state reports on TBED shows that states try to identify peers while targeting other states as members of a group whose success in TBED they aspire to (see below for examples). Peers can foster a sense of real or implied competition that can be manipulated to motivate legislators and other policymakers to act in ways believed to increase the state's attractiveness to businesses, skilled workers, entrepreneurs and investors. Similarly, members of an aspirant group can serve as models to spur state agencies to increase political and business activity to improve economic development. Peers and aspirant groups also provide a state with examples of alternative approaches to economic development. Therefore, it is

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important for a state to make valid comparisons to others in order to find peers and aspirant groups. Since the state's development policies affect the public, it is worthwhile for the citizenry to understand how state agencies go about making these comparisons.

There are many ways that states can identify peers—for example, geographic proximity. Over the past decade or two, however, various agencies have provided indices or "report cards" on the 50 states' TBED activities, resulting in state rankings. For reasons discussed below, these rankings hold the promise of an easy way to find peers using TBED data. But do rankings provide a reliable source for identifying peer and aspirant groups? Is there another reasonable way to identify what makes a good comparison for a given state? By addressing these questions, this research expands on academic inquiry into science and technology (S&T) reporting, which generally has examined national reporting issues (e.g., [1,2]), rather than state efforts (although [3,4] are exceptions). The discussion proceeds with background information on state TBED reporting, including the rise of 50-state indices. The methodology, findings and analysis of the study follow, before the paper concludes with suggestions for further academic research and practical action.

1.2. Background to state reporting on economic development

Federal governments have measured their economic development status and, in particular, the effects of S&T on development, for at least the past 50 years [5–9]. In the U.S. more recently, states have tracked their progress in separate S&T reports and through 50-state scorecards or indices [10]. These indices include the *State New Economy Index* (published over various years by the Progressive Policy Institute, the Kauffman Foundation and the Information Technology and Innovation Foundation), the National Science Foundation's *Science and Engineering Indicators*, the Milken Institute's *State Technology and Science Index*, TechAmerica Foundation's *Cyberstates*, and the *Development Report Card for the States*, once published by the Corporation for Enterprise Development but now discontinued. Even though the extent to which S&T directly affect economic growth remains controversial and the role that a state government can play in fostering growth through S&T is at best indirect, these scorecards remain popular. This is understandable, since publication of such measures not only signals the value the state places on particular aspects of economic development [11], but also can lend credence to a state's claims to progress [see Ref. [12]]. However, this signaling effect means that those involved with these scorecards need to be aware of the state's intentions as a reporter and the audience of users [13,14]. In fact, among the reasons that 50-state indices published by independent agencies are valued is that they allow states to avoid charges of "cherry-picking" measures to serve the reporter's purpose. In addition, it is costly for a state to compile data on its own. Savings come from the use of publicly available data, such as those presented in these scorecards.

1.3. The promise and perils of rankings

Beyond cost savings, these indices provide comparable data, which is not the norm in individual states' S&T reporting.[1] To focus on this comparability, most 50-state scorecards provide rankings that appear easy to understand[2]—one either is or is not in the top ten, the top quintile, or such. Ranking on multiple measures, such as those used in the scorecards, is complicated because a state can score "higher" or "lower" on any single given measure among the many used. To simplify the picture, scorecard issuers combine multiple measures into a final single-number ranking. While some authors provide detail on how to interpret rankings and the limitations of the same (e.g., [15]), it is the overall ranking that draws media and agency attention. That is, rankings tempt readers not to look at similarity of economic or environmental conditions, but to look at "who's ahead" or "who's catching up." Evidence of this power of rankings is plentiful, from state reports (e.g., "In the Technology and Science Workforce Composite Index, Georgia fell 19 spots in 4 years")[3] to issuers' web sites (e.g. "Can anyone catch Massachusetts?").[4]

The use of rankings is thus separate from the question of the degree to which the measures employed are valid, since the public and policymakers take the rankings as published. Their use raises concerns about whether they can tell a state who the state's peers are and who is a member of the state's aspirant group. By comparing rankings to another analytical method using the same data, this research addresses that issue.

2. Method

The method of inquiry proceeded in two phases. In the first, data from two 50-state indices were used to produce self-organizing maps (SOMs)—visualization tools that help one to judge similarities among multi-measure data sets. The second stage used these SOMs to generate clusters—groupings of states with similar characteristics based on the TBED data.

The 2012 edition of two popular scorecards provided the data for this study: the *State New Economy Index* ("SNEI 2012") [16] and the Milken Institute's *State Technology and Science Index* ("STSI 2012") [17]. SNEI began publishing in 1999; STSI in 2002. Both indices are used in individual state

[1] A study of 31 reports issued between 2004 and 2008 by agencies in 24 states found 1160 different measures used, only one of which appeared in more than half of the reports. Less than one percent of the measures appeared in 10 or more reports, with 833 measures (71.8%) appearing only once. Yet 15 of the 24 states compared themselves to others on selected measures. See Flynn, PM and Schwarzkopf, DL. Assessing State Reports on Technology-Based Economic Development: Lessons for Benchmarking. Report to the National Science Foundation (award number 0617112); 2010.

[2] The National Science Foundation's *Science and Engineering Indicators* groups states into quartiles, rather than rank them.

[3] Technology Association of Georgia. *Invigorating Georgia's Technology Industry*, http://www.tagonline.org/files/marketing_collateral.pdf, accessed 11 August 2014.

[4] *State Technology and Science Index* home page, http://statetechandscience.org/, accessed 11 August 2014.