Innovative Metrics for Economic Development: Final Report

November 17, 2017

This report was developed through a cooperative agreement between EDA and SRI International

Acknowledgements

This project was funded by a grant from the U.S. Department of Commerce, Economic Development Administration (EDA). Special thanks to EDA headquarters staff that contributed to the project:

- Ksenia Shadrina
- Bryan Borlik
- Ryan Smith
- Eric Smith

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The findings and observations contained in this report are those of the authors and do not necessarily reflect the views of any particular interviewee or of the Economic Development Administration in general.

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Project Highlights

Study Overview

SRI International's Center for Innovation Strategy and Policy conducted this study in coordination with EDA. The project consists of:

- The development of metrics to assess impact of economic development programs on capacity building and long term economic performance as part of a new program evaluation system. A corresponding toolkit for implementation of the system, including a survey instrument, has also been developed.
- An econometric model to demonstrate the impact of non-infrastructure grant programs on regional economic capacities, and the relationship between those capacities and long-term realized outcomes such as job creation and per capita or earnings growth.
- A pilot of the survey instrument to directly collect data from a subset of EDA's non-infrastructure grantees.

While the project is modeled around EDA programs and uses EDA-specific data in its analyses, the work is intended to inform a broader body of work on program evaluation in economic development.

As a whole, the project suggests that non-infrastructure grant programs, such as those administered by EDA, build economic development capacities and estimates the degree to which these capacities have an impact on long-term economic performance such as employment and income. The study also reveals differences in impact of economic development interventions depending on whether they occur in metropolitan or micropolitan areas in the United States.

Capacity Variables and Economic Performance

Through regression analysis, SRI found the following relationships:

- Increases in financing events are correlated with higher rates of both earnings and employment growth.
- Larger numbers of membership associations and organizations and a higher creative class share of the workforce are correlated with higher rates of earnings growth.
- Higher rates of establishment churn are associated with higher employment growth, but reduced levels of earnings growth.
- Tech intensive non-employer firms (or small enterprises) tend to contribute to employment growth, as well as per capita income growth.

EDA Grants as a Facilitator of Networking Capacity

After creating a combined variable that captures the interaction of regional organizations and EDA activity, SRI found the following through additional regression analysis at a regional level:

- EDA activity and organizational density impact economic performance for micropolitan regions.
- Networking capacity is important in micropolitan regions, and relies heavily on the presence of EDA grants. This supports the hypothesis that institutional capacity and networks in micropolitan regions is an important indicator of future economic performance.

Grantee and Client Survey

SRI piloted the survey instrument to collect data from EDA's Regional Innovation Strategies (RIS) grantees and their clients from 2014 and 2015:

- Respondent grantees in the RIS program served over 3,600 clients through their EDA grants.
- 56 respondent clients reported increasing the TRL of a product or products through services supported by EDA grants, with an average TRL increase of 3.39.
- 88 respondent clients accessed venture capital, seed, and/or angel funding through the services supported by the EDA grant.
- The results from the pilot, albeit limited in sample size, indicate a link between EDA non-infrastructure programs and development of capacities integral to long term economic outcomes.

Executive Summary

This project represents a major step forward in the assessment of non-infrastructure economic development initiatives towards a broad, generalizable approach to data collection and analysis. The assessment is grounded in a comprehensive logic model that captures the progression of a grant program from inputs, to activities, to both short-term and long-term outcomes. As a definitional matter, in this report and analysis, when we refer to performance measurement or program evaluation, we refer to monitoring the performance of or evaluation of economic development programs, respectively.

To monitor short-term impacts at the program level, SRI developed flexible survey instruments for data collection from both, grantee organizations and their clients, and piloted the instruments using a set of EDA grantees from 2014-2015.[1] The results of this pilot were used to both assess the impact of EDA programs on grantee capacities, as well as to refine and improve the survey instruments themselves. Ultimately, these instruments aim to help economic development practitioners to monitor the activities performed by grantees as well as to evaluate the impact of these activities on the building or improving of capacities that businesses and communities need to succeed.

To evaluate long-term impacts of economic development programs at the regional level, SRI developed an econometric model based on measures of economic development capacity. SRI identified a set of measures at the level of metropolitan or micropolitan geographic regions that serve as reliable proxies for the aggregate capacities developed through economic development programs. SRI's regression analysis based on those measures captures the relationships between economic development grant activity and long-term economic growth and development.

SRI conducted quantitative analysis to ascertain the validity of the proposed metrics and the logic model through two econometric methodologies. The first was a regression of capacity measures on long-term economic performance with appropriate controls. In the second model, SRI separated out three variables that represent a region's networking capacity to support economic development. In this study, networking capacity is calculated by interaction of the number of economic development organizations, the number of EDA non-infrastructure grants received, and the number of membership associations and organizations in a region.

The results from SRI's regression analysis elucidate the pathways through which non-infrastructure economic development programs indirectly influence long-term economic performance. One intriguing result is an observed difference between metropolitan and micropolitan regions when it comes to the importance of networking capacity. Stronger networking capacity appears to have a greater impact on smaller regions with limited institutional capacity. An understanding of these differences can be used to guide economic development investment and policy decisions to ensure a strategic place-based implementation conducive to a more inclusive economic development and growth process.

[1] Specifically, SRI piloted the survey instruments among the 2014 and 2015 recipients of the i6 Challenge program and the Seed Fund Support program.

Project Overview

The U.S. Department of Commerce's Economic Development Administration (EDA) is the only federal government agency focused exclusively on economic development. Economic development:

> *"Creates the conditions for economic growth and improved quality of life by expanding the capacity of individuals, firms, and communities to maximize the use of their talents and skills to support innovation, lower transaction costs, and responsibly produce and trade valuable goods and services."*

A key component of this economic development capacity is effective, collaborative institutions focused on advancing mutual gain for the public and private sectors.

EDA has a broad portfolio of non-infrastructure grant programs that support start-ups, small firm development, technology development, regional innovation ecosystems, workforce development, planning activities, and research. These economic development and innovation-focused programs yield improved capabilities for participants, which include entrepreneurs, small businesses, and regional organizations. These programs also have long-term, broader economic benefits, such as increased earnings and job growth. These benefits can be difficult to capture in the short term or as part of a single assessment. Yet, in difficult economic times and in an environment of increasing support for evidence-based policymaking, it is important to develop tools that allow policymakers to forecast the future economic benefits of programs and policies.

Economic development programs are difficult to evaluate due to the temporal and analytical distance between focused program activities and desired long-term economic performance. An additional challenge is the identification of valid indicators for complex programs that fuel economic development capacity-building. While standard approaches to program evaluation focus on long-term economic indicators such as company or job creation, this project demonstrates connections between program activities and shorter-term or capacity outcomes which, as supported by a broad body of research as well as this study, are integral to longer-term desirable economic outcomes.

SRI International was awarded a grant by EDA to formulate an approach that would capture the impact of non-infrastructure economic development investments on long-term realized outcomes. The approach adopted elaborates a carefully refined logic model, suitable for general application to any similar program. The model is grounded in the deep experience of the project team, in the relevant literature, and in the counsel and guidance of EDA staff. The model defines categories of economic development capacity targeted by such programs. These categories map to capacities and are best characterized as short-term effects or outcomes. While, as part of this project, SRI proposes that capacity outcomes can and should be measured at the program level through direct collection of data, these outcomes should also be ascertained in terms of a regional impact where the program is administered. Therefore, in order to estimate the long-term impact of these capacities, the project team established a set of indicators as proxies for the categories of capacities. These indicators, although refined throughout the analysis, originate in the earlier research conducted by SRI in collaboration with other distinguished institutions (UNC Chapel Hill, GWU, etc).[2] The team compiled a dataset containing these indicators for all metropolitan and micropolitan regions of the United States. In addition to the capacity measures, the dataset includes outcome

[2] The reports detailing this work can be found on: https://www.eda.gov/tools/research-reports/.

indicators (earnings, employment, and personal income) and standard social and economic control variables. The team then employed a variety of econometric analyses designed to sift the relationships between capacities and long-term economic performance. The findings are reported below.

In summary, this project developed a logic model for capturing the impact of economic development programs on economic development capacity, and then tested aggregate measures of those capacities against long-term economic performance. This project also developed a comprehensive toolkit for the direct collection of program data. The operational toolkit comprises a survey instrument and a protocol for the use of economic development practitioners. The toolkit and all accompanying instruments have been carefully designed to meet the needs of any non-infrastructure economic development program. The instrument was piloted among recipients of grants from the 2014 and 2015 Regional Innovation Strategies competitions. The results reported in Section III of this report indicate in a straightforward but important way that the program is generating the outputs expected of it.

Logic Model

Establishing the Logic Model for Evaluation of Non-Infrastructure Economic Development Programs

For most economic development programs, it is challenging to establish direct, causal relationships between program activities and long-term outcomes. Logic models help to address this challenge by establishing theoretical "if-then" relationships across a program's activities, outputs, and immediate outcomes. As such, they are useful tools for structuring program evaluations, helping account for immediate, measurable impacts that stem from a program's activities, while logically relating these outputs to longer-term quantitative outcomes.

To review, the logic model captures the logical progression of a grant program, from inputs to activities to immediate outcomes. Within each component of the logic model, different categories of inputs, outputs, and outcomes might occur depending on the program's focus. For example, a program's "outputs" or activities might focus on events, networking, and referrals; or some other area(s) as illustrated in the logic model presented in Figure 1 below.

The specific components of the logic model are defined as follows:

- **Initial Conditions & Capacities:** The "baseline" or underlying factors and externalities that affect the program and its participants, and that may shape the types and magnitude of outcomes achieved.
- **Inputs:** The investments in the program, which may include financial resources (e.g., grants), as well as intangible resources such as staff expertise, space, or other factors.
- **Outputs (Program Activities):** A measurement of the quantity and quality of the activities performed by the program grantees, partners, and clients or participants.
- **Capacity Outcomes:** The direct, shorter-term outcomes that occur as a result of the program that enhance the capabilities of the program's clients or participants.
- **Realized Outcomes:** The broader long-term impacts of a program, including at a regional level, which may include measurable growth in terms of jobs or other quantifiable economic indicators.

The logic model as illustrated below grounded in several years of cooperative research by SRI, EDA, and other institutions. This work both, furthered SRI's understanding of EDA's programs and helped define a general framework for economic development initiatives, more broadly. The components of the logic model, as delineated in this research, draw from a vast body of work on economic development theory and praxis. The literature on the inputs, activities, and outputs of programs that build capacity, and on the impact of those capacities on long-term outcomes such as earnings and employment is quite expansive.

Background

There is an expansive body of work on program evaluation that focuses on program inputs, outputs, and near-term capacity outcomes. This literature tends to be focused on individual and program level activities, as exemplified by assessments of incubator and accelerators as well as broader programs targeting innovation through investment in institutions and networks. While this literature often seeks to identify longer-term impacts, these prove hard to estimate due to limitations of the data and underlying attribution problems. The data in these studies are almost always directly collected or self-reported and rely heavily on survey results.

There is a separate (if logically connected) literature on economic development that focuses on the relationships between near-term capacity outcomes and long-term realized outcomes. This literature is focused on the sector or regional level, and is exemplified by econometric studies that suggest the importance of key cluster or regional capacities—such as a skilled workforce or risk capital—for long-term outcomes such as employment, income, and investment. In this literature, the details of policies that shape workforce or finance are not usually addressed, but their relative importance for outcomes are estimated, based on third party indicators.

The methodological design of this project is grounded in both bodies of work. The first grouping of literature offers analyses of impact, performance, and best practices for specific programs. The second presents evidence for the impact of specific capacities on long-term economic development outcomes. As discussed below, this literature has convincingly shown and empirically demonstrated the importance of capacities—for example, human capital—in determining long-term outcomes such as income and employment. However, as also discussed below, there are gaps in this literature, and the purpose of the econometric work that lies at the heart of this study was to fill a select number of these gaps.

The findings from literature were an important input guiding SRI's selection of data collection requirements at the program level as well as of the kinds of third party indicators at the regional and aggregate levels. Taken together, the components and variables developed, based in part on established findings, were tested to validate a carefully selected set of program metrics and demonstrate their importance for the long-term outcomes (a selected bibliography for these literatures is provided in Appendix C).

Research on Capacity Outcomes

One of the primary goals of this project was the development of general purpose metrics for non-infrastructure programs, insofar as it is practicable. However, from the beginning it has been recognized that some programs are home to highly specialized activities, in particular programs that support a similar population of grantees, such as incubators and accelerators. In these cases, the importance of specific institutional variables can be disentangled in ways that are not possible for programs with more heterogeneous populations of grantees. For example, evaluations of incubators, which have been extensively investigated, have often discovered that key institutional attributes of an incubator, such as for-profit versus non-profit status, governance, partnerships, funding mix, size, etc., are predictors of success.[3] Thus, an analytical framework that captures these attributes is very important. The goal in this project, however, was to build a framework that can encompass a broader range of programs. As such, the framework described below seeks to capture the specific institutional variables that have been previously identified as significant, while simultaneously accounting for generic variables applicable to a heterogeneous population of grantees.

Program evaluations tend to investigate the institutional attributes that result in desirable outputs and outcomes to inform future programs. However, there is wide variation in institutional characteristics across grantee organizations. For example, the i6 program run by EDA has supported grantees that have included a single, free-standing non-profit, a program administered by a partnership between two regional research institutions, and a network of institutions addressing clean tech needs of a multi-state region. This heterogeneity reflects the importance of the "bottom-up" identification of economic opportunity, and emphasizes the fact that economic development organizations tend to invest in communities, in regional development, and in potential innovation,

[3] Lewis, David A., Elsie Harper-Anderson, and Lawrence A. Molnar. 2011. "Incubating Success: Incubation Best Practices That Lead to Successful New Ventures" Institute for Research on Labor, Employment, and the Economy, Ann Arbor, Michigan.

not particular types of institutions. As such, any general-purpose framework must account for this very diverse population of programs and participants; however, developing this framework requires evaluators to confront the challenge of overwhelming institutional variation among grantees, rendering institutional attributes – a common basis for evaluation – impractical.

To overcome this challenge, SRI sought to identify established process measures that could be included in a logic model and be generally applicable to a broad population of grantees, in order to avoid relying on institutional attributes. For example, the research on incubators (referenced in footnote 2 above) shows that time spent by staff on building client business skills, and time spent tracking incubator activities are indicators of good performance. This type of activity can be used as a process measure, and is an example of the type of measures that the SRI team has folded into the toolkit for directly collecting program data.

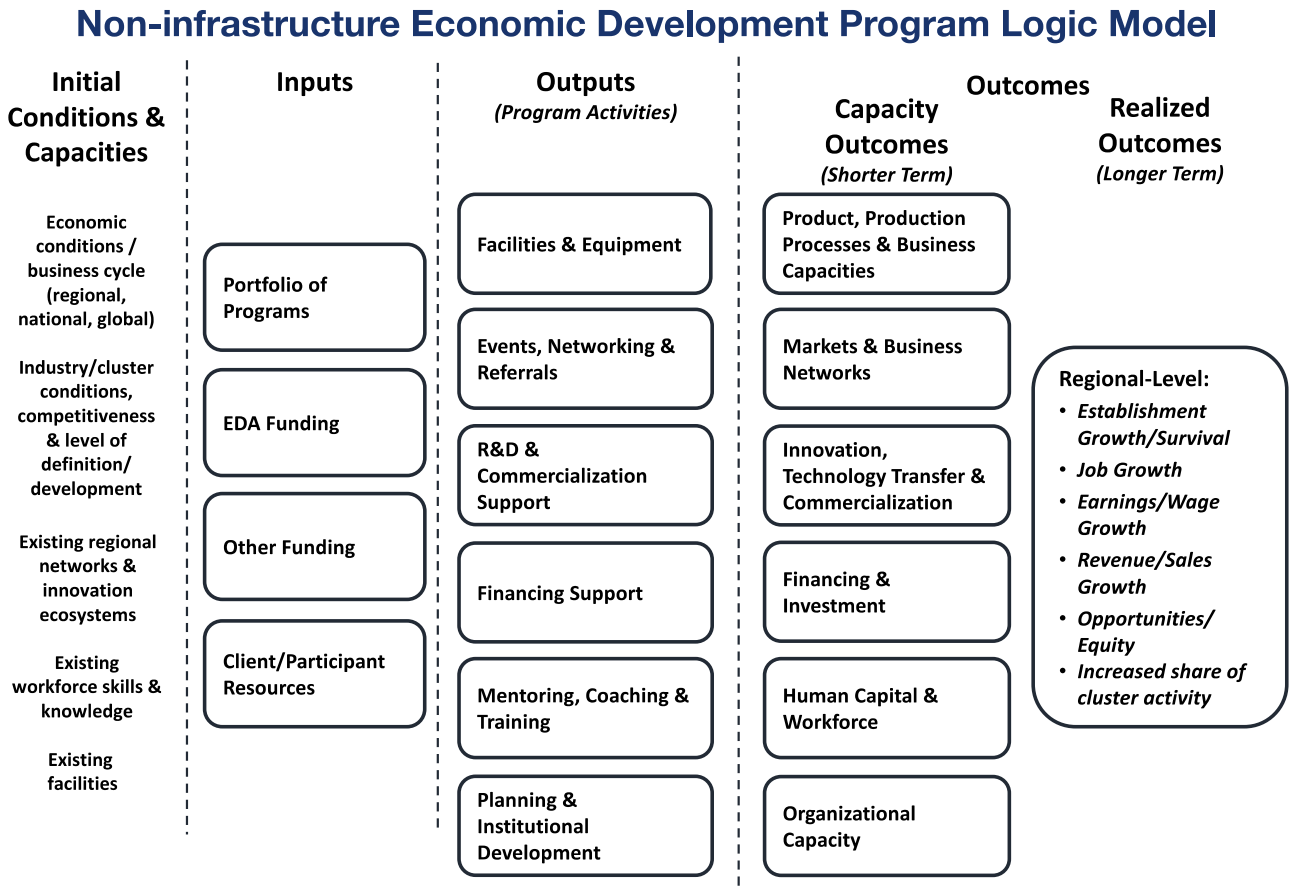

Figure 1: Logic model for non-infrastructure economic development programs

Using an Econometric Model in Conjunction with the Logic Model

The principal goal of the cooperative agreement between SRI and EDA was to develop and operationalize a complete set of metrics for tracking the activities and assessing the impact of non-infrastructure economic development programs, both those implemented by EDA as well as those implemented by other economic development organizations. While the project relied on EDA programs as a model, the work was conducted with a broad frame of reference and is intended to be generally applicable across the economic development field.

The project has settled on a set of program metrics for inputs, outputs, and new capacities. These measures have been embodied in a reporting mechanism for grantees and their beneficiaries and clients which will yield directly collected data on the development of economic development capacity at the program level.[4] However, as noted above, the long-term impact of programs cannot be easily estimated at the program level, because of scale, and because of the difficulty of collecting data months and years after programs come to an end.

The other piece of this project was designed to directly address the problem of assessing long-term impact. This piece is comprised of an econometric model based on aggregate measures of economic development capacity. Such a model can exploit independently collected aggregate data that reflects both economic development capacity and long-term realized outcomes. Accordingly, this project identified a set of measures for economic development capacity, at the regional metropolitan or micropolitan level, that help assess the regional economic impacts of development programs and policies. These indicators were used to estimate the connection, if any, between economic development capacity and long-term realized outcome. Figure 2 illustrates the connections between program-level activities, short-term capacity outcomes, and aggregate level capacities and long-term outcomes.

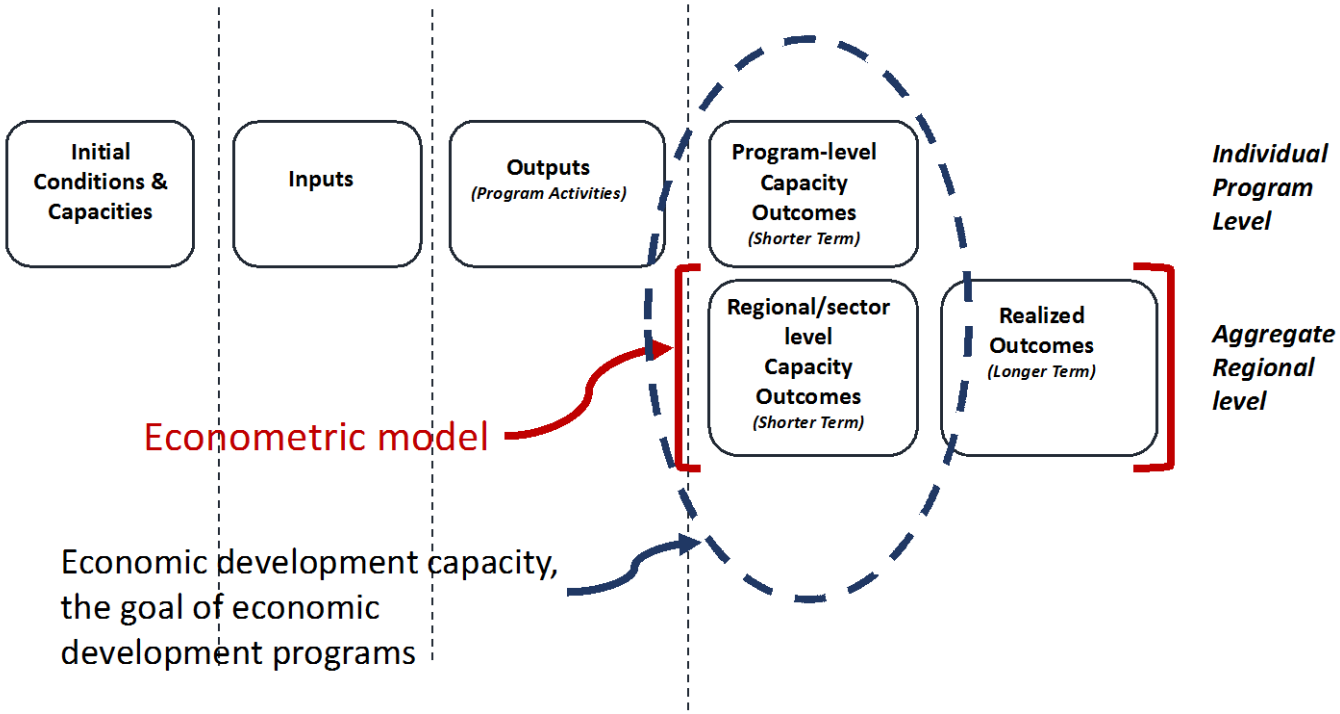

Figure 2: Econometric study for non-infrastructure programs

The econometric model described below estimated (where possible) connections between economic development capacity, as fostered by non-infrastructure programs, and long-term realized outcomes. Specifically, realized outcomes were represented by measures of long-term economic performance in the form of regional growth in average annual earnings, employment, and income. The way that program level measures of capacity map onto aggregate measures of capacity, (as illustrated above,) is the hinge upon which this project turns. The project shows that such programs build economic development capacities, and the degree to which these capacities, in the aggregate, have an impact on long-term economic performance.

[4] As described later in this report, SRI piloted this reporting mechanism with a group of recipients of EDA grants in the spring of 2017.

Econometric Model

Methodological Approach

The regression analysis is a key element in understanding the chain of relationships between economic development grant activity and long-term economic growth and development. The analysis relied on regressions of capacity measures against long-term economic performance, with appropriate controls. In performing this analysis, SRI used data on EDA non-infrastructure grants, a dataset which has previously not been used in this type of work. However, although the model was built using EDA-specific data, the intent of the project was to shed light on a broad set of relationships between regional capacities and long-term economic performance and to generate insights that are generally applicable across the economic development field.

Explaining Long-Term Economic Performance

Policymakers, program staff, grantees, and other practitioners are interested in programs that have a positive, long-term impact on jobs, earnings and overall economic growth. In order to detect that impact, SRI developed a cross-sectional regression analysis using aggregate data for all metropolitan and micropolitan regions in the United States.[5] The unit of analysis for this model was the Core Based Statistical Area (CBSA), as defined by Census to refer to both Metropolitan Statistical Areas and Micropolitan Statistical Areas. Per Census, Metropolitan Statistical Areas are CBSAs associated with at least one urbanized area that has a population of at least 50,000. CBSAs include the central county or counties containing the core, as well as adjacent outlying counties that have a high degree of social and economic integration with the core, as measured through commuting. Micropolitan Statistical Areas are CBSAs associated with at least one urban cluster that has a population of at least 10,000, but less than 50,000. As with Metropolitan Statistical Areas, Micropolitan Statistical Areas are comprised of the county or counties containing the core area, as well as adjacent outlying counties with a high degree of social and economic integration as established through commuting.[6]

SRI performed each analysis three times: once using the combined set of metropolitan and micropolitan regions, once using just metropolitan regions, and once using just micropolitan regions. For discussion purposes, the terms "regions" is sometimes used to refer to the CBSAs; this term is not referring to some other geographic designation. When discussing results, if a particular finding only exists at the metropolitan or at the micropolitan level, the team will specify which level the finding applies to (i.e. "At the micropolitan level, we found that…"). If neither the metropolitan nor the micropolitan level is specified in the reporting, then the result pertains to the combined set of regions.

The independent variables initially consisted of two buckets. First, control variables were selected based on existing literature and designed to account for well-established correlations between underlying characteristics of a region and its future economic performance. Next, capacity outcome variables were selected that were also, in some cases, supported by existing literature but also informed by the logic model.

[5] Due to the fact that metropolitan and micropolitan statistical area definitions are not stable, but change over time as area populations change, we had to account for variations in composition over the timespan of our models. To do so, we created a crosswalk between the 2013 definitions and the counties that comprise them, and used this crosswalk to aggregate historical county-level (or sometimes zip-code level data, when necessary) data to align with the 2013 definitions, thereby consistently reflecting areas across time.
[6] https://www.census.gov/geo/reference/gtc/gtc_cbsa.html.

Research on Long-Term Economic Performance

The key claim is that the inputs and activities build capacity outcomes in a straightforward way, and that these capacities have long-term impacts on economic performance (growth in earnings, employment, and income). This long-term impact is supported by a significant body of literature. For example, one study finds that existing small-business networks account (in part) for variation in entrepreneurship across the United States; another study shows that college attainment determines (in part) state income growth; and a third one suggests that serial entrepreneurs fuel innovation ecosystems.[7]

The overall logic of marrying direct collection of program data to aggregate, regional-level indicators of long-term impact runs as follows: based on the first study above, we may suppose that if the inputs, activities, and outputs of a particular program report data that show a measured impact on small business networks, then a longer-term impact on entrepreneurship will follow. As noted, actually tracking the impact of outputs and new capacity over many years is often impractical. In addition, investments are often relatively small. We can detect their impact at the program level, but their impact on aggregate outcomes cannot be easily discerned.

The literature reviewed by the SRI team addressed, with varying degrees of success, the relationship between capacity outcomes of the logic model at the aggregate level and long-term economic performance, such as growth in earnings and employment. This literature was then used to inform the selection of variables to be used as proxies for capacities in the econometric model.

In some literature, the impact of building certain kinds of capacity is well established. Regions with higher skilled workforces were found to have higher levels of population growth,[8] higher wages,[9] or per capita income,[10] and higher changes in gross state product over time.[11]

In other literature, there is also a fair amount of agreement on impacts. For example, there have been a variety of analyses of the impact of high levels of R&D intensity at the regional and national level. R&D intensity, often described as R&D expenditures (public and/or private), or patents registered, has been found to correlate to higher GPD per capita[12] and, in a wide variety of studies, strongly related to "opportunity" entrepreneurship and higher regional growth.[13]

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[7] See Glaeser, E.L. and Kerr, W. 2009. "Local Industrial Conditions and Entrepreneurship: How Much of the Spatial Distribution Can We Explain?" *Journal of Economics and Management Strategy*, Vol. 18, No. 3: 623-663; Bauer, P.W., Schweitzer, M.E., and Shane, S.A. 2012, "Knowledge Matters: The Long Run determinants of State Income Growth." *Journal of Regional Science*, 52: 240-255; and Feldman, M.P. and Zoller, T. 2012. "Dealmakers in Place: Social Capital Connections in Regional Entrepreneurial Economies." *Regional Studies*, Vol. 46, No. 1: 23-37.

[8] Glaeser, E.L. and Saiz, A. 2003. "The Rise of the Skilled City." Federal Reserve Bank of Philadelphia, Working Paper 04-2.

[9] Florida, R, Mellander, C., Stolarik, and A Ross. 2010. "Cities, Skills and Wages." Institute for Competitiveness & Prosperity, Working Paper.

[10] Weissbourd, R & C. Berry. 2004. *The Changing Dynamics of Urban America*, R.W. Ventures.

[11] Evans, P., and Karras, G. 1994. "Are Government Activities Productive? Evidence from a Panel of U.S. States." *The Review of Economics and Statistics*, Vol. 76, No. 1: 1-11.

[12] Sterlacchini, A. 2008. "R&D, Higher education and regional growth: Uneven linkages among European regions." *Research Policy* Vol. 37, No. 6-7: 1096–1107; and Crescenzi, R. 2005. "Innovation and Regional Growth in the Enlarged Europe: The Role of Local Innovative Capabilities, Peripherality, and Education." *Growth and Change*, Vol. 36 No. 4: 471–507.

[13] Mueller, Pamela, 2007, "Exploiting entrepreneurial opportunities: The impact of entrepreneurship on growth." *Small Business Economics*, Vol. 28, No. 4: 355-362.

On the other hand, less understood are the effects of formal and informal networks linking start-ups and small businesses to markets. Social capital (associated with high levels of trust) embodied in networks is believed by many to be critical for long-term growth.[14] Many programs, including EDA programs, support the development of such networks through dedicated program activities. However, while their importance is very often asserted, there is little in the way of formal measurement or analysis of the long-term impact of this capacity.

The independent variables employed as proxy measures of capacity in the econometric model were selected based on the literature reviewed and on the logic model. Taken together they are intended to represent the waterfront of capacities that are at the heart of this project. Sifting their relationship to long-run economic performance is the goal of the econometric analysis.

Model Design

Ultimately, SRI identified that capacity variables belonged to two separate groups: variables that acted as the primary drivers of economic development and growth, and variables that acted as proxies for the extent of a region's networking capacity and the strength of its institutional support structures. Accordingly, there are two sets of results presented here. The first set of results are from an analysis that regressed each of the capacity variables against long-term economic performance. The second set of results investigated the impact of these networking capacity and institutional support structure variables. For both sets of results, the capacity variables were regressed against the percent change from 2010 to 2015 for three different dependent economic performance variables: earnings, employment, and per capita income.

In order to avoid the distorting effects of the business cycle, in particular the powerful national impact of the Great Recession, the time frame chosen for initial applications of the model was the period from trough to peak prior to the last recession. The National Bureau of Economic Research (NBER) defines recessions as a "significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales." [15] Recessions start at the peak of a business cycle, before any prolonged decline begins, and end at the trough, prior to a prolonged recovery. The first full year following the dot com bust was 2002, and the last full year prior to the peak immediately preceding the great recession was 2007.[16] However, the team judged that this approach relied on too narrow a range of years that could not capture long-term impacts. In order to use a longer time period, the team used initial levels in 2000 for control variables (relying on Census data), capacity levels from between 2005 and 2007 (2007 being the last complete year before the peak of the economic cycle), and outcome variables from between 2010 and 2015 (2010 being the first full year of the recovery from the great recession). Due to the lags in the economic impact of capacity variables, SRI chose a time period that was sufficient to capture impact, but not too long to distort results. Capacity levels prior to the Great Recession reasonably account for the economic development conditions that could influence future outcomes after a complete return to growth following the Great Recession. Unfortunately, SRI was not able to account for any changes to the capacity variables that may have resulted from the response to the Great Recession (such as the stimulus bill or other programs).

[14] For a review of the first wave of social capital literature see Sobel, Joel, 2002, "Can We Trust Social Capital?" *Journal of Economic Literature* Vol. 40: 139–154.

[15] The key problem of the impact of the great recession is that it varied dramatically across regions in ways unrelated to the components being estimated in this analysis.

[16] See: http://www.nber.org/cycles.html.

The control variables applied in the two models reported below are from 2000, being a Census year, and representing characteristics not likely to change as a result of a recession. The capacity variables, (the main object of the analysis,) were selected for the year 2006, ensuring that their relationship with the dependent variable is framed by one business cycle. For patents, Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants, and new product introductions, SRI aggregated the variables over the years 2005, 2006, and 2007 because data for these variables are irregular. Additionally, when they are reported, these events are somewhat arbitrarily assigned to a particular year, and do not necessarily align with such a discrete time period. By aggregating the three years of data, SRI sought to ensure that data for these variables would be comprehensive.

For control variables, the population level, unemployment level, and educational attainment level are straightforward predictors of future regional economic performance. In addition, SRI wanted to investigate the importance of the structure of a regional economy (as measured by the share of manufacturing jobs in the economy) as a determinant of outcomes. The independent or capacity variables map to, and represent measures of, the capacities developed by economic development programs, as described in greater detail below.

Variables

Control Variables

Given the vast differences between baseline conditions across the metropolitan and micropolitan regions included in the analysis, it was critical that the team identified an appropriate set of controls that could account for existing regional differences, without swamping model results. Ultimately, the variables and data sources contained in the following table were identified as an appropriate set of controls for the analysis.

Controls			
Variable Abbreviation	**Long Name**	**Description**	**Source**
Employment 2000	Employment, 2000	Employment levels of the MSA in 2000	BLS LAUS
Earnings, 2000	Earnings, 2000	Average annual pay of wage and salary workers, in 2000	BLS QCEW
Log Pop, 2000	Log Population, 2000	Log Population count of the MSA	Census
Mfg. Share, 2000	Manufacturing as a Share of the Economy, 2000	Manufacturing jobs as a percent of total jobs in the metropolitan/micropolitan economy	BLS QCEW
% Bachelors Plus, 2000	Educational Attainment, 2000	Portion of the population 25+ that has a bachelor's degree	Census
Per Capita Inc, 2000	Per Capita Income, 2000	Personal income per capita, as defined by BEA	BEA Local Area Personal Income
Unemp Rate, 2000	Unemployment Rate, 2000	Annual average unemployment rate, not seasonally adjusted	BLS LAUS

While employment, earnings, and per capita income were all included as dependent variables in the model, SRI opted to include their baseline levels in the model as controls. Regions with higher starting levels of employment and earnings are likely to see stronger growth rates in those variables in later years, regardless of improvements in capacities. For several of the capacity variables, there is likely to be a strong correlation between the included metric and the size of the region. For instance, larger regions are likely to have more financing deals than smaller regions. As such, and to account for any influence due to population, SRI included population as a control variable, and took the log of the value for each region to moderate the significant range in values across regions.[17]

To include a control for the structure of the economy within each region, SRI used manufacturing as a share of the economy, calculated as the percent of jobs within a region that belong to the manufacturing sector. Finally, educational attainment has long been shown to foster economic growth. To avoid erroneously attributing any growth in long-term performance to capacity outcomes, when in fact the growth is due to the established relationships between education and earnings and employment, SRI included educational attainment as a control, calculated as the portion of the population that is 25 and older that holds a bachelor's degree.

Capacity Variables

SRI identified variables and data sources to act as proxies for the capacity outcomes that are central to the econometric model. The SRI team continued earlier work on identifying proxy metrics[18] and conducted extensive new research to find data to leverage in the model. While the team identified and reviewed a substantial number of datasets for use in the model, there were two key criteria that dictated whether a dataset could be used or not:

- ***Free and public access:*** To the fullest extent possible, the SRI team tried to only use free and publicly accessible datasets for the model. This was to serve two purposes: first, the use of free and public data was intended to support replicability of SRI's work in the future, both to validate and expand upon the model and findings. Second, SRI wanted to make the model sustainable for EDA and other practitioners to continue to leverage in future years; relying on expensive, private data sources would likely hinder the ability to continue to run analyses using the model. Ultimately, free and publicly accessible data were not found for three capacity variables, and SRI ended up purchasing three private datasets to address those variables.

- ***Available at the county-level across a time:*** SRI required historical, time-series data for the econometric model, in order to assess the impact of economic development grant activity across lagged time periods. While the model analysis is at the Core Based Statistical Area-level, SRI required county-level data for all variables in the model, in order to account for changes in CBSA-definitions over time.[19] County-lines do not change year-over-year, while several changes in CBSA-definitions (and in fact, identification of new CBSAs) occurred over the time period of SRI's model. As such, SRI collected data at the county-level, and rolled it up to align with current CBSA-definitions, to reflect consistently-defined CBSAs across the years of analysis. However, this ultimately limited the ability of SRI to use certain sources of data, which were available at the CBSA- or state-level, but not at the county-level. Additionally, there were some potential datasets considered by the team that ultimately did not cover the full time-period of the model, and therefore were not valid options for the model.

[17] Wooldrige, Jeffery. 2006. *Introductory Econometrics: A Modern Approach*. 3rd Edition, Thomson South-Western.
[18] SRI International, *Building & Using a new EDA Evaluation System.* 2014.
[19] https://www.census.gov/programs-surveys/metro-micro/about.html.

Ultimately, these two criteria led to the identification of the following data sources for the capacity outcome variables as shown in Figure 3 below. While these data sources accurately approximate the capacities captured in the logic model, it is important to consider that they are largely proxy measures, and do not necessarily fully or exclusively represent the capacities. Alternative proxy measures for these capacities may generate additional findings. SRI encourages further exploration of new and innovative data sources to capture different representations of the capacity outcome variables in future analyses.

Figure 3: Capacity variables

To assess product, production processes, and business capacities, SRI looked for a data source that could reflect the production capabilities of firms and act as a proxy for product innovation. Following the earlier work done by SRI and University of North Carolina, Chapel Hill to identify metrics, the team worked with ThomasNet to acquire a database of new product introductions that had been published on their site. ThomasNet is an online website that allows companies to submit announcements of new products, largely industrial business-to-business (B2B) products, which it publishes and distributes to its audience of manufacturers. Improving processes and creating new products is a key goal of programs such as the i6 Challenge, and regions that generate increasing numbers of new products, particularly on the industrial B2B side, represent strong production processes and business capacities. As such, we expect the number of new product introductions in a region, employed as a proxy in this analysis, will be positively associated with desirable long-term economic performance.

Markets and business networks are important capacities that demonstrate strong social capital within regions, and building that social capital is a goal of economic development programs. To incorporate this capacity in the model, we used the number of membership associations and organizations, as measured by establishments reporting under NAICS code 813 to the Bureau of Labor Statistics. NAICS code 813 refers to “religious, grant-making, civic, professional, and similar organizations” and provides a proxy measure for the number of groups that create networks and facilitate social capital in a region. The number of such organizations reported through BLS (normalized by population) should be positively associated with desirable outcomes.

To assess the innovation, technology transfer, and commercialization capacity of regions, SRI decided to use patent data from the US Patent and Trademark Office. Patents are a measure that is inherently positively associated with innovation and technology development, and may serve as an indicator of how much innovation is occurring within a region. However, SRI acknowledges that this measure suffers from some well-known deficiencies. Primarily, patents are a lagging indicator and represent potential rather than actual innovation. Acknowledging this caveat, however, patent data is still a widely-used, valid proxy measure for innovation, technology transfer, and commercialization for this model.

Finance is a key ingredient in innovation ecosystems, and access to a wide range of financing sources can be crucial to business development and growth. Economic development programs provide important support to organizations looking to find new sources of financing, from support on grant applications to guidance on developing business plans and pitches. To analyze regions' capacities for financing and investment, SRI used two data sources. The first was the number of federal SBIR and STTR grants awarded in a region, accessed through the Small Business Administration's award database. These grants are awarded to small businesses to pursue research and development that could potentially lead to technology commercialization, and provide federal funding to innovative small businesses to support their development capabilities. The second source of financing data was the number of private financing events – angel, seed, and venture capital deals – per region. These data were purchased from Pitchbook, and represent the accessibility of private financing across regions. Both federal and private financial access are key capacities for regions, and we expect a positive association between these metrics and desirable long-term economic performance.

In assessing human capital and workforce capacities, SRI looked for data to represent the development of a particular set of skills associated with starting and growing businesses – skills that economic development programs support. We identified three data sources that could act as proxies for the development of this capacity. The first was the rate of establishment churn in a region.[20] While the Commerce Department is not a workforce agency, its non-infrastructure programs are designed to build the skills needed by entrepreneurs and small business leaders. Establishment churn signifies the dynamism of small enterprise and, by extension, the presence of those skills, filtered by NAICS code to represent tech-intensive firms. [21]

The second was the number of non-employer firms in a region, also filtered to represent tech-intensive firms. Non-employer firm data is provided by Census and represents the number of businesses that have no paid employees and are subject to federal income tax. These types of businesses embody entrepreneurial endeavors by citizens, and can be used as a proxy measure for the entrepreneurial talents that exist among the workforce. SRI filtered the data by NAICS code to only include tech-intensive firms (as measured by share of STEM-intensive occupations), as these firms better illustrate the type of innovation that drives regional economic growth.[22]

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[20] Establishment churn is calculated as the number of business establishment startups and business failures as a share of total establishments. To calculate this variable, the team summed the number of establishment births and deaths in a CBSA for year t and year t-1, and divided each by the total number of establishments for the respective year. These two values were then averaged to calculate the final variable.

[21] Per the National Science Foundation, "An industry is considered a high SET employment industry if employment in technology-oriented occupations accounts for a proportion of that industry's total employment that is at least twice the average for all industries". See https://www.nsf.gov/statistics/2016/nsb20161/#/stateind, technical note #5. SRI used BLS data to determine such industries for the purpose of this model.

[22] Hecker, Daniel E., 2005, "High-technology employment: a NAICS-based update" *Monthly Labor Review,* 57-72.

Finally, SRI included data from USDA on the "creative class" share of the workforce, occupations that require "thinking creatively" as a core job function. This dataset was derived from Richard Florida's thesis in his book *Rise of the Creative Class*, which asserts that certain occupations specialize in the task of combining knowledge and ideas in novel ways. His argument continues that urban development hinges on these novel combinations, and individuals in these "creative" occupations are drawn to regions providing a high quality of life. As such, we expect to see an association between regions with higher creative class shares and improved long-term economic performance, such as increased employment and earnings.

Finally, the organizational capacity of a region is inevitably difficult to capture through data. However, capacity is built by organizations, and as such, the number of organizations dedicated to economic and community development can be used as a proxy for the level of organizational capacity within a region. SRI purchased data from Guidestar on the number of economic development organizations (EDOs), by region, to assess the organizational capacity in the model.[23]

A description of these variables, their nomenclature in the model, and their underlying source data is provided in the table on the following page.

[23] Guidestar provides data on non-profit organizations based on their Form 990-filings with IRS. Non-profits are categorized by the National Taxonomy of Exempt Entities (NTEE), and SRI used data on the organizations categorized as code S, "Community Improvement, Capacity Building". For more, see: https://learn.guidestar.org/help/ntee-codes.

Variable Abbreviation	Long Name	Description	Source
Capacity			
Patents, 05-07	Patents from 2005 – 2007	Number of patents granted in a region between 2005 and 2007	US PTO
Establishment Churn	Establishment Birth and Death Rates, 2006	The annual number of establishment births + deaths in a year, as a share of all establishments at the beginning of the year[24]	Census SUSB
Non-Employer Firms	Nonemployer Firms, Tech Intensive, 2006	As defined by Census, number of firms that have no paid employees and are subject to federal income tax, in tech-intensive industries	Census Nonemployer Statistics
Financing Events	Private Financing Events, 2006	Number of private financing events, such as angel, seed and/or venture capital funding deals	Pitchbook[25]
EDO	Economic Development Organizations, 2006	Number of organizations in a region that are classified by the National Taxonomy for Exempt Entities under the S Community Improvement, Capacity Building code	Guidestar[26]
Assoc./Orgs (NAICS 813)	Membership Associations and Organizations (NAICS 813), 2006	Number of firms categorized under NAICS 813: Membership associations and organizations	BLS QCEW
SBIR + STTR, 05-07	SBIR and STTR Awards between 2005 and 2007	Number of SBIR and STTR awards granted by SBA	SBA SBIR Database
New Products, Sum 05-07	Sum of new product announcements, 2005-2007	New products announced through ThomasNet	ThomasNet[27]
Creative Class Share	Creative Class share of the workforce, 2007-2011 (pooled)	Share of the workforce employed in occupations that involve a high level of thinking creatively, i.e. developing, designing or creating new applications, ideas, systems or products[28]	USDA Economic Research Service

Data Limitations

For some of the capacity variables identified, the source data were very irregular and sporadic, and presented quality issues when used on a year-by-year basis. In particular, patents, SBIR/STTR grants, and new product introductions only had a handful of counts for any region in any given year, making it hard to select a single year's worth of data to work with. To address this issue as stated above, SRI aggregated three years of data to smooth out year variances and create a more robust variable. Therefore, while the model only used data from the year 2006

[24] Exact methodology is taken from the Information Technology and Innovation Foundation's 2014 State New Economy. See http://www2.itif.org/2014-state-new-economy-index.pdf?_ga=1.6859442.1645463451.1492437691, p 60 for details.
[25] SRI worked with University of Wisconsin Extension Division for Business and Entrepreneurship to purchase Pitchbook data.
[26] SRI purchased a custom dataset from Guidestar to account for the number of EDO's by county, by year.
[27] ThomasNet does not make this data publicly available, however SRI worked with ThomasNet staff to purchase a historical dataset of new product announcements.
[28] This share is derived from Richard Florida's thesis in *Rise of the Creative Class*, which argues that creative occupations are critical for rural and urban development. See the USDA ERS page for information on this data: https://www.ers.usda.gov/data-products/creative-class-county-codes/documentation/.

for the other capacity variables, for patents, SBIR/STTR grants, and new product introductions, the variables used in the model were the sum of each capacities total from 2005 to 2007.

Capacity Variable Analysis and Results

The research team estimated the following model for each of the three outcome variables (earnings, employment, and per-capita income):

$$Outcome = B_0 + B_i(controls_i) + B_j(capacity_j) + e$$

Where $controls_i$ is the set of 7 control variables, $capacity_j$ is the set of 9 capacity variables, and e is the error term. The three dependent variables chosen are for the change in levels for years 2010 to 2015. The independent capacity variables were for the period at or around 2006. Controls, as noted, are selected for the year 2000. The initial results from this model are displayed in Appendix B.

However, many of the variables were highly correlated (see tables in Appendix B, Table B-1) with one another, indicating that this analysis may suffer from multi-collinearity. For example, new product introductions, non-employer firms, and economic development organizations are all highly correlated with four other variables.

In assessing this multicollinearity, SRI acknowledged that generally, regions with larger populations will have higher levels of patents, new product introductions, non-employer firms, and economic development organizations. As such, we believed that while we are controlling for population with the log population variable, these other capacity variables were still acting as a proxy for region size. To account for this, the team normalized the variables (except for variables already presented as a rate or share) according to population levels in 2006. Table 1, below, describes the normalization procedure used for each variable.

Table 1: Normalized variable abbreviations and descriptions

Variable Abbreviation	Description
2000 Earnings per Capita	Earnings in 2000 divided by MSA population in 2006
Employed Share of the Population	Employment levels in 2000, divided by population in 2006
Patents, 05-07, Normalized	Aggregate patents from 2005 – 2007 per thousand people in 2006
New Products, 05-07, Normalized	New product introductions from 2005-2007 per thousand people in 2006
Normalized Non-Emp firms, Tech Intensive, 2006	Number of high-tech non-employer firms per thousand people in 2006
SBIR and STTR Grants, Sum 05-07, Normalized	SBIR and STTR grants between 2005 and 2007 per thousand people in 2006
Normalized Number of Financing Events, 2006	Financing events per thousand people in 2006
Normalized Assoc & Orgs (NAICS 813)	Membership association and organizations per thousand people in 2006
Normalized Economic Development Orgs, 2006	Economic Development Organizations per thousand people in 2006

The correlation coefficients for these normalized variables were all substantially lower (see Appendix B, Table B-2), indicating that SRI's hypothesis about the source of the collinearity in the initial results was accurate. The results of this regression are shown in Table 5 on the following page. Compared to the initial, non-normalized results in Appendix B: Table B-3, this set of results represents a more accurate account of relationships between capacity variables and long-term economic performance, due to the additional modifications to address population size.

Detailed Discussion of Results

After accounting for population size, the coefficient of earnings per capita in 2000 on future earnings and income growth was positive and significant in metropolitan regions. Micropolitan regions with greater levels of initial earnings were likely better off, and thus better able to support future economic growth and development. The significant positive coefficient on patents dropped away except on earnings growth at the micropolitan level. This result indicated that in earlier regressions, the patents variable was acting as a proxy for region size. Controlling for population, the positive coefficient of patents on earnings growth in micropolitan regions suggests future earnings growth was positively associated with the inventiveness of a micropolitan region.

Similarly, larger numbers of membership associations and organizations were correlated with increased earnings growth across all regions and for micropolitan regions particularly. These results suggest that membership associations and organizations represent institutions that can support other types of economic activity, and may have contributed indirectly to long-term earnings growth. That the coefficient for membership organizations was significant for micropolitan regions but not metropolitan regions suggests that a larger density of membership organizations may have been necessary to augment economic activity in larger regions compared to smaller ones.

Furthermore, the positive coefficient of the creative class share of the workforce on employment growth across all regions and specifically in micropolitan regions is consistent with Richard Florida's *Rise of the Creative Class* hypothesis. Florida postulates that urban development depends on novel combinations of knowledge and ideas.[29] The higher the share of such specialized occupations, the more likely it is that new knowledge and ideas will be generated, driving urban development in the form of increased employment growth.

EDA programs such as the i6 Challenge program and Seed Fund Support program help foster development of the complex, cognitive skills and talents that are reflected in the creative class share. These results on the creative class share were in line with our findings about membership organizations and associations. In both cases we found evidence that micropolitan regions benefit from institutional support provided from membership organizations and associations, and from higher shares of the creative class. We did not see similar evidence in metropolitan regions. Larger regions are arguably more complex, socially and economically, and house more developed institutions. As such, these regions experience diminishing marginal returns from additional institutional activity or higher shares of the creative class. Conversely, small regions that are not already home to robust institutional networks will be more sensitive to the addition of institutional support, as captured by these two variables. However, this distinction has not been well-studied and could represent an area for additional future research.

Higher rates of establishment churn were negatively correlated with future earnings growth, but positively correlated with future employment growth. These results were logical. Increased rates of firm births and deaths will drive down the average age of firms in a region. Establishment churn will create new job opportunities, as

[29] Florida, R. 2002. *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life.*

explained by a study conducted by the Kauffman Foundation.[30] Young firms hire for newly created jobs at a much higher rate than older firms. These newly created jobs are relatively immature, and naturally, will pay less.

New product introductions were negatively and significantly correlated with employment growth in metropolitan regions. This result could possibly be due to the fact that productivity and process improvements may make some workers redundant. The relationship between new product introductions, earnings growth, and income growth is worth further exploration. Controlling for population, high-tech non-employer firms were positively correlated with income growth in both metropolitan and micropolitan regions as well as employment growth in micropolitan regions, while having no correlation with earnings growth.

We found significant negative coefficients for SBIR and STTR grants on income growth in metro regions and on employment growth in both metro and micro regions. We also found significant negative coefficients of EDOs on employment growth in micro regions and income growth over all regions. These negative coefficients were present in both the normalized and non-normalized results.

The strong positive significant coefficient on financing events and the negative significant coefficient on SBIR/STTR grants and long-term growth in employment was surprising. Even when dropping the financing variable, the effect of SBIR/STTR grants remained consistent. SBIR/STTR grants are a highly specialized subset of financing events that are only awarded to firms performing very specific types of R&D. However, not every firm that receives an SBIR or STTR grant succeeds. In fact, a recent paper found that nascent firms that receive a phase II R&D award from SBIR are more likely to fail in their SBIR-supported R&D endeavors than are established firms.[31] The research team considered several possible explanations for this counter-intuitive finding, the most likely being that such grants are more likely to go to applicants from distressed regions, and so are less likely to perform well over time (a form of negative selection bias).

Summary of Results from Capacity Analysis

SRI found that financing events, membership associations and organizations, and a higher creative class share of the workforce were all correlated with improved long-term economic performance in the form of higher rates of earnings and employment growth. Higher rates of establishment churn were correlated with higher levels of employment growth, but reduced levels of earnings growth. Employment and per-capita income growth rates were also positively correlated with the number of tech intensive non-employer firms in a region.

The tables below present a summary of these relationships. Strong relationships are those at the .01 level, while medium relationships are at the .05 level; the color of the cell indicates the direction of the relationship, with green cells indicating positive relationships and red cells indicating negative relationships. Table 2 is the results from the combined set of metropolitan and micropolitan regions, Table 3 is from just the metropolitan regions, and Table 4 is from just the micropolitan regions.

[30] http://www.kauffman.org/what-we-do/research/business-dynamics-statistics/business-dynamics-statistics-briefing-job-creation-worker-churning-and-wages-at-young-businesses. Haltiwanger, J., Hyatt, H., McEntarfer, E., Sousa, L. 2012. "Job Creation, Working Churning, and Wages at Young Businesses." Business Dynamics Statistics Briefing, Kauffman Foundation.

[31] Gicheva, Link. 2016. "On the Economic Performance of Nascent Entrepreneurs." *European Economic Review* 86: 109-117.

Table 2: Identified relationships, combined metropolitan and micropolitan regions

	Earnings	Employment	Per Capita Income
Patents			
New Product Introductions			
Establishment Churn	Medium	**Strong**	
Non-Employer Firms		**Strong**	**Strong**
SBIR/STTR		**Strong**	Medium
Financing Events	**Strong**	**Strong**	
Associations/Organizations	**Strong**		
EDOs		**Strong**	Medium
Creative Class Share		**Strong**	Medium

Table 3: Identified relationships, metropolitan regions only

	Earnings	Employment	Per Capita Income
Patents			
New Product Introductions		Medium	
Establishment Churn	**Strong**	**Strong**	
Non-Employer Firms			**Strong**
SBIR/STTR		Medium	Medium
Financing Events	**Strong**	**Strong**	**Strong**
Associations/Organizations			
EDOs			
Creative Class Share			Medium

Table 4: Identified relationships, micropolitan regions only

	Earnings	Employment	Per Capita Income
Patents	Medium		
New Product Introductions			
Establishment Churn	Medium		
Non-Employer Firms		**Strong**	**Strong**
SBIR/STTR		Medium	
Financing Events			
Associations/Organizations	**Strong**		
EDOs		**Strong**	
Creative Class Share		**Strong**	

Overall, the results of this regression analysis were encouraging. The different capacity measures that economic programs, such as EDA's non-infrastructure grants, are designed to support were all associated with various measures of improved long-term economic performance. With a better understanding of how these capacity variables influence long-term economic performance, practitioners can build on current best practices, as well as better tailor their programs depending on the type of activity they seek to promote. Furthermore, differences in the behavior of the capacity variables between metropolitan and micropolitan regions provide a guideline for how economic development strategies should vary based on the characteristics of the region they are deployed in.

At the metropolitan level, establishment churn was positively correlated with long-term employment growth, while the presence of non-employer firms was correlated with long-term income growth. Financing events at the metropolitan level were positively correlated with all three measures of improved long-term economic performance. These results suggest that for metropolitan regions, the level of activity was an especially important indicator of future economic performance, namely growth, and that these regions could support higher rates of creative destruction and benefit from freely available capital.

At the micropolitan level, patents and membership associations and organizations were positively correlated with long-term earnings growth. The number of non-employer firms were correlated with long-term employment and income growth, and the creative class share of the workforce was also correlated with long-term employment growth. These results indicate that inventiveness and creativity of micropolitan regions, as indicated by the level of patent activity, the presence of a creative class, and high-tech non-employer firms, were important indicators for future economic growth. Our results suggest that for micropolitan regions, the composition and nature of the region was a more relevant indicator of future economic growth than the level and quantity of new business activity. These results suggest that regions with strong network capacity effectively allocate the resources from investment and interventions. This therefore suggests that investments that foster improved regional characteristics and capacities, such as EDA's non-infrastructure grants, are particularly useful in micropolitan regions.

Table 5: Capacity indicators on outcome variables

Standard errors clustered at the CBSA level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	(1) All, Earnings	(2) All, Employment	(3) All, Income	(4) Metro, Earnings	(5) Metro, Employment	(6) Metro, Income	(7) Micro, Earnings	(8) Micro, Employment	(9) Micro, Income
2000 Earnings per Capita	0.0158***	-0.00169	0.0420***	-0.00302	-0.0291	-0.148	0.0249***	0.0177	0.0727**
	(0.00506)	(0.00999)	(0.0143)	(0.0177)	(0.0368)	(0.140)	(0.00695)	(0.0132)	(0.0336)
Employed Share of the Population	0.0213	-0.0469	-0.0739	0.0244	-0.0835	0.0382	-0.00772	-0.0598	-0.235
	(0.0219)	(0.0324)	(0.0970)	(0.0267)	(0.0534)	(0.115)	(0.0319)	(0.0408)	(0.196)
Unemployment Rate, 2000	-0.00232***	-0.00385**	0.00878	-0.00195*	0.000519	0.0235*	-0.00252*	-0.00660**	-0.00322
	(0.000872)	(0.00181)	(0.00709)	(0.00103)	(0.00177)	(0.0135)	(0.00136)	(0.00275)	(0.00660)
Mfg Share, 2000	-0.0167	0.0987***	-0.00363	-0.0300	0.179***	-0.0715	-0.00436	0.0911**	0.0582
	(0.0191)	(0.0314)	(0.106)	(0.0299)	(0.0548)	(0.125)	(0.0237)	(0.0368)	(0.128)
% Bachelors Plus, 2000	0.000320	-0.00124*	0.00255	0.000399	0.00136	0.00868*	0.000621	-0.00228**	0.00197
	(0.000427)	(0.000682)	(0.00202)	(0.000500)	(0.000897)	(0.00492)	(0.000615)	(0.000962)	(0.00249)
Patents, 05-07 Normalized	0.00260	-0.00197	0.00992*	0.000498	-0.000936	0.00791	0.00891**	-0.00746	0.0166*
	(0.00210)	(0.00155)	(0.00540)	(0.00230)	(0.00167)	(0.00535)	(0.00356)	(0.00491)	(0.00950)
New Products, 05-07, Normalized	0.0193	-0.0864	0.248	-0.0837	-0.317**	0.869	0.0418	0.00170	-0.0427
	(0.0594)	(0.0944)	(0.270)	(0.0841)	(0.138)	(0.908)	(0.0737)	(0.117)	(0.141)
Establishment Churn	-0.116**	0.400***	-0.289	-0.217***	0.738***	0.0499	-0.113*	0.162	-0.450
	(0.0494)	(0.0841)	(0.202)	(0.0803)	(0.143)	(0.470)	(0.0637)	(0.0994)	(0.275)
Normalized Non-Emp Firms, Tech Intensive, 2006	-0.000301	0.00253***	0.00957***	0.000476	0.00228*	0.00735***	-0.000581	0.00311***	0.00954***
	(0.000513)	(0.000877)	(0.00168)	(0.000659)	(0.00123)	(0.00233)	(0.000696)	(0.00115)	(0.00249)
SBIR and STTR Grants, Sum 05-07, Normalized	0.00621	-0.0412***	-0.129**	-0.00596	-0.0387**	-0.243**	0.0132	-0.0448**	-0.0336
	(0.00699)	(0.0117)	(0.0580)	(0.0108)	(0.0188)	(0.110)	(0.00970)	(0.0174)	(0.0354)
Normalized Number of Financing Events, 2006	0.166***	0.292***	0.122	0.276***	0.449***	0.905***	0.107*	0.239*	-0.161
	(0.0477)	(0.105)	(0.158)	(0.0689)	(0.117)	(0.334)	(0.0584)	(0.131)	(0.197)
Normalized Assoc. & Orgs (NAICS 813), 2006	0.0153***	0.00365	0.0253*	0.0114	0.00954	0.0573*	0.0214***	0.00517	0.0310*
	(0.00480)	(0.00792)	(0.0139)	(0.00705)	(0.0112)	(0.0322)	(0.00583)	(0.00965)	(0.0176)
Normalized Economic Development Orgs, 2006	-0.0733	-0.264***	-0.268**	-0.163*	-0.170	-0.745	-0.0632	-0.268***	-0.151
	(0.0467)	(0.0813)	(0.128)	(0.0853)	(0.131)	(0.602)	(0.0531)	(0.0905)	(0.0953)
Creative Class Share of Workforce	-0.0641	0.325***	-0.629**	-0.0802	-0.139	-1.818**	-0.141	0.444***	-0.374*
	(0.0647)	(0.106)	(0.280)	(0.0975)	(0.179)	(0.915)	(0.0873)	(0.141)	(0.217)
Constant	0.121***	-0.0704**	0.150	0.142***	-0.103**	0.137	0.131***	-0.0322	0.225*
	(0.0173)	(0.0295)	(0.101)	(0.0248)	(0.0517)	(0.166)	(0.0222)	(0.0362)	(0.132)
Observations	903	903	900	380	380	378	523	523	522
Adjusted R^2	0.113	0.225	0.026	0.185	0.377	0.048	0.103	0.155	0.024

Differentiating Capacity Variables: Economic Drivers and Networking Capacity

As mentioned earlier, in our second analysis, SRI separated capacity variables into two categories: variables that acted as economic drivers and variables that represent networking capacity and support structures. Economic drivers consisted of patents, new product introductions, establishment churn, non-employer firms, financing events, and SBIR/STTR grants. These variables all related directly to production of goods and services, increased employment opportunities, and direct injection of capital into businesses and regions.

On the other hand, variables such as economic development organizational investments by various actors (federal, state, and local government, non-profit organizations, and private entities), economic development organizations, and membership associations and organizations acted as collaboration systems and support structures for other types of economic activity.[32] EDOs and membership organizations exist to establish, accelerate, and augment work done by regional actors. Similarly, economic development grants are generally for organizations to build networks, institutions, and technical capabilities, or to build projects (in the case of infrastructure funding), but do not often directly inject capital into a regional economy.[33] The research team hypothesized that these types of grants interacted with the presence of economic development organizations and membership organizations to influence long-term economic performance. When taken together, they served as a proxy for the presence of networking capacity systems within a region.

While our hypothesis could apply to any type of economic development grant, we conducted this analysis using data specifically on the impact of EDA non-infrastructure grants. These grants are funded through a variety of different programs and support a broad range of activities and outputs, from planning activities to business training and support. For instance, the Partnership Planning Grants helps regional organizations develop documents such as Community Economic Development Strategies (CEDS), while the Regional Innovation Strategies (RIS) program supports innovation and entrepreneurship activities.

Our access to these data through our collaboration with EDA, as well as our belief in the importance and impact of these programs, were the motivation behind using this dataset for this analysis. However, while this EDA-specific data formed the basis of this work, we acknowledge that there are many other organizations – state, federal, and private/non-profit – that fund similar programs, and as such the analysis conducted here is applicable to a broader group of stakeholders than just EDA grantees.

SRI sought to analyze how the presence of these networking capacity variables contributed to long-term economic performance. Each of the three independent variables captured different components of a region's networking capacity. Through the first analysis, presented above, SRI was unable to identify the specific nature and impact of each individual variable. However, to test how the three terms worked

[32] As mentioned earlier, SRI used data on EDA grants to build and run this model; however, this variable is intended to be a proxy for economic development grant activity more broadly.

[33] There are some cases of economic development grants providing direct capital; for instance, the Rotating Loan Fund supported by EDA.

together to contribute to long-term economic performance, we dropped each individual variable from our analysis and focused instead on examining the combined impact of all three variables.

The scale of each of these variables differed substantially. To weight each type of variable equally, for each of the three networking capacity component variables, we created three separate bins indicating a low concentration, a medium concentration, and a high concentration based on their distributions. For example, for membership organizations, the low bucket ranged from 0 to .005 membership organizations per thousand people, the medium bucket ranged from .005 to .01 membership organizations per thousand people, and the high bucket covered all instances with more than .01 membership organizations per thousand people. The research team then coded these binned variables from 1 to 3. The three coded indicators were then multiplied together to construct the combined network variable, which ranged from 0 to 27. This procedure effectively creates an interaction term between EDA grants, membership organizations, and EDOs. The interaction term captures how all three variables must be present at a high level to contribute to economic growth.

We first tested the following model:

$$Outcome = B_0 + B_i(controls_i) + B_j\left(workhorse\ capacity_j\right) + B_k(networking_k) + e$$

This model tested how the networking capacity variables worked together to influence long-term economic performance. Then, for each of the six capacity variables with direct capacity effects (patents, new products, churn, non-employer firms, SBIR/STTR grants, and financing) we tested the following model.

$$Outcome = B_0 + B_i(controls_i) + B_j\left(workhorse\ capacity_j\right) + B_k(networking_k) + B_k\left(networking_k * direct\ effect\ capacity_j\right) + e$$

This model tested the interaction between the combined networking capacity variable and each direct effect capacity variable to explore whether or not the presence of networking capacity specifically augmented the impact of the direct effect capacity variables.

In our results, presented in Table 6 below, we found that the presence of networking capacity in a region, as indicated by the concentration of EDOs, EDA grants, and membership organizations, was positively correlated with long-term earnings growth in all regions and at the micropolitan level. However, none of the interaction terms between networking capacity effects and any of the direct effect capacity variables had significant correlation. The signs and significance for the coefficients of all other variables remained the same. Thus, we did not find any evidence that the presence of a networking capacity influences the impact of the direct effect capacity variables. However, these results did suggest that the networking capacity variables (EDOs, EDA grants, and membership organizations) rely on each other to influence long-term economic performance in the form of earnings growth.

Recall that in the earlier results presented in Table 5, of these three variables, only membership organizations had a significant and positive correlation with long-term earnings growth in all regions and metropolitan regions. We had some concern that membership organizations were dominating the impact of the other networking capacity variables. We tested four versions of this model, each with a different definition of the networking indicator variable:

1. networking = edo_bin*orgs_bin*eda_bin
2. networking = edo_bin*orgs_bin
3. networking = orgs_bin*eda_bin
4. networking = edo_bin*eda_bin

In these tests, we found that the networking capacity variable had a significant positive correlation with long-term earnings growth in the first and third models, which confirmed that membership organizations act as a strong driver of the correlation between networking capacity and earnings growth. However, the lack of a positive result from the second model indicated that membership organizations are not solely responsible for this correlation. The lack of any significant coefficient on the networking capacity variable in the fourth model likewise indicated that EDOs and EDA grants without the presence of membership organizations are insufficient to influence long-term economic performance.

As discussed earlier, membership organizations are a proxy of the degree of institutional support for economic activities present in a region. High levels of institutional support are clearly necessary for networking capacity to influence long-term economic performance. Similarly, EDOs can be thought of as a different type of institutional support structure that act in a separate and unique fashion. The results from this analysis suggest that for both membership organizations and EDOs to positively impact long-term earnings growth, economic development grants (in this case, from EDA) were necessary.

These results supported our hypothesis that economic development grants, EDOs, and membership organizations each act to support networking capacity in a unique and complementary manner. However, we were unable to make any conclusions about the exact nature of the differences between the three variables.

Summary of Networking Capacity Analysis

Networking capacity was positively correlated with long-term earnings growth at the micropolitan level and across all types of regions. This result was in-line with our hypothesis that networking capacity was especially important in smaller, micropolitan regions. Particularly relevant for this study was the observed importance of EDA grants, which were used as a proxy for institutional investment. The presence of these grants in micropolitan regions were crucial for the significance of the relationships between the networking capacity variables and improved long-term economic performance. This suggests that EDA grants play a vital role in supporting and enhancing the networking capacity of regions, which is in turn associated with improved long-term economic performance.

In addition, in our first model, we found economic development organizations to have a significant negative correlation with long-term employment and per capita income growth. These negative correlations disappeared when accounting for the presence of a networking capacity variable, suggesting that economic development organizations alone were insufficient at fostering ecosystems conducive to long-term economic performance, but can work in conjunction with other types of networking capacity.

Table 6: Capacity indicators on outcome variables with networking capacity analysis

	(1) All Earnings	(2) All Employment	(3) All Income	(4) Metro Earnings	(5) Metro Employment	(6) Metro Income	(7) Micro Earnings	(8) Micro Employment	(9) Micro Income
2000 Earnings per Capita	0.0190***	-0.00109	0.0457***	0.00470	-0.0253	-0.123	0.0279***	0.0186	0.0742**
	(0.00497)	(0.00984)	(0.0140)	(0.0185)	(0.0369)	(0.133)	(0.00685)	(0.0131)	(0.0336)
Employed Share of Pop	0.0234	-0.0611**	-0.0710	0.0135	-0.0913*	0.0119	0.00527	-0.0698*	-0.206
	(0.0212)	(0.0309)	(0.0955)	(0.0259)	(0.0508)	(0.140)	(0.0309)	(0.0393)	(0.185)
Unemployment Rate, 2000	-0.00219**	-0.00382**	0.00923	-0.00192*	0.000642	0.0241*	-0.00211	-0.00665**	-0.00227
	(0.000873)	(0.00181)	(0.00717)	(0.00104)	(0.00176)	(0.0136)	(0.00135)	(0.00277)	(0.00653)
Mfg Share of Emp, 2000	-0.0200	0.107***	-0.0114	-0.0255	0.179***	-0.0840	-0.0114	0.0973***	0.0366
	(0.0182)	(0.0309)	(0.103)	(0.0276)	(0.0513)	(0.133)	(0.0231)	(0.0363)	(0.127)
% Bachelors or >, 2000	0.000187	-0.00132**	0.00231	0.000296	0.00126	0.00817*	0.000398	-0.00236**	0.00167
	(0.000425)	(0.000672)	(0.00196)	(0.000513)	(0.000896)	(0.00474)	(0.000616)	(0.000952)	(0.00237)
Patents, 05-07, Norm	0.00287	-0.00108	0.0107**	0.00110	-0.000341	0.0108*	0.00938**	-0.00590	0.0173*
	(0.00193)	(0.00149)	(0.00529)	(0.00225)	(0.00161)	(0.00616)	(0.00377)	(0.00475)	(0.00971)
New Prod, 05-07, Norm	0.00519	-0.130	0.208	-0.0784	-0.318**	0.878	0.0252	-0.0559	-0.0509
	(0.0584)	(0.0890)	(0.275)	(0.0838)	(0.137)	(0.920)	(0.0738)	(0.113)	(0.136)
Establishment Churn	-0.138***	0.429***	-0.330*	-0.206***	0.737***	0.00379	-0.150**	0.186*	-0.539*
	(0.0465)	(0.0810)	(0.194)	(0.0735)	(0.132)	(0.355)	(0.0619)	(0.0962)	(0.299)
Non-Emp Firms, HT, 2006, Norm	0.000113	0.00241***	0.0103***	0.000620	0.00249**	0.00857***	0.0000698	0.00294***	0.0107***
	(0.000486)	(0.000805)	(0.00174)	(0.000649)	(0.00121)	(0.00235)	(0.000677)	(0.00107)	(0.00280)
SBIR/STTR Grants, 05-07. Norm	0.00448	-0.0402***	-0.131**	-0.00564	-0.0378**	-0.240**	0.0117	-0.0440***	-0.0357
	(0.00706)	(0.0113)	(0.0580)	(0.0106)	(0.0188)	(0.110)	(0.00990)	(0.0166)	(0.0349)
Normalized Financing Events, 2006	0.160***	0.303***	0.110	0.271***	0.443***	0.860***	0.107*	0.250*	-0.179
	(0.0477)	(0.105)	(0.162)	(0.0699)	(0.118)	(0.322)	(0.0603)	(0.135)	(0.208)
Creative Class Share of Workforce	-0.0649	0.315***	-0.618**	-0.0995	-0.156	-1.876**	-0.116	0.449***	-0.307
	(0.0645)	(0.106)	(0.282)	(0.0974)	(0.178)	(0.906)	(0.0883)	(0.139)	(0.204)
Networking Capacity	0.00185***	-0.000101	0.000178	0.00125	0.000112	0.00106	0.00230**	-0.000113	-0.00230
	(0.000679)	(0.000983)	(0.00226)	(0.000879)	(0.00118)	(0.00339)	(0.00110)	(0.00195)	(0.00328)
Constant	0.125***	-0.0756**	0.153	0.145***	-0.0990*	0.161	0.130***	-0.0392	0.225*
	(0.0172)	(0.0300)	(0.0980)	(0.0248)	(0.0509)	(0.154)	(0.0225)	(0.0363)	(0.133)
Observations	903	903	900	380	380	378	523	523	522
Adjusted R^2	0.109	0.213	0.025	0.181	0.375	0.047	0.090	0.139	0.024

Standard errors clustered at the CBSA level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Program Level Impacts: Collecting and Assessing Data

Returning to the visual introduced earlier in the report and replicated in Figure 4 below, while the econometric model has advanced our understanding of the aggregate, regional level relationships between capacities and realized long-term outcomes, the second component to this project was understanding the relationship between non-infrastructure economic development grants and the identified capacity outcomes.

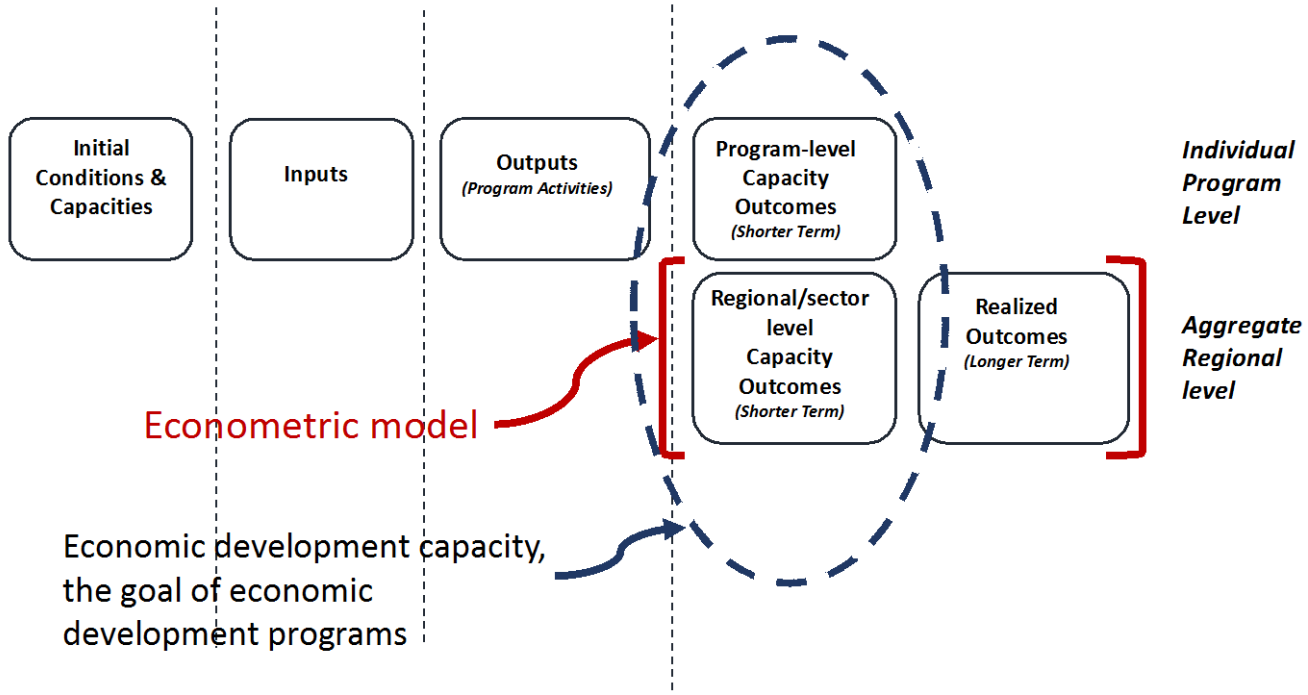

Figure 4: Project components

To address this, SRI developed a data collection methodology and survey instruments to enable EDA and other funders of economic development initiatives to assess the impact of their programs on specific regional capacities. The approach to data collection is purposefully broad and flexible, intended to accommodate a broad population of grantee organizations. The approach consists of two survey instruments: one intended to collect information from funded organizations on the exact outputs (activities, services, etc.) that were supported through the funding received (referred to as the "program outputs survey"); and a second intended to collect information from the end beneficiary of the activities or services on the impact of those services on the range of capacity outcomes (the "capacity outcomes survey"). More likely than not, the second survey will typically be distributed to a set of clients served by the funded organizations, however, it is possible that in some situations, the funded organizations themselves are the ultimate beneficiaries who have experienced improvements in capacity.

The survey instruments were built according to the logic model presented earlier in the report, and shown again here.

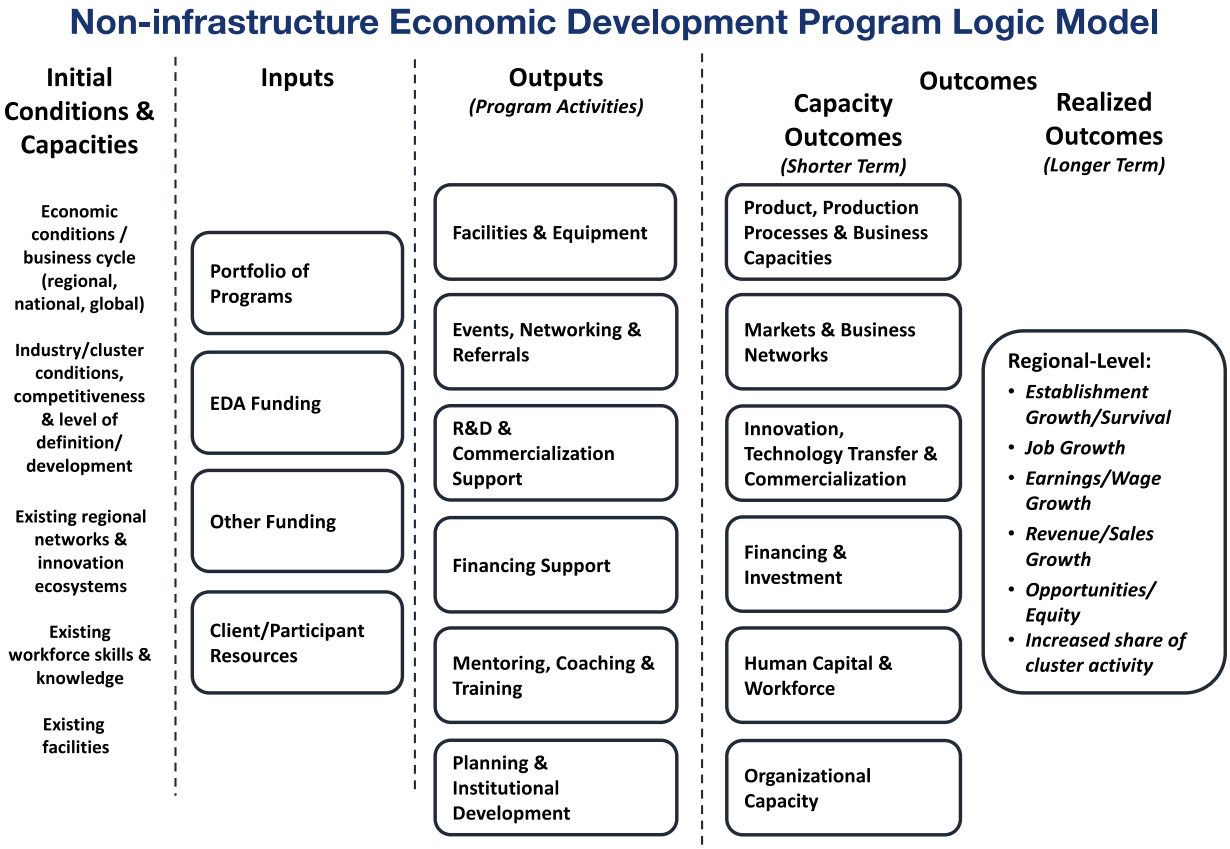

Figure 5: Economic development program logic model

The program outputs survey collects data that align with the six categories in the middle column, asking grantees about the activities, services, equipment, training, and other support they provided due to the support of the grant or funds. The capacity outcomes survey asks detailed questions that align with the six capacity outcomes identified in the model, and probes respondents to assess their improvement in each capacity. It is not expected that any funded organization will have generated program outputs in each of the six categories, or that any beneficiary will have improved in all six capacities. The survey is structured such that respondents are only required to respond to questions that are applicable to their specific goals and approach. However, by including all six categories of activities and capacities in a single survey, program staff can more easily collect and aggregate meaningful data from a broad range of organizations.

Data collection of this sort is not an insignificant endeavor and requires commitment to implementing survey procedures and collecting quality data. To support this endeavor, SRI developed a toolkit to accompany the survey instruments that can be used by grant-making organizations and economic development practitioners to successfully implement this approach. The toolkit, which can be found in its entirety in a separate report, provides detailed information on the survey instruments, support and justification for the metrics being collected, explanations of how to implement survey procedures, and best practices for achieving survey success.

Pilot Survey and Results

SRI piloted the survey instrument that was developed by distributing it to grantees of both the i6 Challenge program and the Seed Fund Support (SFS) Program in 2014 and 2015. SRI tested the fielding of the survey to grantee clients by having i6 grantees forward the survey on to anyone they had served through their i6 grant in the past year, as shown in Figure 6 below.

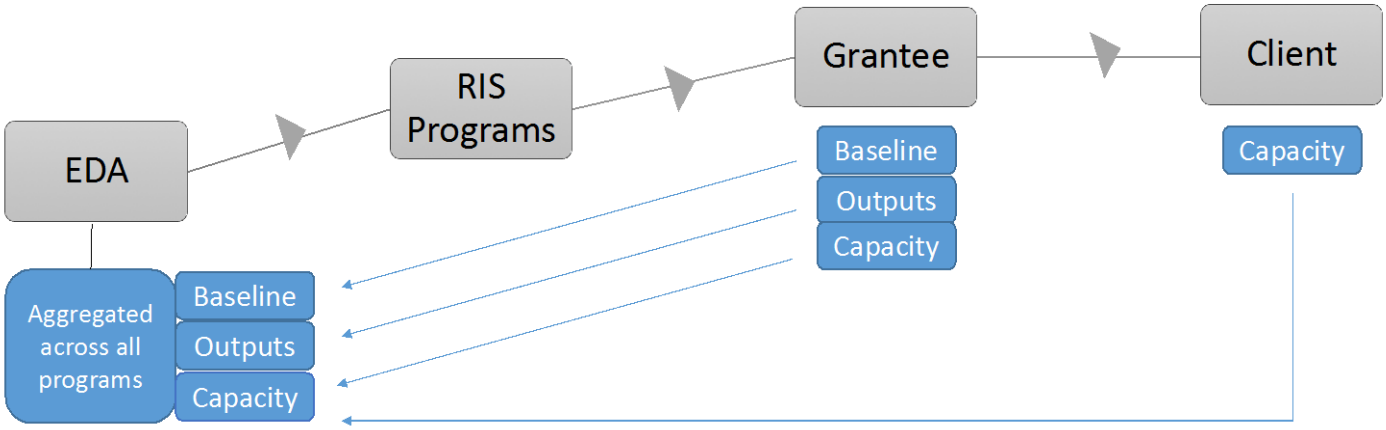

Figure 6: Overview of survey flow

While fielding two surveys to both grantees and clients encountered some logistical difficulties (as discussed below), it nevertheless generated important insights into the full scope of the impact of EDA non-infrastructure grants. Table 7 below shows the total number of survey recipients, program grantees, and respondents, program clients or beneficiaries.

Table 7: Summary of survey recipients and respondents

	Recipients	Respondents
i6 Grantees	34	26
i6 Clients	unknown[34]	129
SFS Grantees	17	13
Total	51+	168

While the data instruments developed for this project were intended to be used across all non-infrastructure programs, and aggregated to generate a holistic view of the outputs of non-infrastructure grants portfolios, throughout this project SRI staff modified the data collection instrument following feedback received from EDA staff. As such, the survey that was fielded to the i6 grantees – who received the survey in February 2017 – was slightly different than the one that was fielded to SFS grantees in April 2017. Therefore, the two sets of survey responses cannot be perfectly aggregated. However, there was substantial overlap between the two surveys, and where possible, SRI aggregated the responses from grantees from both programs. Selected summary statistics from the grantee surveys are presented in Table 8 below, and the full table of aggregated responses is contained in Appendix D: Survey Results.

[34] SRI does not know how many total clients received the survey, as SRI asked the i6 grantees to distribute the survey directly. There was no reporting or tracking mechanism to determine how many clients received the survey.

These findings establish that the protocol and instrument designed by SRI successfully captured program activities and measurable improvements to economic development capacity. This proof of principle provides a model for the survey of complex programs and confirms that useful data can be collected in this way. The summary statistics reported below give examples of the kind of data that can be collected through a well-designed survey instrument. Such data show program success in building capacity.

Table 8: Selected summary statistics from grantee program outputs survey

Program Output	Total
Total number of clients or beneficiaries served	3,619
Number of clients assisted with technology commercialization, licensing, patenting, or other regulatory or government approvals	208
Number of clients assisted in obtaining angel, seed, or venture capital funding	168
Number of participants who attended training and skill assistance sessions	5,159
Number of conferences, showcases, and/or exhibitions and networking events held	881

The client-level survey asked the clients and beneficiaries about the impacts and improvements they saw as a result of services received from the grantees. The impacts were grouped into five categories, and clients were asked to rate the overall level of improvement they saw in each category, due to support and services from the grantees. Table 9 below shows the average client rating of improvement within each category, on a scale from 1 to 5 (where 5 is substantial improvement).

Table 9: Average client rating of improvement due to grantee support and services

	Innovation, tech transfer, or commercialization capacities	Product and production processes and business capacities	Human capital and workforce capacities	Access to markets and business networks	Access to financing and investment
Average Client Rating of Improvement	3.99	4.02	3.52	3.77	3.53

Within each category of impact, the survey asked for additional details and specificity about the improvements seen from the support and services received. Table 10 below presents some of these summary impacts, and the full table of summary results can be found in Appendix D: Survey Results.

Table 10: Selected summary statistics of client capacity outcomes

Client Capacity Outcome	Total
Total number of clients who said they increased the TRL of a product	56
Average increase in TRL	3.39
Total number of new technologies that were licensed or brought to market	44
Total number of new clients gained	3,660
Total number of hours spent on entrepreneurship or leadership programs	8,140

Conclusions

Our goal for this project was to understand the pathways through which economic development programs have an impact on realized outcomes in the long term. We developed a logic model for capturing the impact of economic development programs on economic development capacity, and then tested aggregate measures of those capacities against long-term economic performance. The figure introduced earlier in the report, and presented again in Figure 7, outlines this dual-level approach to assessment. It is the key to understanding how non-infrastructure economic development initiatives can be shown to improve both capacity outcomes and realized outcomes at the regional level.

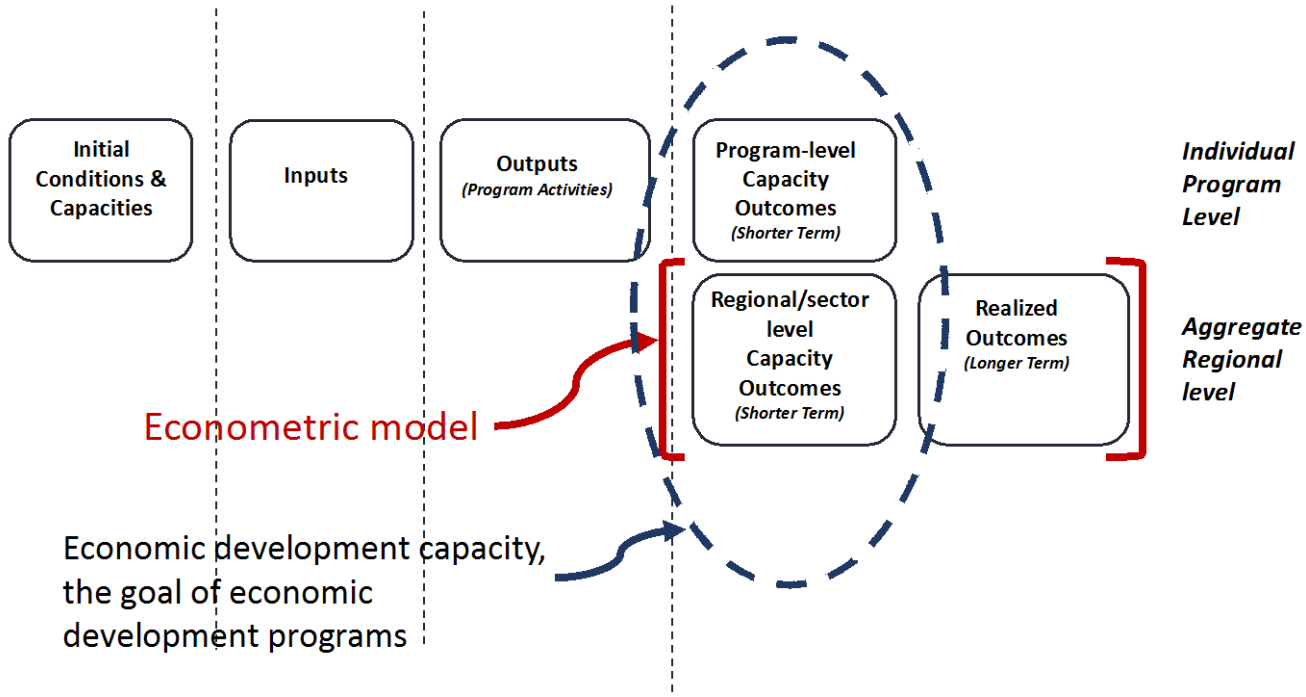

Figure 7: Dual-level approach to assessing impacts

Our econometric analysis suggested that economic development capacity correlates with desirable long-term economic performance in different ways, depending on the metropolitan or micropolitan nature of the region. In metropolitan regions, establishment churn, the number of high-tech non-employer firms, and financing events are, per our analysis, positively correlated with positive long-term economic performance, such as growth in employment and earnings, suggesting that these regions can support high rates of creative destruction and benefit from freely available capital. Conversely, in micropolitan regions, regional characteristics of innovation and creativity (patent activity, high-tech non-employer firms, and creative class share) were correlated with future economic performance. Furthermore, networking capacity matters most for smaller regions with limited institutional capacity.

SRI discovered that these economic development capacities impact different components of the economy. For example, establishment churn was correlated with long-term employment growth, while financing events were correlated with long-term earnings growth. This refined understanding of how economic development capacities influence specific, region-dependent components of the economy provides a baseline to guide economic

development strategies to ensure that a specific strategy is well-suited to accomplish its regional goals. It also helps to elucidate ways in which economic development grants aimed at expanding capacities have influenced regional long-term economic performance. These results serve as a guidepost to improving program evaluation and design in the economic development field more broadly.

Ultimately, this project advanced the field of program evaluation in economic development by thoroughly exploring the chain of connections that drive long-term regional outcomes, from organizational activities, to program and regional level capacities, and ultimately to improved economic performance. Guided by a logic model, this project examined two sets of critical relationships: those between EDA grant activity and organizational capacities, and those between aggregate, regional level capacities and long-term economic performance. The tools developed through this project have generated evidence that non-infrastructure economic development initiatives produce improvements in regional capacities – capacities that our econometric analyses suggest are correlated with improved long-term regional outcomes. Taken together, this work provides a holistic, evidence-based view of how regional investments in economic development influence economic performance, and how those investments can be better designed and evaluated to improve impact.

Appendix A: Summary Statistics

Table A- 1: All regions

All Regions					
Variable	Obs	Mean	Std.Dev	Min	Max
Regional Control Variables					
Earnings, 2000	929	4.49	1.86	1.70	17.50
Manufacturing Share, 2000	903	0.18	0.11	0.00	0.58
% Bachelors Plus, 2000	917	18.89	7.56	6.20	60.50
Population	917	304,609.20	1,032,601.00	12,747.00	19,200,000.00
Earnings, 2000	917	0.43	0.36	0.00	2.40
Employed Share of Population, 2000	917	0.40	0.08	0.11	0.74
Capacity Variables					
Patents, 2005-2007, Normalized	917	0.0043938	0.008486	0	0.1250342
New Product Introductions, 2005-2007, Normalized	917	0.0001271	0.0002034	0	0.0013514
Establishment Churn	917	0.1847068	0.0341519	0.0884527	0.3439444
Non-employer Firms, Tech Intensive, Normalized, 2006	917	0.0858478	0.042675	0	0.3391464
SBIR and STTR Grants, 2005-2007, Normalized	917	0.0004813	0.0015821	0	0.0184481
Financing Events, 2006	917	0.0003959	0.000392	0	0.0029552
Normalized Membership Associations and Organizations, 2006	917	0.0046288	0.0031861	0.0004172	0.0257339
Normalized Economic Development Orgs, 2006	917	0.0003599	0.0003022	0	0.0017939
Creative Class Share, 2006	917	0.2011185	0.0510088	0.0911917	0.4975423
EDA Grants, 2005-2007	929	1.487621	2.486192	0	22
Networking Capacity	929	1.012917	1.837658	0	18

Table A- 2: Metropolitan regions

Metropolitan Regions					
Variable	Obs	Mean	Std.Dev	Min	Max
Regional Control Variables					
Unemployment Rate, 2000	388	4.30	1.94	1.70	17.50
Manufacturing Share, 2000	380	0.14	0.08	0.01	0.51
% Bachelors Plus, 2000	381	22.29	7.26	9.90	52.60
Population	381	663,101.40	1,532,579.00	55,410.00	19,200,000.00
Earnings, 2000	381	0.14	0.10	0.00	0.57
Employed Share of Population, 2000	381	0.42	0.08	0.11	0.71
Capacity Variables					
Patents, 2005-2007, Normalized	381	0.0066063	0.0114694	0.000133	0.1250342
New Product Introductions, 2005-2007, Normalized	381	0.0001676	0.0001856	0	0.0010548
Establishment Churn	381	0.196585	0.0317035	0.1252007	0.3439444
Non-employer Firms, Tech Intensive, Normalized, 2006	381	0.0986057	0.0407425	0.0306678	0.3391464
SBIR and STTR Grants, 2005-2007, Normalized	381	0.0006543	0.0015359	0	0.0124541
Financing Events, 2006	381	0.0004874	0.0003649	0	0.0029552
Normalized Membership Associations and Organizations, 2006	381	0.0045322	0.0026031	0.0011367	0.0192076
Normalized Economic Development Orgs, 2006	381	0.0003908	0.0002161	0	0.0013555
Creative Class Share, 2006	381	0.2297933	0.0477422	0.1277058	0.4261947
EDA Grants, 2005-2007	388	2.489691	3.111602	0	22
Networking Capacity	388	1.458763	2.124266	0	18

Table A- 3: Micropolitan regions

Micropolitan Regions					
Variable	Obs	Mean	Std.Dev	Min	Max
Regional Control Variables					
Unemployment Rate, 2000	541	4.62	1.78	1.90	16.60
Manufacturing Share, 2000	523	0.20	0.12	0.00	0.58
% Bachelors Plus, 2000	536	16.47	6.80	6.20	60.50
Population	536	49,785.47	26,840.53	12,747.00	217,065.00
Earnings, 2000	536	0.64	0.33	0.13	2.40
Employed Share of Population, 2000	536	0.39	0.09	0.16	0.74
Capacity Variables					
Patents, 2005-2007, Normalized	536	0.0028211	0.0048883	0	0.0712159
New Product Introductions, 2005-2007, Normalized	536	0.0000983	0.0002106	0	0.0013514
Establishment Churn	536	0.1762636	0.0333341	0.0884527	0.3363229
Non-employer Firms, Tech Intensive, Normalized, 2006	536	0.0767792	0.0417224	0	0.3182011
SBIR and STTR Grants, 2005-2007, Normalized	536	0.0003583	0.0016042	0	0.0184481
Financing Events, 2006	536	0.0003309	0.0003978	0	0.0026284
Normalized Membership Associations and Organizations, 2006	536	0.0046975	0.0035434	0.0004172	0.0257339
Normalized Economic Development Orgs, 2006	536	0.0003379	0.0003493	0	0.0017939
Creative Class Share, 2006	536	0.1807358	0.0428262	0.0911917	0.4975423
EDA Grants, 2005-2007	541	0.7689464	1.563542	0	14
Networking Capacity	541	0.6931608	1.524531	0	12

Appendix B: Robustness Checks

Table B- 1: Correlation matrix of normalized capacity variables

	Patents, 2005-2007	New Products, 2005-2007	Establishment Churn	Non-employer Firms, Tech Intensive	SBIR+STTR, 2005-2007	Financing Events	Associations and Organizations	Economic Development Organizations	Creative Class Share
Patents, 2005-2007	1.00								
New Products, 2005-2007	0.32	1.00							
Establishment Churn	0.13	-0.04	1.00						
Non-employer Firms, Tech Intensive	0.42	0.29	0.42	1.00					
SBIR+STTR, 2005-2007	0.20	0.13	0.14	0.26	1.00				
Financing Events	0.34	0.28	0.11	0.44	0.11	1.00			
Associations and Organizations	0.10	0.09	-0.11	0.39	0.07	0.07	1.00		
Economic Development Organizations	0.05	0.16	-0.08	0.22	0.06	0.07	0.35	1.00	
Creative Class Share	0.50	0.34	0.41	0.78	0.29	0.41	0.26	0.22	1.00

Table B- 2: Correlation matrix of non-normalized capacity variables

	Patents, 2005-2007	New Products, 2005-2007	Establishment Churn	Non-employer Firms, Tech Intensive	SBIR+STTR, 2005-2007	Financing Events	Associations and Organizations	Economic Development Organizations	Creative Class Share
Patents, 2005-2007	1								
New Products, 2005-2007	0.8012	1							
Establishment Churn	0.1808	0.1503	1						
Non-employer Firms, Tech Intensive	0.7775	**0.9146**	0.2085	1					
SBIR+STTR, 2005-2007	0.6281	0.6345	0.1538	0.5448	1				
Financing Events	0.8425	**0.9265**	0.2049	**0.9722**	0.5936	1			
Associations and Organizations	0.7001	**0.8913**	0.1662	**0.939**	0.5631	**0.8874**	1		
Economic Development Organizations	0.7011	**0.8994**	0.1679	**0.9325**	0.6066	**0.9067**	**0.9617**	1	
Creative Class Share	0.3989	0.3562	0.4081	0.3416	0.3933	0.368	0.3317	0.3437	1

Table B- 3: Non-normalized capacity indicators on outcome variables

	(1) All, Earnings	(2) All, Employment	(3) All, Income	(4) Metro, Earnings	(5) Metro, Employment	(6) Metro, Income	(7) Micro, Earnings	(8) Micro, Employment	(9) Micro, Income
Earnings, 2000	-0.00000142***	-0.00000133*	0.000000544	-0.00000169**	-0.00000113	0.00000272	-0.00000214***	-0.000000138	0.00000203
	(0.000000510)	(0.000000761)	(0.00000262)	(0.000000672)	(0.00000102)	(0.00000238)	(0.000000763)	(0.00000116)	(0.00000446)
Employment 2000	2.74e-08**	-1.32e-08	6.05e-08	-1.56e-09	-2.48e-08	-9.45e-08	0.000000798*	0.000000547	-0.00000350
	(1.38e-08)	(2.37e-08)	(6.29e-08)	(1.19e-08)	(2.32e-08)	(6.21e-08)	(0.000000424)	(0.000000620)	(0.00000301)
Per Capita Inc 2000	0.000000860*	0.00000143**	0.00000514***	0.000000923	0.00000133	0.00000352	4.02e-08	-3.75e-08	0.00000219
	(0.000000443)	(0.000000588)	(0.00000186)	(0.000000564)	(0.000000965)	(0.00000222)	(0.000000609)	(0.000000942)	(0.00000172)
Log Pop, 2000	-0.00330*	0.00410	-0.0150**	0.00192	0.00657	0.0345	-0.0392***	-0.0295	-0.0454*
	(0.00180)	(0.00314)	(0.00590)	(0.00231)	(0.00458)	(0.0223)	(0.00966)	(0.0179)	(0.0272)
Unemp Rate, 2000	-0.00238**	-0.00335*	0.0129*	-0.00205**	0.00128	0.0244*	-0.00186	-0.00589**	0.000421
	(0.000928)	(0.00189)	(0.00733)	(0.00101)	(0.00166)	(0.0137)	(0.00142)	(0.00285)	(0.00692)
Mfg Share, 2000	-0.00394	0.108***	-0.0274	0.00271	0.179***	-0.0428	-0.000290	0.0820**	0.0558
	(0.0187)	(0.0324)	(0.134)	(0.0264)	(0.0527)	(0.114)	(0.0238)	(0.0406)	(0.154)
% Bachelors Plus, 2000	0.000706*	-0.000897	0.00453**	0.000733	0.00124	0.0108*	0.000264	-0.00218**	0.00205
	(0.000409)	(0.000647)	(0.00227)	(0.000517)	(0.000915)	(0.00576)	(0.000570)	(0.000967)	(0.00197)
Patents, 05-07	0.00000487***	9.61e-08	0.000000164	0.00000477***	0.000000445	-0.00000144	0.000230***	-0.000215*	0.000259
	(0.00000101)	(0.00000165)	(0.00000441)	(0.00000113)	(0.00000173)	(0.00000497)	(0.0000820)	(0.000114)	(0.000194)
New Products, Sum 05-07	-0.000251***	-0.000198*	0.000978***	-0.000169**	-0.0000970	0.00143***	-0.000199	-0.00150	-0.00290
	(0.0000698)	(0.000114)	(0.000286)	(0.0000680)	(0.000105)	(0.000383)	(0.00132)	(0.00224)	(0.00348)
Establishment Churn	-0.208***	0.518***	-0.138	-0.252***	0.895***	0.132	-0.160**	0.234**	-0.414
	(0.0461)	(0.0803)	(0.123)	(0.0730)	(0.124)	(0.256)	(0.0657)	(0.102)	(0.270)
Non-employer Firms	-0.00000165***	-0.000000275	-0.00000125	-0.00000104***	-0.000000447	0.000000580	-0.0000145*	0.0000317**	0.000129*
	(0.000000296)	(0.000000556)	(0.00000123)	(0.000000240)	(0.000000449)	(0.00000112)	(0.00000833)	(0.0000128)	(0.0000704)
SBIR + STTR, 05-07	0.0000126	-0.0000204	-0.000160***	-0.000000677	-0.0000208	-0.000196***	0.000397*	-0.000637**	-0.000852
	(0.00000831)	(0.0000176)	(0.0000611)	(0.00000723)	(0.0000169)	(0.0000626)	(0.000213)	(0.000257)	(0.00142)
Financing Events	0.000229***	0.000236***	0.000249	0.000217***	0.000235***	0.000303	0.00202	0.00441**	-0.00645
	(0.0000477)	(0.0000734)	(0.000214)	(0.0000399)	(0.0000651)	(0.000198)	(0.00129)	(0.00200)	(0.00674)

	(1) All, Earnings	(2) All, Employment	(3) All, Income	(4) Metro, Earnings	(5) Metro, Employment	(6) Metro, Income	(7) Micro, Earnings	(8) Micro, Employment	(9) Micro, Income
Assoc./Orgs (NAICS 813)	0.0000219***	0.0000196**	0.0000425**	0.0000172***	0.0000184***	0.0000322	0.000341***	0.000179	0.000730*
	(0.00000525)	(0.00000848)	(0.0000195)	(0.00000354)	(0.00000670)	(0.0000219)	(0.0000892)	(0.000137)	(0.000414)
EDO	-0.000203***	-0.000274***	-0.00132***	-0.000149***	-0.000189***	-0.00108***	-0.00134	-0.00638***	-0.00434
	(0.0000371)	(0.0000774)	(0.000199)	(0.0000294)	(0.0000610)	(0.000231)	(0.000989)	(0.00166)	(0.00307)
Creative Class Share	-0.0376	0.334***	-0.522*	-0.0158	-0.0482	-1.752**	-0.0491	0.508***	-0.257
	(0.0650)	(0.106)	(0.300)	(0.0942)	(0.167)	(0.879)	(0.0828)	(0.139)	(0.223)
Constant	0.201***	-0.149***	0.155*	0.147***	-0.243***	-0.429	0.597***	0.251	0.614**
	(0.0226)	(0.0431)	(0.0901)	(0.0306)	(0.0513)	(0.337)	(0.102)	(0.202)	(0.238)
Observations	869	869	866	380	380	378	489	489	488
Adjusted R^2	0.096	0.180	0.016	0.183	0.309	0.033	0.122	0.138	0.030

Standard errors clustered at the CBSA level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B- 4: Networking capacity and capacity variable interaction on long-term earnings growth tests

	(1) Patents Interaction	(2) New Product Interaction	(3) Establishment Churn Interaction	(4) Non-employer Interaction	(5) Financing Event Interaction
2000 Earnings per Capita	0.0205***	0.0205***	0.0200***	0.0207***	0.0204***
	(0.00457)	(0.00457)	(0.00456)	(0.00460)	(0.00456)
Employed Share of Pop	0.0222	0.0223	0.0245	0.0219	0.0225
	(0.0212)	(0.0212)	(0.0209)	(0.0212)	(0.0211)
Unemployment Rate, 2000	-0.00207**	-0.00209**	-0.00198**	-0.00206**	-0.00208**
	(0.000871)	(0.000872)	(0.000861)	(0.000872)	(0.000871)
Mfg Share of Emp, 2000	-0.0188	-0.0194	-0.0172	-0.0180	-0.0195
	(0.0182)	(0.0182)	(0.0182)	(0.0183)	(0.0183)
% Bachelors or >, 2000	-0.0000689	-0.0000706	-0.0000524	-0.0000652	-0.0000677
	(0.000324)	(0.000324)	(0.000322)	(0.000324)	(0.000325)
Patents, 05-07, Norm	0.370	0.266	0.267	0.264	0.262
	(0.237)	(0.186)	(0.184)	(0.186)	(0.187)
New Prod, 05-07, Norm	-0.373	1.444	-1.113	-0.429	-0.249
	(5.848)	(6.447)	(5.815)	(5.843)	(5.851)
Churn, Select Naics	-0.147***	-0.148***	-0.117**	-0.147***	-0.148***
	(0.0468)	(0.0468)	(0.0508)	(0.0467)	(0.0473)
Normalized Non-Emp Firms, HT, 2006	-0.00346	-0.00185	0.00417	0.0131	-0.00165
	(0.0466)	(0.0464)	(0.0459)	(0.0494)	(0.0464)
SBIR and STTR Grants Combined, Sum 05-07, Normalized	0.433	0.404	0.387	0.436	0.363
	(0.705)	(0.706)	(0.703)	(0.703)	(0.705)
Normalized Financing Events, 2006	16.00***	15.88***	16.13***	15.81***	15.75***
	(4.795)	(4.783)	(4.796)	(4.767)	(4.938)
Networking Capacity	0.00227***	0.00205**	0.00931*	0.00316*	0.00173
	(0.000829)	(0.000905)	(0.00479)	(0.00173)	(0.00114)
Networked Patents	-0.0695				
	(0.0612)				

Networked New Products		-1.350			
		(2.291)			
Networked Churn			-0.0411*		
			(0.0246)		
Networked Non-employer Firms				-0.0114	
				(0.0116)	
Networked Financing					0.132
					(1.690)
Constant	0.118***	0.119***	0.111***	0.117***	0.119***
	(0.0159)	(0.0159)	(0.0163)	(0.0161)	(0.0161)
Observations	903	903	903	903	903
Adjusted R^2	0.109	0.108	0.111	0.109	0.108

Table B- 5: Capacity variables on earnings growth with different definitions of the networking variable

	(1) Orgs*EDO	(2) Orgs*EDA	(3) EDA*EDO
2000 Earnings per Capita	0.0189***	0.0213***	0.0203***
	(0.00452)	(0.00464)	(0.00464)
Employed Share of Pop	0.0275	0.0204	0.0250
	(0.0215)	(0.0211)	(0.0212)
Unemployment Rate, 2000	-0.00196**	-0.00218**	-0.00200**
	(0.000866)	(0.000879)	(0.000871)
Mfg Share of Emp, 2000	-0.0245	-0.0173	-0.0223
	(0.0187)	(0.0181)	(0.0183)
% Bachelors or >, 2000	-0.0000194	-0.0000748	-0.0000628
	(0.000325)	(0.000325)	(0.000324)
Patents, 05-07, Norm	0.00262	0.00248	0.00262
	(0.00187)	(0.00187)	(0.00185)
New Prod, 05-07, Norm	0.00217	-0.00201	0.00110
	(0.0589)	(0.0589)	(0.0586)
Churn, Select Naics	-0.160***	-0.148***	-0.160***
	(0.0489)	(0.0466)	(0.0466)
Normalized Non-Emp Firms, HT, 2006	0.0000761	0.00000151	0.000111
	(0.000485)	(0.000459)	(0.000458)
SBIR and STTR Grants Combined, Sum 05-07, Normalized	0.00401	0.00368	0.00376
	(0.00697)	(0.00715)	(0.00704)
Normalized Financing Events, 2006	0.154***	0.160***	0.154***
	(0.0480)	(0.0476)	(0.0476)
Networking Indicator: Orgs*EDO	0.000351		
	(0.000908)		
Networking Indicator: Orgs*EDA		0.00364***	
		(0.00114)	
Networking Indicator: EDA*EDO			0.00192
			(0.00117)
Constant	0.120***	0.119***	0.120***
	(0.0163)	(0.0159)	(0.0160)
Observations	903	903	903
Adjusted R^2	0.103	0.112	0.105

Appendix C: Selected Literature

Literature for Capacity Outcomes

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Appendix D: Survey Results

Presented here are summary statistics from the surveys SRI fielded. The i6 Grantee and Client Surveys were fielded in February and March 2017, and the SFS Grantee survey was fielded in April and May 2017. All surveys were fielded using the LimeSurvey online platform.

Table D-1: Summarized results from the i6 grantee program outputs survey

i6 Grantee Survey	
Question	**Aggregated response**
Total number of clients or beneficiaries served over the past year through i6 program work	1952
Number of grants that supported events, networking, and referrals activity	21
Total number of educational, training, and/or networking events	713
Number of participants	8773
Total number of Conferences, Showcases, and/or Exhibitions and Participants	73
Number of Participants	6431
Total number of client referrals to a technical expert, business contact, investor, etc. for required services and/or support	2465
Number of grants that supported mentoring, coaching, and technical assistance activities	25
Total number of people who attended boot camps, accelerators, or mentoring and coaching programs	2616
Total number of clients who received product development, supply chain, or other operational assistance	521
Total number of clients who were provided with marketing, sales, or market research or advice	620
Total number of clients who were provided with exporting assistance or advice	81
Number of grants that supported the acquisition of facilities and/or equipment	4
Total amount of new space (in sq. ft.) that was developed, purchased, or leased as a result of grants	19200

Total value ($USD) of new equipment that was purchased or leased as a result of grants	$527,300
Number of grants that supported R&D and technology development activities	17
Total number of new joint research projects facilitated between clients or beneficiaries and university partners	50
Total number of clients or beneficiaries assisted with technology commercialization, licensing, patenting, or other regulatory or government	193
Number of grants that supported financing activities	7
Total number of clients assisted in obtaining angel, seed, or venture capital funding	93
Total number of clients assisted with a grant proposal or award application	103
Total number of clients assisted with obtaining other types of funding (e.g. contracts, loans, etc.)	70
Number of angel, venture capital, seed funding competitions or events supported	24
Number of grants that supported capacity-building activities	16
Total number of hours of outside expertise or professional services, relevant either to your organization's work or your clients' work obtained as a result of support from grants	7821

Table D- 2: Summarized results from the i6 client capacity outcomes survey

i6 Client Survey	
Question	**Aggregated Response**
Total number of respondents	129
Total number of clients who said grant was intended to improve innovation, tech transfer, or commercialization capabilities	75
Average rating of improvement of innovation, tech transfer or commercialization on a scale from 1 to 5	3.99
Total number of clients who said they increased the TRL of a product	56
Average increase in TRL	3.39
Total number of new technologies that were licensed or brought to market as a result of the services received from grantee	44
Total number of patents or trademarks obtained as a result of the grant services	18
Total number of FDA or other government approvals that were obtained as a result of the services received	4
Total number of clients who reported that services were intended to improve products and production processes and/or business capacities	60
Average client rating of improvement of product and production processes and/or business capacities on a scale from 1 to 5	4.02
Total number of days spent working on new or improved designs for products, processes, or services as a result of the services received	4,096
Total number of cost reductions, operational efficiencies, and/or quality improvements made as a result of the services	20,309
Total cost savings ($USD) from these improvements	335,920
Total number of environmental and/or energy efficiency improvements made as a result of the services	7
Total number of clients reporting that the services were intended to improve your human capital and/or workforce	29
Average rating of improvement to human capital and/or workforce capacities on a scale from 1 to 5	3.52
Total hours spent by employees or trainees on skill development as a result of the services	3,111
Total hours spent by employees or trainees on entrepreneurship or leadership programs as a result of the services	8,140
Total number of employees who completed technology or cluster-relevant degrees or certificates as a result of the services	111
Total number of new employees (full-time, part-time, and/or 12-month contract employees) hired as a result of the services	32

Total number of clients reporting that the services received were intended to improve access to new markets and business networks	65
Average rating of improvement of access to markets and business networks on a scale from 1 to 5	3.77
Total number of new customers gained as a result of the services	3,660
Total number of new professional or business relationships formed as a result of the services	767
Total number of clients reporting that new sales, marketing, or branding strategies or materials were developed as a result of the services	46
Total number of clients reporting that new export strategies were developed as a result of the services	15
Total number of clients reporting that the services received were intended to improve your access to financing and investment	51
Average rating of improvement of access to financing and investment on a scale from 1 to 5	3.53
Total number of clients reporting that they received funds from seed, angel, or venture capital deals as a result of the services	13
Total amount of funding received by clients from seed, angel, venture capital deals	$337,000
Total number of clients reporting that they obtained loan funding as a result of the services	2
Total amount of loan funding obtained by clients	$410,000
Total number of clients reporting that they received government funding (grants, contracts, SBIR, STTR)	12
Total amount of funding received by clients from government funding	$257,000

Table D- 3: Average amount of funding obtained by i6 clients, by source

Average amount of funding obtained by clients	
Angel, seed, or venture	$25,923
Loan	$205,000
Government funding	$21,417

Table D- 4: Summarized results from the SFS grantee program outputs survey

SFS Grantee Survey	
Question	**Aggregated response**
Total number of clients or beneficiaries served over the past year through i6 program work.	1667
Number of grants that supported events, networking, and referrals activity	13
Total number of conferences, showcases, exhibitions, networking, or outreach events	95
Number of participants	1698
Total number of client referrals to a technical expert, business contact, investor, etc. for required services and/or support	713
Number of grants that supported mentoring, coaching, and training activities	8
Total number of training or skill assistance sessions	94
Total number of people who attended training or skill assistance	2543
Number of grants that supported the acquisition of facilities and/or equipment	1
Total amount of new space (in sq. ft.) that was developed, purchased, or leased as a result of grants	1000
Total value ($USD) of new equipment that was purchased or leased as a result of grants	$0
Number of grants that supported R&D and technology development activities	3
Total number of new joint research projects facilitated between clients or beneficiaries and university partners	1
Total number of clients or beneficiaries assisted with technology commercialization, licensing, patenting, or other regulatory or government	15
Number of grants that supported financing activities	10
Total number of clients assisted in obtaining angel funding	37
Total amount of angel funding obtained by clients	$6,270,000
Total number of clients assisted in obtaining seed funding	28
Total amount of seed funding obtained by clients	$14,950,450
Total number of clients assisted in obtaining venture capital funding	10

Total amount of venture capital funding obtained by clients	$200,925,000
Total number of clients assisted in obtaining loan funding	13
Total amount of loan funding obtained by clients	$2,725,000
Total number of clients assisted with a grant or award proposal	9
Total amount of grant or award funding obtained by clients	$800,000
Total number of clients assisted with obtaining other types of funding (e.g. contracts, loans, etc.)	4
Number of angel, venture capital, seed or loan funding competitions or events supported	16
Number of grants that supported planning & institutional development activities	6
Total number of hours of outside expertise or professional services, relevant either to your organization's work or your clients' work obtained as a result of support from grants	2050
Total number of hours spent researching funding resources and developing a funding plan	4370
Total number of hours spent on conducting grant-related research, producing plans, reports or tools, and/or on other coordination activities over the past year	1335

Table D- 5: Average amount of funding obtained by SFS grantee clients, by source

Average amount of funding obtained by SFS grantee clients	
Angel	$169,459
Seed	$533,945
Venture	$20,092,500
Loan	$209,615
Grant or other	$88,889

Table D- 6: Summary of combined SFS and i6 program output survey responses

SFS and i6 Grantee Surveys, combined	
Question	**Aggregated response**
Total number of clients or beneficiaries served over the past year through i6 program work	3,619
Number of grants that supported events, networking, and referrals activity	34
Total number of educational, training, and/or networking events	881
Number of participants	16,902
Total number of client referrals to a technical expert, business contact, investor, etc. for required services and/or support	3,178
Number of grants that supported mentoring, coaching, and technical assistance activities	33
Total number of people who attended boot camps, accelerators, or mentoring and coaching programs	5159
Number of grants that supported the acquisition of facilities and/or equipment	5
Total amount of new space (in sq. ft.) that was developed, purchased, or leased as a result of grants	20,200
Total value ($USD) of new equipment that was purchased or leased as a result of grants	$527,300
Number of grants that supported R&D and technology development activities	20
Total number of new joint research projects facilitated between clients or beneficiaries and university partners	51
Total number of clients or beneficiaries assisted with technology commercialization, licensing, patenting, or other regulatory or government	208
Number of grants that supported financing activities	17
Total number of clients assisted in obtaining angel, seed, or venture capital funding	168
Total number of clients assisted with a grant proposal or award application	112
Number of angel, venture capital, seed funding competitions or events supported	40
Number of grants that supported capacity-building activities	22
Total number of hours of outside expertise or professional services, relevant either to your organization's work or your clients' work obtained as a result of support from grants	9,871

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Appendix F: Survey Challenges and Lessons Learned for EDA

This appendix is specifically intended for EDA staff.

While ultimately SRI obtained approximately a 76% response rate for both grantee surveys, which is a very respectable response rate, we had hoped to collect more data, both from grantees and particularly from their clients. We faced several challenges in fielding this survey, due largely to the dual-level design and to our position as a third-party entity removed from the EDA-grantee ecosystem. The two primary challenges we faced are detailed below, along with recommendations for how EDA can mitigate these challenges in their implementation of the surveys.

Survey Fatigue

SRI received feedback from several clients voicing concerns about the apparent redundancy of our survey, as they had recently completed EDA's i6-specific required reporting. Some clients wondered why they had to complete a survey that asked very similar questions to the one they had just completed for EDA, while others said they simply did not have the time to complete another survey. Some grantees also asked to delay distributing the client survey, as they had recently fielded their own client surveys, and did not want to overburden or cause survey fatigue among their clientele. Ultimately, this survey fatigue contributed to a handful of grantees not completing the survey.

EDA Mitigation:

Coordination with other EDA reporting: One way EDA will be better positioned to avoid or mitigate the risk of survey fatigue is by ensuring they coordinate the distribution of this survey with other EDA surveys and required reporting. By working internally to identify all of the necessary reporting they will be asking grantees to complete, EDA staff can determine a reporting schedule that obtains all of the necessary data while spreading out reporting deadlines such that grantees won't feel overburdened or fatigued.

Providing advance notice: While SRI worked with EDA staff to notify grantees that the survey was soon to be fielded, we were unable to provide grantees with substantial advance notice about the survey, and many had not budgeted time for it in their schedules. Since EDA will be building the survey into all of their grants and informing grantees about the reporting requirement through the special terms and conditions of the awards, they will be able to highlight to clients the need to budget appropriate time to respond to the survey. EDA staff should provide very clear timelines for the survey distribution to grantees, and reiterate the need for grantees to provide similar guidance to their clients, in order to facilitate appropriate planning.

Difficulty Reaching Clients

A second challenge encountered by SRI was difficulty in accessing clients of grantees to distribute surveys and follow up to encourage responses. As was mentioned earlier, for the piloting of the survey instrument, SRI distributed the client survey and an accompanying email text to i6 grantee organizations and asked them to forward it to anyone whom they had served over the past year. This inevitably caused some complications in the fielding of the survey, and the inability to directly access clients prevented SRI from following up with them to encourage a better response rate. Additionally, it appears that many grantees did not forward the survey on to their clients, so SRI received a

limited (and possibly biased) sample of client responses. However, EDA is in a better position than was SRI to communicate to grantees the importance of forwarding the surveys on to clients, and to hold them accountable for doing so. Additionally, as the survey is fielded year over year, the process will become more familiar to grantees and the likelihood that they will distribute the surveys as required will increase.

EDA Mitigation

Modify implementation to distribute surveys directly to clients: Should EDA desire, they may decide to alter the implementation of the client capacity outcomes survey to eliminate the need to rely on grantees to distribute the surveys. This could be done by either collecting client contact information from grantees and distributing the survey directly to the clients, or by sending the capacity outcomes survey to grantees and requiring them to collect the necessary information from their clients (however they choose to do so). Either one of these approaches could reduce the complexity of the survey fielding, and hopefully improve response rate.

Providing advance notice and setting clear expectations: SRI was at a disadvantage in trying to distribute the surveys to clients, as a) we were an unknown entity to most grantees, and b) we were coming in largely unannounced, and asking grantees to take on the responsibility of distributing a survey to their clients. EDA, as the provider of funds to grantees, has more credibility and authority to encourage grantees to forward surveys (or collect the required metrics) to their clients. To ensure the most effective survey implementation possible, it is critical that EDA provide substantial advance notice to grantees of the reporting process and timelines, so that they can plan accordingly. It is also critical for EDA staff to be exceptionally clear about their expectations that grantees fully participate in the process and assist with the client capacity outcomes survey as requested. Setting this expectation early and reiterating it throughout the life of the grant will help grantees to accept and embrace their role in the data collection process.