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— RESEARCH NOTE —

## EVALUATION WITHOUT BIAS: A METHODOLOGICAL PERSPECTIVE ON PERFORMANCE MEASURES FOR BUSINESS INCUBATORS

Shaoming CHENG\* and Peter V. SCHAEFFER\*\*

**Abstract:** *Business growth and formation are fundamental drivers of job creation and economic growth. Business incubators provide a nurturing environment, through an array of business support resources and services, where entrepreneurs, start-ups, and small businesses can commercially validate and transform their ideas and concepts into viable and tangible products and services. Despite growing attention to evaluate the performance and impact of business incubators, the existing literature continues to suffer from methodological, theoretical, and empirical limitations. In particular, existing performance measures have inherent biases that lead them to underestimate the role of business incubators in entrepreneurship and economic development in economically distressed areas, which typically face disadvantageous local economic conditions. The purpose of this paper is to explain the need for better performance measures and the difficulties in creating them.*

**Keywords:** ECONOMICALLY DISTRESSED AREAS, BUSINESS START-UPS, BUSINESS INCUBATORS

**JEL classification:** H8, L3, R3

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\*Department of Public Administration, Florida International University, USA.  
E-mail: [scheng@fiu.edu](mailto:scheng@fiu.edu)

\*\*Division of Resource Management, West Virginia University, USA.  
E-mail: [peter.schaeffer@mail.wvu.edu](mailto:peter.schaeffer@mail.wvu.edu)

## INTRODUCTION

New business formation is a fundamental driver of job creation and economic growth in the United States. It is estimated that newly formed firms created over 18 million new American jobs, and the expansion of recent start-ups 44 million more, over the period 1998–2004, representing 17% and 41% of all newly created jobs. Business incubators and related incubation assistance – where the primary goal is to help new businesses survive and thrive – have been playing a critical role in promoting new business creation and generating regional economic development (Campbell and Allen, 1987; Fry, 1987; Markley and McNamara, 1995; Rice, 2002; Udell, 1990; Yu, Yu, and Cheng, 2005). Business incubators provide an array of business support resources and services and thus a nurturing environment where entrepreneurs, start-ups, and small businesses can commercially validate and transform their ideas and concepts into viable and tangible products and services (Acs and Armington, 2006; Smilor and Gill, 1986; Storey, 2003; Yu, Cheng, and Stough, 2006). Business incubation, consequently, has been increasingly recognized as a viable approach for promoting new business formation and accelerating new business growth.

Nevertheless, policy makers, business incubation practitioners and stakeholders, and researchers have lacked a systematic approach for monitoring and evaluating the performance of business incubators across industrial sectors and geographic regions. Despite growing attention by both academics and practitioners to evaluating the performance and impact of business incubators (e.g., U.S. Department of Commerce, 2003), the existing literature continues to suffer from methodological, theoretical, and empirical limitations. For example, prior research has typically used ad hoc approaches and small samples (Bearse, 1998) and hence has lacked consistency, hampering generalizability across measures of incubator performance (Markley and McNamara, 1995; Mian, 1997). Further, previous studies over-relied on self-reported business success/survival and customer satisfaction rates (e.g., Appalachian Regional Commission, 2001), which might be exaggerated (Bearse, 1998; Udell, 1990). In addition, earlier studies overlooked longer-term effects of business incubators because there was no monitoring system to track graduated tenant firms and provide reliable post-graduation data (DiGiovanna and Lewis, 1998; Mian, 1997).

A further methodological concern is that existing performance measures have inherent biases against business incubators in economically distressed areas, where new firms face disadvantageous local economic conditions. In economically challenged regions the role of business incubators in entrepreneurship and economic development may be systematically underestimated. The existing measures do not consider distressed areas' adverse local conditions compared to their more prosperous counterparts and fail to distinguish between the effects of a business incubator in an advantageous from those in a disadvantageous location. Consequently, it is possible that with the existing measures, a successful business incubator in an economically challenged region could show inferior performance to an unsuccessful incubator in an economically advantaged location. This potential failure likely hinders researchers, policy makers,

and incubation practitioners and stakeholders from accurately evaluating the performance of rural business incubators compared to their urban peers. It also prevents them from identifying the specific opportunities and challenges of business incubators in different locations, and from taking action to improve the operations and outcomes of business incubators in rural and distressed regions.

The purpose of this paper is to explain the need for better performance measures and the difficulties in creating them. Two sets of quantitative performance measures, the first from a quasi-experimental approach and the second from an input-output framework will be proposed. Both sets of performance measures differ from previous ones because they control for observable and unobservable external factors across industries and geographic regions that may influence the performance of business incubators. They can therefore eliminate previous performance indicators' inherent biases against business incubators in rural and distressed areas and provide a fairer evaluation of their effectiveness.

## **1. BACKGROUND**

### **1.1. The Development of Business Incubators**

The United States was among the first countries, if not the first, to implement business incubation promoting small enterprise development. The first incubator in the United States appeared in Batavia, NY, in 1959 (Adkins, 2001; Lewis, 2002), but the allocation of significant attention and resources to business incubators and incubation programs did not occur until the late 1980s. It has been estimated that more than half of the currently existing incubation projects were established between the late 1980s and mid-1990s, in part because business incubators were treated as a means to make use of idle manufacturing facilities and create jobs in response to economic recession (Adkins, 1996). Hackett and Dilts (2004), however, maintained that the fundamental reason for the flourishing of business incubators in the late 1980s and early 1990s was the passage of the Bayh-Dole Act that expanded the commercialization of federally funded research results and hence produced significant profit opportunities. Lalkaka (2000) added that incubators in the 1980s essentially offered affordable space and shared facilities, while incubators in the 1990s provided a wide range of professional counseling, skill enhancement, and networking services to connect fledgling entrepreneurs to seed capital, suppliers, and potential buyers.

Incubators are often funded by public resources. The rationale for publicly funded business incubators lies ultimately in addressing market failures, i.e., gaps and deficiencies in the support structure available to new and small firms. Market failures stem from the relatively high costs and risks of providing services to new and small companies compared with larger firms, as well as from the reluctance of the private sector to assume these costs and risks because of often modest returns. Privately funded incubators need "deep pockets" to survive potentially long periods of time before returns can be achieved that are sufficient to even recover costs. So despite visions that incubators should become financially self-sufficient and profit-oriented (Bears, 1998; Quittner, 1999) most have been publicly funded; it has been estimated that a mere four

percent of business incubators are sponsored by for-profit entities (National Business Incubator Association, 2006).

The lack of financial independence and heavy reliance on public funds force incubator management to constantly demonstrate “success” to justify the continued need for subsidies and other public support (Hackett and Dilts, 2004). Thus, incubator managers and stakeholders may be tempted to exaggerate self-reported performance achievements such as business survival rates, elevate perceived success and under-report failures (Bears, 1998; Udell, 1990). Managers mostly justify continued support through their effectiveness in job creation.

Business incubators are critical to the development of entrepreneurship and to growing small businesses in economically distressed areas, yet they are facing many challenges (Weinberg, 1986; Wortman, 1990a, 1990b). Entrepreneurs are needed to reduce poverty and promote economic development in rural America and other regions with distressed economies because traditional production assets in these regions – such as inexpensive labor and abundant resources – are no longer sufficient to compete successfully in a changing global economy (Acs and Malecki, 2003; Appalachian Regional Commission, 2001; Low, Henderson, and Weiler, 2005; Markley, 2006; Mojica, Gebremedhin, and Schaeffer, 2009; Vaughan, Pollard, and Dyer, 1984). As a consequence, traditional “smokestack-chasing” business recruitment, retention, and expansion strategies have been gradually replaced by one that emphasizes homegrown new and small business development (Schaeffer, 2008). Instead of focusing on attracting a “blockbuster” firm, state and local governments are now increasingly turning to helping indigenous start-ups in order to tap their potential to combat poverty, improve the health of rural economies, and create a sustainable economic future for distressed areas.

Business incubators directly provide entrepreneurs with managerial, marketing, financial, and other services, and they significantly contribute to the thriving of rural entrepreneurship and the development of new and small business in rural and other distressed areas (Henderson, 2002; Weinberg, 1986). Compared to their urban peers, however, business incubators in rural regions typically operate in a more challenging context with small budgets, fewer potential new businesses (Greenwood Consulting Group, 2005), and a lack of agglomeration effects. It is necessary to control for and tease out the influences of such factors in the performance evaluation of business incubators in economically challenged regions.

## **1.2. The Performance Evaluation of Business Incubators**

Performance assessment of business incubators emerged in the 1980s as incubators became to be considered an essential tool for new business development, in particular, and economic growth, in general. Early assessment efforts generally took a descriptive approach (e.g., Allen and Levine, 1986; Hisrich and Smilor, 1988; Temali and Campbell, 1984), and were subsequently criticized for lacking a rigorous conceptual and methodological foundation (Allen and

McCluskey, 1990; Mian, 1997). Survival or success rates of incubated firms later were widely used to measure and compare the effectiveness of their business incubators (e.g., Allen and McCluskey, 1990; University of Michigan et al., 1997). Although using survival rates in the temporal evaluation of a given incubator provides insight, using it to directly compare incubators across geographic regions is problematic for the reasons explained above.

To control for the effects of external factors, an experimental or quasi-experimental approach needs to be used with the control group representing what would have happened to tenant businesses in the absence of business incubation. Specifically, a tenant business has to be “matched” with a non-incubated (control) firm of the same age and industry focus, and located in the same geographic area (Bearse, 1998; Sherman and Chappell, 1998; Storey, 1998). In this case, the only difference that may cause firms’ performance to diverge is their participation in an incubator and its effectiveness can be inferred.

Despite various efforts to use quasi-experimental methodology to obtain performance measures, no analysis has yet successfully answered the question: “Does incubator assistance make a significant difference to firm’s performance compared to the performance of comparable companies that have grown up outside of incubators?” (Bearse, 1998, p.323). This is primarily because information on non-incubated control firms has been extremely difficult to obtain. Sherman and Chappell (1998) and Sherman (1998) attempted to construct a control group of non-incubated firms in a quasi-experimental design study in order to estimate the effects of incubators, but they had to abandon the design because of difficulties in identifying “untreated” firms and thus in compiling a statistically meaningful sample. Phillips (2002) took an alternative approach and constructed a comparison group including firms that applied for membership to an incubator but were rejected. This approach suffers from the fact that not every incubator keeps records of rejected applicant businesses. A more serious problem of this research design is that firms accepted into incubators are likely to differ systematically from those who are rejected; that is, this design is likely to suffer from selection bias.

Business incubators in distressed areas also face biases in another set of incubator performance measures, i.e., in their indirect and induced effects. In addition to the direct effects of business incubators, their overall impacts on job creation have also been assessed through multiplier analyses (e.g., Chrisman, 2003; Lewis, 2002; Markley and McNamara, 1995; RESI, 2001; Sherman and Chappell, 1998). However, previous studies focused on the total impacts of incubators in a single location, as their research goal was to compare the cost-effectiveness of incubators with that of other economic development tools in a given spatial area (e.g., Lewis, 2002; Markley and McNamara, 1995). Further, these analyses focused exclusively on *absolute* total impacts and ignored the relative contribution to the local economy. This results in another inherent performance measure bias since urban areas tend to have more closely integrated economic sectors than rural regions, which leads to greater urban multipliers (Blair, 1995) and greater indirect and induced effects, even when both areas experience the same direct impact. The relative contribution analysis is critical,

especially for incubators in distressed areas, because they may play a larger relative role in the local economy than their urban counterparts even if their absolute impacts are smaller.

Most recently, benchmarking has emerged as an alternative method for the performance evaluation of business incubators, but rural business incubators suffer an inherent negative bias once again. Based on the identification and analysis of “best practices” (e.g., the European Commission Enterprise Directorate-General, 2002; U.S. Department of Commerce, 2003), benchmarking is based on the implicit assumption that any incubator can reach the performance level linked to the “best practices,” thus ignoring differences in conditions by location or region. As explained above, the assumption is questionable. Another serious drawback is that benchmarking focuses on “how to do existing things better” rather than “how to do things differently to achieve the target” (Kaplan and Norton, 1993, p.12).

## **2. METHODOLOGICAL IMPROVEMENTS AND DATA NEEDED FOR BETTER PERFORMANCE MEASURES**

Two sets of performance measures for business incubators will be introduced: a quasi-experimental “matching” approach and an input-output “relative contribution” approach. These more theoretically grounded performance measures overcome the inherent biases present in previous measures. Available data sources and data needed for the construction of the two performance measures will be discussed.

### **2.1. The Quasi-Experimental “Matching” Approach**

The development of quasi-experimental quantitative performance measures for business incubators comes is linked to the rise of the theory and practice of social experimentation. The essence of social experimentation is the random assignment of (human) subjects into at least two groups: one eligible for policy interventions (the treatment group) and the other not (the control or comparison group). If the two groups are equivalent except for the treatment, the effectiveness of the program can be inferred and estimated through differences in outcomes between the two groups.

Random assignment is often infeasible in social settings, and the experimental method is adjusted and transformed into a quasi-experimental approach (Glazerman, Levy, and Myers, 2003). The most commonly used quasi-experimental approach is a “matching” method that can be traced back to Fisher (1935), which constitutes a comparison group by statistically matching individuals with subjects in the treatment group to make the two groups as comparable as possible (Campbell and Russo, 1999; Greenberg, Linksz, and Mandell, 2003). The quasi-experimental approach has been widely used in the regional science literature mainly for measuring the impact of a policy on a specific geographic area. For example, Isserman and Rephann (1995) used the method to estimate the economic effects of the Appalachian Regional Commission on its constituent states and counties, Glasmeier and Farrigan (2007)

analyzed the economic impacts of prison development on persistently poor rural counties, and Greenbaum and Engberg (2004) studied the impact of state enterprise zones on urban manufacturing establishments.

In order to evaluate the effectiveness of business incubation it is necessary to understand what would have happened in its absence. The effect can be estimated from the average performance differences of firms assisted compared to those that received no assistance. The quasi-experimental approach has rarely been employed in the evaluation of incubators, chiefly due to the difficulty in assembling data on the control group of non-incubated firms, as discussed above (Sherman and Chappel, 1998; Sherman, 1999; Phillips, 2002).

In the quasi-experimental approach, selection bias is presumed to be present because the subjects in the treatment group are not randomly assigned. Selection bias refers to situations where the outcomes of program nonparticipants may differ systematically from what the outcomes of participants would have been without the program (Heckman et al., 1998). Specifically, businesses admitted to incubators may be subject to two types of selection bias. The first is “self selection,” suggesting that business entrepreneurs who are seeking or are selected in incubation programs may be more educated, more motivated, or more connected to business networks than an average new business owner in the control group. In such a case, businesses in incubators are likely to perform better than peers in the control group. The second possible bias is “administrative selection” bias, referring to competitive selection or screening processes of many business incubators that tend to identify and select the most promising businesses, or at least avoid those least likely to succeed (Storey, 1998). Selected firms may therefore perform better than their matched, non-incubated businesses. Without properly controlling for these biases the effects of incubation programs and the performance of incubators will likely be overestimated.

Selection bias can be mitigated with proper statistical adjustments and controls on “selection,” i.e., non-random assignment (for a review, see Blundell and Costa Dias, 2000, 2008; Heckman, LaLonde and Smith, 1999; Smith, 2000; Winship and Morgan, 1999). Available methods can be roughly divided into “selection on the observables” and “selection on the unobservables” approaches. The first includes matching and propensity score matching. The matching method is equivalent to a linear regression conditional on observed variables, but without imposing any functional specification of the variables (Smith, 2000). The traditional matching method is complemented by the propensity score (Rosenbaum and Rubin, 1983, 1984), which is the predicted probability of a subject being in the treatment group conditional on the subject’s multiple observed factors. Representing a vector of observed characteristics with a single scalar, the propensity score makes it feasible to equate treatment and comparison groups simultaneously on multi-dimensional known attributes (Rubin, 1997; Rubin and Thomas, 1996). Both conventional and propensity score matching rely on observed business owners’ traits, such as, gender and age, and observed firm characteristics, such as, size and capital/labor ratio, and may only adjust for potential selection bias resulting from the observables in both the treatment and comparison groups of businesses.

Unlike matching and propensity score matching, the “selection on the unobservables” approach focuses on unobserved characteristics, and encompasses the difference-in-differences estimator (Ashenfelter and Card, 1985), the instrumental variable estimator (Heckman and Vytlačil, 1999; Imbens and Angrist, 1994), the bivariate normal estimator (Heckman, 1979), and the second-differences estimator (Heckman and Hotz, 1989). These various estimators, however, tend to generate significantly different outcomes. Variability in estimates across estimators arises from the fact that different estimators solve the selection problem under different assumptions about the nature of the selection processes, and these assumptions are often incompatible with each other (Heckman, LaLonde, and Smith, 1999; Smith, 2000). The effectiveness, limitations, and selection of estimators have been heatedly debated and extensively discussed in the literature (for a review see Bertrand, Duflo, and Mullainathan, 2004; Heckman, LaLonde, and Smith, 1999, Reed and Rogers, 2003).

Despite vigorous quasi-experimental research designs deployed to control for selection bias, such bias may continue to be embedded in the results and, hence, the effects of incubators may still be overestimated. However, it may be less likely that such biases will change the *relative* positions of business incubators on a hypothesized performance continuum. This argument is based on an assumption that the biases exist universally and affect business incubators similarly across the continuum. If this is the case, however, policy makers and practitioners will need to be carefully advised how to interpret the potentially overestimated *absolute* effects of incubation programs, and researchers must be careful to ensure that the meaning of the estimated effect is clearly specified.

## **2.2. The Input-Output “Relative Contribution” Approach**

Previous input-output performance indicators for business incubators (e.g., Chrisman, 2003; Lewis, 2002; Markley and McNamara, 1995; RESI, 2001; Sherman and Chappell, 1998) can be improved by a refined input-output performance measure based on the *relative* contribution to the local economy of each individual incubator’s total employment. In the input-output literature, the total impacts – in terms of output, income, or employment – consist of three additive components: direct, indirect, and induced effects. In contrast to direct effects, indirect effects represent impacts created through inter-industry linkages, while induced effects capture impacts derived from household spending (Miller and Blair, 2009).

The ratio of the total and direct impacts is generally referred to as a multiplier. Multipliers or total impacts tend to become greater in geographic areas with greater industrial concentrations and interactions because the initial change (the direct effect) causes more “ripples” in a more integrated economy (Blair, 1995).

Although the multipliers and associated total impacts are directly comparable across geographic units, a simple direct comparison without accounting for the size differences of local economies may be misleading. Thus it may be advisable to use a relative impact performance measure that shows the signifi-



cance of the total impacts relative to the size of a local economy. Such a performance measure also sheds light on whether public funds for incubator development should be allocated to more developed areas, whose economies tend to be more integrated, or to less developed regions.

The refined input-output performance measure focuses on total employment impacts of any individual incubator's graduated tenant firms on the local economy. This is partly because job creation is the paramount goal of most incubators, particularly those in rural and economically challenged areas. However, the data necessary to construct the input-output performance measure are not readily available, primarily because incubator managers have not yet systematically collected information from graduated firms and the jobs those firms create (National Business Incubator Association, 2007). This paper echoes NBIA's efforts to educate and encourage individual business incubators to track graduated incubated businesses and consistently collect information about their performance. What would be needed for the type of performance measurement advocated here is to collect, for example, the number of employees after one year and after five years, and, similarly, information about sales and revenues.

### **3. CONCLUSIONS**

This article has reviewed previously used measures for evaluating the performance of business incubators in the United States and has argued that the approaches relied on to date have had inherent biases against business incubators in rural and economically distressed areas. Such negative biases have prevented researchers, policy makers, and incubation practitioners and stakeholders from accurately evaluating the performance of rural business incubators compared to those of their urban peers and from identifying specific challenges and opportunities by location and geographic area, thereby precluding taking the most effective actions to improve the operations and outcomes of business incubators anywhere. Two sets of potential business incubator performance measures, available data sources, and necessary data to be collected, have been introduced and discussed to eliminate the negative biases existing in prior performance measures. These refined performance measures should be able to provide a more accurate and unbiased assessment of a given individual incubator's effectiveness and impact across geographic areas and industrial sectors when the information needed to operationalize them become available.

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**POUR UNE MÉTHODE D'ÉVALUATION DES PERFORMANCES  
DES INCUBATEURS D'ACTIVITÉ**

**Résumé** - La création et la croissance des entreprises sont des vecteurs fondamentaux de création d'emploi et de croissance économique. Les incubateurs d'activité constituent un environnement propice à la création entrepreneuriale et à la gestation des firmes en offrant une série de services et d'aide aux start-ups et aux petites entreprises, leur permettant de mettre en place, de transformer et de valider leurs idées et leurs concepts pour mener à une commercialisation réussie de produits ou de services. Malgré une volonté croissante d'évaluation des performances et des impacts des incubateurs d'activité, la littérature existante souffre d'un manque de références méthodologiques, théoriques et appliquées. En particulier, les mesures de performances existantes présentent des biais inhérents qui conduisent à sous-estimer le rôle des incubateurs d'activité dans l'action entrepreneuriale, notamment dans les zones en récession, caractérisées par une faible attractivité. L'objectif de cet article est d'insister sur la nécessité de produire une meilleure évaluation de la performance de ces incubateurs d'activité, tout en montrant les difficultés d'une mesure sans biais.