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Geography of Business Incubator Formation in the United States

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The geography of business incubators has seldom been examined against the public aspirations and beliefs that incubators should either inhabit economically distressed areas to alleviate unemployment and poverty (in the case of empowerment business incubators) or proliferate in technologically capable regions to adequately unleash and exploit local high-technology potentials (in the case of technology business incubators). This paper examines the geographic distribution of 719 U.S. business incubators, located within 465 of the 3,141 counties reviewed, drawing upon a newly built incubator population database. In addition, the location factors underlying the formation of business incubators are also identified and analyzed, which leads to the discovery of a dichotomy between rural and urban incubators in their locational determinants.

Keywords: geography; business incubator; entrepreneurship; growth machine; decision-making;

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1. Introduction

Business incubators are intended to guide fledgling enterprises through their growth process within a nurturing environment and, hence, reflect a strong endeavour to promote entrepreneurship, business formation and innovation with dedicated policy interventions (Campbell and Allen 1987; Aernoudt 2004). The first incubator in the United States appeared in Batavia, NY, in 1959 (Adkins 2001; Lewis 2002), and the number grew to only twelve by 1980 (ASME 1996-2008). Since then, however, as a response to the growing economic restructuring pressure brought by the increasingly globalized economy, the interest, confidence and investment scale in business incubator programs continue to soar not only in industrialized countries such as the U.S. and Western Europe but also in industrializing and emerging countries like China and Brazil (Lalkaka 2003; Hackett and Dilts 2004).

Meanwhile, the enormous amount of land, money and human resources that has been poured into the incubator industry has already drawn public concern over its efficiency and is now a subject of intense debate (Yu and Nijkamp 2009; Yu, Stough et al. 2009). Early incubator research literature has shown a vast interest in identifying various motivations that underlie the investment in incubation programs, which include, for instance, combating unemployment, alleviating economic distress and accelerating technology transfer (Campbell and Allen 1987; Castells and Hall 1994; Storey and Tether 1998; Sutherland 2005). Subsequent research has focused more attention on the assessment of the effectiveness of incubation services relative to the natural market environment (Sherman and Chappell 1998; Shearmur and Doloreux 2000) and the discussion of employing more efficient operational models and management tools to improve incubator performance (U.S. Department of Commerce 2003; Hackett and Dilts 2008). Within this vast literature, however, there has been little effort devoted to identifying and understanding the locational pattern of business incubators. As a consequence, policy makers and economic

development practitioners have very limited information from which to consult about the spatial characteristics of incubation behaviour, or to identify those place-specific factors conducive to business incubator formation and effectiveness. Furthermore, while business incubators are designed to tackle socioeconomic issues that already have been found to have strong and evident spatial patterns¹, the lack of knowledge about the geography of business incubators certainly hinders any examination of the linkage between socioeconomic challenges and the policies and programs created to address those challenges. The existence of this knowledge gap also tends to inhibit the impartial assessment of an incubator initiative since the socioeconomic features of a host region and their impacts on the associated incubator's performance have not been systematically captured and separated to form a level playing field for evaluation (Cheng, Jackson et al. 2008; Yu and Nijkamp 2009).

This paper begins to address this knowledge gap from three interrelated perspectives. First, we construct a database to describe and analyze the geographic distribution of U.S. business incubators by identifying their population and obtaining associated location information. Second, we propose a tentative conceptual framework to generalize those critical factors in the location decision-making process of business incubators in the U.S. context, recognizing that some, but not necessarily all, of our conjectures may apply to rural communities in other countries. This framework is not only groundbreaking in terms of conceptualizing the determinants of the geography of business incubators, but it also provides propositions to interpret such geography through further exploratory and confirmatory analysis. Third, we provide an exploratory analysis on the framework by augmenting the U.S. business incubator database with county-level socioeconomic data from the 1999 U.S. Census.

The remainder of the paper is organized as follows. The second section reviews the construction of our database and presents an overview of U.S. business incubators' geographic distribution at a variety of analytical levels. A description and generalization of the location decision-making process for business incubators appears in the third section to establish the theoretical framework for analyzing the geography of business incubators. The fourth section discusses the effects of selected contextual factors associated with the geographic distribution of business incubators, drawing on the augmentation of the database by the inclusion of supplemental socioeconomic information. The final section discusses the implications, limitations and future directions for this research.

2. A First Glance at the Geography of the U.S. Business Incubators

2.1 *Database Construction*

Identifying the population and obtaining associated location information are among the prerequisites for building the geographic overview of U.S. business incubators. Although the National Business Incubation Association (NBIA) has provided a list of 1,115 incubators², it can hardly be relied on even as an approximation of the entire incubator population. This is because 1) NBIA's calculation of the incubator number is primarily based on membership count, which will inevitably include individuals, groups and organizations other than business incubators³ and exclude incubators that have not registered and 2) virtual incubators that do not have physical addresses, provide only professional services but no office space and function just like business consulting firms are also counted as regular incubators in the NBIA list. Researchers must supplement and verify the NBIA list by integrating relevant information from additional sources to construct a more accurate and reliable database.

Accordingly, business incubator information publicly available through state incubation associations and relevant government agencies has been sourced to extend the existing NBIA list⁴. This augmented list was then reviewed for duplicate entries and entries of agencies that did not actually operate incubator facilities. These entries were expunged from the final list. Each entry for the remaining incubator facilities on the list was confirmed by reviewing its Internet web site or telephoning the agency to determine if the entry was a valid business incubator that offered office space and featured professional services such as business counselling and training. The final compiled list consisted of 721 operating business incubators with their mailing address information.

The five digit zip code from the business incubator was used to determine the county in which the facility was located. Using ArcGIS®, a map was prepared that included all zip codes located within each county in the United States. From these data, counties' Federal Information Processing Standard (FIPS) codes were assigned to each incubator facility. Zip codes, however, do not always conform to county boundaries, especially in county border areas. If, after assigning county FIPS codes, it was determined that an identified facility's zip code overlapped counties or had not been assigned, then additional processing would use a county look-up program that matched a city name location to that incubator facility in order to identify a correct, single county FIPS code.

The incubator database was further processed to determine unique county FIPS codes and to count the number of incubators in each county. The county-level database is based on one of the smallest units of political jurisdictions for which social and economic variables are normally available. This incubator database was then matched and joined to a database for the 3,141 counties or equivalent jurisdictions in the United States, again using FIPS codes. The merger of the county database and the incubator allowed for the creation of a binary variable that denoted counties with and without incubators. Our subsequent geographic analysis of U.S. business incubators will be based on this dataset and will be limited to the 48 lower states.

2.2 *A Geographic Overview*

Different aspects of the geographic distribution of U.S. business incubators can be detected by employing different analytical units. In this section, we approach this issue from two perspectives: administration and function. First, business incubator distribution will be examined at the census division level, the state level and the county level to map them at various administrative and jurisdictional levels. Next, in recognition of the functional differences

between rural business incubators and urban business incubators (Hackett and Dilts 2004; Cheng, Schaeffer et al. 2009), the administrative perspective is reinforced by highlighting the rural/ urban division among U.S. business incubators.

In Figure 1 and in the last three columns of Table 1, the number of incubators is seen to vary substantially across U.S. census regions, states and counties. The southern region ranks first with 294 incubators compared to 91 incubators in the western region. The individual states of New York, Oklahoma, Wisconsin, North Carolina and Pennsylvania lead in hosting incubators, each with over 30 in their jurisdictional areas. In contrast, business incubators are much less common in Nevada, Wyoming, Arkansas, New Hampshire, Rhode Island and Vermont, each with less than three incubators. Of the 3,141 counties in the U.S., only 465, or less than 15 percent, host one or more business incubators⁵. While 327 counties host only one incubator, 30 counties host four or more individually. To partially control for the impact of the scale of socioeconomic activities on business incubator formation, we constructed an “incubator density” indicator measured in numbers of business incubators per million people to enable more meaningful comparisons among regions. Shown in Figure 2, the geographic distribution pattern of business incubators in U.S. census regions largely remains the same after the measurement switches from the number of business incubators to incubator density. Regions in the Midwest and South are still more densely populated with business incubators than ones in the West.

[Insert Figure 1 here]

[Insert Table 1 here]

[Insert Figure 2 here]

Another perspective on the geographic distribution of U.S. business incubators is to compare rural areas to urban areas, using the definitions provided by the U.S. Census Bureau, which classifies counties in accordance with the Office of Budget and Management (OMB) guidelines (see Table 1). Areas classified as metropolitan (metro) have an urban core population that exceeds 50,000 while micropolitan (micro) areas have an urban core population of more than 10,000 but less than 50,000. The metropolitan and micropolitan areas cover 93 percent of the total population of the United States. Of the 3,141 counties in the United States, 1,090 counties are located in metropolitan areas and 692 counties are classified as micropolitan counties. Counties outside the Core Basic Statistical Areas (CBSA) account for 1,359 of the counties as well as the majority of land mass area. The OMB classification allows the incubator database to be classified by the rural/ urban division.

In addition to the highly uneven distribution of business incubators among U.S. counties, Table 1 reveals the concentration of incubators in urban areas and their paucity in rural areas. A total of 317 metro counties have at least one business incubator. This represents more than 29 percent of all metro counties and more than 68 percent of all the counties that have incubators. In contrast, less than 15 percent of the micro counties contain incubators while the percentage decreases to less than 4 percent for counties outside the CBSA. All of the counties with four or more business incubators are metro counties, while there are only 12 counties with two to three incubators outside the CBSA and in the micro counties.

3. Revisiting the Geography of Business Incubators

For researchers and policy makers alike, an understanding of the underlying factors that determine the geographic distribution of business incubators is of great value. A carefully theorized geography of business incubators will enable researchers to account for the uneven distribution of business incubators in the U.S. by using the identified location factors. Additionally, it will enable them to further perform evidence-based feasibility analysis and ex-ante evaluation on incubation programs by examining the extent to which local assets in a particular region encompass these factors. Further, federal and local economic development officials will be better able to intervene rationally and effectively in policies affecting local business formation, by understanding and fostering the most critical factors conducive to business incubator development.

However, unlike the abundance of literature analyzing and explaining industrial location and relocation decision-making processes, little work has been done to understand the conditions that give rise to business incubators in a particular U.S. region. Indeed, any previous attempt to address this issue would have been immediately inhibited by the lack of information on how tangible and intangible local assets are involved in planning, financing and managing a business incubator. In this section, accordingly, we first attempt to outline and generalize the business incubator formation process in the U.S. and, thus, build the ground for subsequent analyses on the determinants of business incubator placement. The approach we take to formulating this generalization comprises a traditional economic geography perspective that investigates how local attributes and assets give rise to business

incubators, and a sociological perspective that will reinforce the former standing by considering the impact of the attitude of local interest groups and their collective actions on business incubator formation.

Inevitably, our generalization about the business incubator formation process will be achieved at the cost of overlooking some idiosyncrasies across business incubators. From a global perspective, business incubators are widely known for their diversity in ownership structure and industry focus (Nolan 2003; Aernoudt 2004; Tamasy 2007). For the U.S. case in particular, incubators are often funded by public resources. About 90 percent of incubators in the United States are non-profit. The large number of for-profit incubators, founded primarily during the dot.com boom of the 1990s, did not survive the eventual bust of the .com bubble (ASME 1996-2008). Therefore, it is reasonable to generalize the U.S. business incubator formation process based on the experience of those that are funded publicly. With respect to the diverse industry focus across business incubators, which is defined by tenant firms' industrial classifications, studies in industrial location have shown that businesses in the formative stage often appear to have located in the areas where the founder lived and are less sensitive to the profit-maximizing aspects of location choice than are branch plants (Blair and Premus 1987). As business incubators are normally associated with start-up firms, their formation processes are less likely to be governed by their different industrial foci and, thus, also warrant a generalization process.

3.1 The Locational Decision: a Quasi-selective Process

Publicly funded business incubators in the U.S. that are registered as university and college sponsored account for 25 percent of all U.S. incubators, development foundations and chambers of commerce sponsored 19 percent, governments sponsored 16 percent, economic development corporations sponsored 15 percent, and multiple other organizations sponsored 5 percent. Their construction, staffing, operation and maintenance mostly rely on joint funding agreements between the chief sponsor and the federal or local government economic development agencies (Chandra 2007; Cheng, Schaeffer et al. 2009; Clark 2009). Consequently, a salient feature of business incubator formation is that it is seldom a unilateral decision-making process but rather a result of joint initiatives and coordinated activities among the local communities, local governments and the federal government. In the American federal system, the adoption of an initiative to launch a business incubator must first be mobilized by local stakeholders' negotiation and collaboration and, thus, a grassroots phenomenon based on collective action (Yu, Stough et al. 2009; Ring, Peredo et al. 2010).

Such initiatives are normally proposed by a particular stakeholder as a response to the prominent socioeconomic challenges in the local community and then are widely disseminated for debate among other stakeholders. If the proposition has been well-received locally, a feasibility report typically will be developed to justify the funding and management mechanism of the incubator, particularly within the context of the local socioeconomic profile. Since non-profit incubators are relatively expensive to construct, operate and maintain, community forces can rarely afford to

finance them independently at either the construction stage or at the operation stage. As a solution, those additional potential sponsors identified in the feasibility report will be solicited for investment in the incubator project. These agencies are usually local and federal governments that run associated economic development programs (e.g., states' department of economic and community development, Appalachian Regional Commission, Tennessee Valley Authority, U.S. Department of Housing and Urban Development and the Economic Development Administration of the U.S. Department of Commerce). In theory, such external funding tends to become available when institutional goals and the regional focus of target government agencies are consistent with the anticipated outcome from the proposed incubator program. Another strategy that is also frequently used to attract additional investment is offering governing board memberships to associated government agencies (Humphrey, Erickson et al. 1989; Gulotta and McDaniel 1995).

The preceding generalization outlines a unique feature of business incubator formation in the U.S.—unlike the formation of a branch plant where the parent company is the sole decision maker in selecting the location to invest, the placement of business incubators in a certain location appears to be a quasi-selective process that involves multiple decision makers. Specifically, the formation of an incubator entails a selective location decision-making process in the sense that external funding agencies can choose where their grants go by calculating and comparing the competitiveness of each candidate's locality; however, it is also non-selective since other decision makers, i.e., the local stakeholders, can wield a spontaneous and

collective power to formulate the community's attitude toward business incubators regardless of the prospect of receiving external funding. In other words, the occurrence of a business incubator in a particular location is not only affected by an external funding agency's award decision but is also first preconditioned on a community's capacity to form a consensus among local stakeholders about utilizing business incubators. In light of this, while traditional economic geographic analysis concentrating on the identification of effective local attributes is still somewhat useful in understanding the location choice of funding agencies, it must be complemented by a sociological analysis that can explain why and how interest groups within a community are stimulated and unified to pursue business incubators, so as to formulate a comprehensive and balanced framework for business incubator formation.

3.2 The Determinants of Incubator Geography

3.2.1 Conceptual Framework and Measurements

Drawing on the preceding generalization, we integrate the literature in entrepreneurship, sociology, and regional development to conceptualize the determinants that underlie the business incubator formation process in the U.S. Due to the quasi-selective feature of the placement of business incubators and its analogy to the business formation process, our tentative framework has been largely influenced by, and built upon, the studies explaining the geography of entrepreneurship (Audretsch and Feldman 1996; Audretsch 2002), the place characteristics of business networks (Sommers 1998; Huggins 2000; Anderson and Jack 2002), and the decision-making process of industrial and regional economic development policies (Cheshire

and Gordon 1998; McDonald, Tsagdis et al. 2006). Next, we further refine the elements contained in the framework by examining their relevancy to local aspirations and resolutions of engaging business incubators. As a result, we retain the following factors presented in Figure 3 to constitute the final framework for further exploratory analysis:

[Insert Figure 3 here]

Under place characteristics, ethnic diversity and population age enter as demographic factors that tend to directly influence the attitude of the locality toward entrepreneurship and, thus, may affect its propensity to employ an incubator as an instrument (Greene and Butler 1996; Zhang 2008). Economic factors like income level, unemployment rate and start-up rate are selected because they have well recognized connections with the rationale of utilizing business incubators in combating economic distress, creating jobs and boosting business formation rates (Sherman and Chappell 1998; Storey and Tether 1998). In addition, these factors are often synthesized in different ways by government agencies to define specific areas in which they would invest and, thereby, may qualify or disqualify a place from bidding for those funds.

The structure of the local economy is also included to reflect the differences among industries in business vibrancy and to indicate their impacts on the demand of business incubators in host regions. The geographic and cultural subset is constituted by variables such as proximity to universities and colleges that will create inherent demand for business incubators to mediate technology transfer and commercialization

(Gunasekara 2006). Social capital, both “bridging” and “bonding,” is also necessary to increase the odds of success (Putnam 2000; Scillitoe and Chakrabarti 2010)⁶. It can be an important resource for the development of entrepreneurial ventures (Cornwall 1998; Jack and Anderson 2002; Peredo and Chrisman 2006) and, thus, forms the basis for the process of client firm selection of potential business incubators. The formation of a business incubator, formerly featured as a highly collaborative process, demands “weak ties” among local stakeholders for collective action in planning and management as well as between the host community and external funding agencies for obtaining financial support (Granovetter 1973; Ring, Peredo et al. 2010).. Education attainment is selected because it increases the public awareness of business incubators, along with other entrepreneurship development tools, and is also believed to back the other two variables in this subset (Helliwell and Putnam 1999).

External funding providers’ selection criteria also are introduced in Figure 3 as agency characteristics. As was illustrated, government agencies differ substantially in their legacies and funding schemes from a variety of aspects and, thus, use differing rationales to allocate their funds, both geographically and by mission. For instance, the Economic Development Administration of the U.S. Department of Commerce is well known for its persistent interest in funding business incubators hosted by distressed regions to create more jobs (Reese and Fasenfest 2003), whereas the Small Business Administration and the National Institutes of Standards and Technology tend to invest in high-tech incubators locating in urban areas so as to promote innovation

(Auerswald, Branscomb et al. 2007). When these agency-specific criteria are associated with place characteristics such as income level, unemployment rate and economic structure, they constitute a comprehensive variable set that explains the location choice of government funding, vis-a-vis the *selective process* we defined in Section 3.1. In addition, the interactions and syntheses among other place characteristics, aside from the abovementioned economic ones, are speculated to form the other variable set that accounts for the occurrence of local aspirations and consensus in building business incubators as a precondition. Since the impacts of agency characteristics on the geography of business incubators can be detected directly from their explicitly pronounced institutional commitment, in the remainder of this section we develop an exploratory analysis to examine empirically how place characteristics are affecting the formation and distribution of U.S. business incubators.

Because the initiatives of building business incubators are primarily proposed and executed by local entities, a richer and more precise understanding of the validity and value of our proposed determinants should be achieved by examining county level data rather than state level data and above. Population and economic characteristics for each county were extracted from the Summary Tape File 3 (STF3) as compilation of the 2000 Decennial Census compiled by the United States Census Bureau. These variables include family median income, income per capita, average age cohort, race, high school degree or better. The unemployment average for the five year period 2000-2004 was derived from the Local Area Unemployment Statistics

(LAUS) data program compiled by the Bureau of Labor Statistics (BLS), United States Department of Labor. The business start-up rate was calculated by $\text{birth} / (\text{total} - \text{death})$ using data obtained from the Statistics of U.S. Businesses (SUSB) 2000-2004 compiled by the United States Census Bureau. The quintile rank for each of these data variables is then calculated for subsequent analysis.

To determine the type and number of colleges in each county, the United States Department of Education, National Centre for Educational Statistics, Integrated Postsecondary Education Data System, and Institutional Characteristics database was used. This database provided the county location for all public and private non-profit colleges offering an Associate Arts degree or better. Data collected at the county level were used to determine whether there was a post secondary educational institution within the jurisdiction and to determine whether the program was a two year or four year degree institution.

Unfortunately, ideal empirical measurements for factors like the structure of the local economy, social capital and engagement are insufficiently discussed and unavailable at the county level from public sources. Additional concerns include omitting some important location factors from our conceptual framework and using data from the 2000 Census to develop our 2009 incubator information, prohibiting us from employing confirmatory analytical methods like regression analysis to generate more concrete results. Therefore, we turn to more exploratory statistical tools, such as cross-tabulation and correlation analysis, to maximize our understanding of those measurable factors.

3.2.2 *Exploratory Analysis and Preliminary Results*

In our analysis, the formation of business incubators can be transformed into, and recorded as, a binary variable indicating the dichotomous state of incubator formation in a county. This binary variable can then be used in cross-tabulation and correlation analysis to reveal its possible linkages with those location factors that were previously named.

Shown in Table 2, incubation formation appears to be positively and significantly correlated to all the selected location factors that we could empirically measure, except for the unemployment rate and the start-up rate. However, as we have noted in section 2.2, business incubators located in metro counties have overwhelmingly outnumbered the ones in micro counties and counties outside the CBSA, thus constituting 68 percent of the population of incubator counties. Therefore, it is reasonable to assume that those distinctive features of rural business incubators and their locational determinants might be overshadowed by their urban counterparts. As a response, we apply partial correlation for further analysis while using the OMB definition to control the rural/urban division..

Correlation coefficients for all of the selected location factors have decreased remarkably, as illustrated in the right column of Table 2, once the rural/ urban division is controlled, except for the start-up rate. The shift in results suggests that the correlations between business incubator formation and those selected location factors could be much lower in the rural context than in the urban one, even going in the opposite direction. As a consequence, correlation coefficients for rural counties tend to offset the ones for urban counties and, thus, lead to a weaker correlation for the

entire population in the partial correlation. To confirm this assumption, cross-tabulation analysis was conducted among the rural/urban division location factors for business incubators.

Results of the cross-tabulation analysis are presented in line charts to facilitate reading and interpretation⁷. In Figure 4, the relationship between each selected location factor and business incubator formation is first analyzed for the general population and then against the very urban (metro) and rural situation (outside the CBSA) separately. As expected, for most location factors, excluding education attainment and start-up rate, the business incubator formation pattern differs in rural and urban areas while the overall pattern for the population tends to echo the urban scenario due to urban incubators' overwhelming proportion. Compared to counties without business incubators, the populations of urban incubator counties are younger, more ethnically diverse, richer, less unemployed and more adjacent to universities and colleges. The populations of rural incubator counties are relatively older, less ethnically diverse, poorer, more highly unemployed and seldom have access to local universities or colleges. In other words, business incubator formation in urban and rural counties tends to seek the same location factors, although from opposite ends of the spectrum. Despite these differences, both rural and urban incubator counties appear to be more educated than counties without incubators.

Such a dramatic dichotomy between the geography of rural and urban business incubators may be important empirical evidence for several unresolved disputes. First, it has been long argued that U.S. business incubators have an implicit high technology imperative (Sherman and Chappell 1998; U.S. Department of Commerce 2003) and, therefore, overlook business formation, firm growth and entrepreneurship development in other industries. Our evidence shows this argument to be debatable. Even though it is plausible that the urban area is a conducive environment for high technology firms because the population is younger, richer, more diversified and has access to nearby universities or colleges (C. Devol 1999; Cortright and Mayer 2001; U.S. Department of Commerce 2003), it is still questionable whether or not the development of high-tech industries is non-conducive to rural incubator counties where there is significant poverty, high unemployment rates, and scarce access to local universities and colleges. This conflict between the place characteristics of rural business incubator counties and the recognized profile of high-tech regions is a further challenge to utilizing business incubators to promote high technology industry development in rural America, as optimistically recommended by many researchers and policymakers (Goetz and Rupasingha 2002; Tamasy 2007).

Second, in Section 3.1, we postulate that business incubator formation is built on a quasi-selective process that requires the congruity between indigenous consensus (the predetermined process) and external funding's location choice (the selective process). However, the relative importance of these two processes has been left unspecified. The extent to which the "*selective process*" can actually affect the

formation of business incubators is found to be rather limited, since the concentration of incubators in more prosperous urban counties apparently contradicts the institutional commitments of leading incubator sponsors, i.e. the Economic Development Administration, to serve economically distressed areas, both urban and rural. Accordingly, in relation to the concern of obtaining place characteristics that can match the institutional commitments of funding agencies, more attention should be directed to explaining why prosperous urban counties and distressed rural counties are more capable of formulating consensus among local stakeholders and mobilizing community resources to engage business incubators.

Third, the performance of rural business incubators is controversially poorer than that of the urban business incubators (Cheng, Jackson et al. 2008; Cheng, Schaeffer et al. 2009). Disputes derive primarily from the perception that even though rural business incubators may face disadvantageous local conditions compared to their urban counterparts, existing performance measures may unfairly underestimate their role in rural entrepreneurship and rural economic development. Therefore, it is highly possible that with the existing measures, a successful business incubator operating in an economically challenged rural area shows inferior performance to an unsuccessful incubator that happens to be in an economically advantageous urban area. The results of our analysis offers, for the first time, direct, comprehensive and solid evidence to support this argument by affirming that urban and rural business incubators in America do inhabit contrasting economic environments. Consequently, our research findings suggest that existing performance

measures for business incubators, such as innovation, the creation of new and high quality jobs, and the generation of profits (Sherman and Chappell 1998) must be scrutinized or even reinvented, if necessary, to account for this sharp contrast and, therefore, avoid bias.

4. Discussion

As discussed in the beginning of Section 3, by revisiting the geography of business incubators in the U.S., we expect to identify those place characteristics that determine the geographic distribution of incubators. Drawing on the previous exploratory analysis, we further recognize that the formation of a business incubator, a nominal quasi-selective process, is less reflective of those external funding agencies' preferences and more compatible with local stakeholders' values, aspirations and abilities to mobilize resources via collective action. Next, we preliminarily examine why prosperous urban counties and distressed rural counties are more attracted to business incubators and are better positioned to organize collective action and local resources.

It has been argued for decades that the political and economic essence of any given locality in the U.S. is *growth* (Molotch and Logan 1987), where local stakeholders are convinced by the land-based elite to compete with other places for growth-inducing resources. As a result, it is necessary to see each geographical map not only as a demarcation of legal, political, or topographical features, but as a mosaic of local interests capable of forming coalitions that act to pursue growth. When these coalitions flourish, they constitute a powerful "growth machine" that leverages

community resources to gain government support and enhance the growth potential of the area. In other words, local growth coalitions are accustomed to working through their members' vertical networks to influence the location choice of regional, state, or national agencies' development programs.

At this point, business incubators, long and widely recognized as a tool for spurring economic development, are seen to be desired, advocated and sponsored by growth alliances at various scales—"a residential block club, a neighbourhood association, a city or metropolitan chamber of commerce, a state development agency, or a regional association" (Molotch 1976). Studies have shown that the more social capital and education a population has, the more likely it is to facilitate the formation of local growth coalitions and increase their influence on the local community (Flora, Sharp et al. 1997; Ring, Peredo et al. 2010). Our exploratory analysis further finds that high education attainment rate characterizes business incubator counties in both urban and rural areas, which can be used indirectly to infer the connections between incubator formation and local growth machines.

Though the existence of local growth machines is ubiquitous, their abilities to affect the outcome of community decision-making vary from place to place where different economic and political dynamics have resulted in different priorities of local public concern. In less developed areas, empowering growth often remains atop the community agenda and naturally brings those promoting growth into a power position. For developed areas, emphases are usually placed on maintaining their competitive edges and fostering capabilities to sustain growth under new situations or

emerging challenges, which still fosters growth as an activity in promoting growth-inducing projects as long as they are somewhat visionary.

As increased income fulfils needs, affluent areas are more alert to the costs and problems of growth, i.e. social disparity, increased air and water pollution, traffic congestion, and overtaxing of natural amenities (Molotch and Logan 1987; Isserman 1993) and are, thus, inclined to replace growth with other symbolic issues that gain more public attention. In this respect, the *local economic factors* we listed in Figure 3, other than affecting the decision of external funding agencies, critically constrains the intervention in community decision-making and the mobilization of local resources of local growth machines. For instance, local growth coalitions are placed in prosperous urban counties to advertise technology-oriented incubators under the name of boosting innovation and enhancing local competitiveness, because local political and economic priorities are often overwhelmed by maintaining those counties' edges of competition and images as the technological vanguards. Likewise, growth coalitions in lagging rural counties are more likely to efficiently formulate consensus with the rest of the local stakeholders because job-oriented incubators can serve as catalysts for economic vitality and can directly address local concerns about unemployment and economic restructuring. Conversely, in affluent counties where economic and technological pressures are less prominent, the public is expected to have more equally diversified interests and, thus, oblige local stakeholders to create a balance between equally important community goals. As a result, the influence of local growth coalitions is inevitably diluted, and their abilities to leverage community

resources to compete for external funding in financing incubators are severely weakened.

In summary, building on the empirics of the geographic distribution of U.S. business incubators and an exploratory analysis of their predetermined place characteristics, we speculate that the placing of business incubators in America results more evidently from indigenous consensus-building and resource-mobilizing processes rather than external location choices made by government funding agencies. Specifically, local growth alliances are identified as key factors to advance business incubators as economic development programs. The occurrence of these alliances depends on the quality and endurance of local elite coalitions who will benefit most from winning investments in economic development programs, and, thus, will be affected by local cultural characteristics such as social capital and education attainment. However, the effectiveness of the local growth machine discourse varies in different places and is largely determined by how growth is ranked among a particular community's priorities. As prosperous urban counties and lagging rural counties constitute two extreme sets of areas that both target growth respectively from the high end and the low end, local stakeholder and resources there tend to be more easily convinced and mobilized by local growth machines to build business incubators.

5. Concluding Remarks

The contributions of this research are fourfold: 1) constructing a comparatively clean database for the U.S. business incubator population; 2) examining the geographic distribution of business incubators at various geographic, administrative and functional levels by drawing upon the aforementioned database; 3) generalizing and conceptualizing the location decision-making process of business incubators to unveil those critical factors (selective or predetermined) underlying business incubator formation; 4) conducting an exploratory analysis based on empirical data at the county level to specifically investigate the impact of each location factor.

The results of our analysis show that business incubators in the U.S. are unevenly distributed across regions, states and counties and are highly concentrated in urban areas. While business incubators may be intended to address different types of local concerns, incubator location decision-making can be generalized as a quasi-selective process in which local stakeholders' initiatives, collaborations and consensuses become the cornerstone for later competitions for associated federal incubator assistance grants. An array of locally bounded demographic, economic, geographic and cultural factors has been proposed and elaborated on to account for the underlying forces that foster local collective action in hosting business incubators. Our exploratory analysis reveals that urban counties and rural counties that accommodate business incubator formation have exhibited contradicting profiles, except that both rural and urban incubator counties appear to be more educated than counties without incubators. This dichotomy between the geography of rural and urban business incubators not only advances our understanding of some long-standing

disputes in business incubator study, but it also inspires a further discussion on adopting a sociological “growth machine” theory to tentatively explain the uneven distribution of business incubators in the U.S.

Before concluding, we acknowledge that this research has several limitations and we offer some direction for future examination. A salient shortcoming of this endeavour is our inability to identify measures for crucial location factors like social capital at the county level and, thus, the inability to examine or control their effects on the formation of business incubators. We expect to improve our results with an in-depth exploratory analysis and further confirmatory analyses by continually collecting data for these factors and augmenting the database. The structure of our conceptual framework for understanding the locational formation of business incubators may also be controversial when viewed by some *ad hoc* experiences. Therefore, we plan to verify and improve our proposition with wider survey questions in the next stage of our research. Finally, it is also noteworthy that due to the high vibrancy of the business incubation industry and the divergence in defining a business incubator, the accuracy of our database for the U.S. incubator population should be tentatively viewed and is subject to constant upgrade.

Endnotes:

1. See discussion on the geography of underdevelopment, unemployment, entrepreneurship and innovation in Audretsch and Feldman (1996), Turok and Webster (1998) and Audretsch and Keilbach (2005).
2. From http://www.nbia.org/resource_center/bus_inc_facts/index.php, retrieved February 7, 2009.
3. See http://www.nbia.org/about_nbia/.
4. Specifically, these resources include the lists of incubators that are funded by the U.S. Department of Housing and Urban Development's community development block grants, the Tennessee Valley Authority's business incubation programs, the Economic Development Administration and the U.S. Department of Agriculture's incubator activities.
5. However, it should be noted that the actual number of counties under the influence of business incubators should be larger since some of the incubators are the result of joint efforts of multiple counties and communities (Gulotta and McDaniel, 1995).
6. The strength in social network has been defined as a compilation of emotional intensity, intimacy, time and reciprocity (Granovetter, 1973). The strength of weak ties lies with their ability to foster information exchange across different network systems while strong ties are needed within a particular network to act upon the information. Without contact with other strong tie groups through weak ties, a network tends to be isolated from external resources and opportunities; in absence of strong ties, a network itself becomes fragmented and incapable of coordinating in action. According to Harper (2001), Putnam (2000) and Woolcock (2001), bridging social capital between comparatively heterogeneous groups is often found among weak tie network systems to lubricate a network's ability to engage in mutually beneficial interactions while bonding social capital exists within strong tie network, among homogeneous groups such as families and neighbours, to glue community members together.
7. For parsimony, we only display cross-tabulation results for parts of the factors as the most representative cases for demonstration. The full results will be provided upon request.

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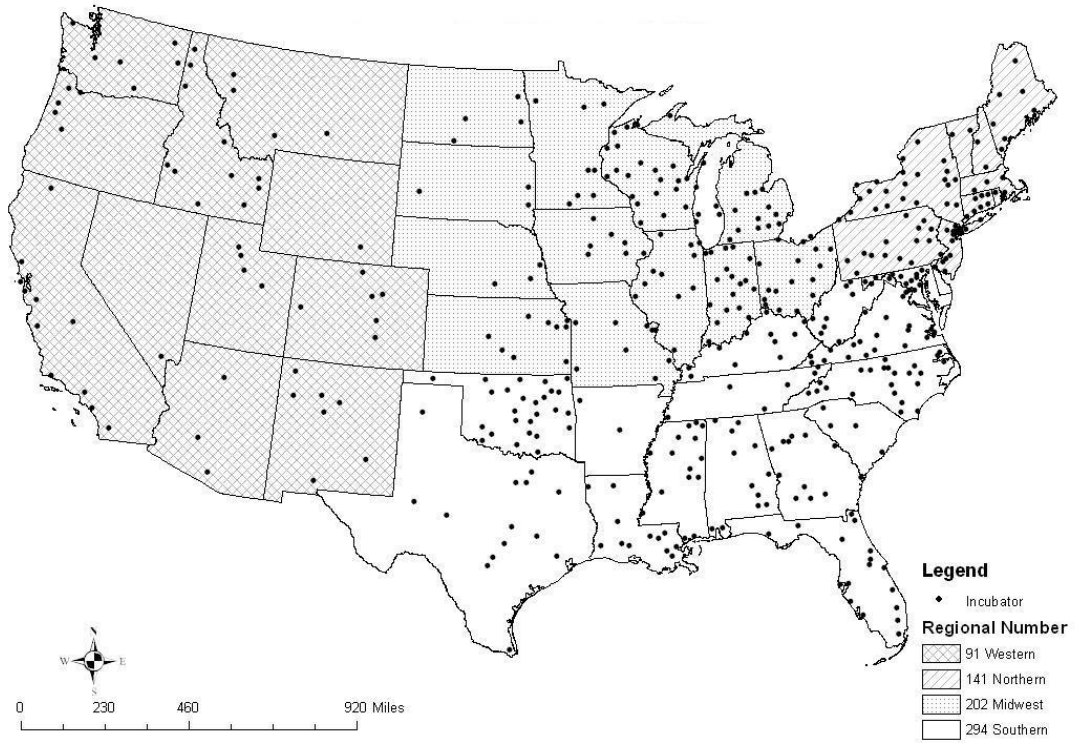


Figure 1: Geographic Distribution of U.S. Business Incubators in Census Regions, States and Counties



Figure 2: U.S. Business Incubator Density in Census Regions

Table 1: Geographic Distribution of U.S. Business Incubators by Rural/ Urban Division

Number of Incubators	Metro Counties		Micro Counties		Outside CBSA Counties		Total Counties		
	Total Counties	Percent of Counties	Total Counties	Percent of Counties	Total Counties	Percent of Counties	Total Counties	Percent of Counties	Percent of Incubator Counties
0	772	70.89	574	85.16	1,330	96.52	2,676	85.2	
1	191	17.54	92	13.65	44	3.19	327	10.41	70.32
2	74	6.8	7	1.04	3	0.22	84	2.67	18.06
3	22	2.02	1	0.15	1	0.07	24	0.76	5.16
4	12	1.10	0	0	0	0	12	0.38	2.58
5	12	1.10	0	0	0	0	12	0.38	2.58
6	3	0.28	0	0	0	0	3	0.1	0.64
7	1	0.09	0	0	0	0	1	0.03	0.22
8	1	0.09	0	0	0	0	1	0.03	0.22
11	1	0.09	0	0	0	0	1	0.03	0.22
Summary \geq 1	317	29.11	100	14.84	48	3.48	465	14.79	
Total	1,089	100	674	100	1378	100	3141	100	100

Note: The “Summary \geq 1” row presents the summary statistics for counties that host at least one incubator.

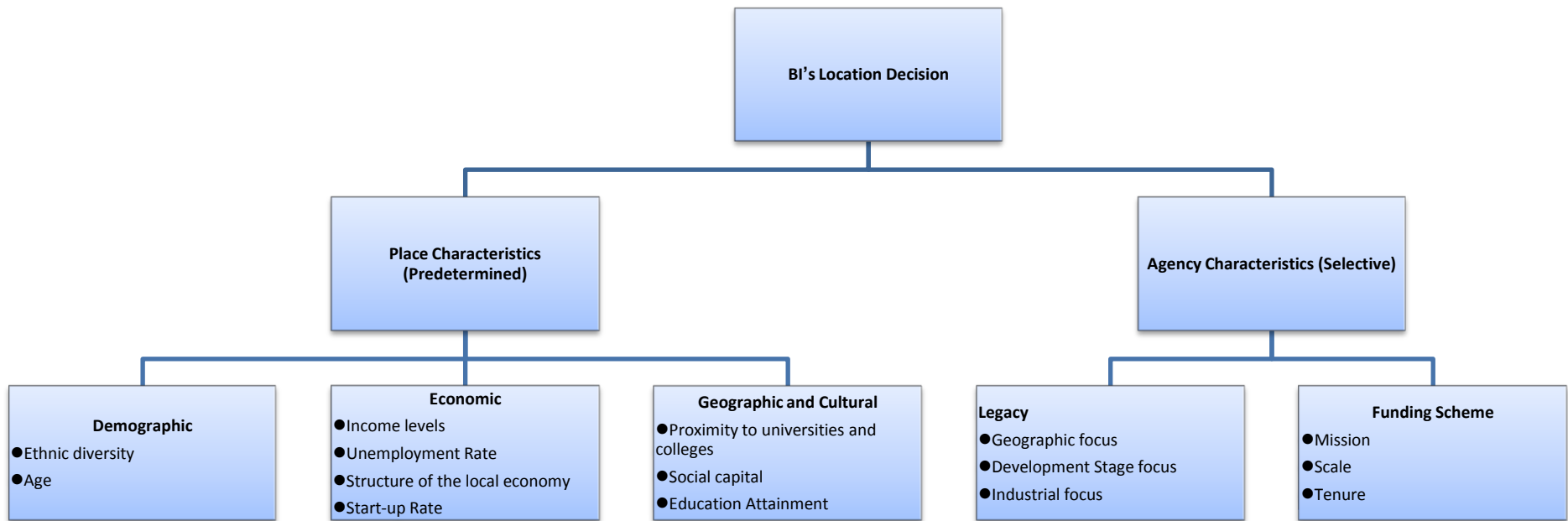


Figure 3: Location Factors for Business Incubator Formation in the United States

Table 2: Correlations between Business Incubator Formation and Selected Location Factors

Determinants	Incubator Formation	
	<i>Correlation</i>	<i>Partial Correlation</i>
Family Median Income	0.231***	0.074***
Per Capita Income	0.247***	0.112***
Average Age Cohort	0.217***	0.126***
Percent Non White	0.171***	0.097***
Percent at least High School	0.186***	0.111***
Percent at least BA A Public or Private	0.337***	0.275***
Non-profit Two Year College in County	0.338***	0.233***
A Public or Private Non-profit Four Year College in County	0.470***	0.330***
A Public or Private Non-profit Offering an AA Degree or Better	0.393***	0.306***
Unemployment Rate	-0.045**	-0.014
Star-up Rate	0.004	-0.041*

Notes: *, ** and *** denote significance at the 0.1, 0.05, and 0.01 level.

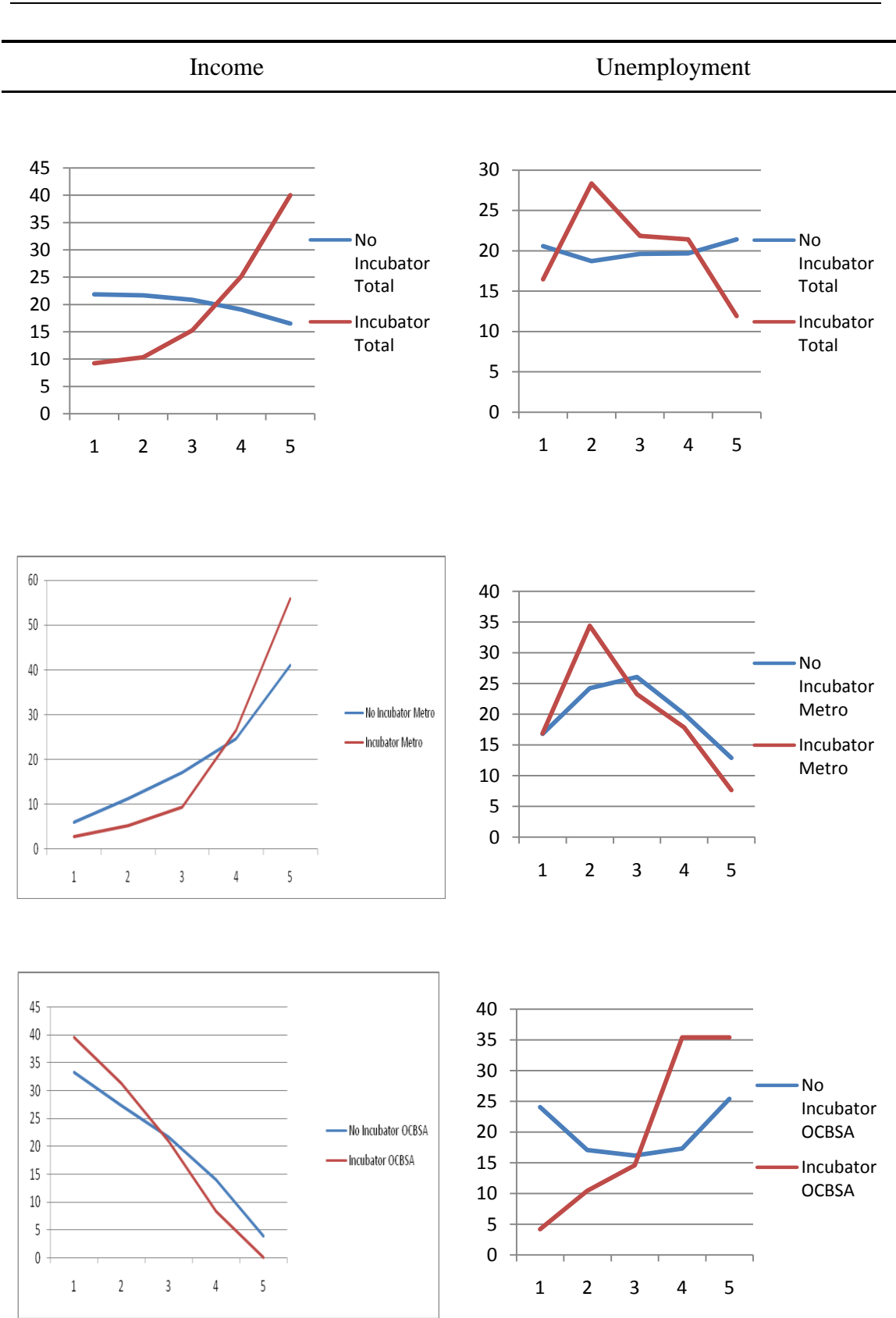


Figure 4: Selected Cross-Tabulation Results between Locational Factors and the Rural/ Urban Division

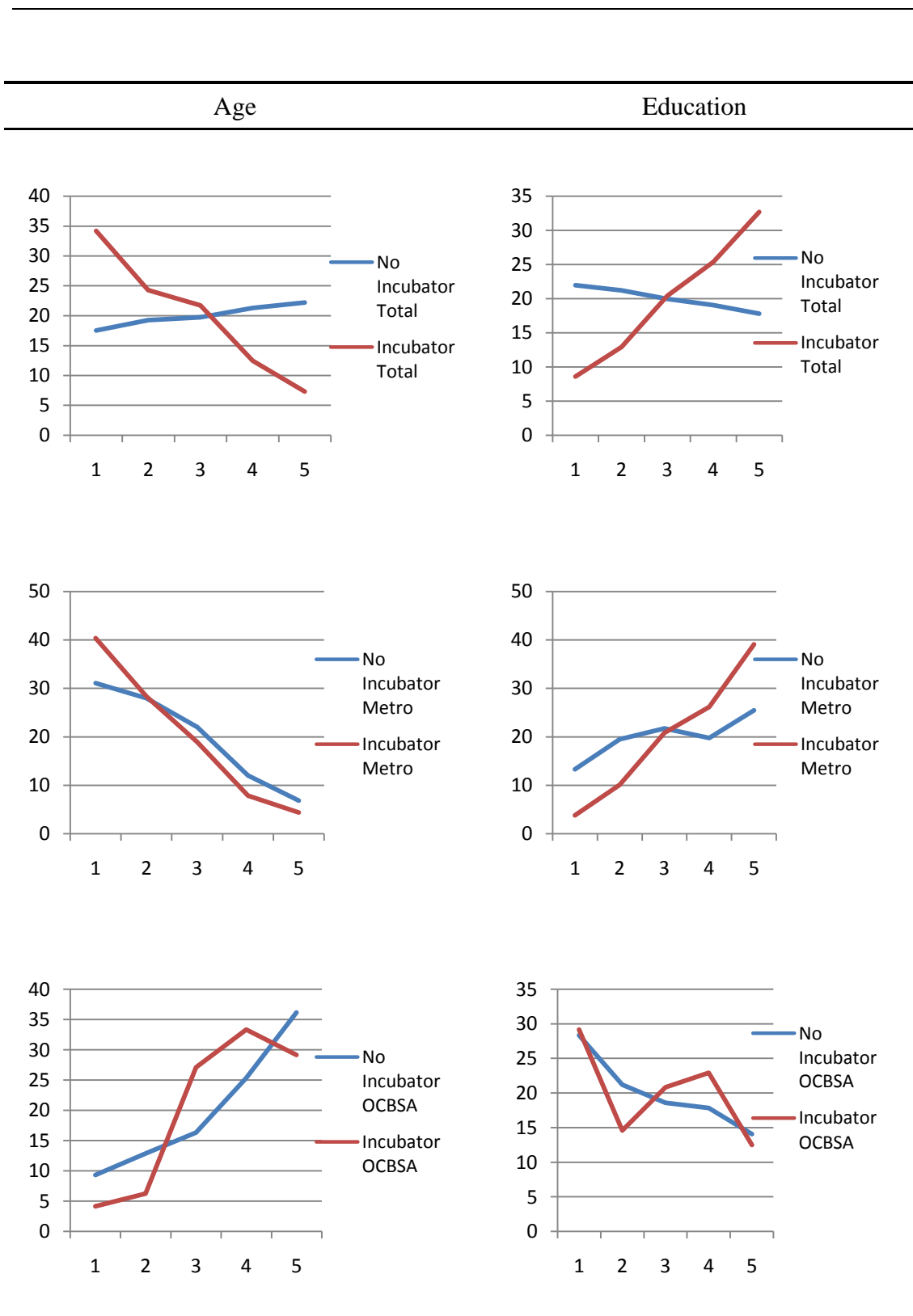


Figure 4 (continued.)

Note: For each line chart, the horizontal axis represents the quintile of the location factor, and the vertical axis indicates the proportion of the counties under concern. The line, therefore, shows the percentage of a specific type of county that falls in the quintile measure of a location factor.

