

Toward the Geography of Business Incubator Formation in the United States

Prepared for the 56th North American Regional Science Association International (RSAI) Conference

Junbo Yu*, Mark Middleton and Randall Jackson

Regional Research Institute, West Virginia University

[Abstract]

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). In this paper, the geographic distribution of 719 U.S. business incubators, which are located in 465 out of the 3,141 counties, is examined 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.

Corresponding Author: Junbo Yu, Regional Research Institute, 886 Chestnut Ridge Road, PO Box 6825, Morgantown, WV 26506-6825, U.S.A. Email: Junbo.Yu@mail.wvu.edu

1. Introduction

Business incubators are intended to guide starting enterprises through their growth process with a nurturing environment and hence reflect a strong endeavor to promote entrepreneurship, business formation and innovation with dedicated policy interventions (Aernoudt, 2004; Campbell and Allen, 1987). 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 the 1980s, however, as a response to the increasing economic restructuring pressure brought by the New 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 (Hackett and Dilts, 2004; Lalkaka, 2003).

The enormous amount of land, money and human resources poured into the incubator industry has already drawn the public concern on their efficiency and is now a subject of intense debate (Yu and Nijkamp, 2009; Yu, et al., 2009). Incubator research literature at the early stage showed great interest in identifying various motivations underlying the investment on incubation programs which comprise, 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 focus paid more attention to the assessment of the effectiveness of incubation service in relative to the natural market environment (Shearmur and Doloreux, 2000; Sherman and Chappell, 1998) and the

discussion of employing more efficient operational models and management tools to improve incubators' performance (Hackett and Dilts, 2008; U.S. Department of Commerce, 2003). Among this vast literature, however, little effort has been made to identify and understand the location pattern of business incubators. As a consequence, policy makers and economic development practitioners have very limited information to consult on the spatial characteristics of incubation behavior, and to identify those place-specific factors that are conducive to business incubator formation. Furthermore, while business incubators are designed to tackle socioeconomic issues which are already found to have strong and evident spatial patterns¹ (), the lack of knowledge on the geography of business incubators certainly hinders the examination of the linkage between 'the cure' and 'the disease'. 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 cannot be systematically captured and separated to form a level playing field for evaluation (Cheng, et al., 2008; Yu and Nijkamp, 2009).

This paper attempts to address the aforementioned gap from three interrelated perspectives. First, we will construct a database to describe and analyze the geographic distribution of U.S. business incubators by identifying their population and location information. Second, a tentative theoretical framework will be proposed to generalize those critical factors in the location decision-making process of business incubators in the U.S. context. This framework is not only ground-breaking in terms

¹ See discussion on the geography of underdevelopment, unemployment, entrepreneurship and innovation in (Audretsch and Feldman, 1996; Audretsch and Keilbach, 2005; Turok and Webster, 1998)

of conceptualizing the determinants of the geography of business incubators, but also provides a hypothesis to theorize such geography for further exploratory and confirmatory analysis. Third, an exploratory analysis on the framework was conducted by augmenting the U.S. business incubator database with county-level socioeconomic data from the 1999 Census.

The remainder of the paper is organized as follows. The second section reviews the construction of our database and presents rough pictures 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 of analyzing the geography of business incubators. The fourth section explores the effects of some contextual factors on the geographic distribution of business incubators drawing on the augment of the database with the inclusion of more associated socioeconomic information. The final section discusses the implications and future directions of this research.

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

2.1 Database Construction

The identification of the population and the acquisition of 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

² From http://www.nbia.org/resource_center/bus_inc_facts/index.php, retrieved February 7, 2009.

approximation of the entire incubator population. Due to the facts that 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 who haven't registered and, 2) virtual incubators who do not have physical addresses, provide only professional services but no office space and function just as business consulting firms are also counted as regular incubators in the NBIA list, researchers will have to supplement and verify the NBIA list by integrating relevant information from additional sources in seek for a more reliable database.

In response, we improved the NBIA list first by adding from lists of state associations of incubators and other sources that listed incubators⁴. The list was then reviewed for duplicate entries and entries for agencies that did not actually operate incubator facilities. These entries were expunged from the incubator study list. Each entry for remaining incubator facilities on the list was confirmed by reviewing their internet web sites or telephoning the agency to determine if the entry was a valid business incubator offering both office space and featured professional services such as business counseling 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 this data

³ See http://www.nbia.org/about_nbia/.

⁴ Specifically, these resources include the lists of incubators that are funded by HUD's community development block grants, TVA business incubation programs, EDA and USDA incubator activities.

county FIPS codes were assigned to each incubator facility. Zip Codes however do not always conform to county boundaries, especially, in areas near county lines. If, after assigning county FIPS codes, it was determined that a zip code was located in more than one county or no zip code entry for an incubator facility. Additional processing on the data was performed using a county look-up program that allowed matching city name location for incubator facility in order to identify a 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 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 code. The merger of the county database and the incubator allowed for the creation of a dummy variable consisting of counties in which no incubators are located, as well as counties that have incubators. Our subsequent geographic analysis of U.S. business incubators will be based on this dataset and 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 administration and jurisdiction levels. Next, being aware of the function differences between rural business incubators and urban business incubators (Cheng, et al., 2009; Hackett and Dilts, 2004), the administration perspective will be reinforced by highlighting the rural/ urban division among U.S. business incubators.

In Figure 1 and Table 1, the number of incubators is seen to vary significantly across US census regions, states and counties. The Southern ranks the first with 294 incubators inside the region while there are only 91 incubators in the Western. States like New York, Oklahoma, Wisconsin, North Carolina and Pennsylvania are taking the lead in hosting incubators, each with over 30 in their jurisdictional areas. In contrast, business incubators are comparatively less common in Nevada, Wyoming, Arkansas, New Hampshire, Rhode Island and Vermont, each with less than 3 incubators. Of the 3,141 counties in U.S., only 465, or less than 15% counties host one or more business incubators⁵. While 327 counties have only one incubator resident, 30 counties host 4 or more individually. In order to somewhat control the effect of the scale of socioeconomic activities on business incubator formation, we construct an “incubator density” indicator measured in number 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 after the measurement switches from the number of business incubators to incubator density. The Midwest and the Southern are the leaders in

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 in fact the results of joint efforts of multiple counties and communities (Gulotta and McDaniel, 1995)

incubator density while the Western still occur to be a sparse area in incubation activities.

[Insert Figure 1 here]

[Insert Table 1 here]

[Insert Figure 2 here]

Another look at the geographic distribution of U.S. business incubators is by rural versus urban area (See in Table 1), utilizing the definitions provided by the U.S. Census Bureau which classifies counties in accordance with Office of Budget and Management (OMB) guidelines. Areas classified as Metropolitan (Metro) 50,000 have an urban core population while Micropolitan (Micro) areas have an urban core of more than 10,000 but less than 50,000 population. The Metropolitan and Micropolitan areas represent 93% of the total population in 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 Core Basic Statistical Areas (OCBSA) account for 1,359 of the counties as well as the majority of land mass. 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 area and their paucity in the rural area. 317 counties, each of which has at least one business incubators, are found to be Metro counties. This stands for more than 29% of all the Metro counties and more than 68% of all the counties that have incubators. In contrast,

only less than 15% of the Micro counties have incubators inside while the percentage decreases to less than 4% for OCSB counties. All the counties with 4 or more business incubators locate are Metro counties while there are only 12 counties in total with 2 to 3 incubators in the Micro and OCBSA counties.

3. Revisiting the Geography of Business Incubators

As for researchers and policy makers, the identification of those underlying factors that determine the geographic distribution of business incubators is a more challenging task and hence of greater value in seeking for the geography of business incubators. Researchers will primarily benefit from the findings by examining the consistency between these locational factors and the alleged motivations of setting up business incubators in a specific region to evaluate the efficacy of government policies. At the meantime, federal and local economic development officials are allowed to intervene local business formation more efficiently by accurately locating and engaging those most effective determinants. However, unlike the abundance of literature describing and explaining the locational process in industrial and migrating sites' decision-making, little work has been done to understand the locational decision of business incubators. In this section, accordingly, we attempt to provide a generalization about the process of locational choice for U.S. business incubators from which the determinants of their placement will emerge.

Inevitably, our generalization about the process of locational choice will be enabled with the price of overlooking some idiosyncrasies among business incubators. From a global perspective, business incubators are widely known for their diversities

in ownership structure and industry focus (Aernoudt, 2004; Nolan, 2003; 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 have non-profit status and those large numbers of for-profit incubators we founded only during the dot.com boom of the 1990s hardly survived the eventual bust (ASME, 1996-2008). View at this point, it is fairly reasonable to generalize U.S. business incubators' locational choice based on the experience of those who are funded publicly. On the other hand, firms in different industries are also found to differ in the way they weigh same location factors during a site selection. Therefore, incubators that are designed to host startup firms from a particular industry may also be suspected to have unique site requirements. However, studies in industrial location have shown that businesses in the formative stage appear to locate in the area where the founder lived and are less sensitive to the profit-maximizing aspects of locational choice than branch plants (Blair and Premus, 1987). In result, the influence from tenant firms' industry focus on the locational decision-making of business incubators is presumed to be trivial in our subsequent generalization.

3.1 The Locational Decision: a Quasi-selective Process

Though publicly funded business incubators in U.S. may be registered as university and college sponsored (25% of all U.S. incubators), development foundation and chamber of commerce sponsored (19%), government sponsored (16%) economic development corporation sponsored (15%), multiply sponsored (5%) and so on, their construction, staffing, operation and maintenance mostly rely on a joint

funding agreement between the chief sponsor and the federal and local government's economic development agencies (Chandra, 2007; Cheng, et al., 2009; Clark, 2009). Therefore, the most important aspect of the locational decision is that it is seldom only a location decision. It is a joint initiative of economic development among the local communities, local governments and the federal government. In American's federal system, the adoption of an initiative to launch a business incubator must rely on local stakeholders' negotiation and collaboration and thus a grass-root phenomenon based on collective action (Yu, et al., 2009).

Such initiatives are normally proposed by a particular stakeholder as a response to the prominent socioeconomic challenge in the local community and then widely disseminated among other stakeholder. If the proposition has been well taken locally, a feasibility report will be developed to justify the funding and management mechanism of the incubator, particularly against the local socioeconomic profile. Since non-profit incubators are relatively expensive to construct, purchase, maintain and operate, rarely can they be financed independently by any local public organization, either at the construction stage or at the operation stage. Therefore, those additional potential sponsors identified in the feasibility report, most of which are usually local and federal governments who 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) will be informed to consider their investments in

the incubator project. In reality, such external funding tends to become available when strong consistency exists between the institutional goals and regional focus of target agencies and the anticipated outcome from the incubator construction, in addition to the offering of a governing board membership (Gulotta and McDaniel, 1995).

The preceding generalization reveals a very unique feature of the locational decision process of U.S. business incubators—unlike the locational choice made by existing firms or individual migrants, the placement of business incubators in a certain location appears to be a quasi-selective process. In specific, the locational decision of an incubator is selective in the sense that it is conditionally enabled by the awardness of competitive external funding, but it is also predetermined since all stakeholders other than external funding agencies are strictly locally bounded. View at this point, the location decision of U.S. business incubators is more analogous to the “business formation” issue: with the selective regulations applied to each candidate equally, the geographic distribution of startups will depend on place characteristics in economy, demography and amenity (Glaeser, et al., 2009).

3.2 The Determinants of Incubator Geography

3.2.1 Conceptual Framework and Measurements

Starting from the generalization of U.S. business incubators’ locational decision process, we develop a conceptual framework to map the determinants that underlie the locational decision of business incubators (Figure 3). Due to the quasi-selective feature of the placement of business incubators and its analogy to the business formation process, our preliminary framework has substantially drawn on the

literature explaining the geography of entrepreneurship (Audretsch and Feldman, 1996; Audretsch, et al., 2002). Next, we further refine the elements contained in the framework by particularly examining their relevancy to the local aspiration of building business incubators. In result, we retain the following factors in the final framework for further exploratory analysis:

[Insert Figure 3 here]

Under the 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 incubator as an instrument (Greene and Butler, 1996; Zhang, 2008). Economic factors like income level and unemployment rate are selected because they have well recognized connections with the priorities of business incubators such as combating economic distress and creating jobs. Structure of the local economy is also included to reflect the differences among industries in business vibrancy and represent their impacts on the demand of business incubators in host regions. The geographic and culture subset is constituted by variables such as proximity to universities and colleges which stands for the inherent demand of universities and colleges in technology transfer and commercialization by pursuing business incubators (Gunasekara, 2006); social capital and the extent to which engagement with other stakeholders has been taken as the development strategy of local governments are also included since they are underlying the joint efforts of different local entities to identify resources for incubator construction and operation; education attainment is selected in the end

because of the belief that it backs all the other three variables in this subset (Helliwell and Putnam, 1999).

The selection criteria of external funding providers are also introduced in Figure 3 as agency characteristics. However, as has been mentioned previously, since all qualified applicants will be subject to these criteria for the selection of grantees, it is those predetermined place characteristics that actually distinguish the final incubator host from its peers. Therefore, in the rest of this section, we will develop an exploratory analysis to empirically investigate how place characteristics are affecting the geography of U.S. business incubators.

As the initiatives of building business incubators are primarily proposed and executed by local entities, one should obtain a richer and more precise understanding of the importance of location factors by examining county level data rather than state level data and above. Population and economic characteristic for each county was extracted from the STF3 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. Unemployment average for the five year period 2000-2004 was derived from Local Area Unemployment Statistics (LAUS) data program compiled by the Bureau of Labors (BLS), United States Department of Labor. The data variables from the U.S. Census and BLS data are divided into 5 n-tiles that are approximately equal. A ranking of 1 is below the 20th percent, 2 is between the 20th and 39th percentile, 3 is between the 40th and 59th , 4 between 60th and 79th percentile, and 5 is above the

80th percentile.

To determine the type and number of colleges in each county the United States Department of Education, National Center for Educational Statistics, Integrated Postsecondary Education Data System, Institutional Characteristics database was used. This database provided the county location for all public and private non-profit colleges offering an A.A. degree or better. Data collected at the county level was used to determine if there was a post secondary educational institution within the jurisdiction offering and to determine if 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 from public sources. In addition, the concerns on omitting other important location factors in our conceptual framework and the time gap between our 2009 incubator information and the 2000 census data altogether prohibit us from employing confirmatory analytical skills such as regression analysis to generate reliable results. Therefore, we turn to more exploratory statistical tools like cross-tabulation and correlation analysis to inform our understandings at the best extent using those measurable factors.

3.2.2 Exploratory Analysis and Preliminary Results

In our analysis, the locational decision 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 other than unemployment rate. However, as we have noted in section 2.2, business incubators locate in Metro counties have outnumbered the ones in Micro and OCBSA counties overwhelmingly and thus constitute 68% 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 controlling the rural/urban division with the OMB definition.

Correlation coefficients for all the selected location factors have decreased remarkably in the right column of Table 3 after the rural/ urban division is controlled. 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, or even in an opposite direction. In 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 is conducted among business incubator formation, selected location factors and the rural/ urban division.

Results of the cross-tabulation analysis are presented in line charts to facility

reading and interpretation⁶. 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 (OCBSA) separately. As we have expected, for all location factors other than education attainment, 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. In specific, compared to counties without business incubators, urban incubator counties are younger, more ethnically diversified, richer, less unemployed and more adjacent to universities and colleges; in contrast, rural incubator counties are relatively elder, less ethnically diversified, poorer, highly unemployed and seldom have their local universities or colleges. In other words, business incubator formation in U.S. urban and rural counties tends to seek for the same location factors yet from the entirely opposite ends despite that 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 become important empirical evidence for several unsolved debates. 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. Viewed by our evidence, however, this argument is

⁶ 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.

only correct in the urban context where a younger and more diversified population, a richer community with nearby universities or colleges altogether constitute a conducive environment for high technology firms (Cortright and Mayer, 2001; DeVol, et al., 1999). Second, business incubators were also occasionally advocated as a propellant for high technology industry development in rural America (Goetz and Rupasingha, 2002; Tamasy, 2007). On the contrary, the results of our analysis prove that rural incubators are still more intended to combat adverse economic conditions such as high unemployment rate and poverty. Third, the performances of rural business incubators are controversially poorer than urban business incubators (Cheng, et al., 2008; Cheng, et al., 2009). According to our analysis, the evaluation of business incubator performance will be seriously biased unless the sharp contrast in operation environment between rural and urban incubators is taken into account.

4. Concluding Remarks

The contributions of this research are fourfold: 1) the construction of a comparatively clean database for the U.S. business incubator population; 2) drawing upon the database, the geographic distribution of business incubators is examined at various geographic, administrative and functional levels; 3) the location decision-making process of business incubators is generalized and conceptualized to unveil those critical factors (selective or predetermined) underlying business incubator formation; 4) an exploratory analysis is conducted 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 U.S. are unevenly

distributed across regions, states and counties and they are highly concentrated in urban area. While business incubators may be intended to address different types of local concerns, their location decision-making can be generalized as a quasi-selective process, in which local stakeholders' initiatives, collaborations and consensus become the cornerstone for later competitions on associated federal grants to build incubators. An array of locally bounded demographic, economic, geographic and cultural factors is then identified to seek for the underlying forces that foster local collective action in incubator construction and attract the designated federal moneys. A preliminary exploratory analysis finds that, rural and urban counties differ significantly in the rationale of utilizing business incubators. Therefore, the planning and evaluation of business incubators in rural and urban area must consider their entirely different logics in location choice and the sharp contrasts in their living conditions.

Before concluding, we would like to highlight several limitations of this research and a few directions for its future extension. A salient shortcoming of this endeavor is our inability to identify measures for crucial location factors like social capital at the county level and thus unable 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 analysis by continuously collecting data for these factors and augmenting the database. The structure of our conceptual framework to understand the locational formation of business incubators is also controversial when being exposed to some *ad hoc* experiences while we plan to verify our proposition with associated survey questions in the next stage of our research. At last, 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 viewed with cautions and premises and is subject to constant upgrade.

References:

- Adkins, D. (2001). *A report for the Japan association of new business incubation organization: Summary of the U.S. incubation industry*. Athens, OH: National Business Incubation Association.
- Aernoudt, R. (2004). Incubators: Tool for Entrepreneurship? *Small Business Economics*, 23, 127-135.
- ASME (1996-2008). Business incubators. Retrieved Oct. 18, 2009, from http://www.professionalpractice.asme.org/SecuredModules/business_functions/incubators/index.htm
- Audretsch, D. B., and Feldman, M. (1996). R&D Spillovers and the Geography of Innovation and Production. *The American Economic Review*, 630-640.
- Audretsch, D. B., and Keilbach, M. (2005). Entrepreneurship Capital and Regional Growth. *The Annals of Regional Science*, 39(3), 457-469.
- Audretsch, D. B., Thurik, R., Verheul, I., and Wennekers, S. (Eds.). (2002). *Entrepreneurship: Determinants and Policy in A European-U.S. Comparison*. London: Kluwer Academic Publishers.
- Blair, J., and Premus, R. (1987). Major factors in industrial location: A review. *Economic Development Quarterly*, 1(1), 72-85.
- Campbell, C., and Allen, D. (1987). The Small Business Incubator Industry: Micro-Level Economic Development. *Economic Development Quarterly*, 1(2), 178.
- Castells, M., and Hall, P. (1994). *Technopoles of the world : the making of twenty-first-century industrial complexes*. London: Routledge.
- Chandra, A. (2007). Approaches to Business Incubation: A Comparative Study of the United States, China and Brazil. *Asia Pacific Business Review* Retrieved June 3rd, 2008, from <http://ssrn.com/abstract=1077149>
- Cheng, S., Jackson, R. R., Haynes, K., and Schaeffer, P. (2008). *Evaluation without Bias: New Performance Measures for Business Incubators in Rural America*. Morgantown, WV: US Department of Agriculture.
- Cheng, S., Schaeffer, P., and Middleton, M. (2009). *Incubators in rural environments: a preliminary analysis*. Paper presented at the International workshop on creative, intellectual and entrepreneurial resources for regional development: analysis and policy.
- Clark, J. (2009). Coordinating a conscious geography: the role of research centers in multi-scalar innovation policy and economic development in the US and Canada. *The Journal of Technology Transfer*, 1-15.
- DeVol, R., Wong, P., Catapano, J., Robitshek, G., and Institute, M. (1999). *America's high-tech economy: Growth, development, and risks for metropolitan areas*: Milken Institute Santa Monica, CA.
- Glaeser, E. L., Kerr, W. R., and Ponzetto, G. A. M. (2009). Cluster of Entrepreneurship. *US Census Bureau for Economic Studies, CE-WP- 09-36*.
- Goetz, S., and Rupasingha, A. (2002). High-tech firm clustering: implications for rural areas. *American Journal of Agricultural Economics*, 1229-1236.

- Greene, P., and Butler, J. (1996). The minority community as a natural business incubator. *Journal of Business Research*, 36(1), 51-58.
- Cortright, J., and Mayer, H. (2001). High tech specialization: a comparison of high technology centers. *The Brookings Institution Survey Papers*, 1-18.
- Gulotta, C., and McDaniel, G. (1995). A regional incubator program: the case of the Northeast Mississippi Business Incubation System. *Economic development review*, 13(4), 71-73.
- Gunasekara, C. (2006). Reframing the role of universities in the development of regional innovation systems. *The Journal of Technology Transfer*, 31(1), 101-113.
- Hackett, S., and Dilts, D. (2004). A systematic review of business incubation research. *The Journal of Technology Transfer*, 29(1), 55-82.
- Hackett, S., and Dilts, D. (2008). Inside the black box of business incubation: Study B- scale assessment, model refinement, and incubation outcomes. *The Journal of Technology Transfer*, 33(5), 439-471.
- Helliwell, J., and Putnam, R. (1999). Education and social capital. *NBER Working Paper No. W7121*
- Lalkaka, R. (2003). Business incubators in developing countries: Characteristics and performance. *International Journal of Entrepreneurship and Innovation Management*, 3(1,2), 31-55.
- Lewis, D. (2002). *Does Technology Incubation Work? A Critical Review*. Athens, OH: National Business Incubation Association.
- Nolan, A. (2003). Public policy on business incubators: an OECD perspective. *International Journal of Entrepreneurship and Innovation Management*, 3(1), 22-30.
- Shearmur, R., and Doloreux, D. (2000). Science parks: actors or reactors? Canadian science parks in their urban context. *Environment and Planning a*, 32(6), 1065-1082.
- Sherman, H., and Chappell, D. (1998). Methodological Challenges in Evaluating Business Incubator Outcomes. *Economic Development Quarterly*, 12(4), 313.
- Storey, D. J., and Tether, B. S. (1998). Public policy measures to support new technology-based firms in the European Union. *Research Policy*, 26(9), 1037-1057.
- Sutherland, D. (2005). China's Science Parks: Production Bases or a Tool for Institutional Reform? *Asia Pacific Business Review*, 11(1), 83-104.
- Tamasy, C. (2007). Rethinking Technology-Oriented Business Incubators: Developing a Robust Policy Instrument for Entrepreneurship, Innovation, and Regional Development? *Growth and Change*, 38(3), 460.
- Turok, I., and Webster, D. (1998). The New Deal: jeopardised by the geography of unemployment? *Local Economy*, 12(4), 309-328.
- U.S. Department of Commerce (2003). *A National Benchmarking Analysis of Technology Business Incubator Performance and Practice*. Washington, DC.
- Yu, J. B., and Nijkamp, P. (2009). *Methodological Challenges and Institutional Barriers in the Use of Experimental Method for the Evaluation of Business*

Incubators: Lessons from the US, EU and China. Paper presented at the Atlanta Conference on Science and Innovation Policy, Atlanta, Georgia.

Yu, J. B., Stough, R. R., and Nijkamp, P. (2009). Governing Technological Entrepreneurship in China and the West. *Public Administration Review*, 69(s1), s95-s100.

Zhang, T. (2008). *Elderly entrepreneurship in an aging US economy : it's never too late.* Singapore ; Hackensack, NJ: World Scientific Pub.

Number of Incubators In United States Census Bureau Regions and Incubator Locations

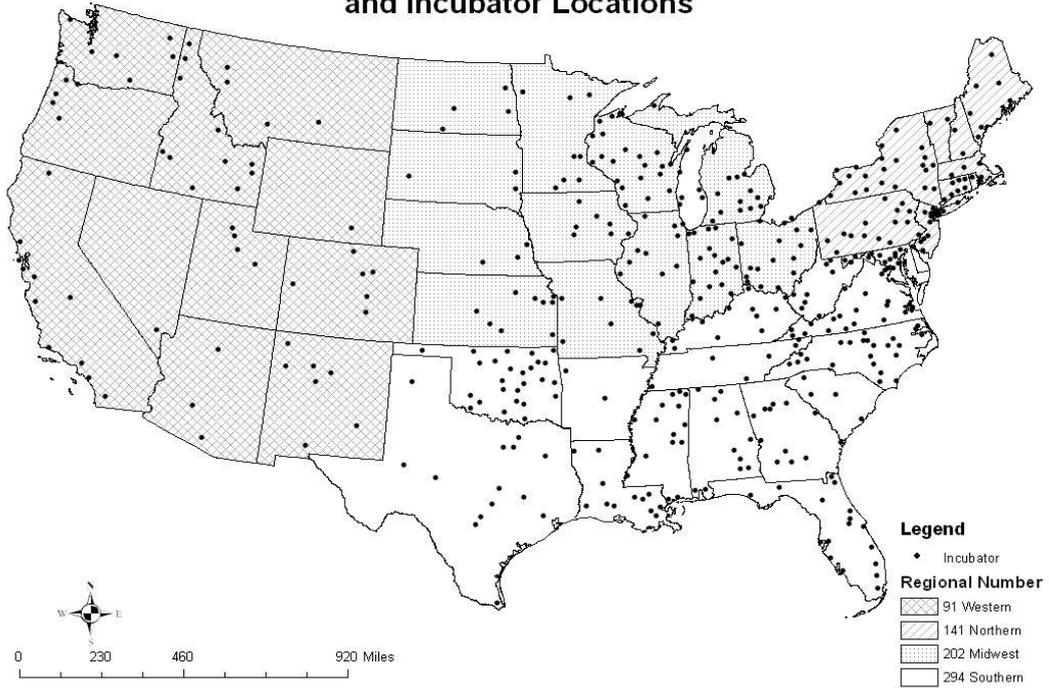


Figure 1 Geographic Distribution of U.S. Business Incubators in Census Regions, States and Counties

Incubators Per 1,000,000 by United States Census Bureau Regions

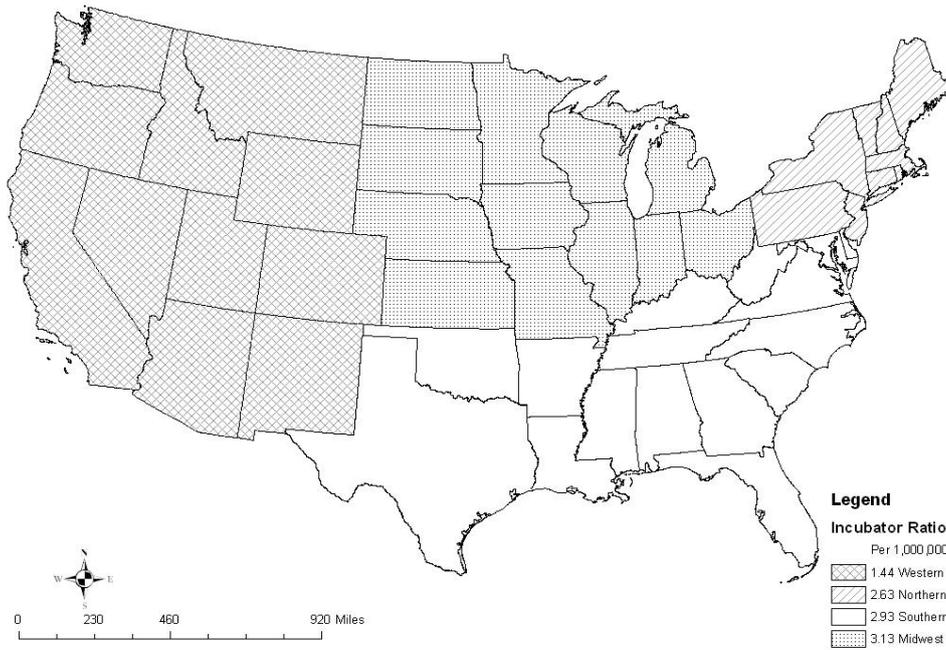


Figure 2 U.S. Business Incubator Density in Census Regions

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

Number of Incubators by OMB Metropolitan Classification System									
Number of Incubators	Metro Counties		Micro Counties		OCBSA Counties		Total 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.

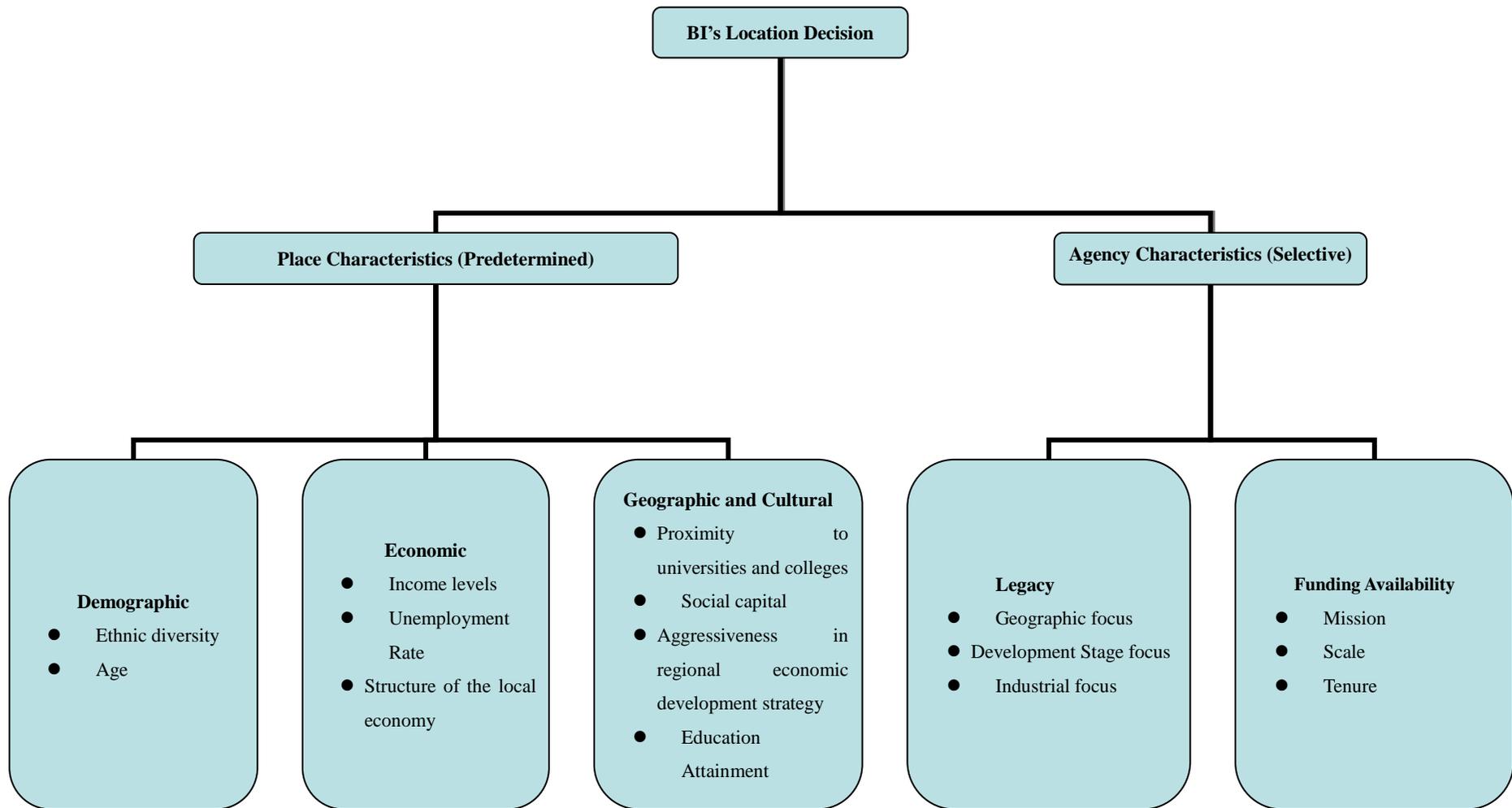


Figure 3 Location Factors for Business Incubator Formation in the United States

Table 3 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 Capital 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 A Pubic or Private	0.338***	0.233***
Non-profit Four Year College in County A Public or Private	0.470***	0.330***
Non-profit Offering an AA Degree or Better	0.393***	0.306***
Unemployment Rate	-0.045**	-0.014

Income

Unemployment

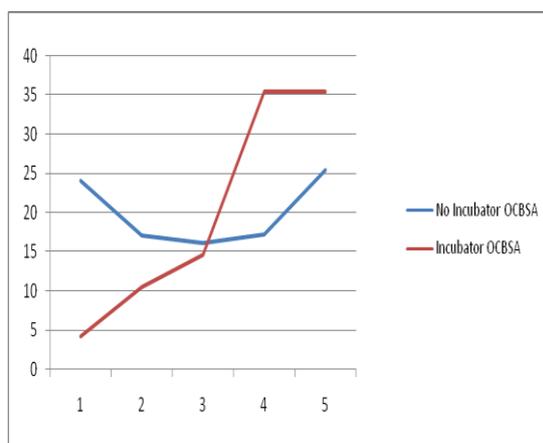
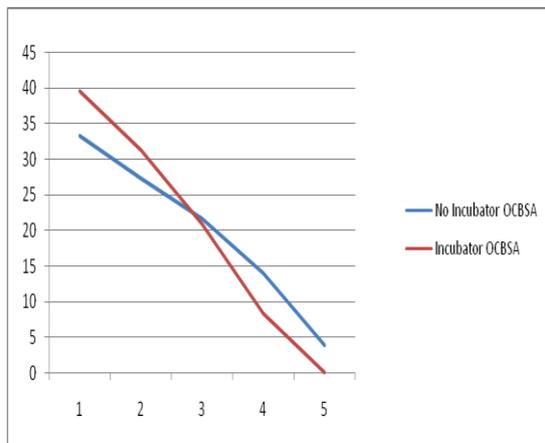
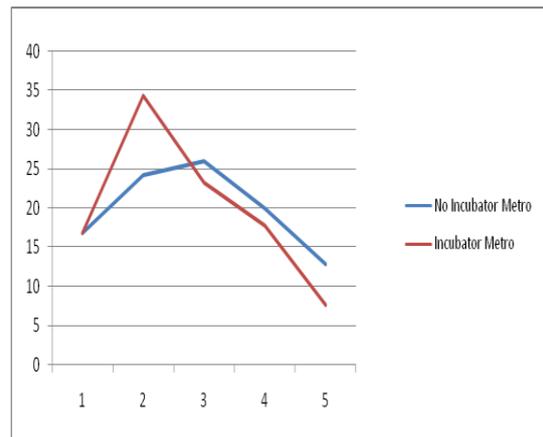
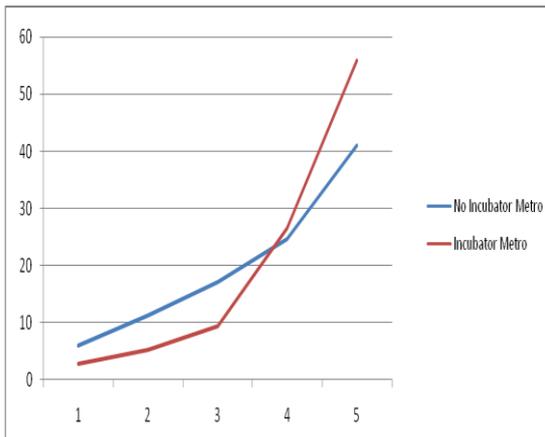
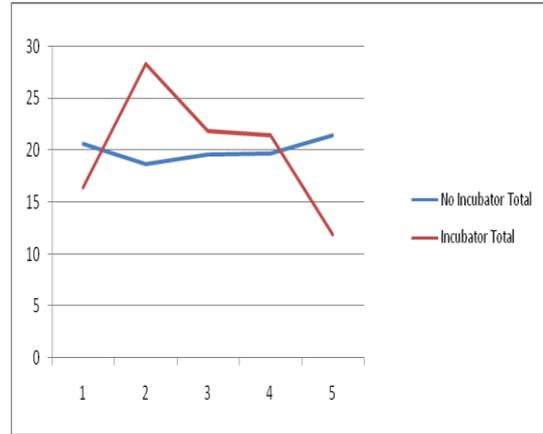
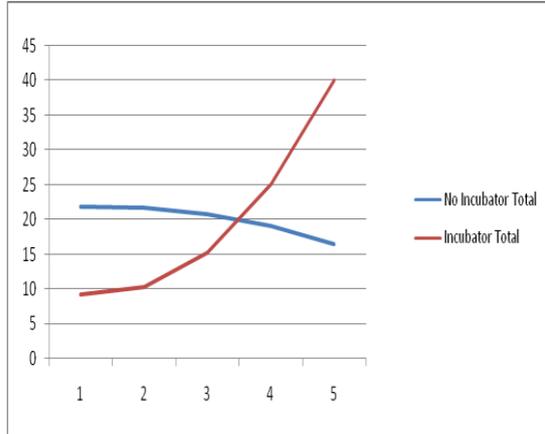


Figure 4 Selected Cross-Tab Results between Locational Factors and the Rural/ Urban Division

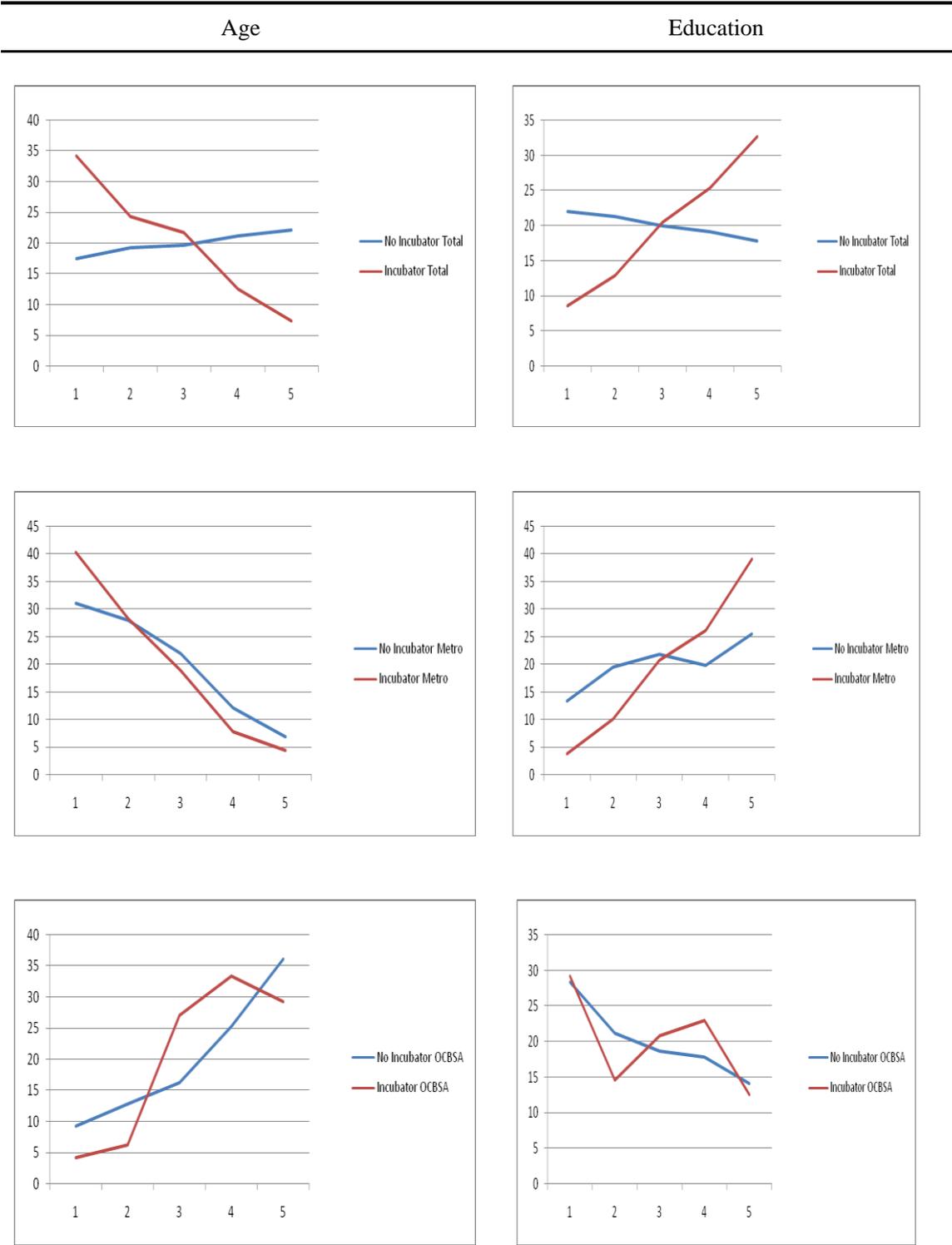


Figure 4 (Contd.)

Note: For each line chart, the horizontal axes stands for the 5 n-tiles division of the location factor while the vertical axes represents the percentage of the designated counties.