Rural and Urban Establishment Births and Deaths Using the U.S. Census Bureau's Business Information Tracking Series

An Office of Advocacy Working Paper by

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Business dynamics—the entry and exit of firms—is the mechanism by which outdated ideas and industry practices are replaced by new and potentially revolutionary ones. Higher density urban and suburban areas are said to have a fast pace of life, but it is unclear if this translates into high rates of entry and exit.

This paper has two objectives focusing on local business dynamics. First, it documents a set of establishment birth and death (EBD) tabulations now available from the U.S. Census Bureau's Company Statistics Division. These tabulations report establishment births and deaths by industry classification for every county in the United States from 1990 to 2003. In particular, tabulations report the total, single-unit, and multi-unit births and deaths. Second, it presents preliminary descriptive analysis of the establishment birth and death rates by rural and urban counties.

Overall Findings

The rural-urban analysis gives a surprising result. When measured by either of two analytical methods (ecological or labor force) the differences in the average rates of establishment births and deaths for urban and rural areas are extremely small. While the difference is statistically significant, on average, the general dynamic of economic activities is not a function of rural versus urban conditions. This result has implications for the setting and study of economic development policy for both rural and urban areas, especially where such policies hinge on stimulating and supporting local entrepreneurial activity (i.e., "economic gardening").

Highlights

- The establishment birth and death (EBD) tabulations comprise 14 years of birth and death data for every county in the United States. Each annual file includes an average of 650,000 observations. (The tabulations may be obtained from the Census Bureau's Company Statistics Division for a nominal fee.)
- There were 11 million establishment births and 9.7 million establishment deaths between 1990 and 2003. In that period, the average number of establishment births per county was 247 and the average number of deaths per county was 221.
- Single-unit establishments account for a little more than 80 percent of both the birth (82 percent) and death (83 percent) totals.
- Most business locations are in urban or suburban areas. 93.4 percent of all U.S. business establishments are located within MSAs. Large establishments with 500 or more employees are even more highly concentrated: less than 5 percent are located in non-MSA areas.
- The average annual number of establishment births per county is 1,128 in primary MSA counties, 182 in secondary MSAs, and 58 in non-MSA counties. (The terms "primary," "secondary," and "non-MSA" roughly track "urban," "suburban," and "rural" areas.)
- The rate of establishment births and deaths varies very little across urban and rural counties. This holds true for both the ecological and labor force method of calculating the rates. This is also true for both MSA and RUCC urban-rural definitions. The mean establishment birth rate—calculated by the

ecological method—is 0.11 for primary counties, 0.12 for secondary counties, and 0.11 for non-MSA counties.

Scope and Methodology

The EBD tabulations were extracted from the Census Bureau's Business Information Tracking Series (BITS) file, a component of the Statistics of U.S. Business (SUSB) database. The paper provides an overview of the tabulated data, summarizes various practical matters on using the EBD tabulations, and reports descriptive statistics (in both tables and figures) of the data. The urban-rural descriptive analysis is reported in a series of figures coupled with simple data analysis to determine the statistical differences of the group means.

For the EDB tabulations, an establishment birth is counted for establishments reporting payroll sometime in the current year and no payroll the year prior. An establishment death is counted for establishments reporting no payroll in the current year and payroll at some point the year prior.

The authors assess the birth and death rates using two different methods: the ecological method and the labor force method. The ecological rate is based on the the number of establishment births or deaths divided by the number of establishments in the previous year. The labor force rate is the number of establishment births or deaths divided by the number of workers in the county labor force. These rates are compared across urban and rural areas, which are also defined according to two different systems: metropolitan statistical areas, or MSAs, and rural urban continuum codes, or RUCCs.

This report was peer reviewed consistent with the Office of Advocacy's data quality guidelines. More information on this process can be obtained by contacting the director of economic research at **advocacy@sba.gov** or (202) 205-6533.

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EXECUTIVE SUMMARY

This paper serves two related purposes. First, we conduct a preliminary descriptive analysis of the establishment birth and death rates by rural and urban counties. This analysis gives a surprising result: when measured by the ecological and labor force method, the rural versus urban differences in the average rates of establishment births and deaths are extremely small. While the difference is statistically significant, on average, the *general* dynamic of economic activities is not a function of rural versus urban conditions. It is expected, though, that such a dynamic *specific* to a particular industry will show strong urban versus rural effects. This result has implications for the setting and study of economic development policy for both rural and urban areas, especially where such policies hinge on stimulating and supporting local entrepreneurial activity (i.e., "economic gardening"). Note that the ecological and labor force methods provided similar results, so the choice of method for analyzing birth rates has no significant impact on the results.

Second, it documents a set of establishment birth and death (EBD) tabulations now available from the U.S. Census' Company Statistics Division. In particular, we provide an overview of the Census database from which the tabulated data were extracted, summarize the information and variables in the data, and discuss several practical issues with using the EBD tabulations. Among these issues are the reliability of the data, the industry and county classifications used in reporting the data, and issues concerning statistical analysis in a spatial context. We also discuss how the EBD tabulations and other custom data orders can be obtained.

TABLE OF CONTENTS

TABLES AND FIGURES

List of Tables:

List of Figures:

1. INTRODUCTION

Business dynamics in the form of entry and exit is the mechanism by which outdated ideas and industry practices are replaced by new and potentially revolutionary ones. This dynamic is at the heart of competition creating new industries, invigorating old ones, and relegating inefficient practices to the pages of history. As such, exit and entry drive the growth and prosperity of individual firms as well as the economy at large and is a central focus of research in both economics and management (Geroski 1995, 2002; Porter 1991). In particular, an expanding body of work focuses on the geographic dimension of entry and exit, the effect on the formation and growth of firms, and the associated implications for local and national economies (Rosenthal and Strange, 2004). Research on such agglomeration effects, however, is hindered by a lack of nationwide data on business entry and exit reported at small geographic scales such as counties or zip codes (Rosenthal and Strange, 2004).

With this said, the U.S. Bureau of the Census maintains a number of county-level business databases including a particularly rich source of dynamic firm and establishment information known as the Business Information Tracking Series (BITS). The BITS data is dynamic in that it not only reports the information found in other static sources such as the Census' County Business Patterns (CBP) and Statistics of U.S. Business (SUSB) files, it also can be used to measure the births, closures, and expansions of establishments and firms. Its other notable benefit is that it reports this data by county and by industry, making the BITS file an attractive option for exploring regional entrepreneurship and small business activities and patterns.

BITS data have been used in a number of entrepreneurship and small business studies. Acs and Armington (1998, 2005), in particular, make considerable use of the BITS data to investigate gross job flow dynamics in the service and manufacturing sectors (Armington and Acs, 2004) as well as the formation of new firms (Armington and Acs, 2002). Likewise, Acs and Plummer use the data to explore the relationship between entrepreneurial activity, knowledge creation, and economic growth in high growth (Acs and Plummer, 2004) as well as rust belt local economies (Acs, Plummer, and Sutter, 2007). Finally, Headd (2003) uses the BITS data to examine the survival and closure rates of start-up.

Most researchers will find working directly with the BITS file to be impractical. The U.S. Census Bureau restricts public access to its databases given concerns of releasing private

and confidential business information. Accessing Census data typically requires that researchers become sworn "employees" of the U.S. Census Bureau and complete any work at one of the Census' research centers located throughout the United States. Despite these hurdles, BITS can be accessed via special tabulations of the data published by the U.S. Census or the SBA Office of Advocacy. Such special tabulations can be ordered at cost from the Census' Company Statistics Division (CSD). Such custom ordered tabulations enable researchers to access especially useful Census data without the considerable effort of accessing the database directly.

This paper has two purposes: one, to provide a comparative analysis of entry and exit rates in rural and urban areas of the United States and, two, to document a particular example of a special BITS data tabulation obtained from the U.S. Census Bureau.[1] The establishment birth and death (EBD) tabulations custom ordered from the U.S. Census' CSD cover every county in the fifty states and the District of Columbia. The tabulations report the total, single-unit, and multi-unit establishment births and deaths by county and industry from 1990 to 2003 and constitute a huge source of rich data well suited to entrepreneurship and small business research.[2] Best of all, since the fees paid to Census for the tabulations cover the cost of their preparation rather than the data itself, the EBD tabulations are now available to other researchers for a nominal processing charge. Thus, we hope that our fellow scholars and colleagues will make prodigious use of the EBD tabulations and the BITS data to advance the field of entrepreneurship research.

With this in mind, this paper is organized as follows. In Section 2, we provide an overview of the data sources of the EBD tabulations. Two Census datasets are discussed including the County Business Patterns and the SUSB/BITS files. In Section 3 of this paper, we summarize the EBD tabulations as well as the variables and information reported therein and report the summary statistics of the data. In Section 4, we provide a deeper analysis of the information in the EBD tabulations by exploring descriptively the rural versus urban establishment birth and death rates by county. Calculating the rates involves combining the EBD tabulations with labor force information (from the Bureau of Labor Statistics) and existing

[1] For purposes of his dissertation, Larry Plummer obtained custom dynamic establishment data tabulations from the Company Statistics Division (CSD) of the U.S. Bureau of the Census. Funding for the data purchase came from a research contract (SBAHQ-06-Q-0015) awarded to him by the Office of Advocacy, the results of which are reported in SBA working paper #293 (Plummer, 2007a) and his thesis (Plummer, 2007b).

[2] Establishments are employer business locations. Single-unit births represent the formation of new firms while multi-unit births represent the geographic expansion of existing firms.

establishment data (from the Census' CBP). In the appendix, we discuss several practical matters researchers should consider when using the EBD tabulations. These issues include the data reliability, industry classification, county boundary definitions, and combining the data with other county-level information. Section 5 of this paper offers a few concluding comments.

2. U.S. CENSUS BUSINESS DATA SOURCES OF THE EBD TABULATIONS

The establishment birth and death (EBD) tabulations are extracted from the U.S. Census' Business Information Tracking Series (BITS) file. In addition to BITS, the Company Statistics Division of the U.S. Bureau of the Census maintains other databases that entrepreneurship and small business researchers may find of interest. The first, the County Business Patterns (CBP) file, provides annual aggregate county-level data on the number of establishments, annual and first-quarter payroll, number of employees, and establishment size classes from 1988 to 2005.[3] The second file, the Statistics of U.S. Businesses (SUSB) tracks much of the same information as the CBP file, but adds the time-series tracking of establishment information from one year to the next. This dynamic data is contained in the Business Information Tracking Series (BITS), which is a component file of the SUSB database. Two additional datasets are the Non-Employers (NE) statistics database and the Census' and the Bureau of Labor Statistics' jointly produced Current Population Survey (CPS). The NE and CPS files are discussed in the appendix to this paper.

Although dated, the U.S. Census Bureau's *County and City Data Book: 2000* gives a basic understanding of what data is available at the county level. The County Business Patterns (CBP) file is the basis for most of the business data contained in the data book. Census has also developed the SUSB (and its component BITS file) and the NE databases. CBP, SUSB and NE are all annual files comprising the universe of the relevant data and have a time lag of around two years (e.g., 2005 data became available in 2007). Although the public SUSB data is available at the metropolitan statistical area (MSA) level, the underlying microdata is indexed at the county level, which can be obtained in special tabulations. The CBP and non-employers data are published at the county level.

It is important to know that, with the exception of CPS, the Census' Business Register (BR) – formerly called the Standard Statistical Establishment List (SSEL) – is the primary data source for the CBP, SUSB, and NE data. The BR file combines business information on all taxpaying organizations (including business and agricultural establishments) on record with the Internal Revenue Service (IRS). The IRS tax return data provides payroll and establishment employment on March 12 of every year. The Company Organization Survey (COS) also

[3] The 2006 data should be available sometime in 2008.

provides information on the organization and employment of multi-unit firms. The COS is conducted annually except in years in which the quinquennial Economic Census is taken (i.e., years ending in 2 and 7). Given the key limitations on how the data is collected and processed – especially concerning the quinquennial Economic Census – scholars are strongly advised to familiarize themselves with the SUSB, BITS, and CBP documentation (Acs and Armington, 1998, 2005; Armington, 1998; Robb 1999) available from the U.S. Census and should not consider this paper the definitive reference for these data sources and their application.

The remainder of this section is an overview of the CBP and BITS databases.

2.1. County Business Patterns

County Business Patterns is an annual U.S. Census Bureau data program providing county data by industry for employer business locations or establishments.[4] The CBP data goes back to 1946, with annual data beginning in 1964 and covers virtually all industries. It does, however, exclude establishments in crop and animal production (NAICS 111, 112); rail transportation (NAICS 482); postal service (NAICS 491); pension, health, welfare, and vacation funds (NAICS 525110, 525120, 525190); trusts, estates, and agency accounts (NAICS 525920); private households (NAICS 814); and public administration (NAICS 92). It also excludes most government establishments except wholesale liquor stores (NAICS 4248), retail liquor stores (NAICS 44531), federally chartered savings institutions (NAICS 522120), federally chartered credit unions (NAICS 522130), and hospitals (NAICS 622). The CBP data are processed to avoid the public disclosure of private confidential data.

A troublesome aspect of CBP is that the size of an establishment could be misstated if its parent company has multiple establishments. This is a result of issues with the Economic Census conducted every five years and the component Company Organization Survey. The survey respondents provide information on the firm's employment, which is then used to estimate the employment of the firm's individual establishments. In addition, the COS methodology also has the effect of creating "surges" in the count of multi-unit establishments for the Census years (specifically, the years ending in 2 or 7). Given these limitations, CBP data – especially concerning multi-establishment businesses – should be used cautiously when analyzing small

[4] CBP data is additive across geographic areas as an establishment may only exist in one location.

business issues. Since these limitations are relevant to the EBD tabulations, we discuss these issues in more detail in the appendix.

2.2. SUSB and BITS

The SUSB file, developed with the cooperation and partial funding of the Small Business Administration Office of Advocacy, is an extension of the County Business Patterns database. It builds from the business register information and reports firm (i.e., enterprise) data aggregated from information for all the establishments owned by a parent company.[5] The major benefit of the SUSB file is that it reports establishment *and* firm or "enterprise" level information including the employment size classification, payroll, receipts, industry, and primary location of the firm owning each establishment.[6] Because of the time it takes to collect and process the data, this employer data is available about two to three years behind the current year. Aside from the establishment information provided by the CBP database, the SUSB file also reports more precise industrial classification codes as well as the establishment's metropolitan statistical area (MSA) codes.

The BITS file, formerly known as the Longitudinal Establishment and Enterprise Microdata (LEEM), is a component of the SUSB database. The BITS file is constructed by using the Longitudinal Pointer File to merge the annual SUSB records to create single longitudinal records for each establishment appearing in any of the annual SUSB files. As a result, the data facilitates the tracking of each establishment's record even if its ownership or employer identification number (EIN) changes. This is achieved by assigning to each establishment a Census file number (CFN), which is a ten digit code identifying the firm and the establishment within that firm. BITS includes the following fields by establishment for each firm: the establishment's location (state, county, and if applicable the MSA), employment,

[5] Technically, firm and enterprise represent slightly different concepts. An enterprise is Census nomenclature for the entire organization in the U.S. while firm can represent a subset of the enterprise, such as the amount of business activity in a state or industry.

[6] There are seven employment size classifications of the firm: 0, 1-4, 5-9, 10-19, 20-99, 100-499, and 500+ employees. SUSB includes all firms that had payroll during the year, and measures their March employment. This results in an employment size class of 0 (new firms and seasonal firms), with annual payroll and no employees. Beginning in 1992, SUSB broke out the 0 size class from the 0-4 size class. For 1995, the firm employment size class 0 represented 12.8 percent of firms, and 1.0 percent of the annual payroll. Additional firm sizes may be available upon request (see, e.g., White, 2002).

annual payroll, original or secondary establishment status, primary industry, start year, and the firms' employment.

The dynamic data contained in BITS are its major benefit. The static data in SUSB is a snapshot of activity reporting the number of employer firms, the number of establishments, total employment, annual payroll, and estimated receipts by employment size of firm. While annual static data can be used to study, for example, the (changing) importance of firm size classes over time, it does not account for business starts, closures, or changes in the employment size class and, thus, cannot be used to estimate the effects of entrepreneurial activity in the county. The dynamic data, on the other hand, indicate the growth of establishments and employment for employment firm size classes, classified by beginning year size.[7] It also makes it possible to count firm or establishment *births* and *deaths.* The age of the firm, however, is difficult to determine because BITS tracks the age of the *establishment,* which may not have been owned by the same firm since the establishment's creation.

2.3. Obtaining Special Tabulations

It is extremely difficult to work directly with BITS considering the proprietary nature of the microdata. Researchers submit a proposal and, if accepted, they must become sworn "employees" of the U.S. Census and conduct their research at one of the Bureau's research centers located throughout the U.S. The data can be accessed, however, through publicly available or custom-ordered tabulations. Published SUSB/BITS data is available online from websites of the U.S. Census Bureau's and the SBA Office of Advocacy. In addition, as long as the privacy of the underlying firms is maintained, custom data tabulations may also be purchased from the Company Statistics Division of the U.S. Census. Before contacting Census to order custom tabulations, researchers should know that many previously prepared tabulations and variables already exist; these are available for a nominal processing fee.[8]

[7] Dynamic data does not include firms in the size class of 0, therefore caution is needed when comparing beginning year dynamic data to static data. Dynamic data is available as yearly changes from 1989 to 2004.

[8] Researchers should contact the CSD staff to find out what existing tabulations are available. For custom tabulation orders, we recommend that, along with the data specifications, the requester create a set of "mock tables" to minimize the confusion on what is being sought. Keep in mind that Census will need to check the data for privacy disclosure. Mock tables resulting in cells that contain too small a number of firms will not be prepared. Special tabulations may be prepared from the SUSB, County Business Patterns, and Non-Employers files for a fee, but an agreement with the U.S. Census Bureau on the specifications and fees involved should be established in advance.

3. ESTABLISHMENT BIRTH AND DEATH (EBD) TABULATIONS

The Establishment Birth and Death (EBD) tabulations report the single-unit, multi-unit, and total establishment births and deaths in every county in the 50 states and the District of Columbia. These annual data are sorted by industry classification from 1990 to 2003. The EBD tabulations are contained in fourteen annual data files; a companion file describes the format and contents of the data files. The data is limited to the same industry classifications as the CBP file and no data were suppressed or excluded beyond the criteria applicable to the BITS file. The tabulations are based on several definitions that require some discussion. In particular, it is necessary to define clearly the terms "establishment," "birth," "death," "single-unit," and "multi-unit."

According to the U.S. Census Bureau, an *establishment* is "a single physical location at which business is conducted or services or industrial operations are performed" (Armington, 1998). A single-unit establishment represents a firm with only one location; single-unit establishment births are a reasonable estimate of new venture creation in the county. Likewise, a multi-unit establishment is one of at least two establishments under the common ownership or control of a firm. Therefore, a multi-unit establishment birth is a reasonable estimate of an existing firm expanding geographically into a given county. In the case of the EDB tabulations, an establishment birth is counted for establishments reporting payroll sometime in the current year and no payroll the year prior. An establishment death is counted for establishments reporting no payroll in the current year and payroll at some point the year prior.

The alternative to defining establishment births and deaths by payroll is defining them by mid-March employment (Acs and Armington, 1998, 2005). With the payroll definition, a birth is counted if payroll anytime in the calendar year is reported. With the employment criterion, a birth is counted if the establishment reports having employees *on* March 12 of that year. By using payroll, any establishments that are born or die *between* the mid-March periods are included in the EBD tabulations. In comparison, any births and deaths between the mid-March periods would have been excluded by the employment definition. Thus, using payroll to define establishment births and deaths has two implications: First, very short-lived and seasonal

businesses are included in the EBD tabulations and, second, some births and deaths are observed one year earlier than if defined by employment.[9]

3.1. Information and Variables

The EBD tabulations are reported in nine columns of data (not shown). The first and second columns report the two-digit state and the three-digit county identifying codes (these two columns may be merged to report a five-digit county code in a single column). The third column reports the industrial classification code. Columns four through six report, respectively, the count of total, single-unit, and multi-unit establishment births. Finally, columns seven to nine report counts of the total, single-unit, and multi-unit establishment deaths. There are approximately 650,000 observations in *each* annual tabulation file. What follows is a more detailed description of the variables.

3.1.1. County FIPS Code

The primary identifier or index for the data in the EBD tabulations is the Federal Information Processing Standards (FIPS) county code (NIST, 2007). The county FIPS is a five-digit code assigned to every county (and statistically equivalent entity) within the United States, the District of Columbia, and the possessions and associated areas of the United States. Given the geographic coverage of the EBD tabulations, the first two digits of the FIPS code identify the state and the last three digits identify the county within the state. Per the standard, the "first-order subdivisions" of each state and possession are the equivalent of counties regardless of the local designations.[10] In a small number of cases, the establishment's county cannot be identified are thus reported with a "statewide" FIPS code (i.e., XX999).

[9] For example, per the payroll definition, an establishment born after March 12 and before December of 2000 is counted as a birth for that year. In contrast, it would be counted as a 2001 birth using the mid-March employment definition.

[10] In other words, the parishes of Louisiana, the "boroughs" and census areas of Alaska, the District of Columbia, the "independent cities" of Maryland, Missouri, Nevada, and Virginia, and the part of Yellowstone National Park in Montana are indexed by county FIPS.

3.1.2. Industry Classification

The EBD tabulations report establishment births and deaths by one of two industry classification systems. The 1990 to 1997 EBD tabulations use the 1987 Standard Industrial Classification (SIC) system and are reported at the division (one-digit), major group (two-digit), industry-group (three-digit), and industry (four-digit) levels. For a small number of establishments, the SIC code could not be identified at a more detailed level (i.e., three- or four-digit). In these instances, the establishments are grouped as "unclassified." The 1998 to 2003 EBD data are reported using the 1997 North American Industrial Classification System (NAICS) codes from the two- to six-digit level of aggregation. Again, in some cases, the more detailed NAICS code could not be determined for some establishments, and they are grouped as "unclassified."

3.1.3. Establishment Births

The variable, *total establishment births,* is the number of all the establishment births in the county for the given industry and given year. The variable, s*ingle-unit establishment births,* is the number of all the independent establishment births in the county for the given industry and given year. Correspondingly, *multi-unit establishment births* is the number of all the new establishments – in the given county and industry – born to an existing firm; to be clear, the reported industry is that of the establishment, not that of the firm. The total count of establishment births is equal to the sum of the single-unit and multi-unit establishment births for the given year, county, and industry classification. As mentioned earlier, a birth is counted for establishments reporting payroll *sometime* in the current year and no payroll the year prior.

3.1.4. Establishment Deaths

The variable *total establishment deaths* is the number of all the establishment closures in the county for the given industry and given year. The variable s*ingle-unit establishment deaths* is the number of all the independent establishment closures in the county for the given industry and given year. Correspondingly, *multi-unit establishment deaths* is the number of all the establishments owned by a firm that closed in the county in the given industry and year. The

total count of establishment deaths is equal to the sum of the single-unit and multi-unit establishment deaths for the given year, county, and industry classification. A death is counted when establishment reports payroll *sometime* in the prior year and no payroll in the current year.

3.2. Descriptive Statistics

Table 2 reports the overall and yearly descriptive statistics for the EBD tabulations. Ignoring the "statewide" observations of births and deaths, there are nearly 11 million county establishment births and 9.7 million establishment deaths between 1990 and 2003. The average number of births per county is about 247 and the average number of deaths per county is about 221. Single-unit establishments account for a little more than 80 percent of both the birth (82%) and death (83%) totals. In addition, the minimum value observed for each variable is zero. During the fourteen-year period covered by the EBD tabulations, there are only 118 instances – out of the nearly 44,000 county-year observations – in which zero establishment births are counted. More revealing, there are 142 instances in which zero single-unit births are reported, but 4,540 cases in which no multi-unit births are observed. Likewise, there are 135 cases of zero total deaths, 160 instances of zero single-unit deaths, and 4,733 observations of zero multi-unit deaths. Finally, comparison of the means, medians, and standard deviations indicates that the distribution of each variable is highly skewed.

4. RURAL-URBAN ANALYSIS OF ESTABLISHMENT BIRTH RATES

In this section, we provide a descriptive comparison of urban versus rural establishment birth and death rates. To facilitate a rural-urban comparison of the rates, each county is assigned an MSA county code indicating it as a primary, secondary, or non-MSA area. The *primary*, or main, counties are "characterized by high percentages (65 percent or greater) of employed residents who remain in the county to work and by high ratios of jobs to resident workers (75 percent or greater)" (OMB 2000, pg. 82234). *Secondary* counties are "those with high ratios of jobs to resident workers, but a lower percentage of employed residents working within the county (50 percent to 64.9 percent)" (OMB 2000: 82234). Counties not classified as primary or secondary areas of an MSA are categorized as *non-MSA* counties, which is used as a proxy for rural areas. Descriptive statistics are then obtained by MSA classification.

As shown in Table 1, the bulk of the business establishments in the U.S. economy in 2004 are located in metropolitan statistical areas (MSA). Indeed, it appears that 93.4 percent of all U.S. business establishments are located within MSAs; this is especially true of large establishments with 500 or more employees since less that 5 percent of this group is located outside of MSAs. Such geographic concentration of business establishments is not surprising. As of the 2000 Census, for example, 75 percent of people in the United States lived in cities that together encompass approximately 2 percent of the land area of the lower 48 states (Rosenthal & Strange, 2004).

Despite the clear agglomeration of economic activity in the U.S., Dumais, Ellison, and Glaeser (2002) find that this pattern changes very little over time. In particular, they decompose *dynamic* changes in agglomeration into plant entries, expansions, and closures by new and existing firms. In doing so, Dumais, et al (2002) find that (1) new firm plants have a "de-agglomerating" effect in that these entries generally locate away from the current geographic centers of industry, (2) plant growth (in employment terms) is faster and the risk of closure is greater at the geographic periphery of industry concentrations, and (3) new firm plants locate where the availability of labor is greater while multi-plant entries locate where the pool of potential suppliers is greater.

The 2002 study by Dumais, et al. is limited to MSAs, leading us to ask whether establishment births and deaths are predominantly an urban phenomenon. When considering

simply the counts of establishment births and deaths using the EBD tabulations, the answer is overwhelmingly "yes." The average number of total establishment births, for example, in primary MSA counties is nearly 1,128, an average of 182 establishment births in secondary MSAs, and an average of 58 establishment births in non-MSA counties. Such counts, however, do little to answer our question. If non-urban counties are less populated and concentrated than urban counties, then the birth and death counts simply reflect the geographic distribution of economic activity. Indeed, it would be preferable to determine if establishment birth and death rates are more or less prevalent in urban areas.

Thus, to provide further analysis of the EBD tabulations, this section explores the *rates* of establishment births and deaths as measured using both "ecological" and "labor force" calculation methods (Audretsch and Fritsch, 1994). The ecological method (EM) divides the number of establishment births and deaths by the number of establishments in the county the year prior and is the more common rate calculation in the literature. Since people are the ones to start firms, the labor force method (LM) divides the number of births and deaths by the number of workers in the county labor force. The ecological measure can be interpreted as the business "fertility" of the given county, while the labor force measure can be interpreted as the propensity of workers in the county to start new ventures. Statistically, each measure has its pros and cons (Audretsch and Fritsch, 1994); because these issues are a subject of debate in the research literature, we report the results of both the EM and LM calculations.

In addition, we explore the rates of births and deaths using two urban-rural methods of comparison. The first compares establishment birth and death rates in primary, secondary, and non-MSA counties (OMB, 2000). The second approach compares these birth and death rates in nine county classifications using the Rural-Urban Continuum Code (RUCC) system (USDA, 2007).

4.1. Data Analysis Summary

4.1.1. Establishment Birth and Death Rates

Table 3 reports the overall and yearly establishment birth and death rates calculated by the ecological (EM) and labor force (LM) method. For the ecological rate, the births and deaths per establishment are calculated using data on existing establishments from the County Business

Patterns file. In the case of each variable, the births and deaths are divided by the total number of establishments in the county the prior year. Data suppression in the CBP data reduced the total number of observations of the ecological rates to 43,924. For the labor force rate, the establishment births and deaths per worker are calculated using labor force data from BLS' Local Area Unemployment Statistics (LAUS) file (see appendix). Specifically, the establishment births and deaths are divided by the total labor force in the county the same year. Labor data for 1990 is not reported in the LAUS, reducing the observations of the labor force rate to 40,792.

Figure 1 presents the ecological rates (i.e., establishment births and deaths per establishment) by year and Figure 2 shows the labor force rates (i.e., establishment births and deaths per worker) by year. As described earlier, the surges in the multi-unit deaths and births can be clearly seen in both figures. The figures also show that the rates of births and deaths are relatively stable from 1990 to 2003; the exceptions to this are the ecological and labor force rates of single-unit births. Both Figure 1 and Figure 2 depict – starting in 1997 – a downturn in single-unit births with a corresponding uptick in single-unit deaths. The slow down in single-establishment births is consistent with the business cycle (especially the bursting of the "dot com" bubble) of the period.

4.1.2. Establishment Birth and Death Rates by MSA

The total birth and death rates by MSA are reported in Table 4. The mean establishment birth rate – calculated by the ecological method – is 0.11 for primary counties, 0.12 for secondary counties, and 0.11 for non-MSA counties. Likewise, the mean single-unit birth rate for primary counties is 0.09, 0.10 for secondary counties, and .09 for non-MSA counties. Finally, the mean multi-unit birth rate for primary counties is 0.02, 0.02 for secondary counties, and 0.01 for non-MSA counties. By comparison, the ecological death rate for primary counties is 0.10, 0.10 for secondary counties, and 0.10 for non-MSA counties. The mean single-unit birth rate for primary counties is 0.08, 0.09 for secondary counties, and .0.09 for non-MSA counties. The mean multi-unit birth rate for primary counties is 0.10, 0.10 for secondary counties, and 0.11 for non-MSA counties. The differences between the respective means are very small, but statistically significant. Single-unit birth and death rates are larger than multi-unit rates and MSA and non-MSA areas show similar rates.

Figures 3 through 8 display the ecological birth and death rates by the 2000 MSA definitions (OMB, 2000). In each case, the rates are reported on the vertical axis, the MSA classification on the horizontal axis, and the mean rate is projected as a solid horizontal line. The figures do not report birth rates greater than 0.5; only two counties are dropped by doing so. The data are displayed for each category using a box and whiskers plot. The shaded portion of the box plot projects the 25^{th} to 75^{th} percentile rage and the horizontal line bisecting the box is the median of the distribution. As discussed earlier, the plots show highly skewed distributions. The projections are quite surprising in showing small (although statistically significant) differences in the overall birth and death rates across MSA categories. The plots, however, do show that the variance in non-MSA counties is greater compared to primary and secondary MSA counties.

In contrast, the mean establishment birth rate – calculated by the labor force method and rounded to three decimal places – is 0.006 for primary counties, 0.005 for secondary counties, and 0.005 for non-MSA counties. The mean single-unit birth rate is 0.005 and the mean multi-unit birth rate is 0.001, 0.001 for primary, secondary counties, and non-MSA counties. On the other hand, the death rate for primary counties is 0.005, 0.004 for secondary counties, and 0.004 for non-MSA counties. The mean single-unit birth rate for primary counties is 0.004 for primary, secondary counties, and non-MSA counties. The mean multi-unit birth rate for primary counties is 0.005, 0.004 for secondary counties, and 0.004 for non-MSA counties. The differences in means are small, but likewise statistically significant. Figures 9 through 14 report the labor force birth and death rates by the 2000 MSA definitions (OMB, 2000). Again, the projections show that greatest variance is reported for the non-MSA counties and that the differences between counties, although statistically significant, are very small.

4.1.3. Establishment Birth and Death Rates by RUCC

In addition to the MSA codes, each county is also assigned a Rural-Urban Continuum Code (USDA, 2007) based on the RUCC county classifications published by the Office of Management and Budget (OMB) in 2003 and published by the USDA's Economic Research Service. Table 5 describes the codes assigned to each county. The RUCC system classifies metropolitan and non-metropolitan counties by degree of urbanization and adjacency to metro areas. As shown in Table 5, there are three metro area groupings and six non-metro groupings.

The 2003 RUCC codes are based on data collected from the 2000 Census with the metropolitan counties classified by the population size of the MSA to which they belong.

Table 6 reports the rate of total establishment births and deaths by RUCC classification as calculated by both the ecological method (EM) and labor force method (LM). Figures 15 to 26 plot the results graphically. The average rate of single establishment births as measured by the ecological method is actually highest in the most rural areas (RUCC code 9) at 0.115. In comparison, the average EM rate of single-establishment births in the most urbanized areas (RUCC code 1) is 0.105. This pattern is the same for the LM rate of single-establishment births; the highest average rate is 0.0051 for RUCC code 9 in comparison to a rate of 0.0045 for RUCC code 1. In the case of multi-unit births, the highest average EM rate of multi-unit births is 0.019 for RUCC code 1 with the lowest rate of 0.011 for RUCC code 9. When measured by the LM rate of multi-unit births, however, the pattern is quite different. The highest average LM rate of multi-unit births is 0.001 for RUCC code 5 and lowest at 0.00057 for RUCC code 8.

4.2. Implications and Discussion of the Rural-Urban Analysis

A surprising feature of these results is that while urban areas account for a large proportion of all establishment births and deaths, the *rates* of births and deaths – whether measured by the ecological or labor force method – indicate very small (yet statistically significant) differences between urban and rural economic activity. The findings fit the overall results of Dumais, Ellison, and Glaeser (2002) showing that the agglomeration of businesses remains *generally* unchanged from year to year. That is, when ignoring industry classifications, economic activity does not appear to be become more or less concentrated with the passing of time. Instead, the dynamic agglomeration pattern of local births and deaths is surprisingly uniform across rural and urban counties. One would expect, however, a quite different pattern if the rural-urban analysis were constrained, for example, to "high technology" growth industries such as the information, communications, and telecommunications sectors. Such analysis was not conducted as part of this paper, but we hope it is readily evident from the above discussion that the EBD tabulations are well suited to such a study.

Although we do not address the industry distribution of the establishment births and deaths, the results nevertheless carry a few implications. First, the EBD tabulations – extracted as they are from the BITS file – exclude businesses engaged in animal and crop production (as

well as railroad and government activities). As a result, it is clear that rural counties in the United States are not strictly limited to the agricultural activities most people most associate with such areas. In particular, it implies that *rural* and *agricultural* are not synonymous terms for describing non-urban counties and that both researchers and policymakers should keep this important, yet subtle, point keenly in mind.

Second, rural communities seeking to spur economic development through local entrepreneurial activity (SBA, 2006) may face the challenge not of *stimulating* start-up, per se, but rather of *shaping* the distribution of new firms. As the figures consistently suggest – especially those reporting the rate of single-unit establishment births – counties in the rural U.S. are no less prone to entrepreneurial activity than their urban counterparts. Whether these areas are prone to creating the *types* of businesses argued to most drive growth is a different matter and should be a subject for further analysis. Nevertheless, assuming that start-ups with the greatest potential for growth and job creation locate in urban and suburban areas, designing development programs to stimulate specific types of start-ups seems a more daunting task than supporting local entrepreneurial activity more generally.

Finally, keeping in mind that the ecological and labor force methods tend to overestimate the rate of births and deaths in sparsely populated areas (Audretsch and Fristch, 1994), it is interesting that the rate of establishment deaths in particular shows greater variation in rural counties. Figures 19 and 22, for example, report the rate of single-unit deaths by RUCC. They show that although the median rate of deaths in the most rural counties (i.e., RUCC 9) differs very little from the other counties, outlying observations of the death rates are highest in these counties. Statistical anomalies notwithstanding for the moment, this may suggest that a firm's survival may be driven not just by some competitive dynamic with its rivals, but also by the concentration of businesses or the local supply of workers. Such a labor supply may simply be scarcer in particularly rural areas, thus hindering the firm's ability to grow and survive. Such an argument fits the general tenor of theory concerning agglomeration externalities (Rosenthal and Strange, 2004), but also implies that such theory may be advanced by studying businesses in geographic isolation.

5. CONCLUSION

The purpose of this paper has been to document a set of establishment birth and death (EBD) tabulations now available from the U.S. Census' Company Statistics Division. In doing so, we provided an overview of the Census databases from which the tabulated data were extracted, summarized the information in the data, and discussed several practical issues with using the EBD tabulations. We also provided a preliminary analysis of the establishment birth and death rates by rural and urban counties. This analysis gave a surprising result: when measured by the ecological and labor force methods, the rural versus urban differences in the average rates of births and deaths were extremely small, but statistically significant. This implies that, on average, the *general* dynamic of economic activities is not a function of rural versus urban conditions. Further analysis is expected to show, though, that such a dynamic *specific* to a particular industry will show strong urban versus rural effects. Indeed, the rural-urban comparison carries implications for the setting and study of economic development policy, especially in rural areas.

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7. TABLES AND FIGURES

Table 1: MSA and Non-MSA Establishments by Employment Size of Firm, 2004

MSA and Non-MSA Establishments by Employment Size of Firm, 2004

	Establishments				Percentages	
	Total	<20	<500	500+	<20	<500
Numbers						
Total	7,387,724	5,308,118	6,331,242	1,056,482	71.9%	85.7%
MSA	6,903,590	4,936,812	5,895,943	1,007,647	71.5%	85.4%
Non-MSA	484,134	371,306	435,299	48,835	76.7%	89.9%
Percentages						
MSA	93.4%	93.0%	93.1%	95.4%		
Non-MSA	6.6%	7.0%	6.9%	4.6%		

Source: Office of Advocacy, U.S. Small Business Administration from data provided by the U.S. Census Bureau, Statistics of U.S. Business.

Table 2: Establishment Births and Deaths by Year

Year	Variable	Obs.	Sum	Mean	Med.	S.D.	Min	Max
Totals	Total Births	43,941	10,858,146	247.11	56	887.70	0	31,111
	Single-Unit Births	43,941	8,916,742	202.93	48	737.90	0	26,318
	Multi-Unit Births	43,941	1,941,404	44.18	7	163.62	0	6,269
	Total Deaths	43,941	9,688,392	220.49	51	801.10	0	28,224
	Single-Unit Deaths	43,941	7,998,505	182.03	44	660.36	0	23,397
	Multi-Unit Deaths	43,941	1,689,887	38.46	6	148.33	0	5,370
1990	Total Births	3,137	733,837	233.93	52	861.14	0	27,181
	Single-Unit Births	3,137	638,802	203.63	48	749.12	0	24,261
	Multi-Unit Births	3,137	95,035	30.29	4	116.61	0	2,920
	Total Deaths	3,137	671,233	213.97	49	788.05	0	25,425
	Single-Unit Deaths	3,137	582,899	185.81	45	679.40	0	22,212
	Multi-Unit Deaths	3,137	88,334	28.16	4	113.13	0	3,213
1991	Total Births	3,137	720,219	229.59	52	845.41	0	26,719
	Single-Unit Births	3,137	586,395	186.93	43	698.89	0	22,634
	Multi-Unit Births	3,137	133,824	42.66	8	150.58	0	4,085
	Total Deaths	3,137	690,847	220.23	50	816.28	0	26,448
	Single-Unit Deaths	3,137	591,784	188.65	45	697.23	0	23,005
	Multi-Unit Deaths	3,137	99,063	31.58	5	123.46	0	3,443
1992	Total Births	3,139	811,033	258.37	59	910.64	0	27,542
	Single-Unit Births	3,139	615,586	196.11	47	701.29	0	21,273
	Multi-Unit Births	3,139	195,447	62.26	12	215.66	0	6,269
	Total Deaths	3,139	691,285	220.22	50	837.27	0	28,224
	Single-Unit Deaths	3,139	556,621	177.32	42	677.71	0	23,397
	Multi-Unit Deaths	3,139	134,664	42.90	7	165.24	0	4,827
1993	Total Births	3,138	727,318	231.78	55	816.14	0	23,990

	Single-Unit Births	3,138	641,686	204.49	50	722.36	0	21,609
	Multi-Unit Births	3,138	85,632	27.29	4	97.19	0	2,381
	Total Deaths	3,138	645,705	205.77	45.5	798.53	0	27,128
	Single-Unit Deaths	3,138	536,553	170.99	40	661.41	0	22,985
	Multi-Unit Deaths	3,138	109,152	34.78	5	141.92	0	4,143
1994	Total Births	3,138	759,626	242.07	56.5	858.04	0	26,128
	Single-Unit Births	3,138	646,623	206.06	51	733.36	0	23,070
	Multi-Unit Births	3,138	113,003	36.01	6	129.45	0	3,058
	Total Deaths	3,138	651,216	207.53	47	781.58	0	25,624
	Single-Unit Deaths	3,138	551,476	175.74	42	654.41	0	21,602
	Multi-Unit Deaths	3,138	99,740	31.78	5	130.66	0	4,022
1995	Total Births	3,138	747,215	238.12	55	848.80	0	26,101
	Single-Unit Births	3,138	647,608	206.38	49	740.44	0	23,491
	Multi-Unit Births	3,138	99,607	31.74	5	113.71	0	2,610
	Total Deaths	3,138	645,568	205.73	48	745.89	0	23,483
	Single-Unit Deaths	3,138	547,036	174.33	43	626.89	0	19,969
	Multi-Unit Deaths	3,138	98,532	31.40	5	122.74	0	3,514
1996	Total Births	3,140	773,691	246.40	57	873.21	0	26,635
	Single-Unit Births	3,140	670,418	213.51	51	761.29	0	23,925
	Multi-Unit Births	3,140	103,273	32.89	5	117.45	0	2,710
	Total Deaths	3,140	649,930	206.98	49	743.12	0	23,200
	Single-Unit Deaths	3,140	549,778	175.09	44	627.62	0	20,104
	Multi-Unit Deaths	3,140	100,152	31.90	5	119.79	0	3,096
1997	Single-Unit Births	3,139	643,600	205.03	49	738.69	0	23,363
	Multi-Unit Births	3,139	241,970	77.09	15	260.49	0	6,249
	Total Deaths	3,139	727,197	231.67	54	825.91	0	26,037
	Single-Unit Deaths	3,139	570,379	181.71	45	643.41	0	20,667
	Multi-Unit Deaths	3,139	156,818	49.96	8	188.03	0	5,370
1998	Total Births	3,139	760,229	242.19	56	865.82	0	26,213
	Single-Unit Births	3,139	637,936	203.23	49	731.43	0	23,106
	Multi-Unit Births	3,139	122,293	38.96	6	141.19	0	3,107
	Total Deaths	3,139	709,966	226.18	53	797.75	0	25,011
	Single-Unit Deaths	3,139	585,767	186.61	48	657.08	0	21,198
	Multi-Unit Deaths	3,139	124,199	39.57	6	148.60	0	3,813
1999	Total Births	3,139	770,071	245.32	54	878.65	0	26,915
	Single-Unit Births	3,139	627,656	199.95	46	725.39	0	23,308
	Multi-Unit Births	3,139	142,415	45.37	7	161.54	0	3,607
	Total Deaths	3,139	703,532	224.13	53	795.06	0	24,203
	Single-Unit Deaths	3,139	588,123	187.36	47	662.03	0	20,783
	Multi-Unit Deaths	3,139	115,409	36.77	6	139.38	0	3,420
2000	Total Births	3,139	767,165	244.40	53	892.73	0	27,296
	Single-Unit Births	3,139	635,219	202.36	46	748.46	0	24,013
	Multi-Unit Births	3,139	131,946	42.03	6	153.27	0	3,283
	Total Deaths	3,139	701,199	223.38	53	780.13	0	23,303

	Single-Unit Deaths	3,139	575,235	183.25	47	641.09	0	19,816
	Multi-Unit Deaths	3,139	125,964	40.13	6	144.95	0	3,487
2001	Total Births	3,139	764,795	243.64	52	876.57	0	26,903
	Single-Unit Births	3,139	618,119	196.92	45	721.34	0	23,367
	Multi-Unit Births	3,139	146,676	46.73	7	165.47	0	3,536
	Total Deaths	3,139	737,427	234.92	56	825.93	0	24,857
	Single-Unit Deaths	3,139	601,813	191.72	48	676.55	0	21,421
	Multi-Unit Deaths	3,139	135,614	43.20	7	157.13	0	3,436
2002	Total Births	3,139	864,131	275.29	59	991.53	0	31,111
	Single-Unit Births	3,139	643,515	205.01	45	763.45	0	25,221
	Multi-Unit Births	3,139	220,616	70.28	13	237.75	0	5,890
	Total Deaths	3,139	756,637	241.04	56	860.05	0	25,889
	Single-Unit Deaths	3,139	588,231	187.39	46	675.47	0	21,543
	Multi-Unit Deaths	3,139	168,406	53.65	9	193.83	0	4,346
2003	Total Births	3,140	773,246	246.26	53	903.57	0	28,901
	Single-Unit Births	3,140	663,579	211.33	46	790.81	0	26,318
	Multi-Unit Births	3,140	109,667	34.93	6	121.86	0	2,583
	Total Deaths	3,140	706,650	225.05	52	811.88	0	25,156
	Single-Unit Deaths	3,140	572,810	182.42	44.5	661.73	0	21,558
	Multi-Unit Deaths	3,140	133,840	42.62	7	158.92	0	3,598

Source: Establishment Birth and Death (EBD) Tabulations (special tabulations from the U.S. Census Bureau, Statistics of U.S. Business).

Table 3: Birth and Death Rates by Ecological and Labor Force Method

Year	Variable	Obs.	Mean	Med.	S.D.	Min	Max
Totals	Total Birth Rate (EM)	43,924	0.110	0.106	0.035	0	1.00
	Single-Unit Birth Rate (EM)	43,924	0.095	0.090	0.033	0	1.00
	Multi-Unit Birth Rate (EM)	43,924	0.016	0.014	0.012	0	0.29
	Total Death Rate (EM)	43,924	0.100	0.098	0.026	0	1.00
	Single-Unit Death Rate (EM)	43,924	0.088	0.085	0.026	0	1.00
	Multi-Unit Death Rate (EM)	43,924	0.013	0.012	0.010	0	0.50
	Total Birth Rate (LM)	40,792	0.005	0.005	0.002	0	0.04
	Single-Unit Birth Rate (LM)	40,792	0.005	0.004	0.002	0	0.04
	Multi-Unit Birth Rate (LM)	40,792	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	40,792	0.005	0.005	0.002	0	0.04
	Single-Unit Death Rate (LM)	40,792	0.004	0.004	0.002	0	0.04
	Multi-Unit Death Rate (LM)	40,792	0.005	0.005	0.002	0	0.04
1990	Total Birth Rate (EM)	3,135	0.114	0.110	0.033	0	0.54
	Single-Unit Birth Rate (EM)	3,135	0.104	0.100	0.032	0	0.54
	Multi-Unit Birth Rate (EM)	3,135	0.010	0.009	0.008	0	0.10
	Total Death Rate (EM)	3,135	0.107	0.105	0.029	0	0.50
	Single-Unit Death Rate (EM)	3,135	0.097	0.094	0.028	0	0.41
	Multi-Unit Death Rate (EM)	3,135	0.010	0.009	0.011	0	0.50
		Labor force data not available for 1990					
1991	Total Birth Rate (EM)	3,135	0.114	0.109	0.035	0	0.63
	Single-Unit Birth Rate (EM)	3,135	0.095	0.090	0.033	0	0.63
	Multi-Unit Birth Rate (EM)	3,135	0.019	0.018	0.011	0	0.15
	Total Death Rate (EM)	3,135	0.107	0.106	0.027	0	0.40
	Single-Unit Death Rate (EM)	3,135	0.096	0.093	0.027	0	0.39
	Multi-Unit Death Rate (EM)	3,135	0.011	0.010	0.008	0	0.06
	Total Birth Rate (LM)	3,135	0.005	0.005	0.002	0	0.03
	Single-Unit Birth Rate (LM)	3,135	0.005	0.004	0.002	0	0.03
	Multi-Unit Birth Rate (LM)	3,135	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	3,135	0.005	0.005	0.002	0	0.04
	Single-Unit Death Rate (LM)	3,135	0.005	0.004	0.002	0	0.04
	Multi-Unit Death Rate (LM)	3,135	0.005	0.005	0.002	0	0.04
1992	Total Birth Rate (EM)	3,135	0.129	0.124	0.040	0	0.75
	Single-Unit Birth Rate (EM)	3,135	0.102	0.096	0.037	0	0.75
	Multi-Unit Birth Rate (EM)	3,135	0.027	0.027	0.015	0	0.27
	Total Death Rate (EM)	3,135	0.106	0.104	0.025	0	0.28
	Single-Unit Death Rate (EM)	3,135	0.090	0.087	0.024	0	0.25
	Multi-Unit Death Rate (EM)	3,135	0.016	0.016	0.010	0	0.17
	Total Birth Rate (LM)	3,136	0.006	0.006	0.003	0	0.03
	Single-Unit Birth Rate (LM)	3,136	0.005	0.004	0.002	0	0.02
	Multi-Unit Birth Rate (LM)	3,136	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	3,136	0.005	0.005	0.002	0	0.02

	Single-Unit Death Rate (LM)	3,136	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,136	0.005	0.005	0.002	0	0.02
1993	Total Birth Rate (EM)	3,138	0.113	0.109	0.033	0	0.39
	Single-Unit Birth Rate (EM)	3,138	0.103	0.099	0.032	0	0.31
	Multi-Unit Birth Rate (EM)	3,138	0.010	0.009	0.009	0	0.17
	Total Death Rate (EM)	3,138	0.095	0.093	0.025	0	0.40
	Single-Unit Death Rate (EM)	3,138	0.084	0.081	0.024	0	0.40
	Multi-Unit Death Rate (EM)	3,138	0.012	0.011	0.008	0	0.08
	Total Birth Rate (LM)	3,137	0.005	0.005	0.002	0	0.03
	Single-Unit Birth Rate (LM)	3,137	0.005	0.005	0.002	0	0.02
	Multi-Unit Birth Rate (LM)	3,137	0.000	0.000	0.000	0	0.01
	Total Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.02
	Single-Unit Death Rate (LM)	3,137	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.02
1994	Total Birth Rate (EM)	3,134	0.114	0.110	0.034	0	0.39
	Single-Unit Birth Rate (EM)	3,134	0.102	0.097	0.033	0	0.37
	Multi-Unit Birth Rate (EM)	3,134	0.012	0.012	0.009	0	0.13
	Total Death Rate (EM)	3,134	0.097	0.095	0.024	0	0.33
	Single-Unit Death Rate (EM)	3,134	0.086	0.084	0.023	0	0.33
	Multi-Unit Death Rate (EM)	3,134	0.010	0.010	0.007	0	0.09
	Total Birth Rate (LM)	3,137	0.005	0.005	0.002	0	0.03
	Single-Unit Birth Rate (LM)	3,137	0.005	0.004	0.002	0	0.03
	Multi-Unit Birth Rate (LM)	3,137	0.001	0.001	0.000	0	0.01
	Total Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.02
	Single-Unit Death Rate (LM)	3,137	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.02
1995	Total Birth Rate (EM)	3,138	0.111	0.107	0.037	0	1.00
	Single-Unit Birth Rate (EM)	3,138	0.100	0.096	0.036	0	1.00
	Multi-Unit Birth Rate (EM)	3,138	0.011	0.010	0.009	0	0.20
	Total Death Rate (EM)	3,138	0.096	0.094	0.024	0	0.33
	Single-Unit Death Rate (EM)	3,138	0.085	0.083	0.023	0	0.26
	Multi-Unit Death Rate (EM)	3,138	0.010	0.010	0.007	0	0.13
	Total Birth Rate (LM)	3,137	0.005	0.005	0.002	0	0.02
	Single-Unit Birth Rate (LM)	3,137	0.005	0.004	0.002	0	0.02
	Multi-Unit Birth Rate (LM)	3,137	0.001	0.000	0.000	0	0.01
	Total Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.03
	Single-Unit Death Rate (LM)	3,137	0.004	0.004	0.002	0	0.03
	Multi-Unit Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.03
1996	Total Birth Rate (EM)	3,138	0.114	0.109	0.037	0	0.67
	Single-Unit Birth Rate (EM)	3,138	0.103	0.098	0.036	0	0.67
	Multi-Unit Birth Rate (EM)	3,138	0.011	0.010	0.009	0	0.18
	Total Death Rate (EM)	3,138	0.096	0.094	0.025	0	0.50
	Single-Unit Death Rate (EM)	3,138	0.086	0.083	0.024	0	0.50

	Multi-Unit Death Rate (EM)	3,138	0.011	0.010	0.008	0	0.11
	Total Birth Rate (LM)	3,137	0.005	0.005	0.002	0	0.02
	Single-Unit Birth Rate (LM)	3,137	0.005	0.005	0.002	0	0.02
	Multi-Unit Birth Rate (LM)	3,137	0.001	0.000	0.000	0	0.00
	Total Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.03
	Single-Unit Death Rate (LM)	3,137	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,137	0.005	0.004	0.002	0	0.03
1997	Total Birth Rate (EM)	3,139	0.124	0.121	0.032	0	0.36
	Single-Unit Birth Rate (EM)	3,139	0.094	0.091	0.029	0	0.33
	Multi-Unit Birth Rate (EM)	3,139	0.029	0.029	0.015	0	0.20
	Total Death Rate (EM)	3,139	0.103	0.102	0.024	0	0.33
	Single-Unit Death Rate (EM)	3,139	0.087	0.084	0.024	0	0.33
	Multi-Unit Death Rate (EM)	3,139	0.016	0.016	0.011	0	0.25
	Total Birth Rate (LM)	3,139	0.006	0.006	0.002	0	0.04
	Single-Unit Birth Rate (LM)	3,139	0.005	0.004	0.002	0	0.03
	Multi-Unit Birth Rate (LM)	3,139	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.03
	Single-Unit Death Rate (LM)	3,139	0.004	0.004	0.002	0	0.03
	Multi-Unit Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.03
1998	Total Birth Rate (EM)	3,139	0.103	0.100	0.030	0	0.44
	Single-Unit Birth Rate (EM)	3,139	0.090	0.087	0.029	0	0.44
	Multi-Unit Birth Rate (EM)	3,139	0.012	0.012	0.009	0	0.11
	Total Death Rate (EM)	3,139	0.100	0.099	0.025	0	0.50
	Single-Unit Death Rate (EM)	3,139	0.088	0.085	0.023	0	0.30
	Multi-Unit Death Rate (EM)	3,139	0.013	0.012	0.012	0	0.50
	Total Birth Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
	Single-Unit Birth Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
	Multi-Unit Birth Rate (LM)	3,139	0.001	0.001	0.000	0	0.01
	Total Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
	Single-Unit Death Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
1999	Total Birth Rate (EM)	3,139	0.102	0.099	0.033	0	1.00
	Single-Unit Birth Rate (EM)	3,139	0.087	0.084	0.032	0	1.00
	Multi-Unit Birth Rate (EM)	3,139	0.014	0.014	0.009	0	0.08
	Total Death Rate (EM)	3,139	0.100	0.097	0.031	0	1.00
	Single-Unit Death Rate (EM)	3,139	0.089	0.085	0.031	0	1.00
	Multi-Unit Death Rate (EM)	3,139	0.011	0.011	0.008	0	0.10
	Total Birth Rate (LM)	3,139	0.005	0.005	0.002	0	0.03
	Single-Unit Birth Rate (LM)	3,139	0.004	0.004	0.002	0	0.03
	Multi-Unit Birth Rate (LM)	3,139	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.03
	Single-Unit Death Rate (LM)	3,139	0.004	0.004	0.002	0	0.03
	Multi-Unit Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.03

2000	Total Birth Rate (EM)	3,139	0.099	0.096	0.030	0	0.33
	Single-Unit Birth Rate (EM)	3,139	0.086	0.082	0.029	0	0.33
	Multi-Unit Birth Rate (EM)	3,139	0.013	0.012	0.010	0	0.29
	Total Death Rate (EM)	3,139	0.098	0.096	0.024	0	0.33
	Single-Unit Death Rate (EM)	3,139	0.085	0.083	0.023	0	0.33
	Multi-Unit Death Rate (EM)	3,139	0.013	0.012	0.008	0	0.08
	Total Birth Rate (LM)	3,139	0.005	0.004	0.002	0	0.04
	Single-Unit Birth Rate (LM)	3,139	0.004	0.004	0.002	0	0.04
	Multi-Unit Birth Rate (LM)	3,139	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
	Single-Unit Death Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
2001	Total Birth Rate (EM)	3,139	0.099	0.096	0.031	0	0.67
	Single-Unit Birth Rate (EM)	3,139	0.085	0.081	0.029	0	0.67
	Multi-Unit Birth Rate (EM)	3,139	0.014	0.013	0.010	0	0.13
	Total Death Rate (EM)	3,139	0.102	0.100	0.029	0	1.00
	Single-Unit Death Rate (EM)	3,139	0.088	0.085	0.029	0	1.00
	Multi-Unit Death Rate (EM)	3,139	0.014	0.013	0.009	0	0.14
	Total Birth Rate (LM)	3,139	0.005	0.004	0.002	0	0.02
	Single-Unit Birth Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
	Multi-Unit Birth Rate (LM)	3,139	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
	Single-Unit Death Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
2002	Total Birth Rate (EM)	3,138	0.113	0.109	0.035	0	0.58
	Single-Unit Birth Rate (EM)	3,138	0.087	0.082	0.033	0	0.55
	Multi-Unit Birth Rate (EM)	3,138	0.026	0.025	0.014	0	0.25
	Total Death Rate (EM)	3,138	0.102	0.101	0.024	0	0.38
	Single-Unit Death Rate (EM)	3,138	0.084	0.082	0.023	0	0.38
	Multi-Unit Death Rate (EM)	3,138	0.018	0.018	0.010	0	0.10
	Total Birth Rate (LM)	3,139	0.005	0.005	0.002	0	0.03
	Single-Unit Birth Rate (LM)	3,139	0.004	0.004	0.002	0	0.03
	Multi-Unit Birth Rate (LM)	3,139	0.001	0.001	0.001	0	0.01
	Total Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
	Single-Unit Death Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
	Multi-Unit Death Rate (LM)	3,139	0.005	0.005	0.002	0	0.02
2003	Total Birth Rate (EM)	3,138	0.097	0.094	0.030	0	0.30
	Single-Unit Birth Rate (EM)	3,138	0.086	0.082	0.029	0	0.30
	Multi-Unit Birth Rate (EM)	3,138	0.011	0.011	0.008	0	0.07
	Total Death Rate (EM)	3,138	0.094	0.093	0.024	0	0.43
	Single-Unit Death Rate (EM)	3,138	0.081	0.078	0.024	0	0.43
	Multi-Unit Death Rate (EM)	3,138	0.013	0.013	0.009	0	0.13
	Total Birth Rate (LM)	3,139	0.005	0.004	0.002	0	0.02

Single-Unit Birth Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
Multi-Unit Birth Rate (LM)	3,139	0.001	0.000	0.000	0	0.01
Total Death Rate (LM)	3,139	0.005	0.004	0.002	0	0.02
Single-Unit Death Rate (LM)	3,139	0.004	0.004	0.002	0	0.02
Multi-Unit Death Rate (LM)	3,139	0.005	0.004	0.002	0	0.02

Source: Establishment Birth and Death (EBD) Tabulations (special tabulations from the U.S. Census Bureau, Statistics of U.S. Business) and Bureau of Labor Statistics.

Table 4: Total Birth and Death Rates by MSA

Total Birth and Death Rates by MSA

Total Birth Rate (EM)

MSA	Mean	S.D.	Min	Max
Primary	0.11	0.02	0.03	0.42
Secondary	0.12	0.03	0.04	0.39
Non-MSA	0.11	0.04	0	1

Total Death Rate (EM)

MSA	Mean	S.D.	Min	Max
Primary	0.10	0.01	0	0.20
Secondary	0.10	0.02	0.04	0.22
Non-MSA	0.10	0.03	0	1

Total Birth Rate (LM)

MSA	Mean	S.D.	Min	Max
Primary	0.006	0.002	0.001	0.03
Secondary	0.005	0.002	0.001	0.03
Non-MSA	0.005	0.002	0	0.04

Total Death Rate (LM)

MSA	Mean	S.D.	Min	Max
Primary	0.005	0.002	0	0.02
Secondary	0.004	0.001	0.001	0.02
Non-MSA	0.005	0.002	0	0.04

Source: See Table 3.

Table 5: Description of RUCC Codes

Code	Description
	Metro counties:
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
	Non-metro counties:
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area
Source: ERS/USDA Briefing Room, “Measuring Rurality: Rural-Urban Continuum Codes	

Table 6: Total Birth and Death Rates by RUCC

Total Birth and Death Rates by RUCC

Total Birth Rate (EM)					Total Death Rate (EM)				
RUCC	Mean	S.D.	Min	Max	RUCC	Mean	S.D.	Min	Max
1	0.12	0.03	0.03	0.62	1	0.11	0.02	0.03	0.26
2	0.12	0.03	0.04	0.42	2	0.10	0.02	0	0.23
3	0.11	0.03	0	0.44	3	0.10	0.02	0	0.33
4	0.10	0.02	0.05	0.24	4	0.10	0.02	0.05	0.18
5	0.10	0.02	0.05	0.21	5	0.09	0.01	0.05	0.16
6	0.11	0.03	0	0.41	6	0.10	0.02	0.04	0.40
7	0.10	0.03	0.02	0.33	7	0.10	0.02	0.02	0.34
8	0.11	0.04	0	0.47	8	0.10	0.03	0	0.35
9	0.11	0.05	0	1	9	0.10	0.04	0	1
Total Birth Rate (LM)					**Total Death Rate (LM)**				
RUCC	Mean	S.D.	Min	Max	RUCC	Mean	S.D.	Min	Max
1	0.005	0.002	0.001	0.03	1	0.005	0.002	0.001	0.02
2	0.005	0.002	0.001	0.02	2	0.004	0.001	0	0.01
3	0.005	0.002	0	0.03	3	0.005	0.002	0	0.02
4	0.005	0.002	0.001	0.01	4	0.005	0.001	0.002	0.01
5	0.006	0.002	0.002	0.02	5	0.005	0.001	0.002	0.01
6	0.005	0.002	0	0.02	6	0.005	0.002	0.001	0.04
7	0.006	0.003	0.001	0.03	7	0	0.002	0	0.02
8	0.005	0.003	0	0.02	8	0.005	0.002	0	0.02
9	0.006	0.003	0	0.04	9	0.005	0.003	0	0.03

Source: See Table 3.

Figure 1:

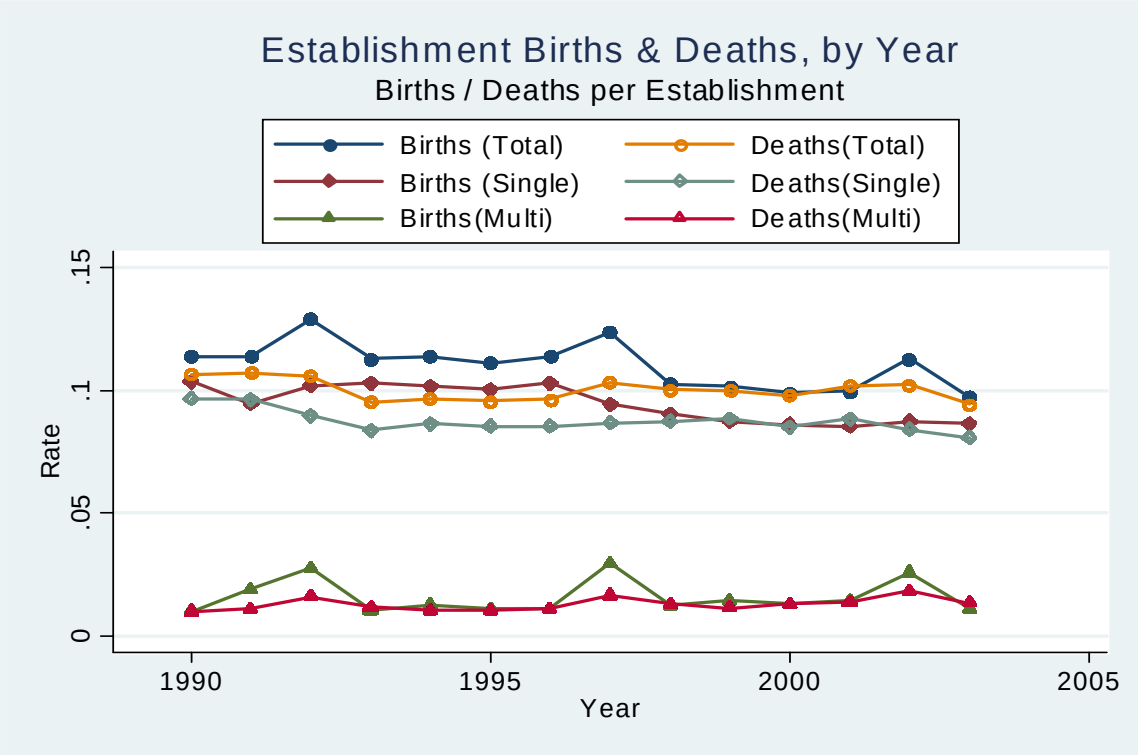
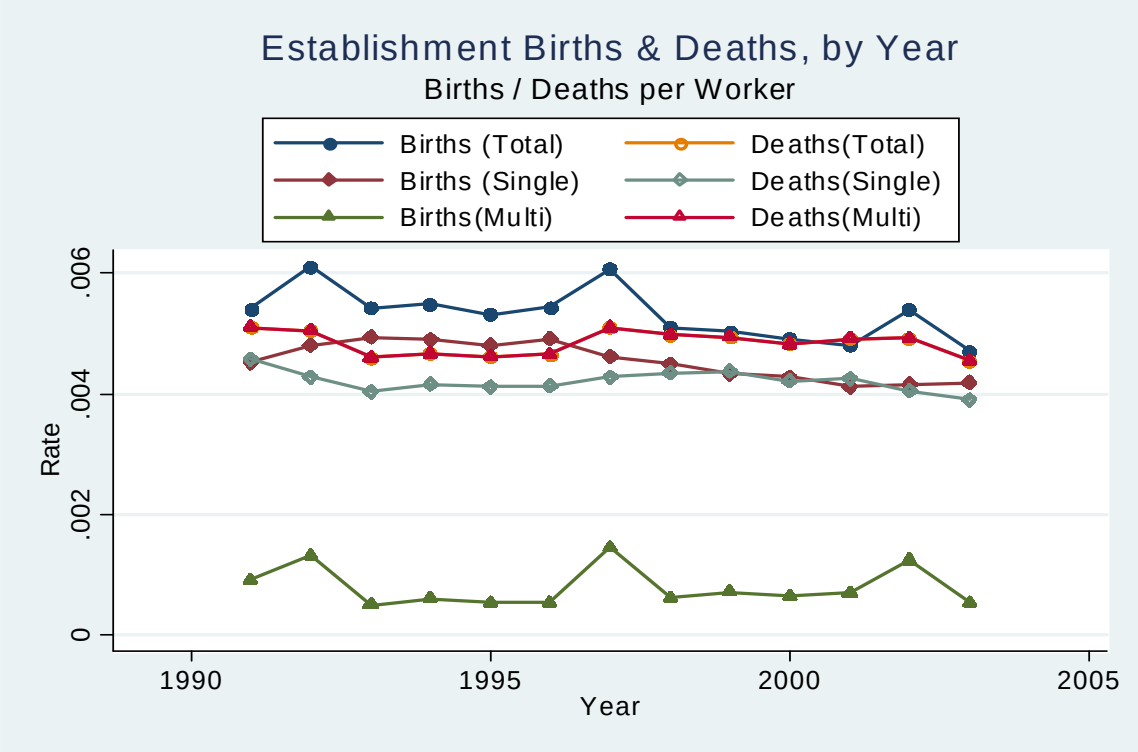
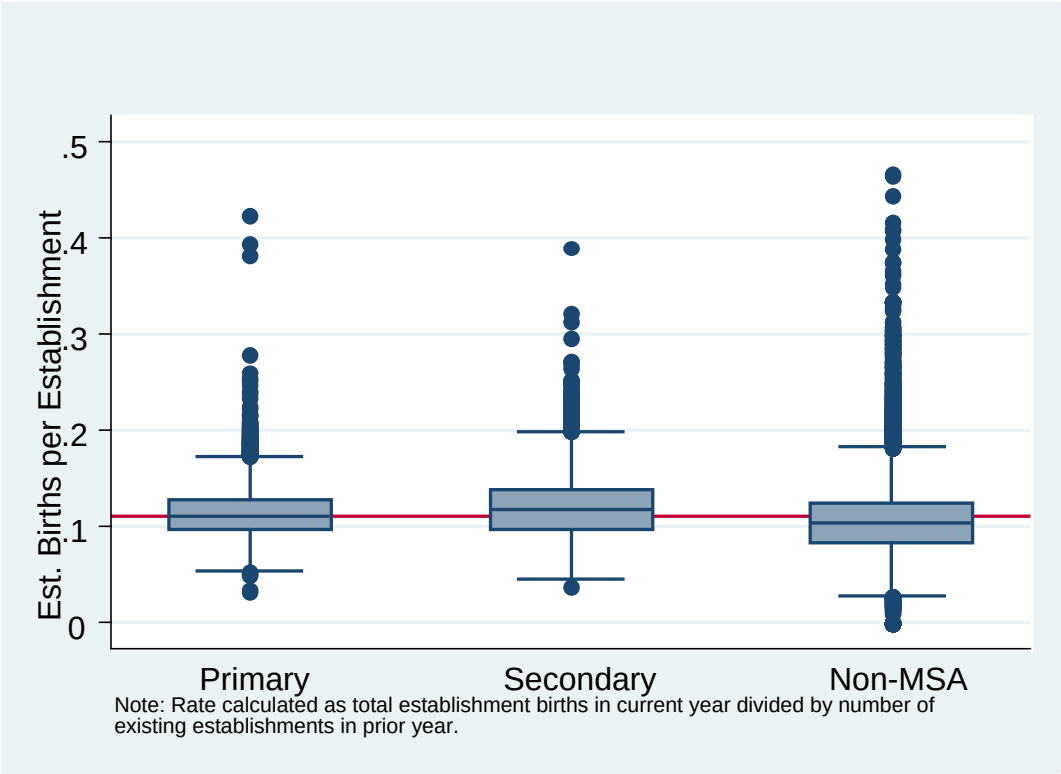


Figure 2:



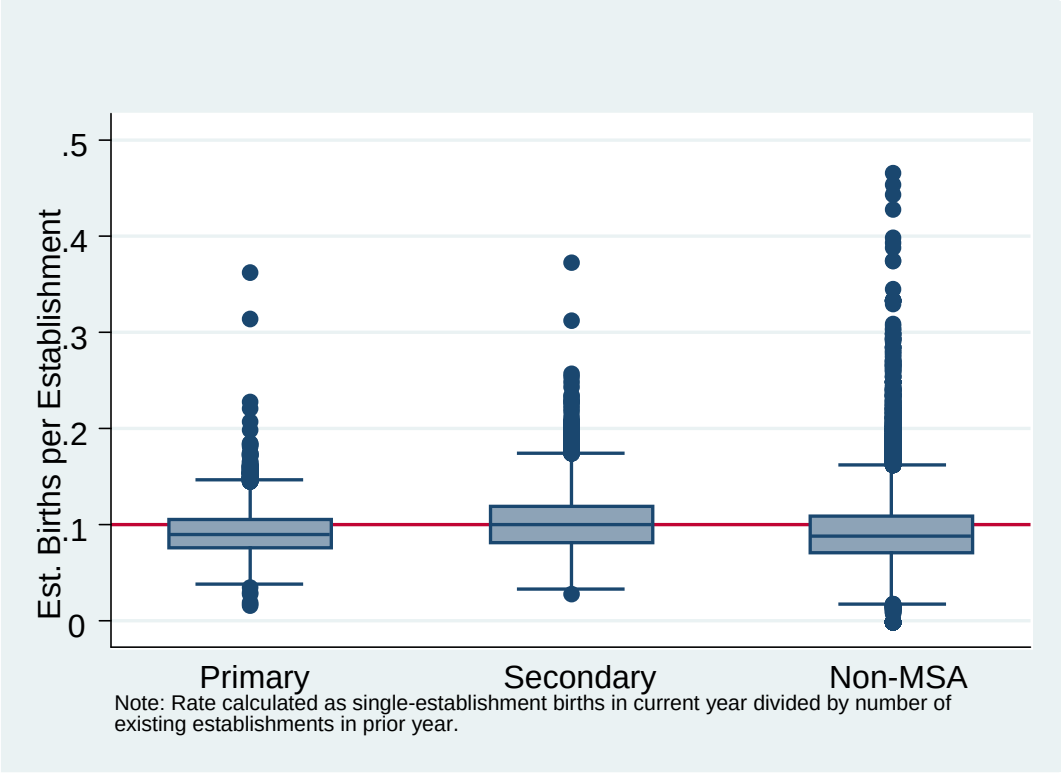
7.1. Establishment Births and Deaths (Ecological Method) by MSA

Figure 3: Establishment Births per Establishment, by MSA



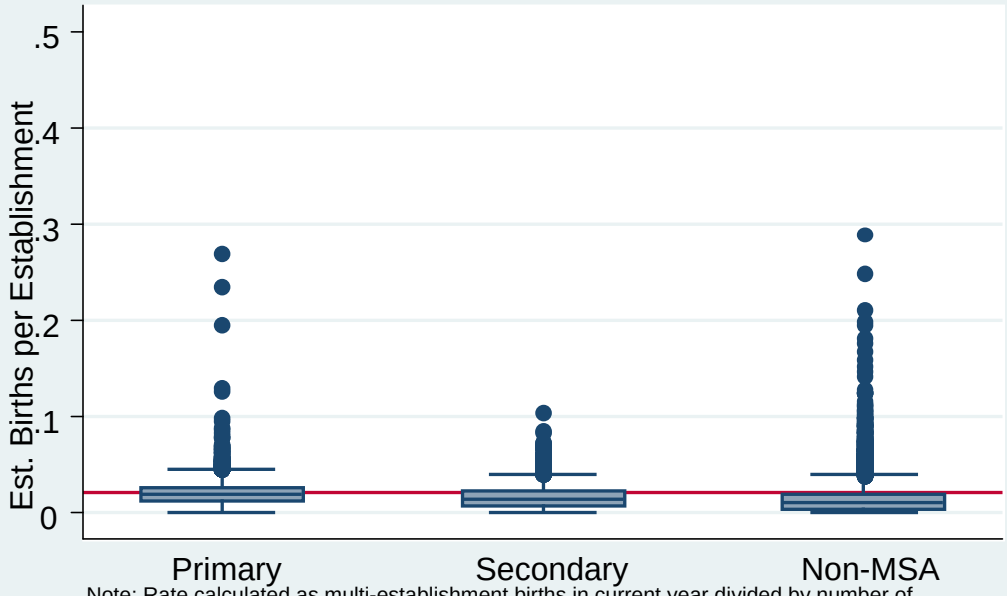
Note: Rate calculated as total establishment births in current year divided by number of existing establishments in prior year.

Figure 4: Single-Unit Establishment Births per Establishment, by MSA



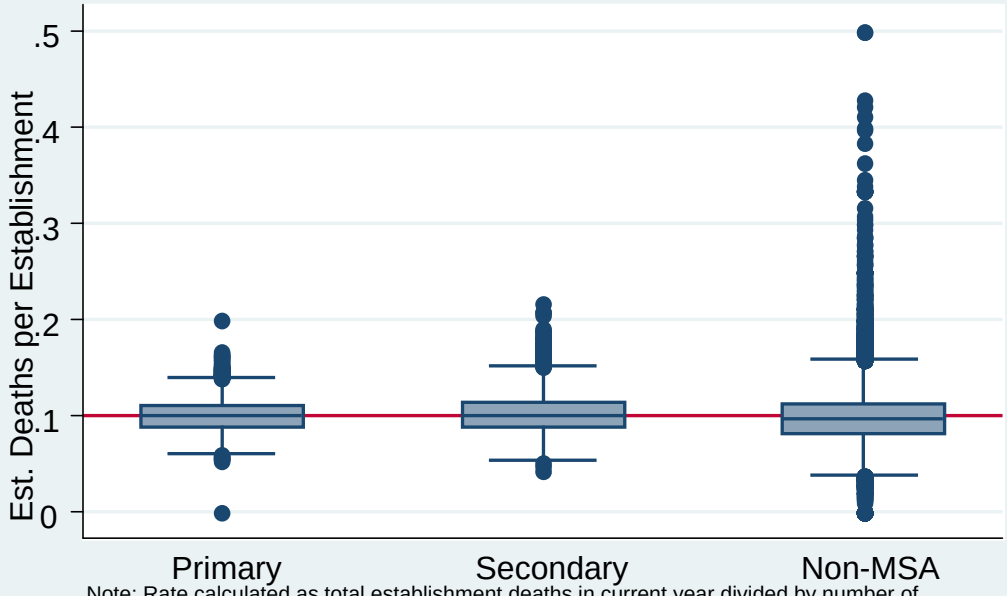
Note: Rate calculated as single-establishment births in current year divided by number of existing establishments in prior year.

Figure 5: Multi-Unit Establishment Births per Establishment, by MSA



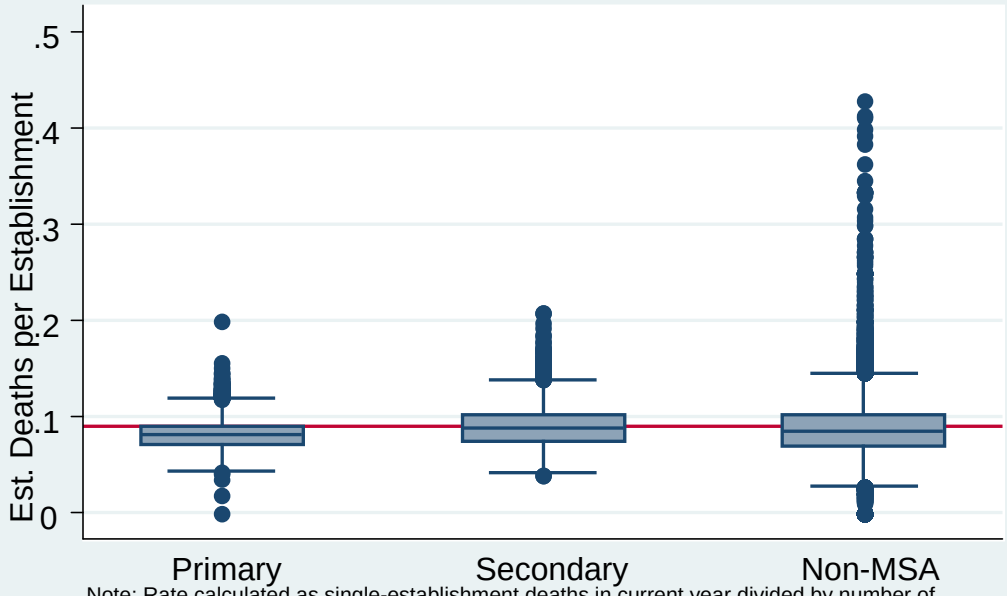
Note: Rate calculated as multi-establishment births in current year divided by number of existing establishments in prior year.

Figure 6: Establishment Deaths per Establishment, by MSA



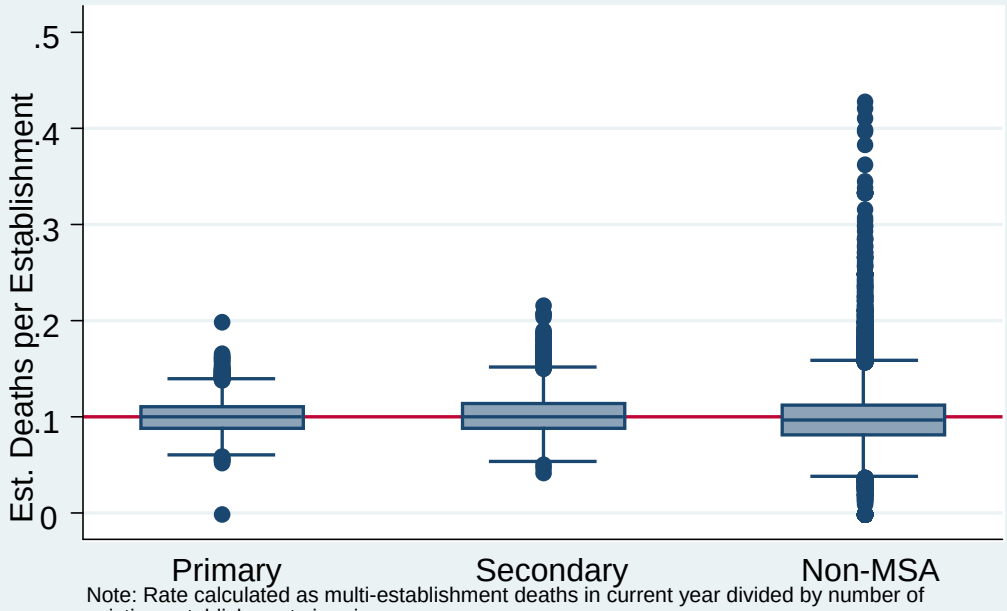
Note: Rate calculated as total establishment deaths in current year divided by number of existing establishments in prior year.

Figure 7: Single-Unit Establishment Deaths per Establishment, by MSA



Note: Rate calculated as single-establishment deaths in current year divided by number of existing establishments in prior year.

Figure 8: Multi-Unit Establishment Deaths per Establishment, by MSA



Note: Rate calculated as multi-establishment deaths in current year divided by number of existing establishments in prior year.

7.2. Establishment Births and Deaths (Labor Force Method) by MSA

Figure 9: Establishment Births per Worker, by MSA

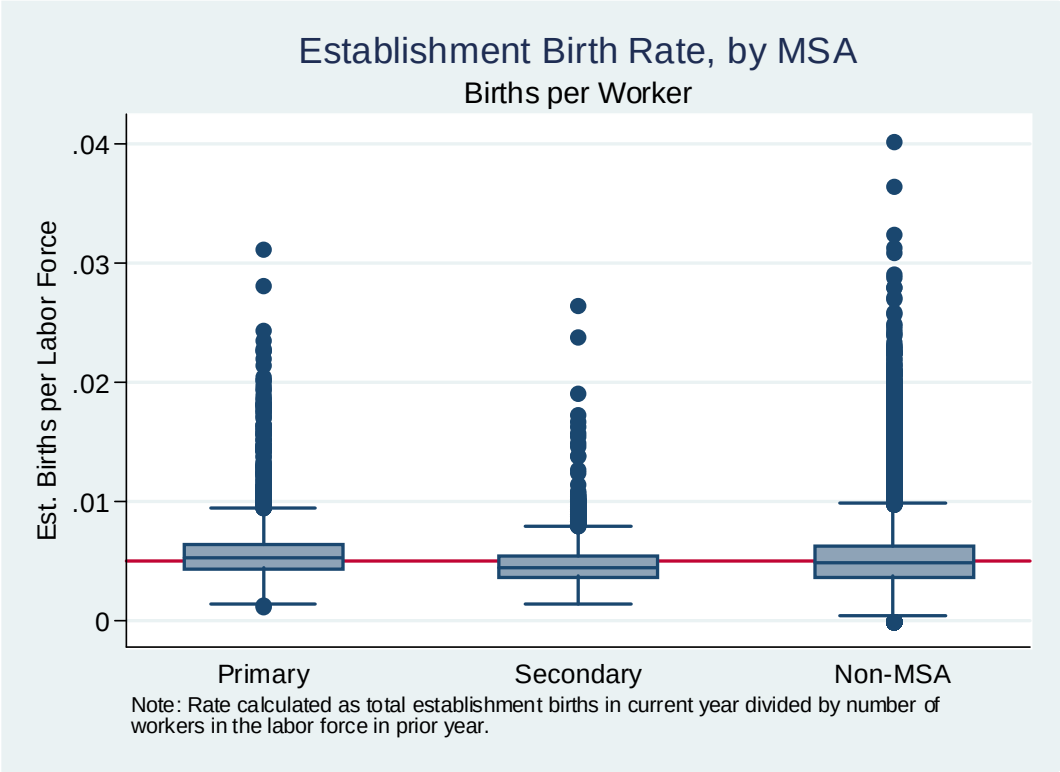


Figure 10: Single-Unit Establishment Births per Worker, by MSA

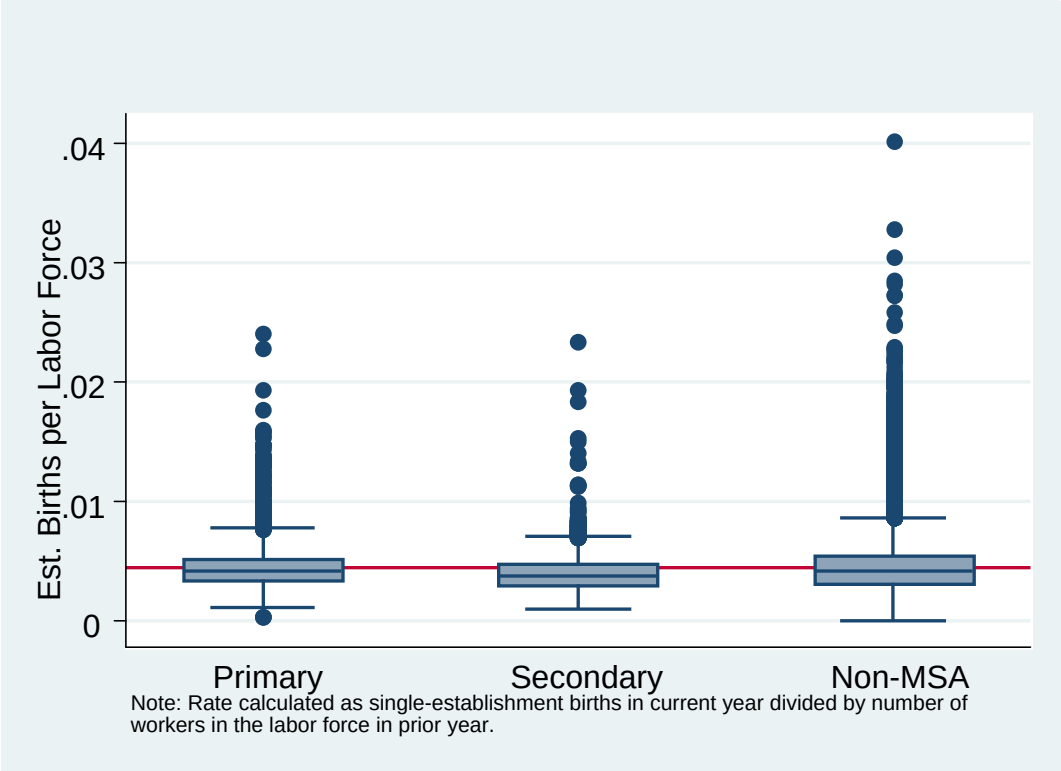


Figure 11: Multi-Unit Establishment Births per Worker, by MSA

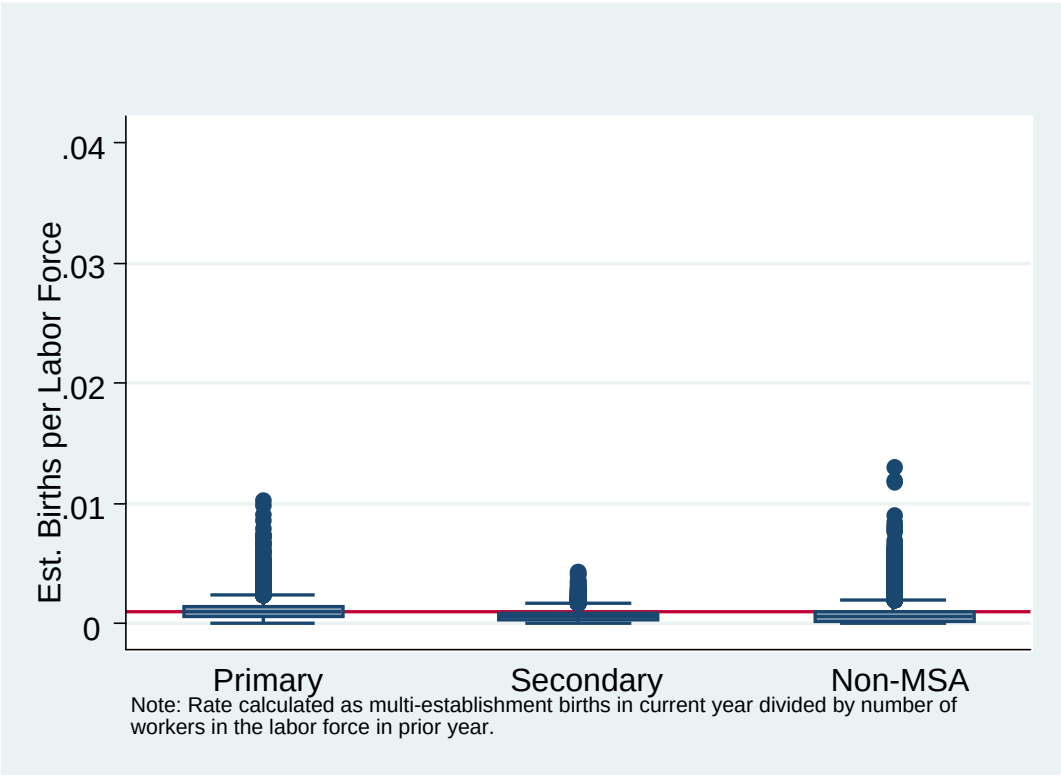


Figure 12: Establishment Deaths per Worker, by MSA

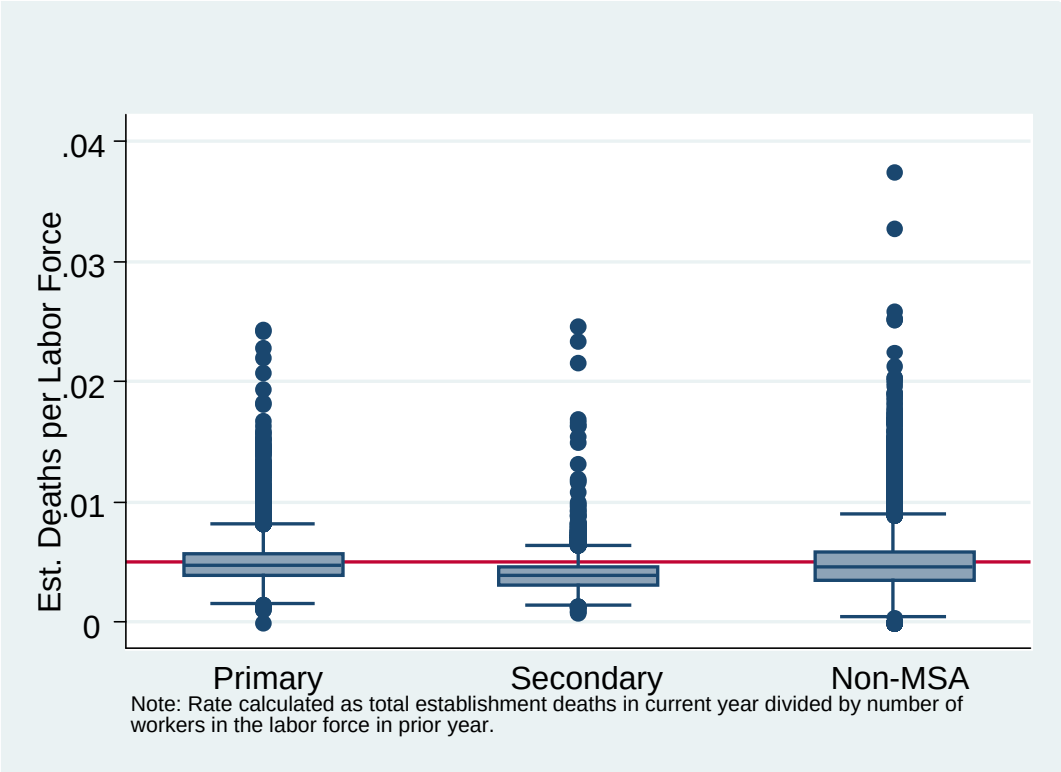
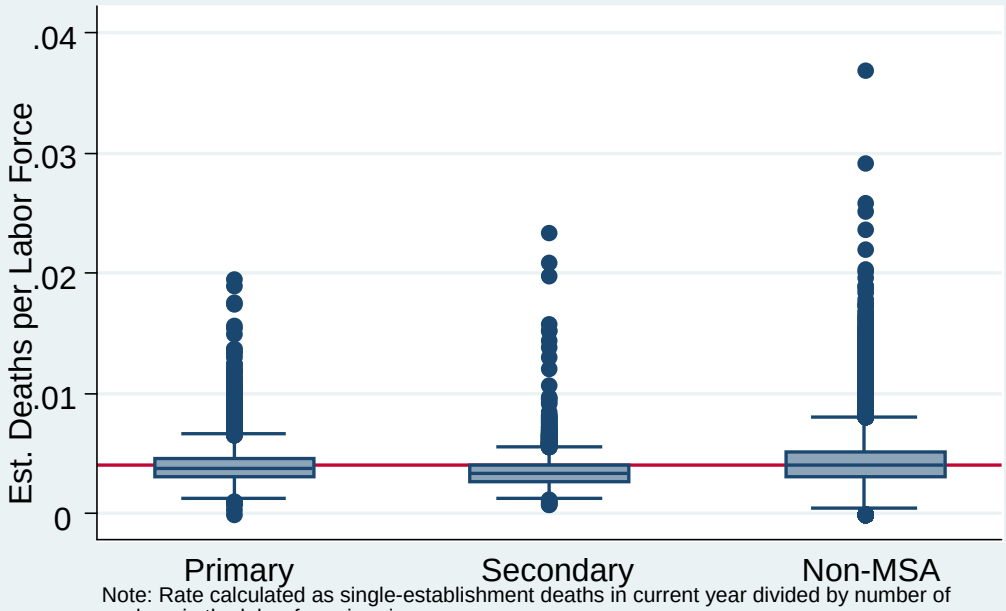
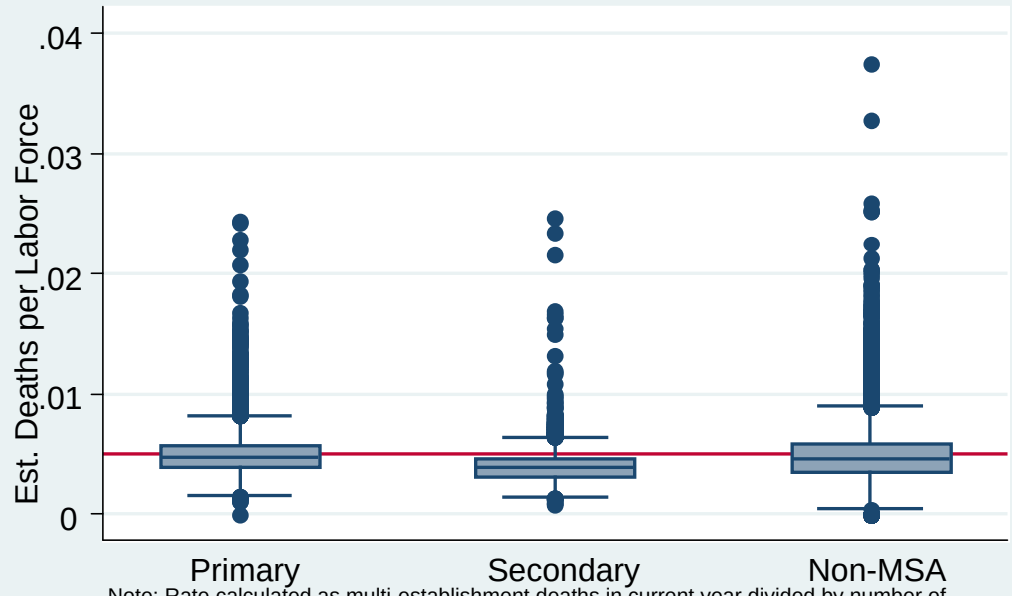


Figure 13: Single-Unit Establishment Deaths per Worker, by MSA



Note: Rate calculated as single-establishment deaths in current year divided by number of workers in the labor force in prior year.

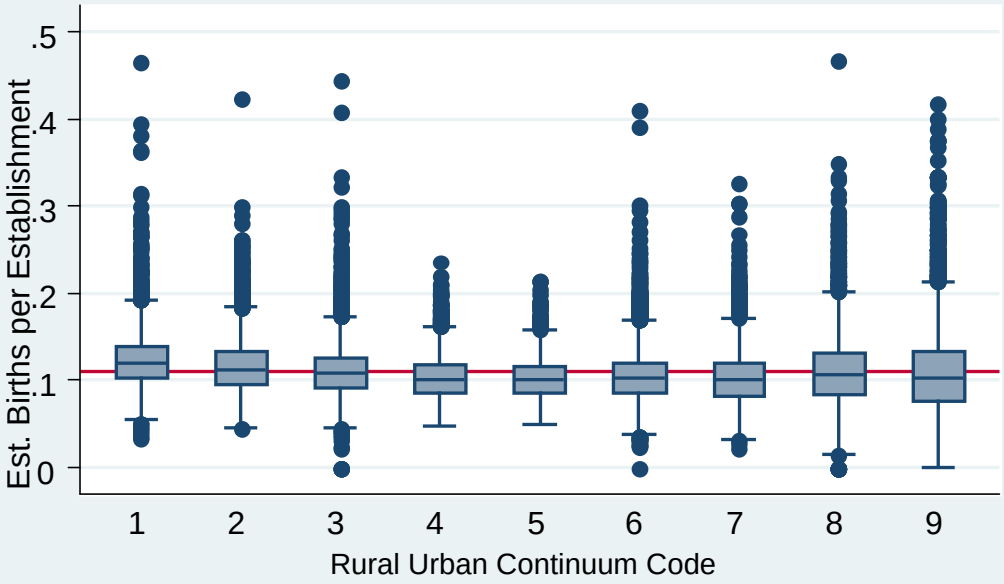
Figure 14: Multi-Unit Establishment Deaths per Worker, by MSA



Note: Rate calculated as multi-establishment deaths in current year divided by number of workers in the labor force in prior year.

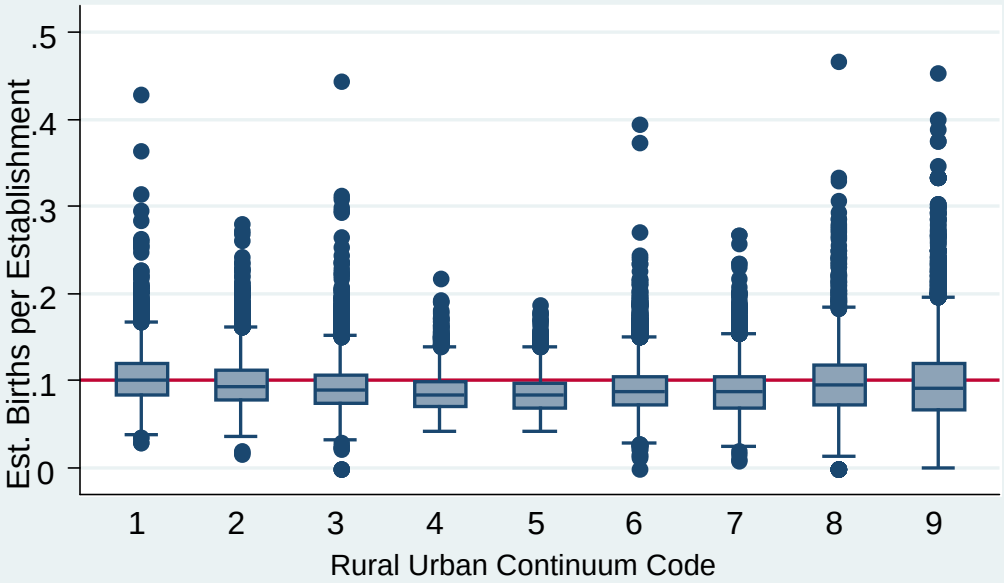
7.3. Establishment Births and Deaths (Ecological Method) by RUCC

Figure 15: Establishment Births per Establishment, by RUCC



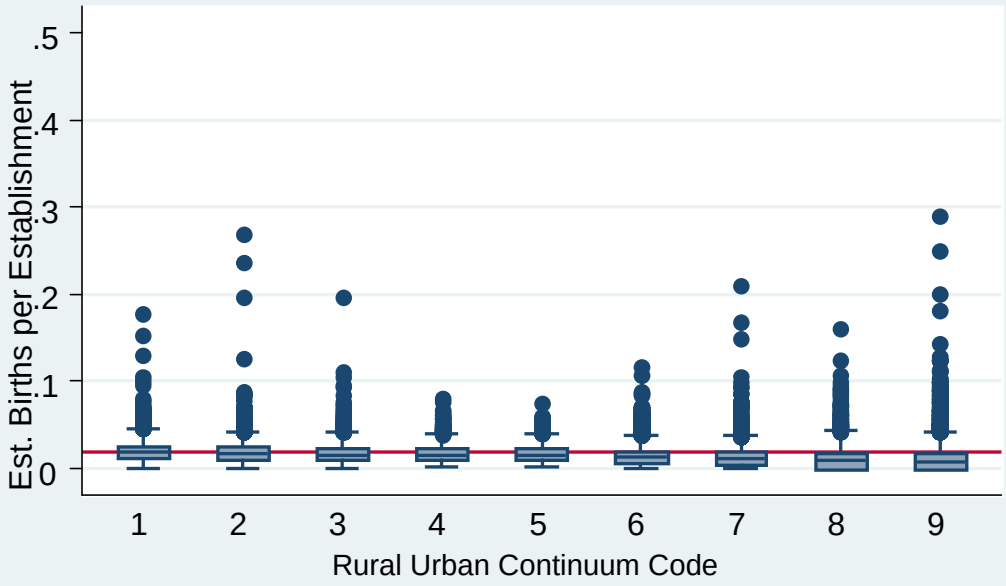
Note: Rate calculated as total establishment births in current year divided by number of existing establishments in prior year.

Figure 16: Single-Unit Establishment Births per Establishment, by RUCC



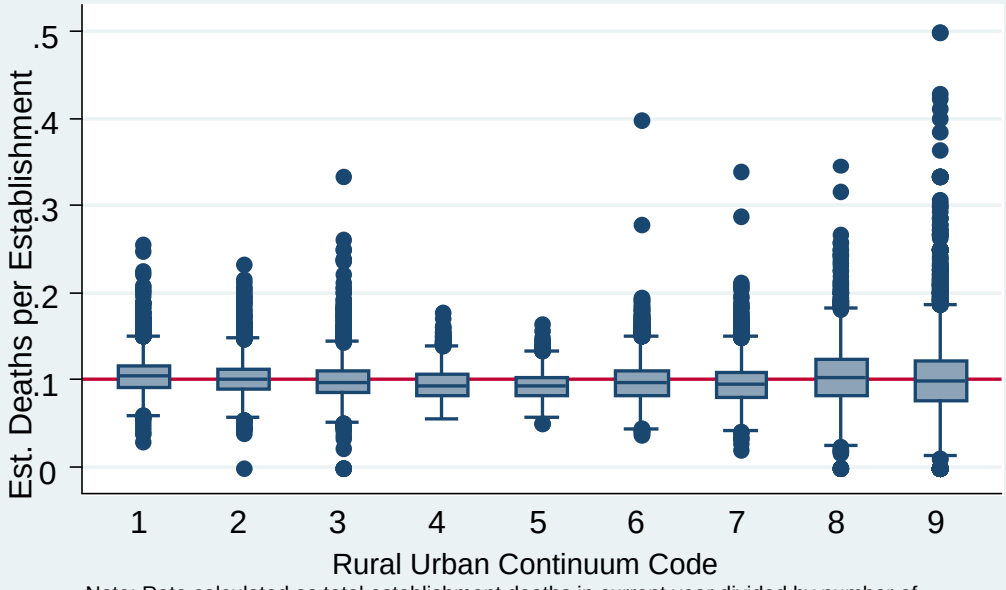
Note: Rate calculated as single-establishment births in current year divided by number of existing establishments in prior year.

Figure 17: Multi-Unit Establishment Births per Establishment, by RUCC



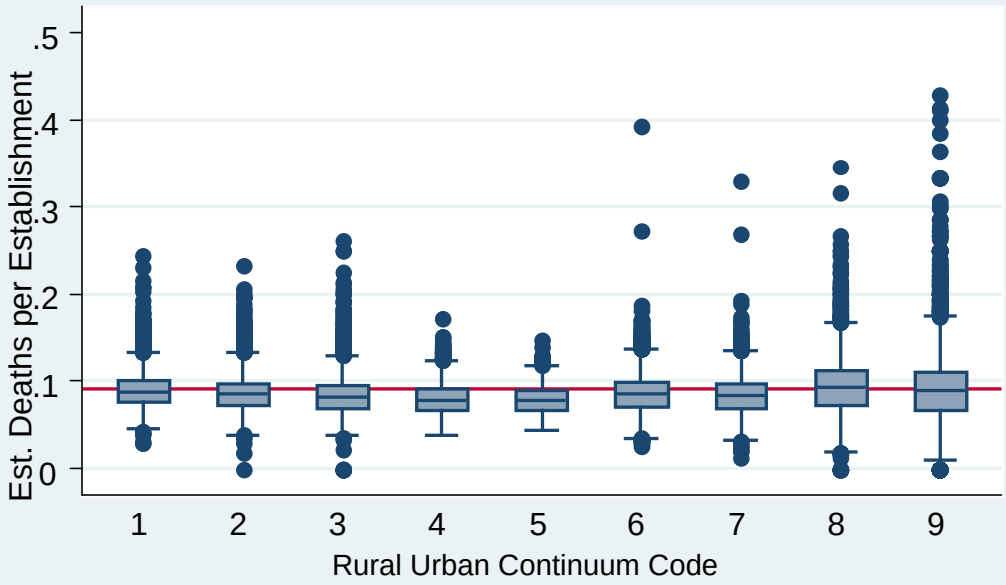
Note: Rate calculated as multi-establishment births in current year divided by number of existing establishments in prior year.

Figure 18: Establishment Deaths per Establishment, by RUCC



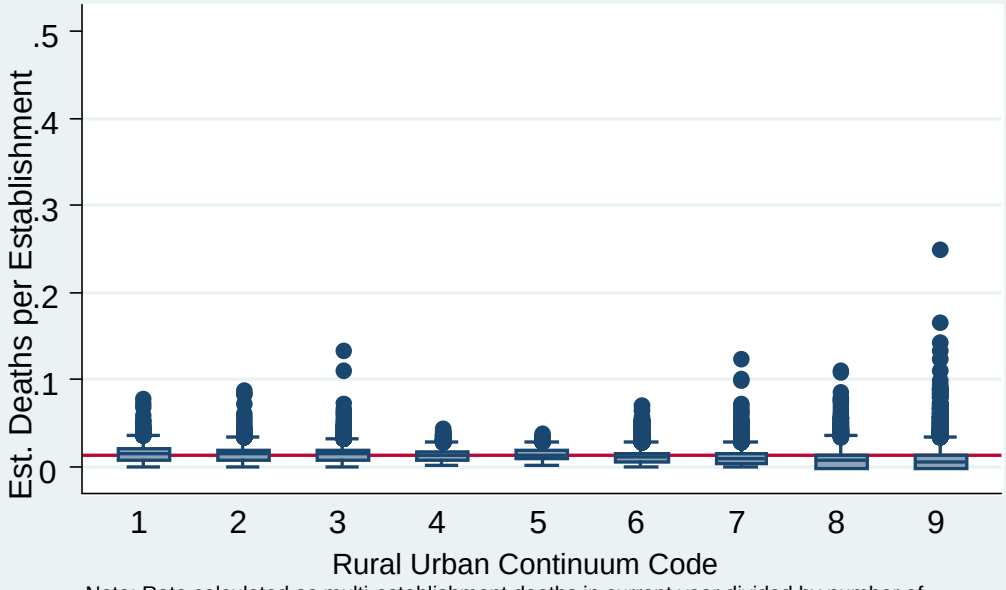
Note: Rate calculated as total establishment deaths in current year divided by number of existing establishments in prior year.

Figure 19: Single-Unit Establishment Deaths per Establishment, by RUCC



Note: Rate calculated as single-establishment deaths in current year divided by number of existing establishments in prior year.

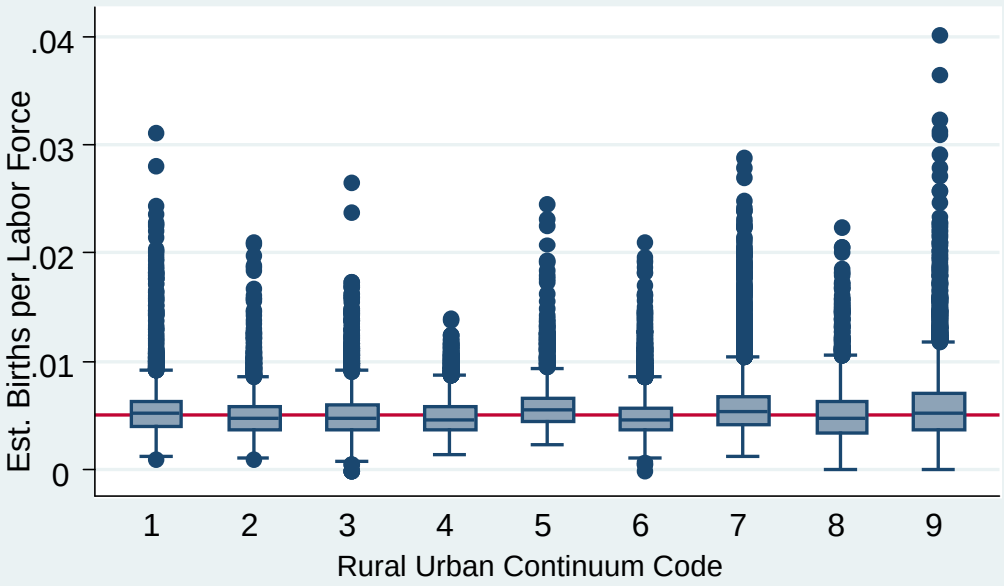
Figure 20: Multi-Unit Establishment Deaths per Establishment, by RUCC



Note: Rate calculated as multi-establishment deaths in current year divided by number of existing establishments in prior year.

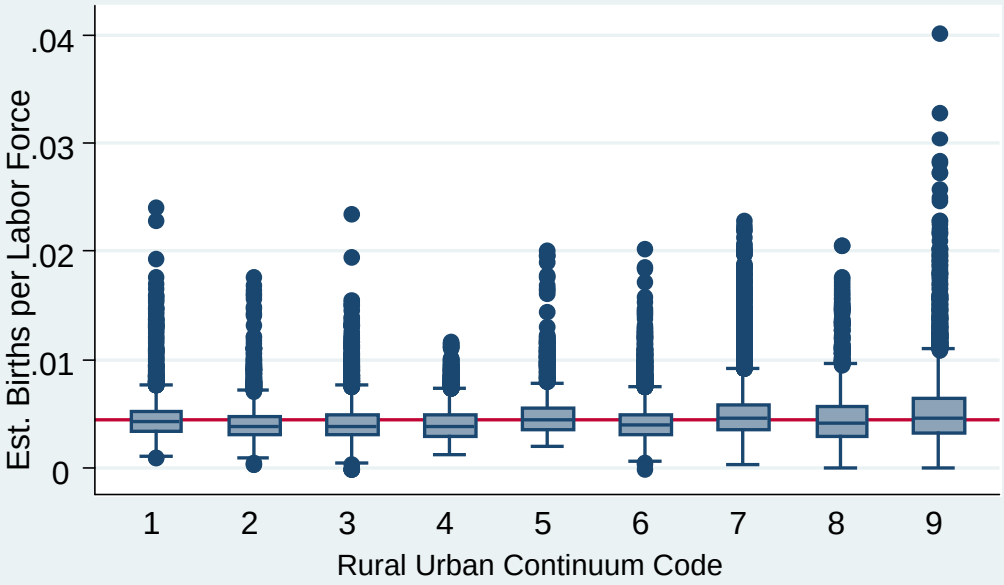
7.4. Establishment Births and Deaths (Labor Force Method) by RUCC

Figure 21: Establishment Births per Worker, by RUCC



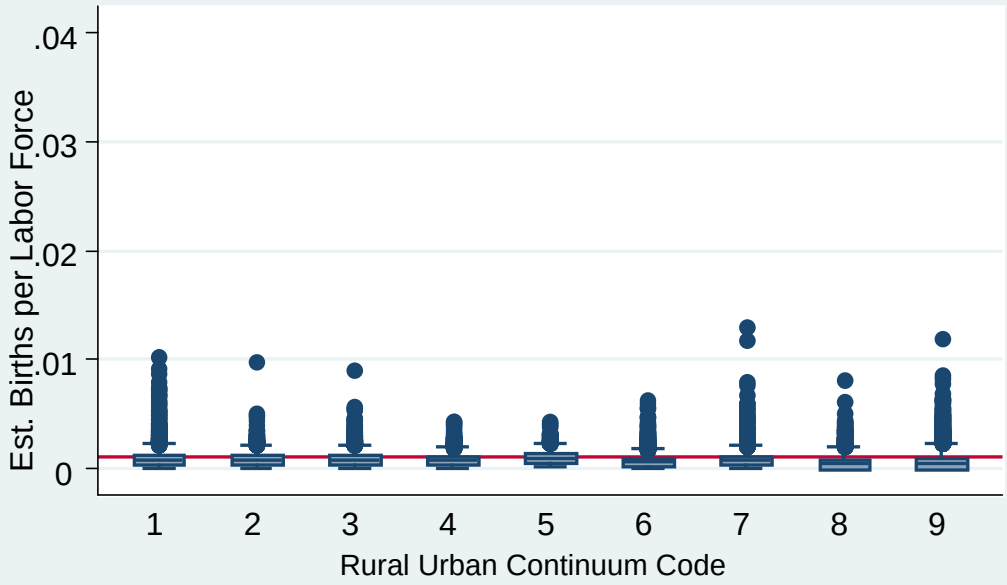
Note: Rate calculated as total establishment births in current year divided by number of workers in the labor force in prior year.

Figure 22: Single-Unit Establishment Births per Worker, by RUCC



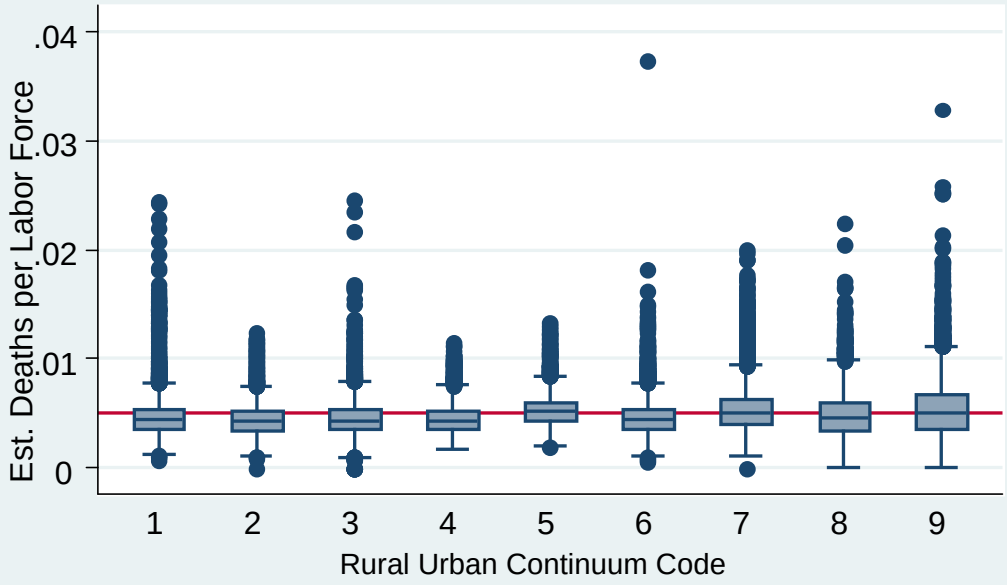
Note: Rate calculated as single-establishment births in current year divided by number of workers in the labor force in prior year.

Figure 23: Multi-Unit Establishment Births per Worker, by RUCC



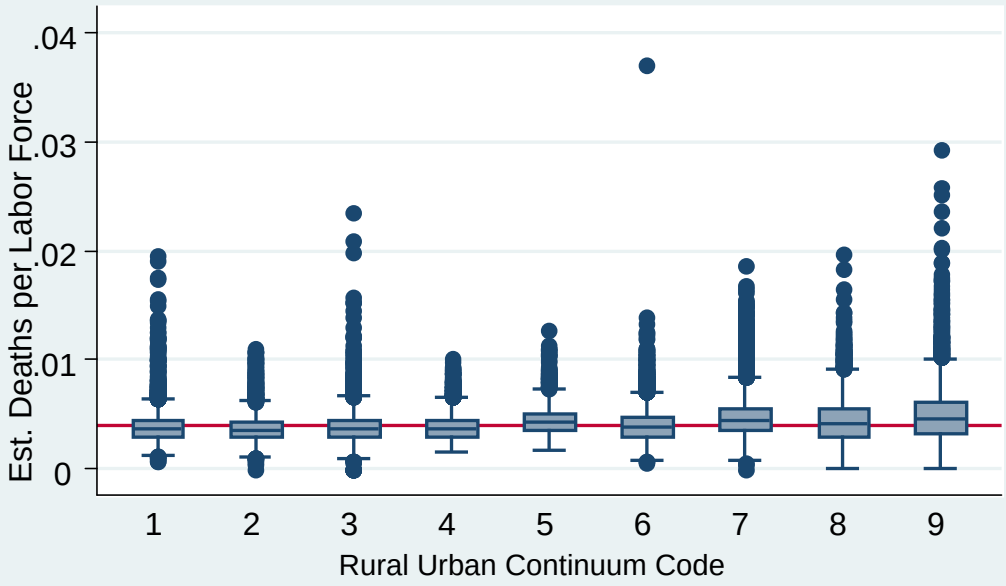
Note: Rate calculated as multi-establishment births in current year divided by number of workers in the labor force in prior year.

Figure 24: Establishment Deaths per Worker, by RUCC



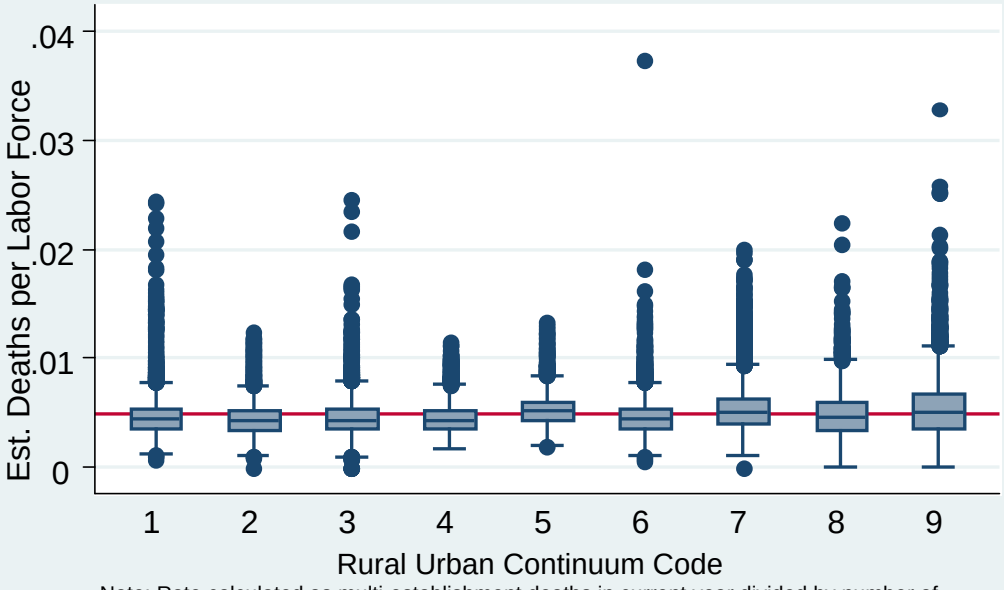
Note: Rate calculated as total establishment deaths in current year divided by number of workers in the labor force in prior year.

Figure 25: Single-Unit Establishment Deaths per Worker, by RUCC



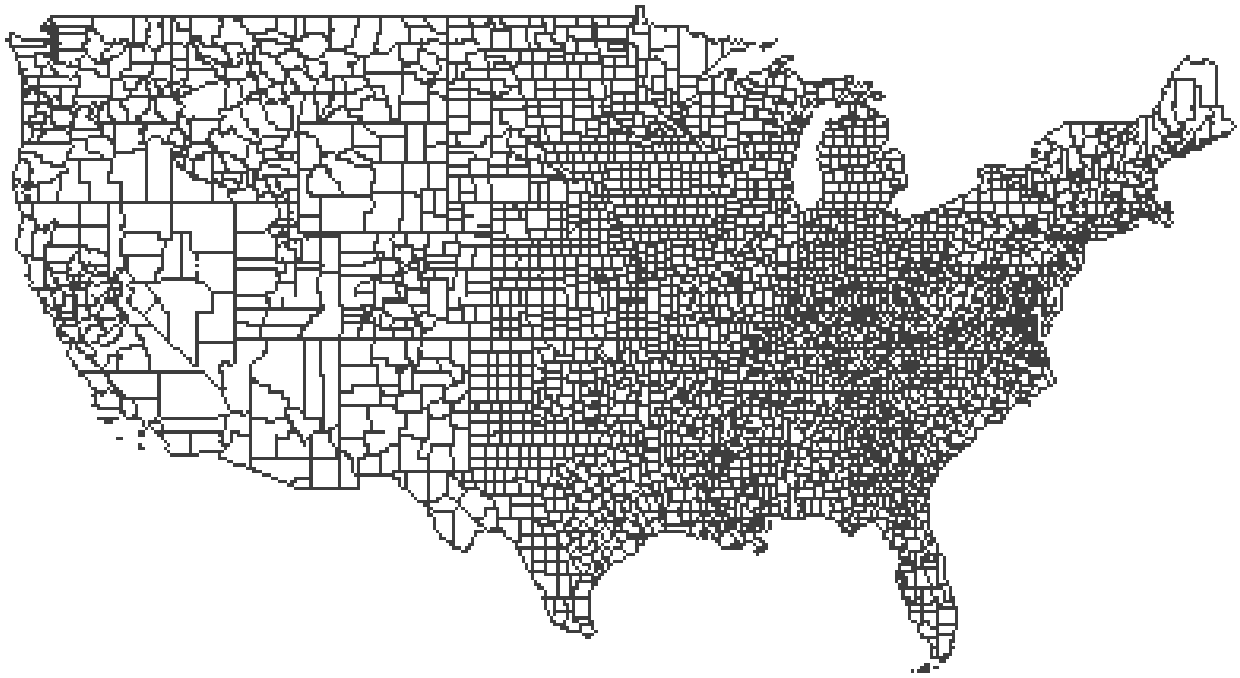
Note: Rate calculated as single-establishment deaths in current year divided by number of workers in the labor force in prior year.

Figure 26: Multi-Unit Establishment Deaths per Worker, by RUCC



Note: Rate calculated as multi-establishment deaths in current year divided by number of workers in the labor force in prior year.

Figure 27: County Boundaries in the Continental United States



8. APPENDIX: DATA DETAILS AND USER GUIDE

As detailed in the Statistics of U.S. Businesses (SUSB) and Business Information Tracking Series (BITS/LEEM) documentation and elsewhere, there are a number of practical matters to consider when using the data in the Establishment Birth and Death (EBD) tabulations. Among these issues are the reliability of the data, changes and updates to the industry classifications, changes and updates to county delineations and definitions, and the proper methods for statistical analysis. Information on combining the EDB tabulations with other data is provided in this appendix. We summarize each of these issues in this section; as already stated, scholars are urged to review thoroughly the SUSB, BITS/LEEM, and CBP documentation (Acs and Armington, 1998, 2005; Armington, 1998; Robb, 1999).

8.1 Data Reliability

The U.S. Census maintains that because the SUSB and BITS establishment data, from which the EBD data are extracted, are tabulated from the Business Register universe, the data are not subject to sampling errors (Census, 2007a). With that said, the SUSB/BITS website states:

> The data are subject to nonsampling errors. Nonsampling errors can be attributed to many sources: inability to identify all cases in the universe; definition and classification difficulties; differences in interpretation of questions; errors in recording or coding the data obtained; and estimation of employers who reported too late to be included in the tabulations and for records with missing or misreported data. The accuracy of the data is determined by the joint effects of the various nonsampling errors. No direct measurement of these effects has been obtained; however, precautionary steps were taken in all phases of collection, processing, and tabulation to minimize the effects of nonsampling errors. (U.S. Census, 2007a)

One particular factor affecting the accuracy of the EBD tabulations, particularly the reporting of multi-unit births, is the sample size of the Company Organization Survey conducted as part of the Economic Census. In particular, the EBD tabulations are subject to "surges" in the count of multi-unit establishment births for the years the Economic Census is conducted. These "surges" can be seen in the establishment birth rates for 1992, 1997, and 2002 in Figure 1 and Figure 2 are explained as follows:

> The irregularity in the sample size of the COS causes corresponding surges in the numbers of conversions from single units to multi-unit establishments. In 1990, for instance, there were about 34,900 establishment such status changes, and in 1991 this rose to 76,700. This tends to produce surges in the relative numbers of multi-unit establishments in the years with larger samples, which are primarily prior to each Economic Census and in each Economic Census (years ending with 2 or 7). Other years have correspondingly greater numbers of small and medium-sized single units, which actually represent more than one location, but have reported their consolidated payroll and employment of all their locations together. This probably results in some distortion of the timing of individual establishment births, deaths, expansions, and contractions for affiliates of multi-unit firms, although the firms' overall employment changes are accurately reported each year. (Armington, 1998: 8)

8.2 Industry Classifications

The change in industry classifications in 1998 from SIC to NAICS codes may present a bit of a challenge to longitudinal designs that "straddle" the period of change. Not only does NAICS code industries differently from the SIC system, the concepts underlying the NAICS classification scheme also differ. Thus, in many cases, the SIC classifications corresponds to the NAICS classification perfectly, while in others the SIC classification has only a partial, if any, applicable counterpart in the NAICS system (U.S. Census, 2007b). In addition to the SIC to NAICS change, the NAICS codes have gone through at least two revisions since their introduction. Thus, it is important to know if the NAICS codes conform to the 1997, 2002, or 2007 definitions. In the case of the EBD tabulations, the NAICS codes conform to the 1997 definitions. Data for future EBD tabulations, however, are expected to follow later NAICS revisions.

8.3 County Boundaries

Descriptive and statistical analyses of between-county comparisons across the entire United States face a number of challenges. First, two counties in different states sharing a common border might differ as measured by a specific statistical variable for no other reason than the period at which the data is collected (i.e., state agencies might collect the same data at different times of the year). This particular case is rarely an issue with nationally collected data such the SUSB/BITS establishment and establishment birth data, but it does provide ample

warning for researchers to consider carefully such issues in their studies. Understanding how, when, by what methodology, and from what sources estimates are based is critical when combining county data from multiple sources.

Related to this issue is the definition of county boundaries. Using an example from the state of Colorado, Arapahoe County includes two areas land-locked within the county of Denver. While these areas are comparatively small relative to the total land area of the county, it highlights the issue of statistical "islands" that might otherwise hamper econometric analysis. Even more problematic is the *changing* of county boundaries. From time to time, FIPS standards are modified to reflect new city incorporations, the merging of county or county-equivalent areas, and other changes. In 2001, for example, the city of Broomfield became the 64th county in the state of Colorado. Before that year, the city's boundaries encircled neighborhoods located in Boulder, Weld, Adams, and Jefferson counties. Notices of changes in county and county equivalent boundaries are reported in FIPS Publication #6-4 published by the National Institute of Standards and Technology.

Finally, there is the issue of irregularly shaped boundaries and the relative land areas of counties. As the boundary map of the continental United States in Figure 27 shows, the county areas in the western states are larger on average than in the east. As a comparison, according to the 2000 Census, Adams County in the state of Colorado covers a land area of 1,192 square miles with 305 persons per square mile, while the *five* counties of Rhode Island make up only 1,045 square miles of land area and 1,003 persons per square mile. With this in mind, care should be given to descriptive and statistical analyses to ensure proper and valid between-county comparisons, especially between western and east coast counties.

8.4 Data Analysis

In a regression context, establishment birth and death observations are not independent across counties. Typically, counties with high rates of establishment births are adjacent to neighboring counties with equally (or nearly so) establishment birth rates. Acs and Plummer (2005), for example, find that the rate of single-establishment births for Colorado counties is spatially correlated. Such spatial dependence in the data, which can be diagnosed with the Moran's I statistic (Anselin and Bera, 1998), precludes the use of ordinary least squares (OLS) estimation requiring instead a spatial econometric estimation method (Anselin and Bera, 1998).

These techniques include spatial lag and spatial error models that account, respectively, for spatial correlation of the dependent variable and spatial correlation of the errors.

8.5 Combining EBD Tabulations with Other Data

Researchers are quite likely to combine the EBD tabulations and BITS data with other county-level data available from a number of sources. Several government agencies including the Census, Bureau of Labor Statistics, Bureau of Economic Analysis, U.S. Patent and Trademark Office, National Science Foundation, and state and local agencies provide a variety of county-level data. This section provides an overview of some of these sources of data. As before, researchers are cautioned to review the relevant documentation of the data before proceeding with any data collection and statistical analyses.

8.5.1 Non-Employers Statistics File

The SUSB and CBP data exclude non-employer businesses. At least nine years of annual data for these businesses are available from the Census's Non-Employers with a reported data time lag of about two years. Non-employers represent about 75 percent of all U.S. businesses and approximately five to ten percent of private sector economic activity. Non-employers are similar in concept to self-employment, but self-employment is a primary labor occupation while non-employers are businesses without employees (see the Office of Advocacy's *Small Business Economy, 2005*, chapter 1 for more detailed differences, www.sba.gov/advo/research/sbe.html). The majority of non-employers are sole proprietors (slightly less than 90 percent). Aggregate tables as well as cross tabulations by location, industry, and receipt data are available from the U.S. Census Bureau (see www.census.gov/epcd/nonemployer/).[11] The data consists of the number of non-employers, receipts by industry, and county or metropolitan area. Legal form of organization for more recent years is also available via the American Fact Finder data access tool on the Census website. The non-employer data are additive across geographic areas as a non-employer may exist in only one location.

[11] Note that preliminary work at the U.S. Census Bureau is being done to link the annual non-employer files to create longitudinal data so entry, exit, age and growth can be tracked. Individuals associated with the work include Alfred Nucci, Rick Boden, Steven Davis, John Haltiwanger, Ron Jarmin, C.J. Krizan, and Javier Miranda. The Office of Advocacy's contribution to the efforts was the temporary transfer of Rick Boden (who was on sabbatical from the University of Toledo) from Advocacy to Census begin the preliminary work.

8.5.2 Current Population Survey

The U.S. Census Bureau, with some funding from the U.S. Bureau of Labor Statistics, conducts the Current Population Survey of the general public on a monthly basis. CPS data is available online at a time lag of a few months and contains demographic and economic data unique from the Census' other data sources. In particular, CPS reports for each respondent his or her gender, race, ethnicity, age, labor force status, occupation, occupation industry, and county. It also includes two elements most related to small business – self-employment and size of employer. Both of these items, along with county codes, are available in the March CPS supplement microdata. Given data suppression rules, however, the county codes are available for about 60 percent of the March respondents.

The self-employment data reports the respondent's longest occupation of the previous year, his or her primary and secondary occupation, and whether the incorporated or unincorporated status of the self-employment. The March supplement also contains a variable on the size of the firm for the respondent's longest job. To be clear, researchers need to be cognizant that this firm size variable is only available for the longest job for the *previous* year, while some of the other variables are for the *current* month. Although there is a worry that employees would not be privy to the size of their employer, the range of the employment size categories are large enough for respondents to answer with some accuracy. For an example of CPS tables, see the *Monthly Labor Review*, Brian Headd, "The Characteristics of Small-Business Employees," April 2000 (www.bls.gov/opub/mlr/2000/04/contents.htm).

8.5.3 Other Census Data Sources

The EBD tabulations can be readily combined with data on existing establishments from the Census' County Business Patterns (CBP) database. In addition to the CBP, researchers may want to combine EBD tabulations with county information from the quinquennial Economic Census; the Consolidated Federal Funds Reports, and the Building Permits, Government Surveys; and State and County QuickFacts databases. The Geographic Area Series of the Economic Census, for example – in addition to the number of establishments, paid employees, and payroll – reports at the county-level the value of sales, shipments, receipts, revenue, or business done by domestic establishments (i.e., excluding foreign subsidiaries). The Economic Census serves as the source for the Survey of Business Owners, which combines the former

Surveys of Minority- and Women-Owned Business Enterprises and the Characteristics of Business Owners (CBO).[12]

8.5.4 Local Area Unemployment Statistics (LAUS)

The Bureau of Labor Statistics' (BLS) maintains several sources of data of potential interest to entrepreneurship and small business scholars including the Local Area Unemployment Statistics (LAUS) program. LAUS provides monthly and annual average estimates at the county-level of labor force, employment, unemployment, and the unemployment rate. BLS handles the procedures, validation, and publication of the LAUS estimates prepared by the employment agencies in each state. The LAUS data is available from 1991 to the present.

8.5.5 Regional Economic Accounts

The Bureau of Economic Analysis' (BEA) Regional Economic Accounts provides data on personal income at the county-level. In particular, BEA freely provides data on county population, total and per capita incomes. Data provided include the components of earnings (i.e., wages and salaries, proprietor income, employer-provided health insurance, dividends and interest income, social security benefits, and other types of income), earnings by place of work (i.e., farm and non-farm, industry, and government enterprises), and net earnings (earnings net of government social insurance and inter-area commuting expenditures).

8.5.6 Patent Data

The U.S. Patent and Trademark Office's (USPTO) Patent Technology Monitoring Branch (PTMB) publishes a number of statistical reports on state, metropolitan, and county patenting activity. In particular, the USPTO's publication, "United States Patent Grants by State, County, and Metropolitan Area," reports the number of *utility* patents granted in each geographic area from 1990 to 1999. While the corresponding data subsequent to this period is not currently available, the data can be ordered from PTMB or obtained from the searchable patent database.

[12] Researchers should keep in mind that data is occasionally suppressed to avoid disclosure of private information. Data suppression "flags" note and characterize the nature of the suppression.

8.5.7 Science and Engineering Data

Although it does not publish strictly county-level data, the National Science Foundation's (NSF) Science and Engineering State Profiles do include information on the number of Ph.D. scientists and engineers, relevant doctorate degrees awarded, federal R&D obligations by agency and performer, total and industry R&D expenditures, academic R&D expenditures, and other data. In addition, NSF's "Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions" reports federal R&D obligations and expenditures at the nation's public R&D performing institutions including those referred to in the title of the report as well as Federally-Funded R&D Centers (FFRDC's). Although the data is not strictly at the county-level, information is available for the location (city and state) of each individual R&D performing institutions. With this location information, the data on these R&D performing institutions can then be aggregated to the county level (Plummer and Audretsch, 2006).

8.5.8 State Data Sources

Depending on the administrative structure of individual states, county-level data is often available from state, county, and municipal agencies. The state of Colorado's Department of Local Affairs, for example, maintains the Colorado Economic and Demographic Information System providing menu-based access to state, region, city, and county level data. Available resources include population estimations, housing and household statistics, employment data, local government information (e.g., finances and tax information), and incomes and earnings data. In some cases, the information is identical to what can be obtained from federal sources such as the U.S. Census or BEA. An individual county may also report relevant data through its planning, development, or geospatial information systems (GIS) division.

8.5.9 Subscription Databases

Adventurous researchers can create county data from individual firm listings or link county data to individual firms. Subscription-based databases – such as Standard and Poor's Compustat, Thomson Financial's SDC Platinum, D&B and InfoUSA – often include geographic information in addition to individual company and financial data. Compustat's annual industrial file, for example, reports the county FIPS code were a company's primary business address is

located, while the executive compensation file gives the street, city, state, and zip code of the headquarters address. The website Econdata.net has links to various sources of firm listings.

8.6 SUSB/BITS Data Methodology

The Statistics of U.S. Businesses (SUSB) is an aggregation of microdata describing individual business locations. The following lists the steps the Bureau of the Census uses to create the microdata and aggregations for SUSB:[13]

- To develop microdata, the Bureau of the Census assembles data from a number of sources to construct its annual Business Register (BR), formerly known as Standard Statistical Establishment List or SSEL. Census uses the BR as a basis for business samples/surveys and to maintain annual business statistics for each establishment. The BR incorporates data from the Internal Revenue Service (IRS). In addition, Census' annual Company Organization Survey (COS), annual survey of manufactures, economic census, current industrial reports, and other Census current surveys are used to find linked establishments that create multiple-unit enterprises (missing payroll and employment are imputed). Since 1991, the Bureau of Labor Statistics has supplied Census with industry classifications for some establishments without industry identification.
- To select relevant microdata from the BR, Census runs the County Business Patterns (CBP) program to select data from the BR for all businesses which had any payroll payments during the year. It further edits the key data for the selected records to ensure they are reported consistently with the previous year's data. The selected records are aggregated to produce CBP tables on establishments by industry, state, and county.
- To produce SUSB microdata, the Bureau of the Census selects records from the CBP microdata file which contains a code that links establishments which are part of multi-establishment (or multi-unit) firms. In addition, codes for Metropolitan Statistical Areas are calculated for each establishment in an MSA and if necessary an MSA code is added to establishment records.
- To produce SUSB static tables, Census runs the SUSB Tabulation programs on the SUSB microdata aggregating the employment of commonly-owned establishments to create

[13] Details were taken from the U.S. Census Bureau's websites on methodology and through discussions with Census staff.

enterprise employment. This enterprise employment is appended to each establishment record. To produce state tables, Census aggregates firms, establishments, employment, annual payroll, and estimated receipts within a state by employment size of enterprise. Note that the overall U.S. employment of the enterprise is used to determine the employment size class for enterprises within states. Similar methods are used to create industry and MSA tables.

- To produce BITS dynamic tables, the Bureau of the Census constructs the SUSB Composite file using a Longitudinal Pointer file to track the identity of each establishment in the Tabulation files for different years. The Longitudinal Pointer file is constructed by linking records for establishments in each new SUSB Tabulation file to those in the file from the previous year, matching first on Census Identification Number. If this does not match, then a variety of other characteristics are used to search for continuing establishments. This facilitates tracking individual establishments whose identification numbers have been changed due to changes in ownership or legal form or structure. Use of the Longitudinal Pointer file prevents the double counting of establishments that exist under more than one identity during a year, and it greatly reduces the incidence of false births and deaths occurring as a result of identification number changes.

Table 7: Statistics of U.S. Businesses, 2004

Employment size of firm	Employer Firms	Establishments	Employment	Annual payroll ($000)
Totals	5,885,784	7,387,724	115,074,924	4,253,995,732
0 *	802,034	803,355	0	40,043,549
0-4 *	3,579,714	3,585,607	5,844,637	205,948,113
5-9	1,043,448	1,055,937	6,852,769	195,519,100
10-19	632,682	666,574	8,499,681	257,802,789
<20	5,255,844	5,308,118	21,197,087	659,270,002
20-99	526,355	692,677	20,642,614	670,418,442
100-499	86,538	330,447	16,757,751	587,676,161
<500	5,868,737	6,331,242	58,597,452	1,917,364,605
500+	17,047	1,056,482	56,477,472	2,336,631,127

* = Employment is measured in March, so while some employer firms have some annual payroll, they may not have employment in March.
Source: Office of Advocacy, U.S. Small Business Administration, from data provided by the U.S. Census Bureau, Statistics of U.S. Businesses.