Business Formation and Dynamics by Business Age: Results from the New Business Dynamics Statistics

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I. Introduction

Business dynamics is a central feature of market economies with broad impacts on labor markets, technical progress and economic growth. The process of Schumpeterian creative destruction is at the heart of the innovative process and productivity growth in modern market economies. Businesses and organizations that develop and/or adopt new and improved products, services and processes grow and displace those that don't. Recent research suggests a substantial fraction of productivity growth is accounted for by the shifting of outputs and inputs away from less productive to more productive businesses as part of this ongoing creative destruction process. However, in spite of the potential importance measures of business dynamics are relative newcomers in official economic measurement and have not yet been fully integrated into the broader measurement framework.

A recent report from the National Academies (NAS, 2007) highlights the need for tracking business formation as well as tracking business dynamics in the first several years post entry. A key recommendation of this report is that the U.S. statistical agencies develop their administrative data to improve our understanding of business dynamics including releasing public domain statistics on economic activity by business age. Consistent with this recommendation, in this paper, we describe a new business dynamics data product from the U.S. Bureau of the Census – the Business Dynamic Statistics (BDS). The BDS provides rich new data products on business dynamics including in this initial release measures of business dynamics at the economy-wide, broad industry, business size and age levels of aggregation. As will become clear in our description of these rich new series, this first release of BDS products already provides a rich new picture of business dynamics in the U.S.

The BDS data products are the result of a multi-year effort. In the late 1990s, the Census Bureau's Center for Economic Studies (CES) began development of an economy-wide establishment-level longitudinal database for use in economic research. The development of the Longitudinal Business Database (LBD) was a natural follow-up to its very successful predecessor, the Longitudinal Research Database (LRD). The LRD was used in groundbreaking empirical research on business dynamics by Dunne, Roberts and Samuelson (1989) and by Davis, Haltiwanger, and Schuh (1996) (hereafter DHS), among others. Constructed from respondent-level information in the Annual Survey of Manufactures and the Census of Manufactures, the LRD contained a wealth of information on the activities

of manufacturing establishments over time. It was, however, limited to the manufacturing sector. The LRD remains a rich analytical database for studying the dynamics of U.S. manufacturing businesses and is still actively being used by the research community.

The development of the LBD was spurred by the need to see if results obtained with the LRD applied to other sectors of the economy, and by the fact that manufacturing's importance as a source of jobs in the economy was decreasing. The source data and basic structure of the LBD are described in Jarmin and Miranda (2002). By utilizing stored "snapshot" files of the Census Bureau Business Register (formerly known as the Standard Statistical Establishment List or SSEL), Jarmin and Miranda were able to construct a longitudinal establishment level dataset for the private non-farm economy from 1975 to 1999. Subsequent updates have extended coverage through 2005. The LBD has been utilized in numerous microeconomic analyses including Foster (2003), Jarmin, Klimek and Miranda (2005), and Davis, Haltiwanger, Jarmin, and Miranda (2007). The success of these and other studies has generated substantial interest in public use tabulations from the LBD. The data infrastructure has now been sufficiently developed to update the LBD on an ongoing basis with the objective to remain as timely as possible.

The BDS data products include measures of establishment and firm births and deaths, job creation and destruction by firm size, age, and industrial sector, and several other statistics on business dynamics. The BDS has some elements that are similar with the Bureau of Labor Statistics (BLS) Business Employment Dynamics (BED) and the Census Bureau's Statistics on U.S. Business (SUSB) programs. However, the BDS tabulations focus more on business formation and business age dynamics taking advantage of the unique aspects of the LBD. A key advantage of the LBD is that business dynamics at both the firm and establishment-level can be tracked, measured and analyzed. This implies that when, for example, a new establishment (a specific physical location like a store) is opened it can be determined whether the new establishment is a (or part of a) new firm or part of a larger multi-establishment firm (like a national chain). Another related advantage is that the LBD is based on a very long time series dating back to 1975. As such, business dynamics can be tracked, measured and analyzed for young firms in their first critical years as well as for more mature firms that are also in the process of reinventing themselves in an ever changing economic environment. Another related feature is that the BDS provides the first publicly available tabulations of job creation by business size *and* age. There is a longstanding interest in the contribution of small businesses to job and productivity growth in the U.S.

Some recent research suggests that it is business age rather than size that is the critical factor (see, e.g., Davis and Haltiwanger (1999) and Haltiwanger (2006)). The BDS permits exploring the respective contributions of both business age and size.

This overview paper for the first release of the BDS data products proceeds as follows. In section II, a brief description of the LBD is provided along with a description of key measures such as business age and business size. Section III provides a brief overview of the statistical products of the BDS. Section IV provides an overview of the basic facts that emerge from the new data products. Since business formation and business age are amongst the most novel aspects of the BDS, section V highlights the patterns that emerge about business formation and business age. Section VI provides concluding remarks.

II. The Underpinnings of the BDS – the LBD

The Longitudinal Business Database (LBD) is constructed from the Census Bureau's Business Register (BR) of U.S. businesses with paid employees and enhanced with survey data collections. The LBD covers all sectors of the economy and all geographic areas and currently runs from 1976 to 2005. In recent years, it contains over 6 million establishment records and almost five million firm records per year. Basic data items include employment, payroll, 4-digit SIC through 2001 and 6-digit NAICS starting in 1997, employer identification numbers, business name, and information about location. Identifiers in the LBD files permit computing growth rate measures for establishments and firms. Firms in the LBD are defined based on operational control, and all establishments that are majority owned by the parent firm are included as part of the parent's activity measures.[2]

The LBD is comprised of longitudinally linked Business Register (BR) files. The BR is updated continuously and a snapshot is taken once a year after the incorporation of survey data collections. The resulting files contain longitudinal establishment identifiers designed to remain unchanged throughout the life of the establishment and regardless of

[2] A critical advantage of the BR and the LBD is in its comprehensive characterization of the firm-establishment ownership structure. Unlike other administrative datasets where firms can only be aggregated to the level of taxpayer IDs, the LBD utilizes the company based information in the BR (which derives from administrative data but also from the Company Organization Survey and the Economic Censuses).

reorganizations or ownership changes.[3] Conceptually, longitudinal establishment links are relatively straightforward because they are one to one, and because establishments typically have well-defined physical locations. The longitudinal identifiers permit measuring true greenfield entry (a new establishment at a physical location) and true establishment exit (the establishment ceases operations at a physical location) as well as permits measures of contraction and expansion of continuing establishments.

The longitudinal establishment identifiers also make it relatively straightforward to measure establishment age. An establishment of age "0" is a given year is an establishment for which this is the first year of positive employment (where employment is measured as the number of workers on the payroll for the payroll period including March 12). Establishment age for a continuing establishment cumulates by one year thereafter.[4] It is also straightforward to classify establishments into size classes based upon measures of employment.

It is a greater challenge to define and measure firm age and size. In any given year, the LBD includes a firm identifier that is common for all the establishments owned by that firm. It is this firm identifier that readily enables measures of both firm size and age. Firm size in a given year is measured as the sum of employment across all establishments of the firm. In the BDS, the firm size measure is assigned to all the establishments that are owned by the firm.

Firm age is more of a challenge since considerable caution must be used in using firm identifiers as longitudinal identifiers. Longitudinal linkages of firm identifiers can be broken by the expansion of single location firms to multi establishment entities and by merger and acquisition (M&A) activity. We address the first problem by assigning a unique firm identifier to firms that expand from single to multiple establishments. This process is straightforward because we can track establishments over time. The second

[3] There are known breaks in the establishment identifiers. Jarmin and Miranda (2002a) addressed these shortcomings in the BR files in creating the initial version of the LBD. Their methodology employed existing numeric establishment identifiers to the greatest extent possible to repair and construct longitudinal establishment links. They further enhanced the linkages using commercially available statistical name and address matching software. The methods developed by Jarmin and Miranda (2002a) have been applied and extended in the version of the LBD underlying the BDS.

[4] Establishments with a temporary shutdown (i.e., a year with zero activity) are not considered when starting up to generate a restart of the establishment age clock.

problem is harder to resolve, because M&A activity can result in many-to-many matches, e.g., when a firm sells some establishments and acquires others in the same period. While for most firms, the firm identifier on the LBD does not change from one year to the next, incorrect inferences about firm age would emerge based upon the length of time the current firm identifier has been in existence. Instead, the approach taken here is to combine the information from the establishment longitudinal identifiers with the cross sectional firm identifiers. Specifically, firm age is defined as follows for a given firm identifier. In the first year the firm identifier has positive activity (for BDS purposes, activity is measured as employment), firm age is set at the age of the oldest establishment for that firm. Firm age then grows for this firm identifier by one year for each additional year that the firm identifier continues to have positive activity. For all establishments owned by the firm they are assigned a firm age consistent with this definition. Note that this implies that it is straightforward to identify new firms (business formation) using this methodology. Specifically, new firms are captured by all establishment entry of age "0" firms.

III. Measures of Job Creation, Job Destruction, Entry and Exit

In this section, we provide an overview of the statistical measures that are at the core of the BDS data products. Let E_{it} be employment in year t for establishment i. Recall this is a point-in-time measure reflecting the number of workers on the payroll for the payroll period that includes March 12th. We measure establishment-level employment growth as follows:

$$g_{it} = (E_{it} - E_{it-1}) / X_{it},$$

where

$$X_{it} = .5*(E_{it} + E_{it-1}).$$

This growth rate measure has become standard in analysis of establishment and firm dynamics, because it is a symmetric growth rate measure in a manner similar to log differences but also accommodates entry and exit. (See DHS, Davis et al. (2006), and Tornquist, Vartia, and Vartia (1985)). Aggregate employment growth at any level of aggregation is given by the appropriate employment weighted average of establishment-level growth:

$g_t = \sum_i (X_{it} / X_t) g_{it}$ where $X_t = \sum_i X_{it}$

It is instructive to decompose net growth into those establishments that are increasing employment (including the contribution of entry) and those establishments decreasing employment (including the contribution of exit). Denoting the former as (gross) job creation and the latter as job destruction, these two gross flow measures are calculated as:

$$JC_t = \sum_i (X_{it} / X_t) \max\{g_{it}, 0\}$$

$$JD_t = \sum_i (X_{it} / X_t) \max\{-g_{it}, 0\}$$

In addition, computing the respective contribution of entry to job creation and exit to job destruction is useful. These measures are given by:

$JC\_Entry_t = \sum_i (X_{it} / X_t) I\{g_{it} = 2\}$, where I is an indicator variable equal to one if expression in brackets hold, zero otherwise, and g_{it}=2 denotes an entrant.

$JD\_Exit_t = \sum_i (X_{it} / X_t) I\{g_{it} = -2\}$, where g_{it}=-2 denotes an exit.

At the establishment-level, these measures correspond to true establishment entry (greenfield entry) and exit (shutting down operations at that site). These measures of entry and exit are employment-weighted measures of entry and exit and thus can be used to quantify the contribution of establishment entry and exit to employment dynamics. It is also useful to consider measures of entry and exit on an unweighted basis and such measures are part of the BDS data products. Given discussion in section II, the entry of new establishments does not necessarily correspond to new firm entry. In the BDS data products to identify new firm entry, establishment entry associated with age "0" firms corresponds to new firms or business formation.

Given these definitions, the following simple relationships hold:

$g_t = JC_t - JD_t$, $JC_t = JC\_Cont_t + JC\_Entry_t$ and $JD_t = JD\_Cont_t + JD\_Exit_t$

where JC_Cont and JD_Cont are job creation and job destruction for continuing establishments respectively.

All of the above statistics are described in terms of rates. The BDS data products will include all of the above statistics in levels as well (e.g., the number of jobs created). To be precise, the BDS data products include:

- number of establishments
- number of employees
- gross job creation rate (and the number of jobs created)
- gross job destruction rate (and number of jobs destroyed)
- gross job creation rate from establishment entry (and number of jobs and establishments created from establishment entry)
- gross job destruction rate from establishment exit (and number of jobs and establishments from establishment exit)

Each of these data series are available by year and in the initial release by:

- broad sector
- firm size
- firm age
- firm size and firm age
- establishment age
- establishment size
- establishment age and establishment size
- establishment age and firm age
- establishment size and firm size

A few additional remarks are useful about the measure of firm and establishment size used in this analysis. As has been well documented in the empirical literature (see, DHS and Okolie (2004)), establishments (and firms) are subject to transitory shocks so that at the establishment and firm level, net growth rates are inversely correlated. Put differently, there is evidence of regression-to-the-mean effects being relevant for establishment and firm-level growth. While this pattern is of interest in its own right, it poses a challenge for summary statistics of job creation and destruction by measures of business size. Given transitory shocks, businesses that have recently had an adverse transitory shock will be growing while businesses with a recent positive transitory shock will be contracting. This implies that if businesses (at the establishment or firm level) are classified by size based upon period t-1 employment, then statistically small businesses will have measured net growth rates on average higher than larger businesses from regression-to-the- mean effects alone. To provide perspective on the contribution of regression-to-the-mean effects, DHS proposed using

average size (i.e., averaging employment size between t-1 and t) to classify firms.[5] DHS and others have found that the relationship between business size and growth is sensitive to the size class definition used in a manner consistent with the observed regression-to-the-mean effects. Given this sensitivity, the initial BDS release includes two alternative measures of size: classifying firms and establishments based upon their average size and their initial size.[6]

IV. Basic Patterns from the New BDS Data Products

In this section, we provide an overview of the basic patterns that emerge from the initial release of the BDS data products. The discussion here is not exhaustive but only intended to be illustrative – as such not all cross-classifications of the data described in section III are discussed. In addition, the discussion of the most novel aspects of the BDS in terms of measures of business formation and business dynamics by business age are discussed in the subsequent section.

To begin, Figure 1 shows the overall magnitude of the establishment-level job creation and destruction rates. The annual job creation rate is about 17 percent (as a percent of employment) suggesting that on average in any given year about 17 percent of jobs are newly created in the sense that the expanding and newly opened establishments have generated 17 percent new jobs. About 1/3 of the annual job creation rate is due to establishment entry. The very high rate of gross job creation is balanced with a very high rate of gross job destruction. The gross job destruction rate is around 15 percent on average indicated that about 15 percent of jobs that existed one year prior no longer exist. About 1/3 of the job destruction is accounted for by establishment exit.

This very high pace of gross job creation and destruction in the BDS can be compared and contrasted with related statistics. From the LRD, DHS report about 10 percent annual creation and destruction rates using establishment-level data in manufacturing. It is apparent that the pace of job flows is much higher on average outside of manufacturing. For the BED, quarterly job creation and destruction rates are about 7 to 8 percent per quarter on an economy-wide basis. The annual rates from the BDS are substantially higher but not four

[5] In the BED, a further step was taken to classify businesses using a dynamic size measure where the job creation (or destruction) is allocated to a size class dynamically as a business passes through that size class from t-1 to t. In practice, average size approach of DHS can be viewed as an approximation of the dynamic size allocation method.

[6] For entering establishments in using the initial size approach, establishments are classified based on their period t size. For new firms, firms are classified based on their period t size.

times as large – the reason is straightforward – individual businesses are subject to transitory shocks so that some of the within year variation is reversed. However, the overall high annual rate indicates that the pace of job reallocation (which can be measured as the sum of creation and destruction) is very large. It is apparent that U.S. businesses are constantly reinventing themselves with a large pace of associated restructuring and reallocation. The BDS permits quantifying this reallocation and decomposing key components by characteristics such as firm age and size.

Turning to a depiction of the series over time, Figure 2 shows that job creation is procyclical and job destruction is countercyclical. However, unlike the pattern in U.S. manufacturing emphasized by DHS, the relative cyclicality of job creation and destruction are about the same. Figure 2 also shows a summary measure of overall job reallocation (which is derived simply as the sum of job creation and destruction). The job reallocation measure is an overall measure of the dispersion of establishment-level growth rates – as shown by DHS it is an absolute deviation measure of dispersion deviated around a zero growth rate. In figure 2, a downward trend in the overall pace of job reallocation is observed. This downward trend is consistent with other measures of declining firm and establishment level volatility as documented and analyzed in Davis et. al. (2006).

Figure 2 also depicts the net growth rate of employment series from the BDS along with the analogous net growth rate series from the County Business Patterns data. Since the source data for the BDS and CBP are essentially the same, it is reassuring that the growth rate patterns are quite similar. Note however that even though the source data are the same the BDS is not benchmarked to the CBP and could differ as the CBP series is based on the cross sectional tabulations of employment in any given year while the BDS is based on the tabulations from the LBD with the associated processing of the LBD as described in section II as well as Jarmin and Miranda (2002).

Industry patterns across broad sectors are reported in Figure 3. The pace of job creation and destruction is highest in agricultural services, construction and retail. On a broad sectoral basis, the lowest pace of job reallocation is in the manufacturing sector with sectors such as construction having job flow rates that are more than twice as large as those in manufacturing. There are many factors underlying these industry differences. As discussed in Dunne, Roberts and Samuelson (1989) and Baldwin, Dunne and Haltiwanger (1996), differences in the sunk cost of setting up a business, differences in the minimum

efficient scale, differences in the pace of idiosyncratic shocks, differences in the costs of entry and exit and differences in the adjustment costs across industries all play a role.

Figures 4-7 show patterns by Firm Size. Figures 4 and 5 use the average size definition while Figures 6 and 7 use the initial size definition for classifying establishments into firm size classes. While these definitional differences matter for some purposes, many of the overall basic patterns are robust to these alternatives. Small businesses have very high rates of job creation and destruction and corresponding high rates of entry and exit. Small businesses are obviously an important source of volatility in the U.S. economy. However, even amongst the largest businesses there is still considerable churning of jobs. For example, for establishments that are owned by firms with more than 10,000 workers the annual pace of creation and destruction still exceed 10 percent and the pace of entry and exit (on an employment weighted basis) are still close to 5 percent. The patterns of the establishments for the very largest firms is important since a substantial fraction of overall employment (close to 25 percent) is accounted by these firms.

The sensitivity to using average size vs. initial size shows up mainly in the patterns relating net growth rates to firm size. Since the gross flows dwarf the net changes, these figures that show net and gross together make it harder to discern this sensitivity. Nevertheless, careful examination of the patterns in Figures 4 and 6 show that net growth rates decline with firm size in a more pronounced manner (especially for firms under 20 workers) when using initial firm size. This pattern reflects the volatility of very small firms where part of this volatility reflects transitory shocks. As discussed in section III, it is the transitory shocks that underlie much of the sensitivity to the classification of firms by size class. At the end of the day, though, when the patterns of gross and net are shown together, the take away observation is not the net-size relationship but rather the more robust relationship between volatility and size.

V. Business Formation and Business Dynamics by Business Age

The most novel aspects of the BDS are the data products on business formation and business dynamics by business age. These aspects are closely related as business formation is measured in the BDS by measuring the job creation of new establishments from new firms (age “0” firms under the BDS firm age measurement). For job creation (and destruction) for young and more mature businesses, the BDS tracks the patterns by detailed firm age class.

Figure 8 shows the time series averages of job flows by firm age. For purposes of illustration, we focus here on the 2003-05 period since it is in the most recent years that the richest firm age categories can be constructed.[7] Job creation and job destruction rates for age "0" firms are not depicted since by construction they are equal to 200 percent and 0 percent respectively. Of interest though is the share of employment accounted by new firms (business formation) – for the 2003-05 period such business formation accounts for about 2.5 percent of overall U.S. employment. This indicates that the overall net employment growth in the U.S. economy is 2.5 percentage points higher than it otherwise would be in the absence of business formation. The implied contribution of business formation is very substantial especially in light of the average overall net growth of employment for this period of about 1 percent per year. Compared to the 2.5 percent number, this suggests that all other firms taken together were a net drag on the economy in terms of job growth of about -1.5 percent. Put differently, the U.S. economy is constantly reinventing itself – on net adding jobs but doing so through business formation (new firms) with existing firms on average contracting. As we shall see, however, it is misleading to lump the entire set of existing firms together as there are many sources of both creation and destruction in existing firms.

Figure 8 also shows that young businesses have very high creation and destruction rates and that the pace of job flows declines monotonically with firm age. For the oldest left censored firms (those that are more than 29 years old in 2003-05), the pace of job creation and destruction is still quite large – in excess of 10 percent for both creation and destruction. Given that a very large fraction of overall employment (over 40 percent) is accounted for by these firms, these findings highlight the high pace of restructuring and reallocation amongst the most well established firms in the U.S. economy.

In exploring business dynamics by business age, it is instructive to decompose net growth of existing firms into the net growth for survivors from the job destruction from exit. By construction, the net growth for existing firms is equal to the sum of these two components. Figure 9 shows that conditional on survival that existing firms of all ages have positive net growth with young firms having especially high net growth (e.g., conditional on survival, age 1 firms have a net growth of around 16 percent). Yet we know from Figure 8 that all age groups over this time period have overall net growth that is negative. The reason is clear from Figure 9 – the job destruction rate from exit exceeds the net growth rate for

[7] In earlier years, a smaller range of age categories is released with an accompanying larger left-censored group.

survivors. This pattern is especially striking for very young firms. Again consider age 1 firms. The job destruction from exit is about 18 percent while the net growth rate for survivors is around 16 percent. The pattern for young firms is thus one of "up or out" with very rapid net growth for survivors balanced by a very high exit rate.

We now turn to exploring firm age and firm size simultaneously. The patterns we have observed thus far suggest small and young firms are very volatile but we also know that these two business characteristics are closely related. The BDS permits measuring and analyzing the independent contributions of business size and age and as will become clear there are distinctly different patterns. To start, Figure 10 shows job creation rates by firm age and firm size. It is apparent that creation rates fall by firm age controlling for firm size. However, the reverse is less true – controlling for firm age, there is less of a monotonic relationship between creation and size. Figure 10 examines the destruction patterns. Observe that destruction rates decline monotonically with age especially for smaller firms For smaller size classes (up though size of 100 or so), destruction falls with size, controlling for age. Taken together, there is an apparent asymmetry between creation and destruction for firm size, holding age constant. Creation is less systematically related to size while destruction falls with size. Put in lay terms, holding age constant, small firms have high destruction rates while not systematically higher creation rates.

This asymmetry between creation and destruction patterns yields implications for net growth patterns as depicted in Figure 12. Net growth patterns (excluding new firms – age '0" not depicted – they are at 200) show that controlling for age, small firms have lower net growth. As for firm age, there is less of a systematic relationship between net growth and age (excluding business formation – age "0" firms). We do observe that for very small firms that net growth rate is lower for young firms. This pattern reflects the high exit rates for young firms that are observed in Figure 13. We observe that exit rates fall by firm age even controlling for firm size. Interesting, exit rates only fall by firm size holding age constant only amongst very small firms.

In interpreting these patterns by firm age and size, it is instructive to recall how skewed the distribution of employment is across firm size and age classes. Figure 14 shows that employment is concentrated in the largest, mature (left censored) firms. In a related way, it is very useful to examine the levels of net job creation and the job creation from entry as depicted in Figures 15 and 16. Looking at levels the contribution of

business formation and age 1 firms is apparent in Figure 15. It is also apparent in Figure 15 that there is net job creation among large, mature firms. Figure 15 also shows the net job losses among small mature firms.

In terms of job creation from establishment entry, Figure 16 shows the contribution of new (young) firms as well as the very large contribution of establishment entry for the largest, mature firms. Here it is useful to be reminded of the differences between firm and establishment definitions. The very large contribution of establishment entry for large, mature firms reflects the opening of new establishments by existing firms. Given the very large share of activity accounted for by large, mature firms, it is not surprising that in terms of sheer numbers that the largest, oldest firms have the largest number of jobs created from establishment entry.

VI. Concluding Remarks

This paper provides an overview of the new data products from the Business Dynamic Statistics. The initial release of the BDS provides measures of firm and establishment entry and exit rates as well as measures of job creation and destruction on annual basis from 1977-2005 and classified at the total economy, broad sector, firm size, firm age, establishment age, establishment size, firm size and firm age levels. The most novel aspects of the BDS are the long time series and the associated rich characterization of business formation and business dynamics by business age. The long time series permits tracking young firms through the first critical years of existence as well as the dynamics of very mature businesses (e.g., businesses in existence more than 25 years).

In this paper, we provide an overview of the data infrastructure, the statistical methodology and discuss some of the basic patterns that emerge. Our discussion is not intended to be exhaustive as it will take analysts of the rich BDS series to draw out the full implications. Even though our analysis is only intended to be suggestive, the patterns observed in terms of business formation and business dynamics by age are striking. For example, we find that on average the positive net growth of jobs in the U.S. economy is accounted for the substantial positive contribution of business formation (new firms) offset by the contraction of existing firms. This by itself is interesting as it highlights that

U.S. businesses are constantly reinventing themselves. But it would be incorrect to lump all existing businesses together. We find, for example, that it is instructive to decompose the net growth of existing businesses into the net growth for surviving establishments and job destruction from exit. We find that for establishments of young firms there is an "up or out" dynamic with very high rates of net growth for surviving establishments accompanied by very high rates of job destruction from establishment exit.

Another unique feature of the BDS is that it enables measuring and analyzing the contributions of firm size and firm age in a comprehensive manner simultaneously. We find that young and small businesses are more volatile than larger, mature businesses. Interestingly, we find that job destruction rates fall by firm age, holding size constant and fall by firm size, holding age constant. But the patterns differ somewhat for job creation. Job creation rates fall by firm age, holding firm size constant but there is less of a systematic pattern by firm size, holding firm age constant. The resulting implication is that we find that net growth rates are lower for small businesses relative to larger businesses, holding firm age constant.

References

John Baldwin & Timothy Dunne & John Haltiwanger, 1998. "**A Comparison Of Job Creation And Job Destruction In Canada And The United States**," The Review of Economics and Statistics, MIT Press, vol. 80(3), pages 347-356, August.

Becker, Randy, John Haltiwanger, Shawn Klimek and Daniel Wilson, "Micro and macro data integration: the case of capital," (2006), in Jorgenson, Landefeld and Nordhaus (eds.), A New Architecture for the U.S. National Accounts, University of Chicago Press.

Helfand, Jessica, Akbar Sadeghi and David Talan, 2007 "Employment dynamics: small and large firms over the business cycle", Monthly Labor Review, pages 39-50, March.

Davis, Steven J. and John Haltiwanger, 1999, "Gross Job Flows" in the Handbook of Labor Economics. North-Holland

Davis, Steven J., John Haltiwanger and Scott Schuh, 1996, *Job Creation andDestruction*, MIT Press.

Davis, Steven J., John Haltiwanger, Ron S. Jarmin and Javier Miranda, 2007 "Volatility and Dispersion in Business Growth Rates: Publicly Traded vs. Privately Held Firms." NBER Macroeconomics Annual 2006, vol. 21..

Dunne, Timothy, Mark Roberts and Larry Samuelson, 1989. "Plant Turnover, and Gross Employment Flows in the U.S. Manufacturing Sector," Journal of Labor Economics, 7, no. 1, 48-71.

Foster, Lucia, 2003, “Establishment and Employment Dynamics in Appalachia: Evidencefrom the Longitudinal Business Database.” CES Working Paper 03-19.

Haltiwanger, John and C.J. Krizan (1999) “Small Business and Job Creation in the United States: The Role of New and Young Businesses” in Are Small Firms Important?: Their Role and Impact, edited by Zoltan Acs, Kluwer Academic Publishing Company.

Haltiwanger, John, 2006 "Entrepreneurship and Job Growth", mimeo.

Jarmin, Ron, Klimek, Shawn and Javier Miranda, “The Role of Retail Chains: National, Regional and Industry Results,” (forthcoming), in Dunne, Jensen and Roberts (eds.), Producer Dynamics: New Results from Micro Data, available at http://www.nber.org/booksnew/dunn05-1.

Jarmin, Ron S., and Javier Miranda, 2002, “The Longitudinal Business Database”, CES Working Paper 02-17.

National Research Council 2007 “Understanding Business Dynamics: An integrated Data System for America’s Future” Hatiwanger, John, Lisa M. Lynch, and Christopher Macker, Editors

Cordelia Okolie, "Why Size Class Methodology Matters in Analyses of Net and Gross Job Flows." July 2004 Monthly Labor Review.

Figure 1:

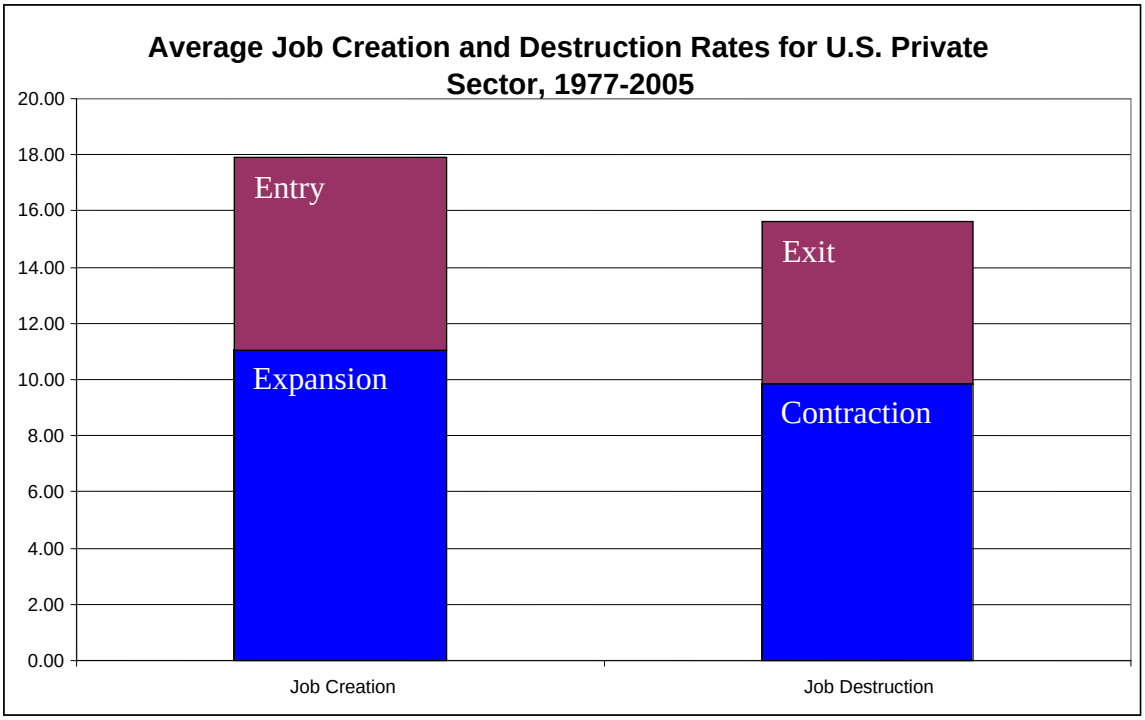


Figure 2:

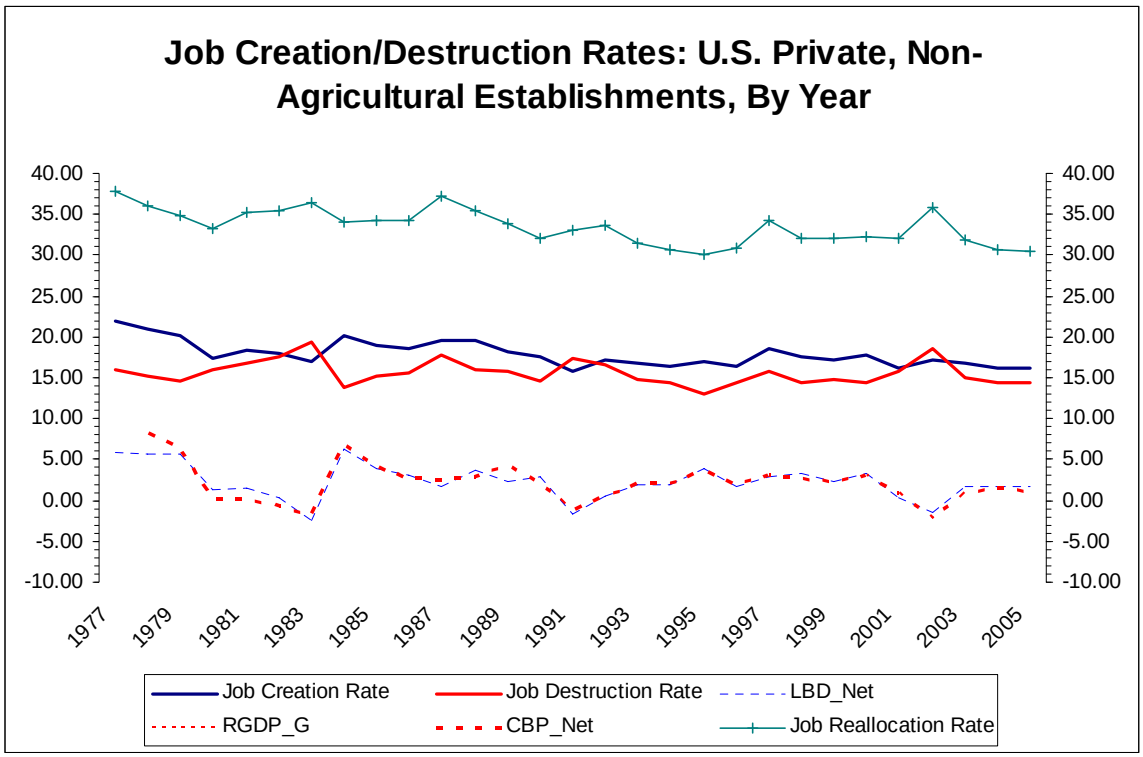


Figure 3:

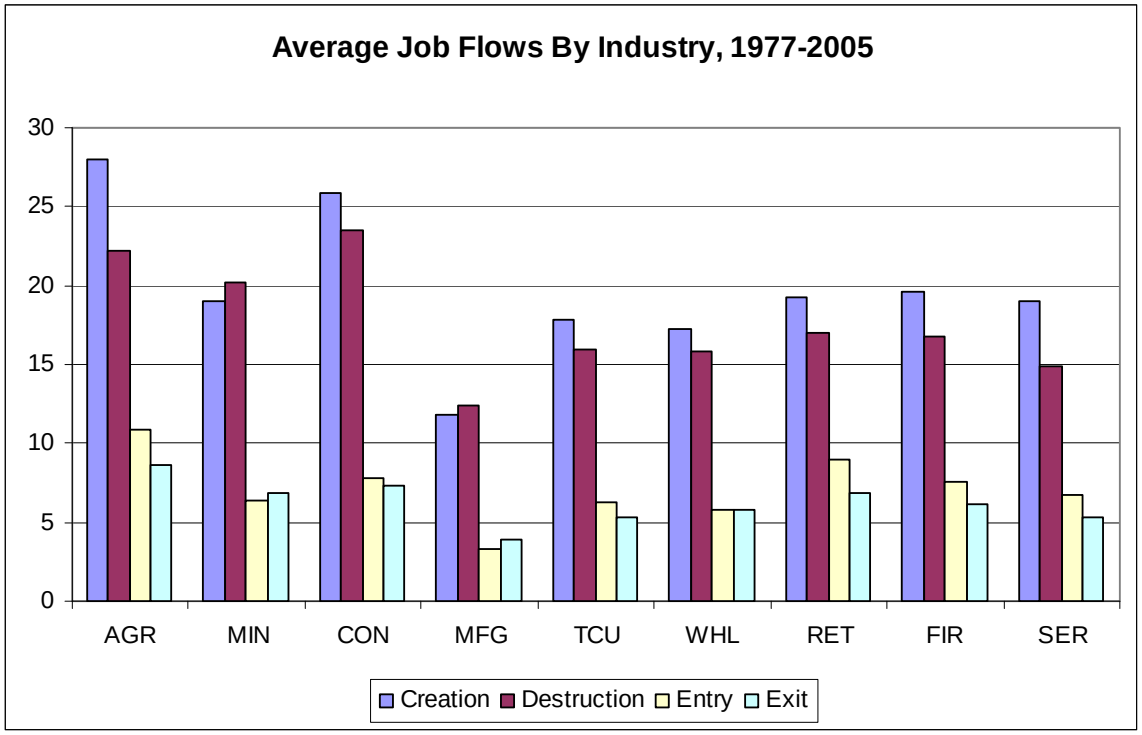

Average Job Flows By Industry, 1977-2005
30
25
20
15
10
5
0
AGR
MIN
CON
MFG
TCU
WHL
RET
FIR
SER
Creation
Destruction
Entry
Exit

Figure 4:

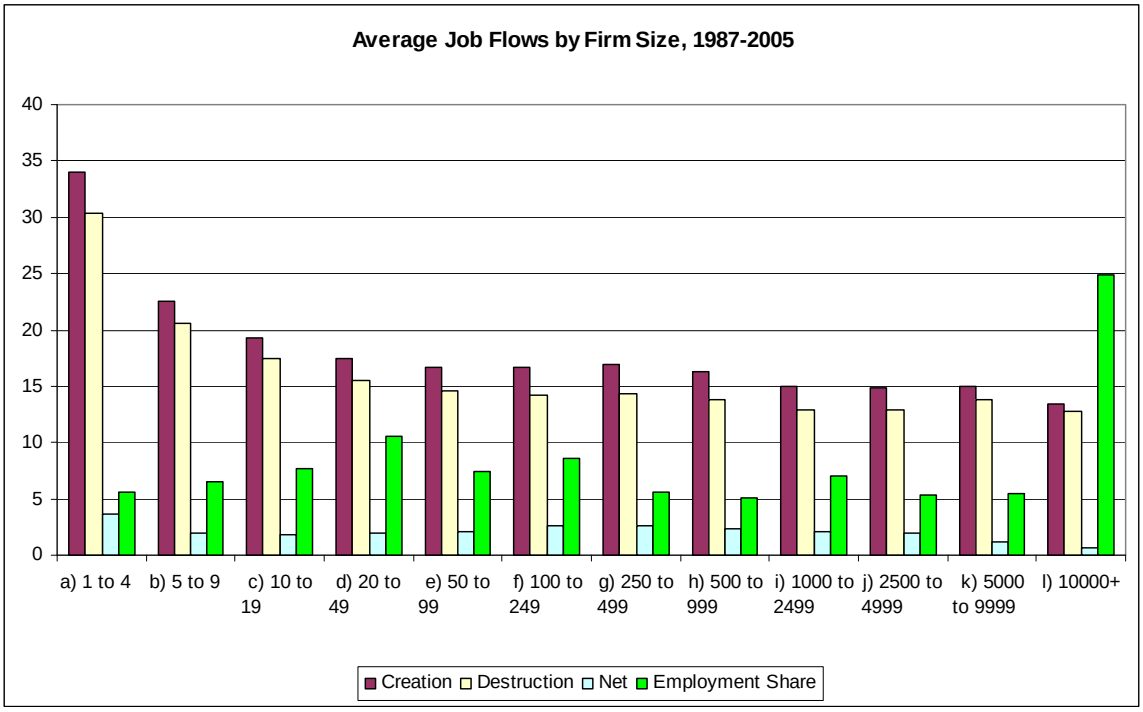


Figure 5:

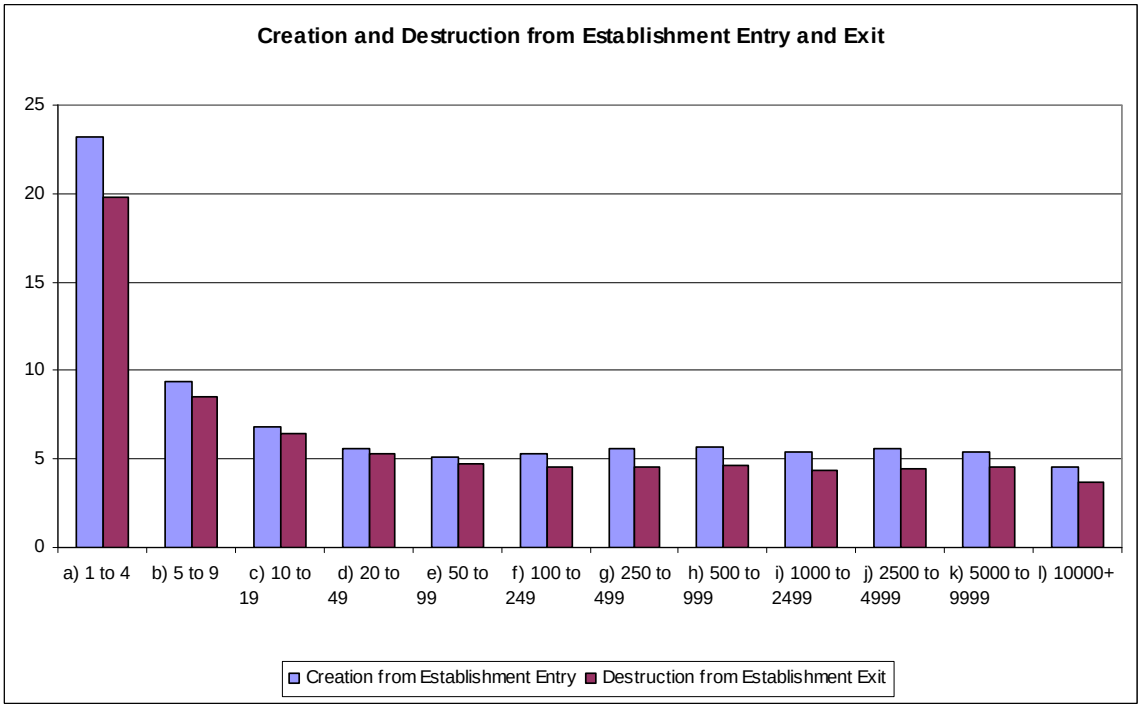


Figure 6:

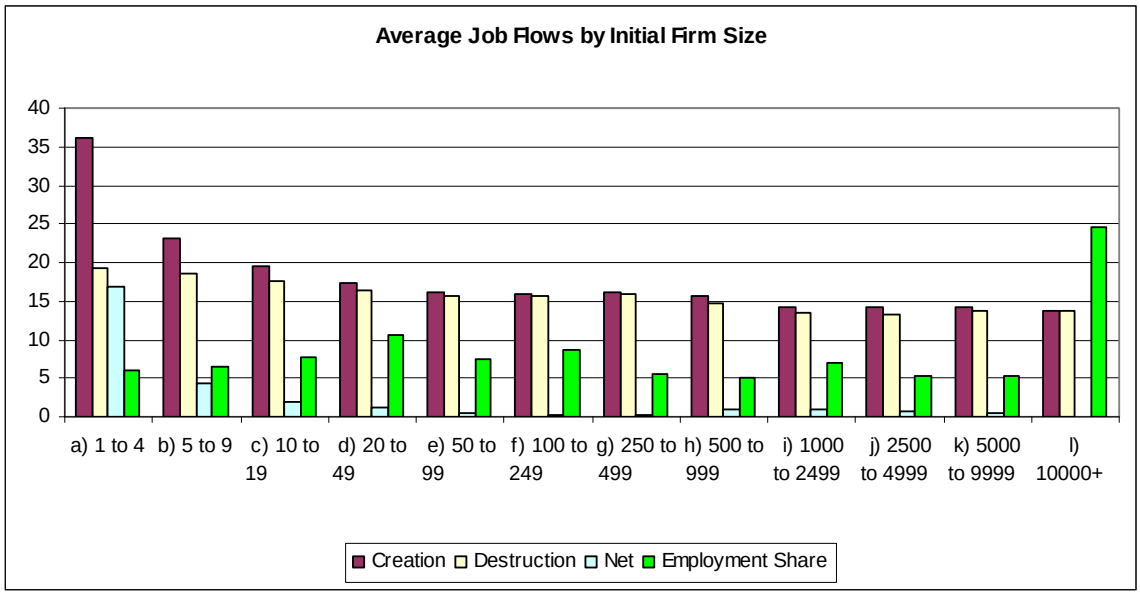


Figure 7:

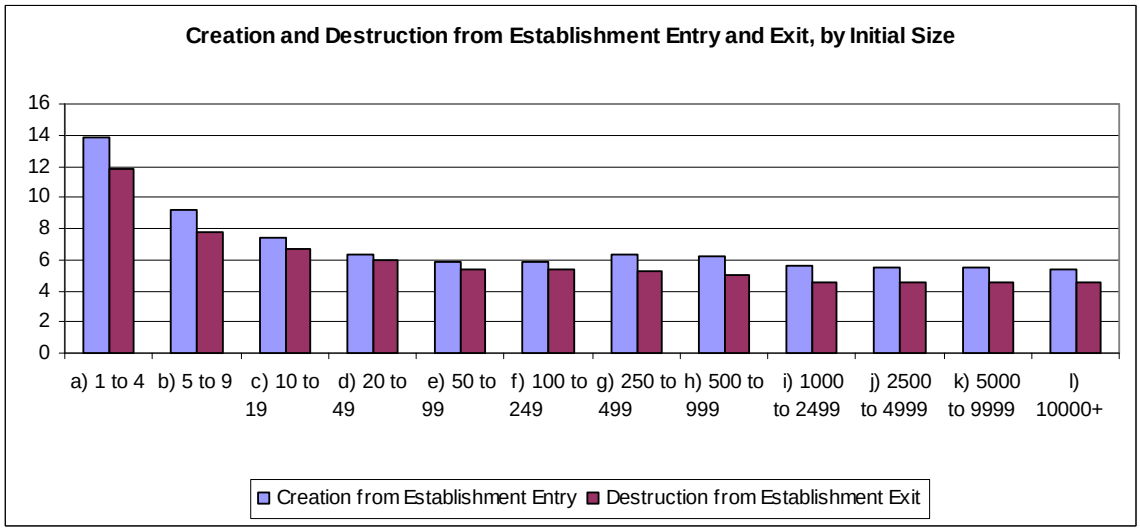


Figure 8:

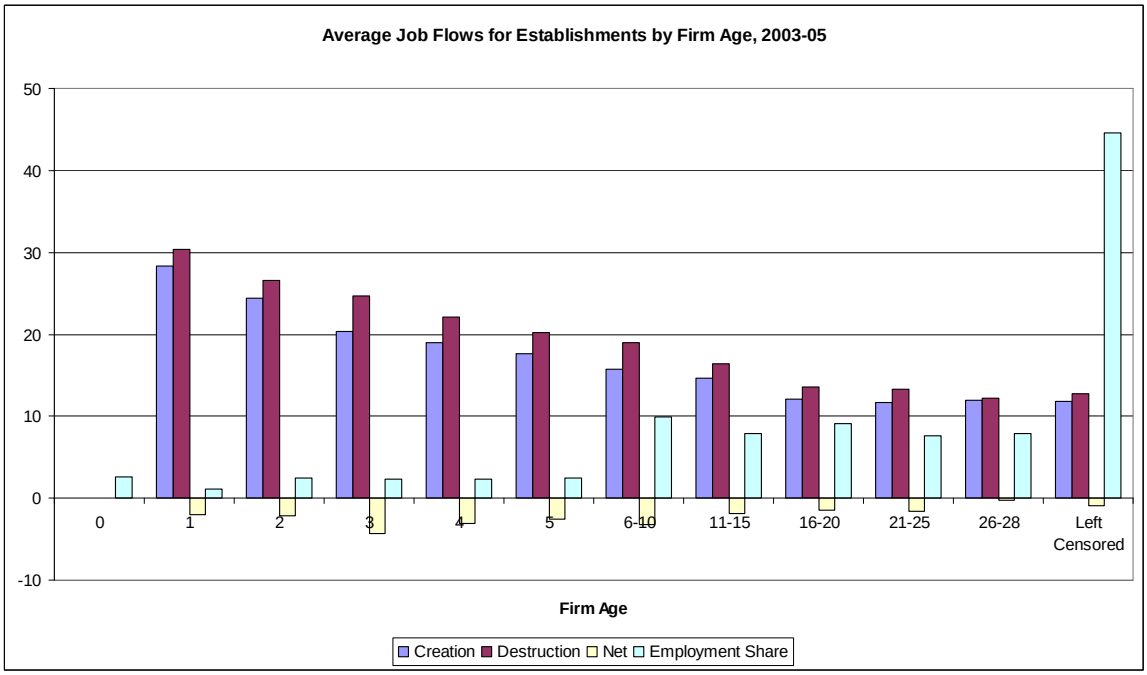


Figure 9:

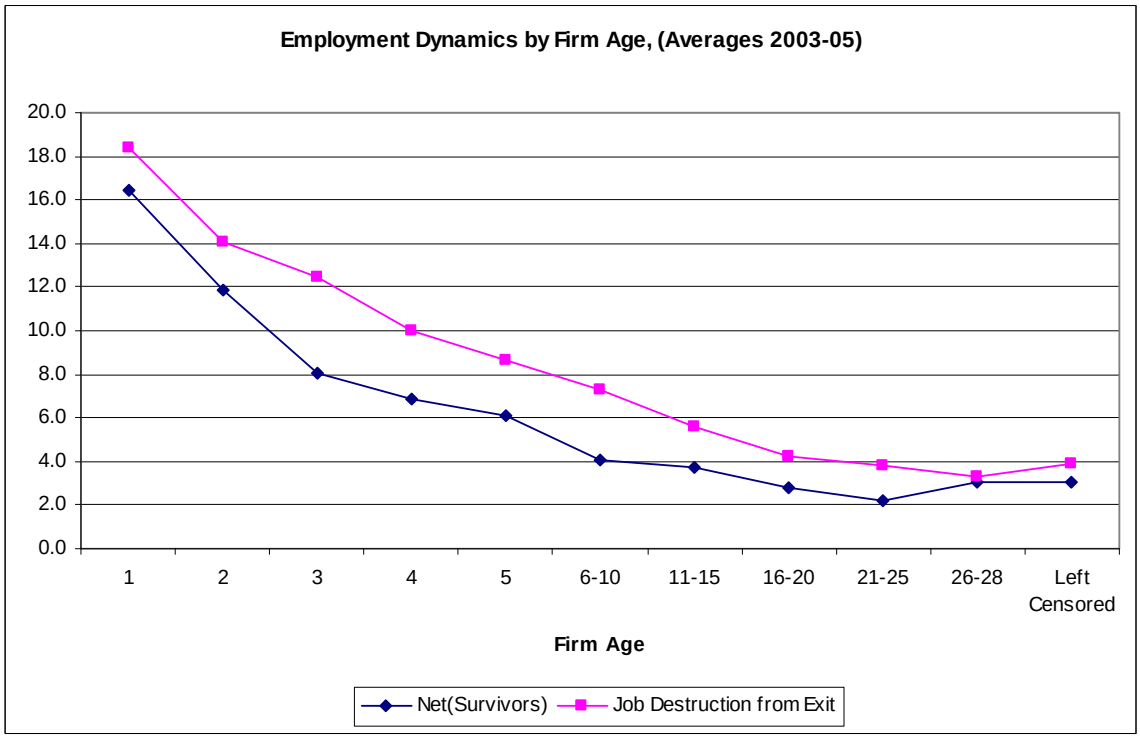


Figure 10:

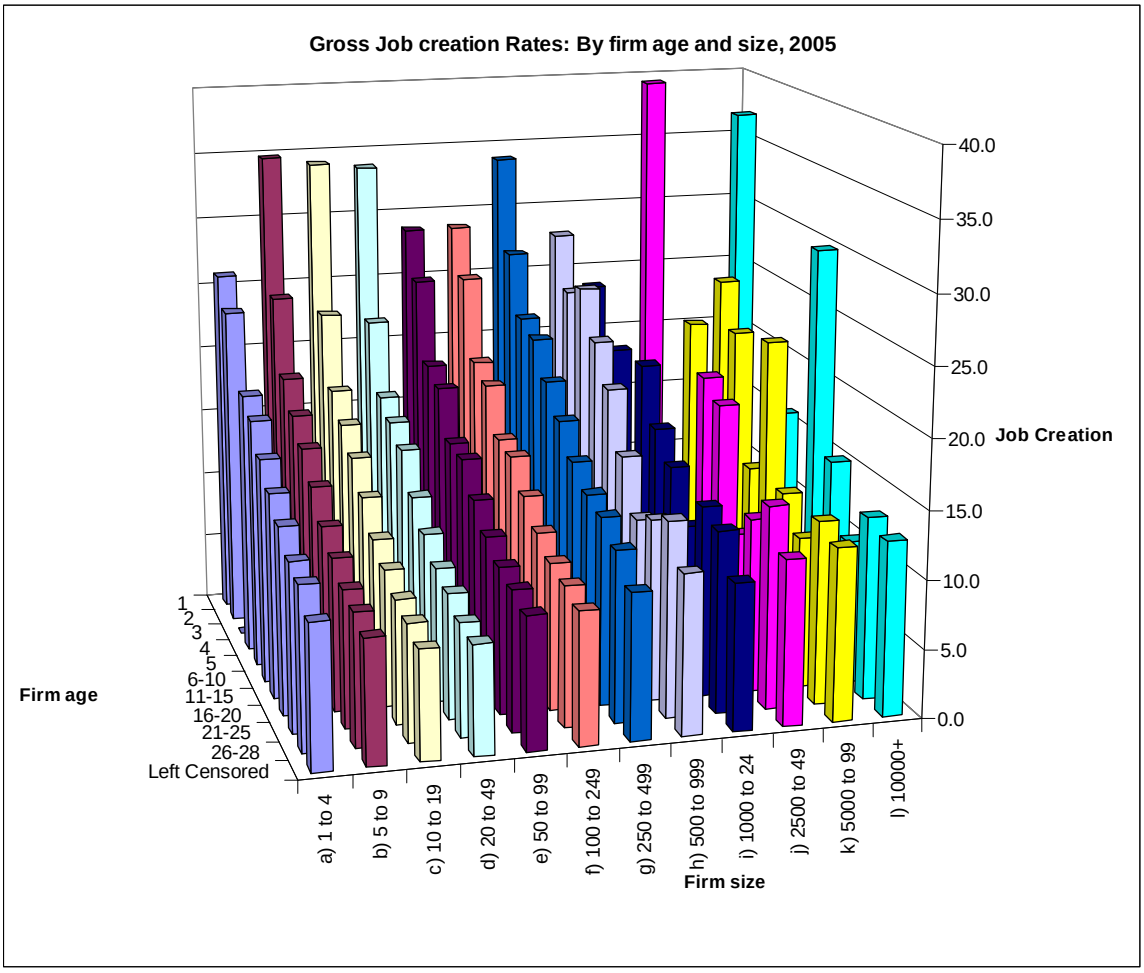

Gross Job creation Rates: By firm age and size, 2005
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Job Creation
Firm age
1
2
3
4
5
6-10
11-15
16-20
21-25
26-28
Left Censored
a) 1 to 4
b) 5 to 9
c) 10 to 19
d) 20 to 49
e) 50 to 99
f) 100 to 249
g) 250 to 499
h) 500 to 999
i) 1000 to 24
j) 2500 to 49
k) 5000 to 99
l) 10000+
Firm size

Figure 11:

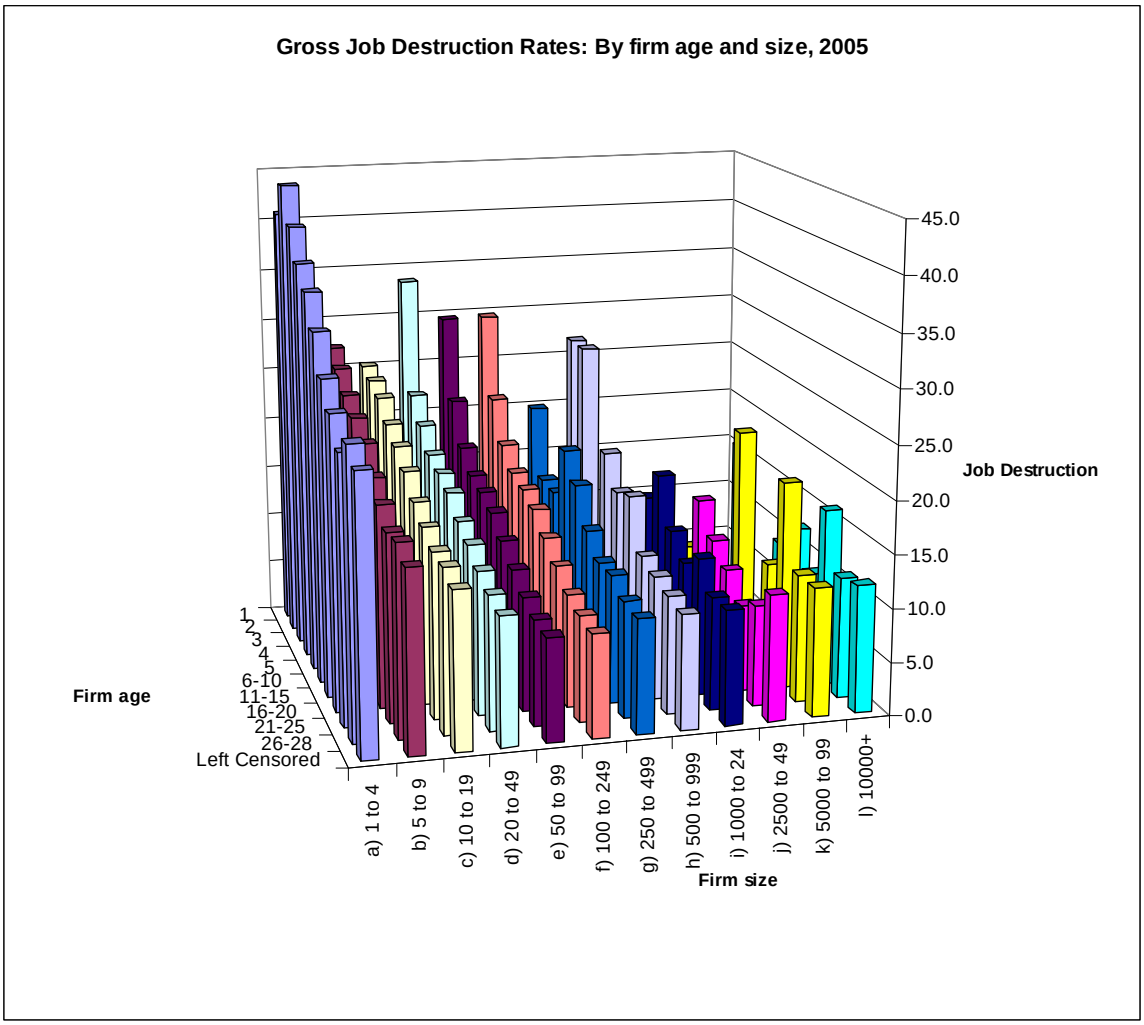

Gross Job Destruction Rates: By firm age and size, 2005
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Job Destruction
Firm age
1
2
3
4
5
6-10
11-15
16-20
21-25
26-28
Left Censored
a) 1 to 4
b) 5 to 9
c) 10 to 19
d) 20 to 49
e) 50 to 99
f) 100 to 249
g) 250 to 499
h) 500 to 999
i) 1000 to 24
j) 2500 to 49
k) 5000 to 99
l) 10000+
Firm size

Figure 12:

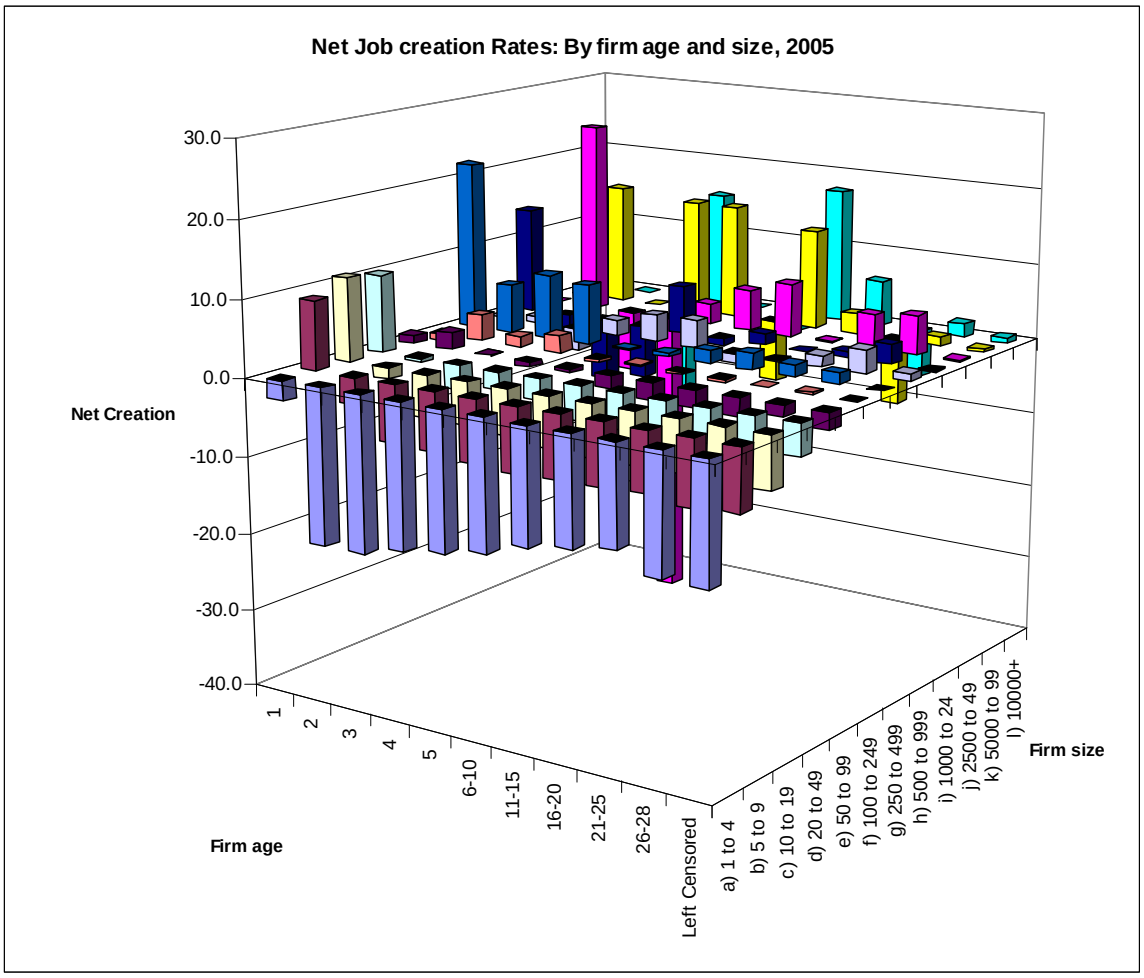

Net Job creation Rates: By firm age and size, 2005
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Net Creation
1
2
3
4
5
6-10
11-15
16-20
21-25
26-28
Left Censored
Firm age
a) 1 to 4
b) 5 to 9
c) 10 to 19
d) 20 to 49
e) 50 to 99
f) 100 to 249
g) 250 to 499
h) 500 to 999
i) 1000 to 24
j) 2500 to 49
k) 5000 to 99
l) 10000+
Firm size

Figure 13:

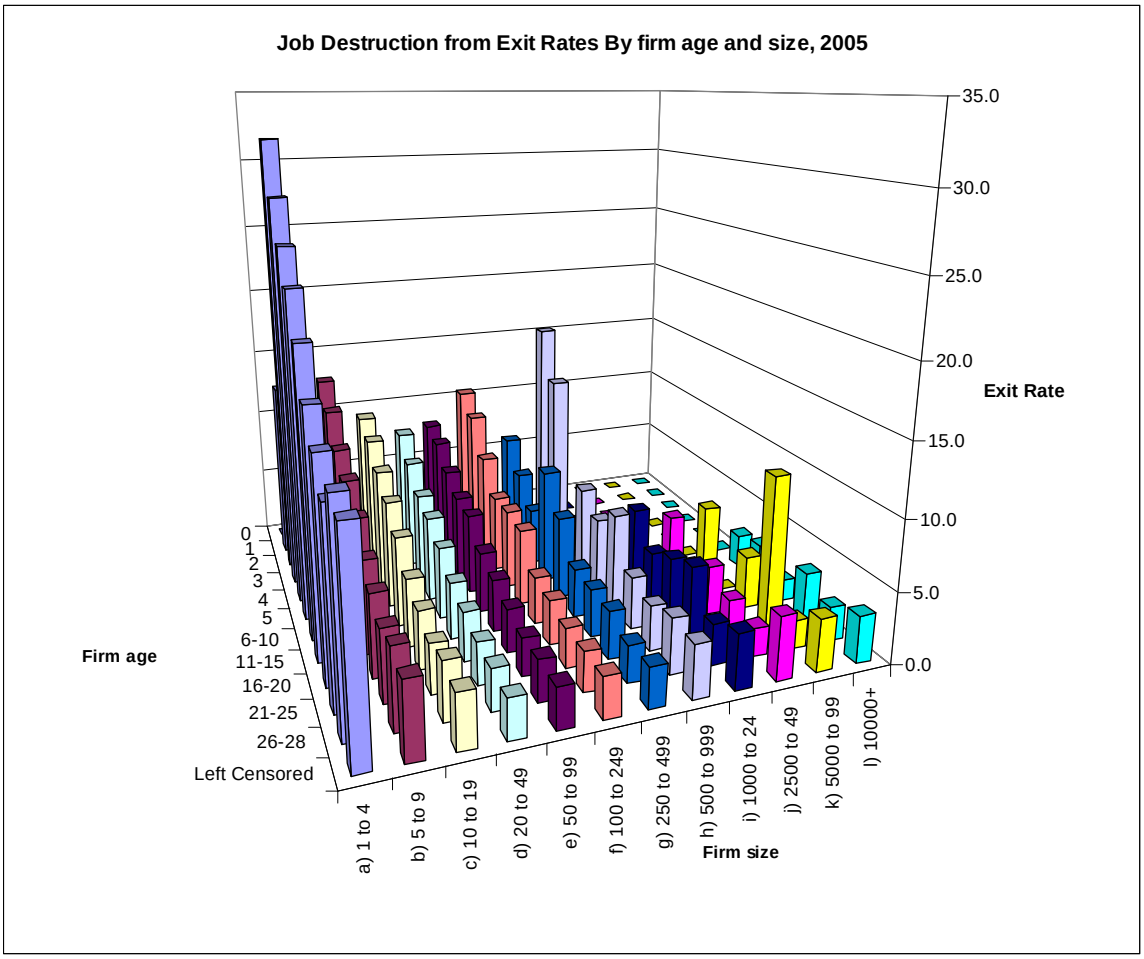

Job Destruction from Exit Rates By firm age and size, 2005
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Exit Rate
Firm age
0
1
2
3
4
5
6-10
11-15
16-20
21-25
26-28
Left Censored
a) 1 to 4
b) 5 to 9
c) 10 to 19
d) 20 to 49
e) 50 to 99
f) 100 to 249
g) 250 to 499
h) 500 to 999
i) 1000 to 24
j) 2500 to 49
k) 5000 to 99
l) 10000+
Firm size

Figure 14:

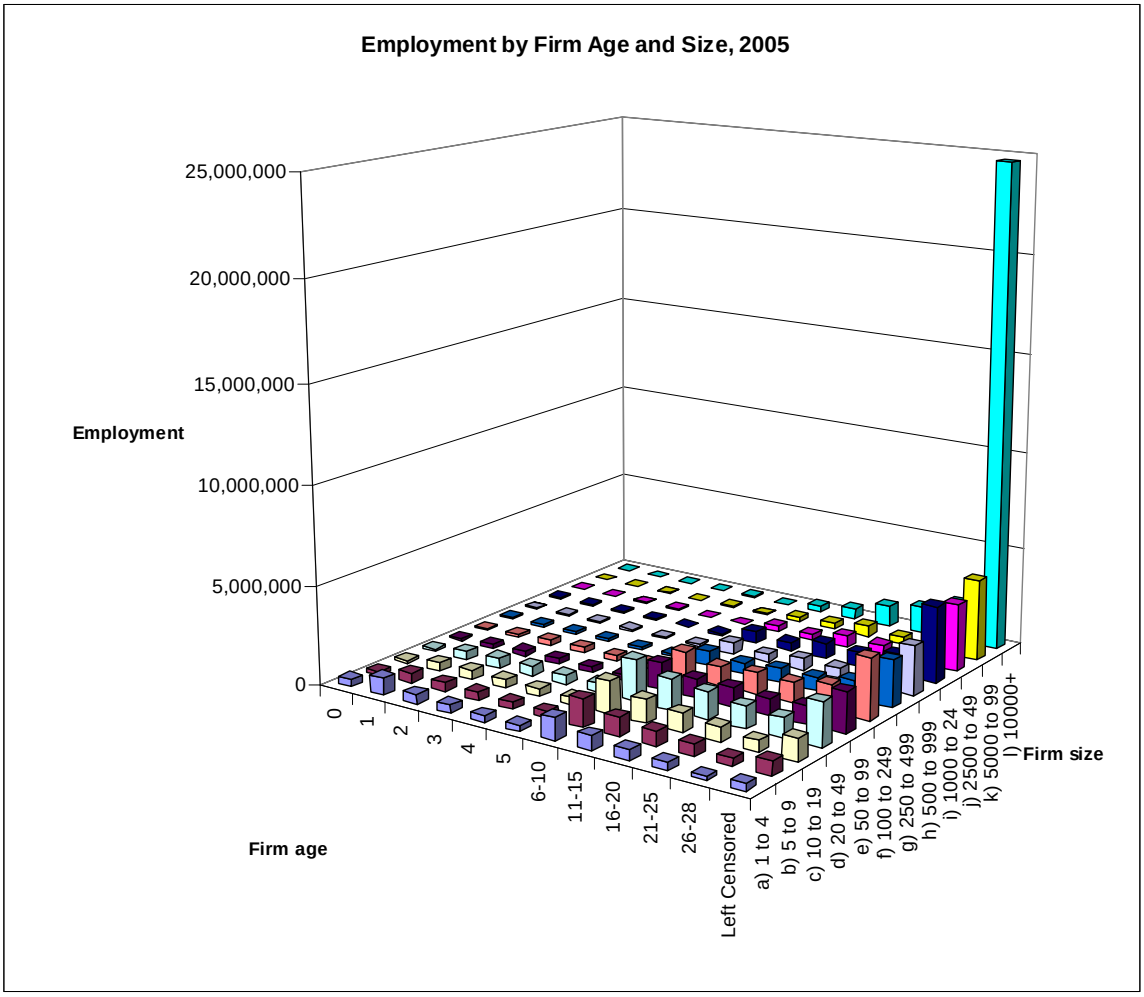

Employment by Firm Age and Size, 2005
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
Employment
0
1
2
3
4
5
6-10
11-15
16-20
21-25
26-28
Left Censored
Firm age
a) 1 to 4
b) 5 to 9
c) 10 to 19
d) 20 to 49
e) 50 to 99
f) 100 to 249
g) 250 to 499
h) 500 to 999
i) 1000 to 24
j) 2500 to 49
k) 5000 to 99
l) 10000+
Firm size

Figure 15:

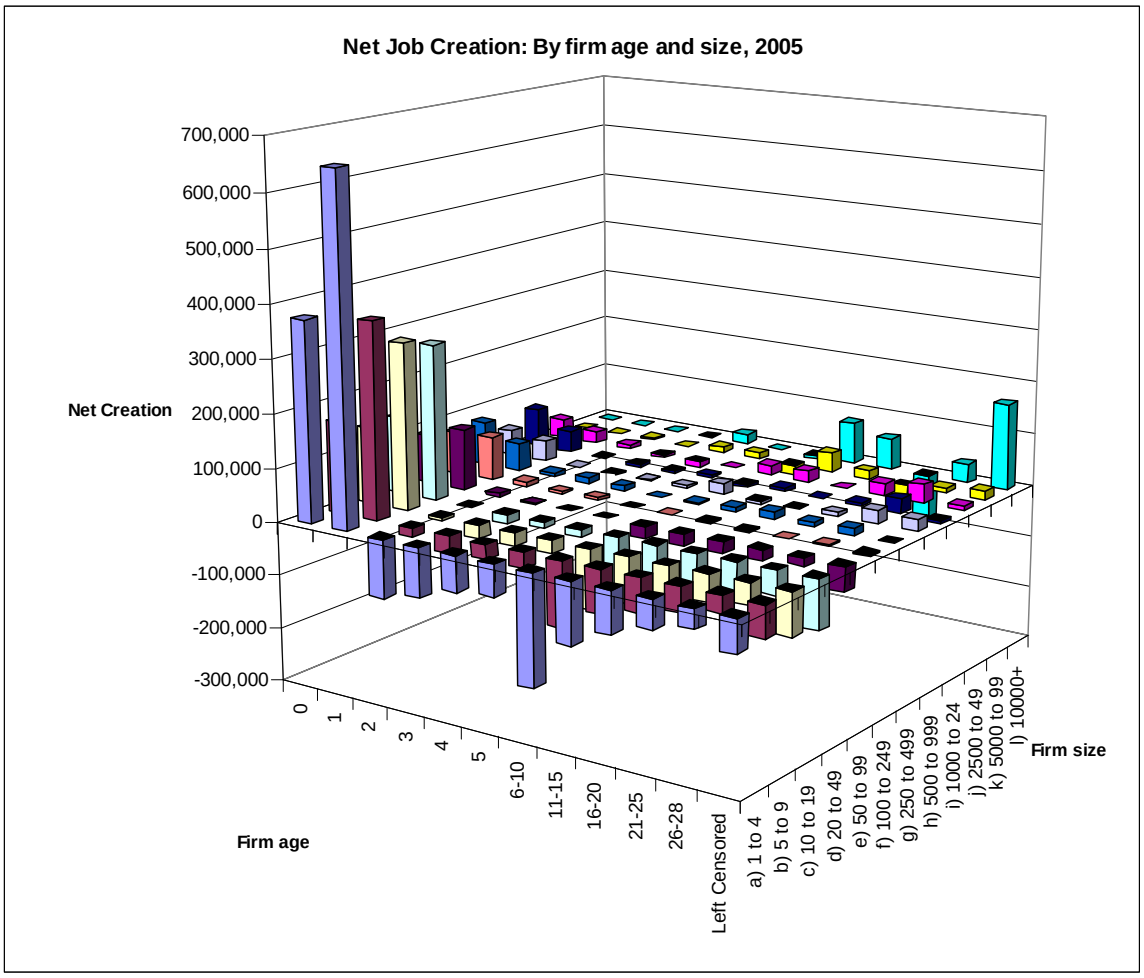
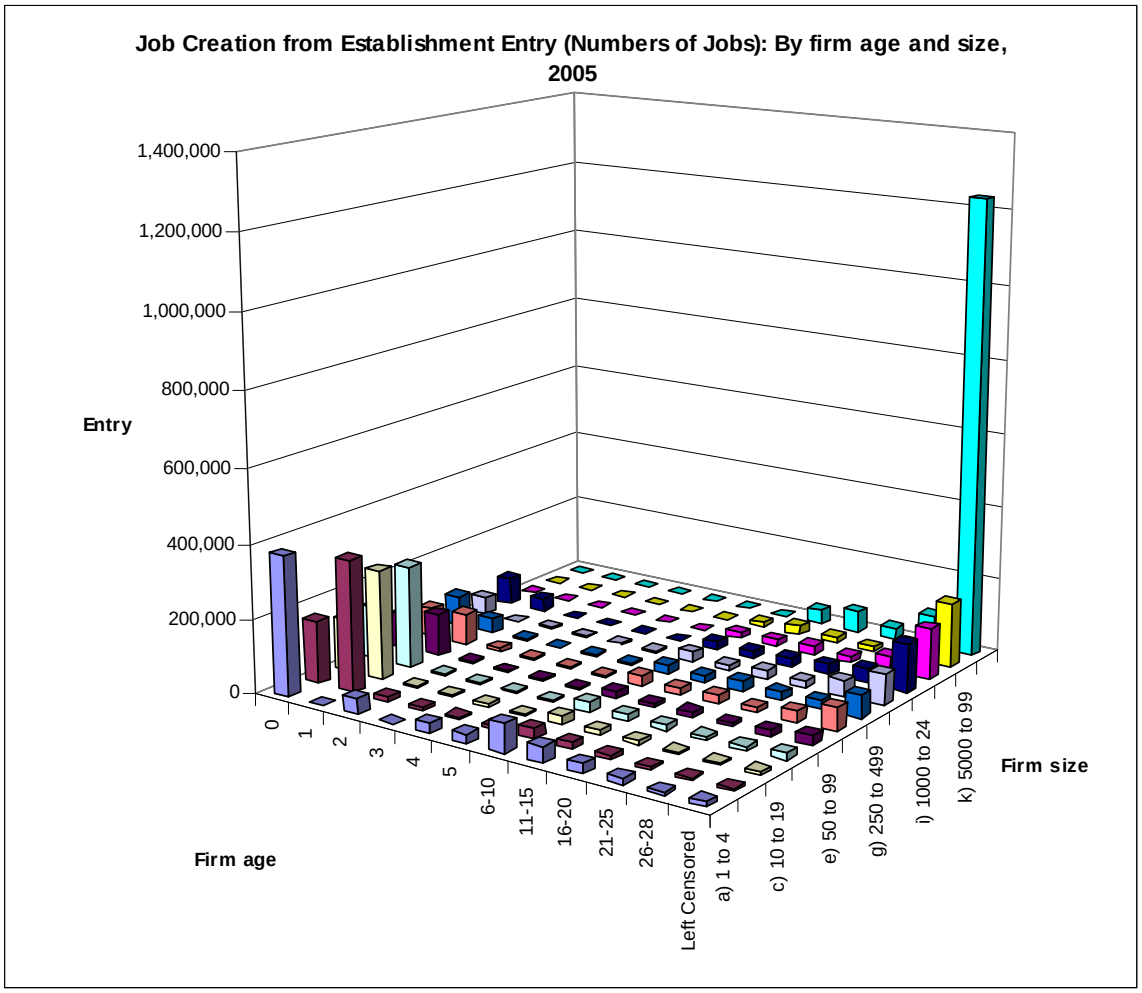

Net Job Creation: By firm age and size, 2005
Net Creation
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
-100,000
-200,000
-300,000
Firm age
0
1
2
3
4
5
6-10
11-15
16-20
21-25
26-28
Left Censored
Firm size
a) 1 to 4
b) 5 to 9
c) 10 to 19
d) 20 to 49
e) 50 to 99
f) 100 to 249
g) 250 to 499
h) 500 to 999
i) 1000 to 24
j) 2500 to 49
k) 5000 to 99
l) 10000+

Figure 16:


Job Creation from Establishment Entry (Numbers of Jobs): By firm age and size, 2005
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Entry
0
1
2
3
4
5
6-10
11-15
16-20
21-25
26-28
Left Censored
Firm age
a) 1 to 4
c) 10 to 19
e) 50 to 99
g) 250 to 499
i) 1000 to 24
k) 5000 to 99
Firm size