A Multi-Dimensional Analysis of Size Class Methodologies and Employment Changes —March 1993 to March 2003

Shail Butani, George Werking, Vinod Kapani , and Paul Grden
Shail Butani, BLS; 2 Massachusetts Ave. N.E. #4985; butani.shail@bls.gov

I. Introduction

Background—There has been a great deal of interest over the years in understanding the job generation dynamics of the economy. Of particular interest has been the debate over whether large employers or small employers are responsible for the majority of the job creation. This discussion has been complicated by a debate over the proper method for measuring job creation by size class. In order to properly measure this type of change, longitudinal data files are required. Traditionally, the base-sizing was the primary method discussed and used by most statistical agencies to directly measure size class change over a 12 month period (e.g., March-to-March) from longitudinal data files. The results from base-sizing show the smallest employers create disproportionately more jobs relative to their share of employment in the population (Baldwin and Picot[1], and Davidsson, Lindmark, and Olofsson[2]).

In the mid-1990, two other approaches were suggested for the measurement of job change by size class: mean-sizing by Davis, Steven, and Haltiwanger[3] and momentary-sizing by Davidsson[4]. Davis, et. al. made a case for mean-sizing by using the results from end-sizing as a justification. In stark contrast to base-sizing, end-sizing shows job growth coming predominantly from the largest employers; hence, the emergence of mean-sizing as an attempt to bridge (average) the differences between base and end-sizing. Later, momentary or dynamic-sizing was suggested by Davidsson as a method for continuous measurement of size class growth that overcomes many of the conceptual and statistical shortcomings associated with mean-sizing.

In this paper, we provide for the four methodologies: the concepts and questions addressed by each of them; an analysis of the 10-year graphs of data broken down by expansion (March 1993 – March 2001) and contraction (March 2001 – March 2003) periods; and a profile of the statistical properties including strengths and limitations.

Additionally, we provide measurements from a detailed analysis of the base-sizing methodology. We give results from a multi-dimensional analysis that provide a deeper insight into some of the major contributors to the employment change including single vs. multi-establishment employers, start up effects vs. smallness, and age of firm.

We also address the concerns of a potential "regression-to-the-mean-bias" for the base-sizing methodology. In the literature, the "regression fallacy" or "regression-to-the-mean-bias" is summarized by Davis, et. al. as: on average, employers classified as small in the previous period are relatively more likely to expand whereas employers classified as large in the previous period are relatively more likely to contract.

We conclude with brief sections on longitudinal versus cross-sectional analysis and on summary of results and conclusions.

We have chosen firm or employer rather than establishment as the unit of analysis because we are trying to answer the question whether most jobs are created by big or small businesses. For the same reason, our analysis is on net employment change rather than on gross job gains and losses.

Data Source—The data used for this study are from the Bureau of Labor Statistics (BLS) longitudinal database (LDB) for the 10-year period March 1993 - March 2003. The primary data source for the LDB is the Quarterly Census of Employment and Wages (QCEW) files. Employment on the quarterly contributions reports filed by employers with their State's unemployment insurance (U.I.) agency provides a virtual census (98 percent) of employees on non-farm payrolls. In an average quarter, this rich and comprehensive database includes about eight million establishments covering about 105 million employees. Among other data elements, the database has information about establishments' State, county, industry classification, single- or multi-establishment employer status, employment for each month of the quarter, and total quarterly wages.

The BLS processes these files through various edits and links records to previous quarters. The purpose of the record linkage is to match, to the extent possible, worksites or establishments that were in continuous operations from one quarter to another, thereby separating them from the worksites that have opened or closed during the quarter[5]. The record linkage step is an important component for longitudinal analysis.

The LDB created from QCEW is a unique and excellent data source for the purposes of this longitudinal analysis[6] because it is a virtual census of all employers across all industrial sectors, all states, and it is the only data source that we know of with quarterly information on a very timely basis. The quarterly information allows us to perform timely and additional analysis like how is the employment change by size class affected in the presence of seasonality.

Concepts and Definitions—For the most part, the terms and concepts used in this paper are the same as those used in the quarterly publication of BLS Business Employment Dynamics (BED)[7] data. For ease of reading, we repeat some definitions and define some new terms and concepts.

Establishment or reporting unit. An economic unit, such as a farm, mine, factory, or store, which provides goods or services.

Employer Identification Number (E.I.N.). A number assigned by the Federal Government for Federal income tax purposes. An E.I.N. covers one or more establishments.

Single-establishment employers or singles. Employers that operate from one location nationwide or, more specifically, E.I.N.'s that report as having one location nationwide.

Multi-establishment employers or multis. Employers that operate from more than one business location nationwide or, more specifically, E.I.N.'s that report as having more than one location nationwide.

Continuous EIN's. EIN's that have positive employment in $period_t$ and $period_{t+1}$.

Openings or new business. Employment generated by EIN's that had zero employment in $period_t$ and positive employment in $period_{t+1}$.

Closings or out-of-business. Employment loss by EIN's that had positive employment in $period_t$ and zero employment in $period_{t+1}$.

Longitudinal analysis time periods—This longitudinal analysis is based on employment changes from one March to the next; the results of the analysis may change considerably if changes were measured over a 2 or 5-year period.

Expansion period[8]—For some tabulations it is March 1993 through March 2001.

Contraction period[8]—March 2001 through March 2003.

Size class—Employers are classified into one of the nine BLS standard size classes based on their total employment according to their Federal tax Employer Identification Number (E.I.N.) Size class 1) 1-4 employees; 2) 5-9; 3) 10-19; 4) 20-49; 5) 50-99; 6) 100-249; 7) 250-499; 8) 500-999; and 9) 1000 or more employees.

Size class methodologies—The four size class methodologies considered are: 1) base-sizing; 2) end-sizing; 3) mean-sizing; and 4) momentary or dynamic-sizing. The base-sizing classifies an employer based on its initial period employment; the mean-sizing uses the average of initial and end period employment to classify an employer; end-sizing uses the end period employment; and momentary or dynamic-sizing operates on a continuum. A simple example of the calculation for each methodology is given in Figure 1.

Figure 1

Employer Number	Initial Empl.	End Empl.	Base-Sizing Class			Mean-Sizing Class			End-Sizing Class			Dynamic-Size Class			
			1	3	4	1	3	4	1	3	4	1	2	3	4
1.	**2**	**28**	**26**			**26**					**26**	**2**	**5**	**10**	**9**
2.	**28**	**2**			**-26**	**-26**			**-26**			**-2**	**-5**	**-10**	**-9**
Total	**30**	**30**	**26**	**0**	**-26**	**0**			**-26**	**0**	**+26**	**0**	**0**	**0**	**0**

In the above example, all four methods give the total employment change of zero when summed over size classes but the distribution of employment gains or losses across the size classes is very different.

II. Profiling the Alternative Size Class Methodologies

Measurement Concept: What is the question to be answered? For statistical surveys, one of the first areas that we address is "what is the question that we are trying to answer" and correspondingly, "what is the concept to be measured". While this seems straightforward, the answers to these questions can have a major impact on the design of a survey and its estimation process. For example, if we want to measure what is the total national employment, we need to define whether employment means the number of people employed or it means the number of jobs. These are two different concepts and that is why BLS measures the number of people employed by a household survey, Current Population Survey (CPS), and the number of jobs by an establishment survey, Current Employment Statistics Survey, also known as the Monthly Payroll Survey.

Similarly, before we begin to address the issue of job creation by size class, we need to determine "what is the question that we are trying to answer". We begin by examining what question each of the four methodologies answer. We will see that each methodology actually answers a different question and not unexpectedly, each produces a different distribution for employment change across the size classes. Thus, these methodologies are not equivalent or interchangeable; rather, each measures a different concept. In this section, we examine four primary size class methodologies' concepts and measurement goals and provide graphs of their size class growth/decline over the 10-year period from March 1993 to March 2003.

Base-sizing annual—The base-sizing has been the traditional method used by most statistical agencies to measure size class job growth. Base-sizing is often calculated on an "annual" job growth basis, where the size class is fixed at the initial period. For example, in measuring employment change from one March to the next, the classification of an employer is based on its initial $March_t$ employment and the employment change is measured at $March_{t+1}$. Subsequently, all employers are reclassified into their new size class for the next measurement period $March_{t+1}$ to $March_{t+2}$. Thus, base-sizing answers the question of "Where does job growth originate?"

Looking at the base-sizing annual results over the 10-year period (chart 1), we see that much of the growth occurs in the smallest size class. This large growth occurs not only during the expansion period but also during the contraction period. Based on results like these, there has been some concern expressed that job growth is overly attributed to the small employers while job declines are overly attributed to the large employers under this methodology – in essence, that there is an inherent bias in the methodology which is often referred to as a "regression-to-the mean-bias".

End-sizing—There are no statistical agencies that actually use end-sizing as a primary measure of employment change by size class. End-sizing answers the question of "Where did job growth end-up" and there has never been any specific economic interest in the answer to this question. Looking at the end-sizing results over the 10-year period (chart 1), we see that most of the job growth is attributed to the largest size class with significant losses occurring in the smallest size class. The end-sizing calculations have

been used to suggest that base-sizing is biased towards attributing growth to the small employers just as end-sizing appears to be biased towards attributing growth to the large employers and that the truth may lie in between these two results. However, the issue of the existence and size of a potential "regression-to-the-mean-bias" for base-sizing can be more appropriately addressed by direct calculations and not by inference from end-sizing results. Since there are no direct applications for end-sizing data, this methodology will be dropped from the subsequent analysis.

Mean-sizing—Davis, et. al. offered mean-sizing as a way of bridging the differences between base and end-sizing to mitigate the potential biases which might be associated with these methodologies. Mean-sizing, however, lacks a conceptual foundation or a specific question it is measuring or answering.

Looking over the 10-year period, we see that mean-sizing smoothes the distribution of job growth across the size classes (chart 1) but it does this by creating an "average" (artificial) size class to attribute all of the job growth to, however, the employer may or may not have ever had a presence in that size class (figure 1). The mean-sizing can also present issues in the proper handling of seasonal changes. Ideally, we would want the seasonal increases and subsequent decreases to be reflected within the same size class and this does not always occur with mean-sizing.

Additionally, mean-sizing changes the expected mean value of both the openings and closings. Under this method, the openings or new businesses are classified in size class determined by (0 + ending employment)/2 and similarly closings or out-of-businesses are classified in size class (initial employment + 0) / 2. Thus, all openings and closings with employment equal to or less than eight are classified in size class 1 (1- 4 employees). Hence, the mean value of openings and closings in size class 1 is based on all employers having 1–8 employees rather than 1- 4 employees.

These concepts and technical issues with mean-sizing become somewhat moot with the introduction of momentary-sizing. For large populations, the distribution for mean-sizing is very similar to that of momentary-sizing (chart 2) for which there is strong conceptual and statistical foundations. For these reasons, mean-sizing will be dropped in favor of momentary-sizing for the subsequent analysis.

Momentary or dynamic-sizing—Davidsson describes an alternative methodology called momentary-sizing for measuring size class change – BLS, later in its work, refers to this as "dynamic-sizing". Unlike the static nature of base and end-sizing, dynamic sizing provides a continuous allocation of job growth or loss across size classes during the observation period. For example, a firm that grew from 45 to 55 employees would attribute an increase of four employees to size class 20-49 and six employees to size class 50-99. For more details on some of the issues surrounding size class methodology see "Business employment dynamics: tabulations by employer size"[9]. Dynamic-sizing allocates job growth across all size classes that it occurs in and answers the question of "Where did job growth occur during the observation period?"

Looking at the 10-year period, we see the results for dynamic-sizing are very similar to those of mean-sizing (chart 2). This is because of the law of large numbers—eight million establishments in an average quarter on LDB. Additionally, the data are averaged over 8 years for the expansion period and 2 years for the contraction period. For smaller domains, the two set of numbers can be very different. A case in point is the example given in figure 1. The major difference between the two methodologies is dynamic-sizing has clear measurement objective and statistical underpinnings whereas mean-sizing does not.

Each methodology discussed above answers a different question relating to employment change by size class and in most cases the results are dramatically different as shown in chart 1. These methodologies, therefore, cannot be viewed as equivalent or interchangeable approaches for measuring job growth/decline by size class. A decision needs to be made as to the appropriate concept for the intended use. While measurement concepts play an important part in choosing a measurement methodology, the statistical properties of a methodology is also very important. In the next section, we will look at the statistical properties both in terms of strengths and limitations for the remaining two methodologies: base-sizing and dynamic-sizing.

Statistical Properties of Base-Sizing and Dynamic-Sizing—In the above section, we looked at what concept or question each methodology addressed; in this section, we will look at the statistical properties of base-sizing and dynamic-sizing. Specifically, the methodologies will be evaluated in terms of their:

- additivity across quarterly estimates;
- comparability of over-the-year seasonally adjusted data and not seasonally adjusted data;
- ability to handle seasonal movements without introducing biases in the estimates;
- ability to handle birth and death units in the estimates;
- additivity across sub-classifications of industry and geography;
- satisfying conditions of trivial cases; and
- ease of comprehensibility

Additionally, we discuss any potential sources of bias.

Base-sizing annual—This method measures where job growth originates or comes from. Under this method, the size class is fixed for the entire reference period for which the change is to be measured; the size is determined by the employment at the initial period. For example, in measuring employment change from one March to the next, the classification of an employer is based on its initial March$_t$ employment and the employment change is measured at March$_{t+1}$; at this time, all employers are reclassified into their new size class for the period March$_{t+1}$ to March$_{t+2}$. The major statistical properties of this method are given below.

1. Base-sizing annual provides additivity at many levels. That is, sum of the quarterly changes are equal to over-the-year changes for both continuous and out-of-business employers; sum of the not seasonally adjusted estimates of

employment change are essentially the same as the sum seasonally adjusted estimates of change on a yearly basis; and the sum of the changes in industrial sectors as well as geography is equal to the total quarterly change.

2. The sum of quarterly changes of openings or "new" employers, however, do not equal to the over-the-year changes because these employers are classified by their initial employment during the reference period. For example, an employer opened a business in June 2004 with four employees and by March 2005 it had 15 employees. Then, for first quarterly estimates of change (March 2004 to June 2004), size class 1 (1-4 employees) openings data would show a job growth of four. For the other three quarters, the job growth of 11 employees will also be credited to size class 1 but to the category of continuous employers. However, when measuring over-the-year employment change, the entire job gains of 15 employees will be classified in the openings for size class 3 (10-19 employees). Some may view this as inconsistency but the difference is part of the start-up effect.

3. Base-sizing provides a size class classification methodology which is consistent with the approach used for tabulations of industry and geographic classification of data in other BLS programs.

4. It satisfies conditions of all trivial cases. It is conceptually easy to understand.

5. There is no bias associated with base-sizing over a specified reference period (i.e., $March_t$ to $March_{t+1}$ or $March_t$ to $March_{t+5}$). There may, however, be some bias associated when measurements are taken across different reference periods. For example, an employer moving from size class 1 to size class 4 during $March_t$ to $March_{t+1}$ period and then back to size class 1 during $March_{t+1}$ to $March_{t+2}$ period.

6. The base-sizing annual methodology allows users to reconcile estimates of change from longitudinal vs. cross-sectional analysis. In fact, if proper procedures are used, the tabulations can even separate the size class movement into two components. First, the movement from size class growth or decline (e.g., a firm grew from size class 8 to size class 9). Second, the movement due to change in reporting status like mergers, acquisitions, breakouts, consolidations, etc. (e.g., two firms in size class 8 merged together and moved into size class 9). This can be a valuable piece of information in understanding the business employment dynamics data for distribution of employment and number of firms by size of employer.

7. The major concern expressed with base-sizing annual is that it shows a disproportionate share of the job growth (chart 1) relative to the share in the population[10] (table 1) coming from the very small employers. Is this growth real or the result of some inherent bias? The issue of bias is discussed in the section "measurement of regression-to-the-mean-bias", while the growth is discussed in the section "profile of employers originating job growth and losses."

Dynamic-sizing—This method measures how employment change evolves or occurs over time especially over a long period. To the best of our knowledge, the BLS is the first agency to actually use this method to publish official Business Employment Dynamics statistics by size class[11] released in December 2005. Major statistical properties of this method are:

1. It provides additive estimates across time. That is, sum of quarterly changes are equal to over-the-year changes. Similarly, sum of quarterly changes for a five year period are the same as change over a five year period for employers who do not change their reporting basis due to mergers, acquisitions, etc. Sum of not seasonally adjusted changes are essentially the same as sum of seasonally adjusted changes on a yearly basis.

2. It does not require a reference period (i.e., annual, quarterly, etc) to classify employers. This method operates on a continuum size; thus, dynamic-sizing reduces the need for periodic resizing.

3. It is symmetrical. The growth and decline in jobs are attributed in a similar manner to each size class; thus, there is no potential for a regression-to-the-mean bias.

4. It uses the same methodology to classify new, out-of-business, and continuous employers.

5. It is a relatively easy concept to understand. It is operationally simple. It satisfies conditions of all trivial cases.

6. The limitation of this method is that it can not be applied to categorical data such as industrial or geographic classification. This is because it does not provide consistency between sum of industrial changes and the total change as well as sum of state changes and the national change. For example, an employer has in each of the 50 states 30 employees in the initial period and 15 employees in the end period. Then, at the national level, the dynamic-sizing will show job losses in size classes 9 (1000 or more employees) and 8 (500-999). While, at the state level, the losses will be shown in size classes 4 (20-49) and 3 (10-19).

Base-sizing quarterly—In addition to analyzing the statistical properties of base-sizing annual and dynamic sizing, BLS also examined the statistical properties of base-sizing quarterly since the LDB provides data on a quarterly basis. This method is appropriate for measuring change for a short term of one quarter and for measurement of seasonal movement. The major concern with this method is it confounds measurement of employment change with seasonal movement changes when it is used over multiple consecutive quarters. As a result, this method is inherently biased towards job growth coming from smaller size classes and losses coming from larger size classes. Base-sizing

quarterly is discussed in Cordelia Okolie's paper "Why Size Class Methodology Matters in Analysis of Net and Gross Job Flows"[12], although it is not explicitly stated.

For example, an employer with three employees in January – March and April - June quarters has 12 employees in October – December quarter and seven employees in the following January – March quarter. Under base-sizing quarterly methodology, size class 1 (1-4 employees) will show growth of nine employees in October – December quarter while size class 3 (10-19 employees) will show loss of five employees. With base-sizing annual, both the gain of nine employees and a loss of five employees will be under size class 1, with a net gain of four jobs for $March_t$ – $March_{t+1}$ period for size class 1.

Our findings indicate a very strong seasonal pattern for LDB size class data. As an example, chart 3 shows the quarterly changes in size class 1 (1-4 employees) data using base-sizing annual; other size classes exhibit similar seasonal patterns. These strong quarterly seasonal changes cannot be separated from the trend changes under the base-sizing quarterly method.

Table 2 shows the estimates of average yearly employment change by size class for the expansion and contraction periods. For base-sizing quarterly, the sum of the quarterly changes by size class is very different than over-the-year changes by size class. In particular, the sum of the quarterly changes is more than double the over-the year change for size class 1. Because of resizing every quarter, the base-sizing quarterly estimates exhibit strong "regression-to-the mean-bias" during a 1-year time period. In addition to the poor statistical properties that base-sizing quarterly possesses, the changes by size class do not make economic sense because most of the larger size classes show a loss during one of the biggest economic expansion of recent times. The base-sizing quarterly, therefore is also not a viable option to measure what size employers create or destroy most jobs over a long period of time.

Summary: Base-Sizing Annual vs. Dynamic-Sizing—The choice between base-sizing annual or dynamic-sizing depends on the measurement objective. Is the goal to measure where job growth or loss originates or how job growth or loss evolves or occurs over time? The base-sizing annual methodology is the appropriate one to measure where change in jobs originates or comes from. Whereas, dynamic-sizing is appropriate to measure how change in jobs evolves or occurs over time from inception to the end. The two methodologies paint a very different picture of employment change by size class as shown in charts 1 and 2.

The next section is devoted to addressing the two major concerns identified with base-sizing annual. The first issue is to explain the phenomenal employment growth of size class 1 (1-4 employees) employers during both expansion and contraction periods and tremendous job losses by size class 9 (1000 or more employees) during the contraction period. The second issue is to provide measurement of regression-to-the-mean-bias for base-sizing annual.

Base-Sizing Annual: Addressing the Two Major Concerns

A Profile of Employers Originating Job Growth and Losses—In this section, we examine some of the major contributors to the employment growth especially for size class 1 employers and losses under base-sizing during both the expansion and contraction periods. We look at the effect from the dynamics of single- vs. multi-establishment employers; the effect of new businesses and their subsequent transitions (i.e., start-up effect); and the effect of age-of-firm by size class on employment change.

The empirical results show size class 1 as having phenomenal growth irrespective of whether the economy is in expansion or contraction period (table 2 and chart 1). At first glance, this disproportionate growth especially relative to about 5 percent share of the employment in the population (table 1) seemed unbelievable. These results, however, replicate over-the-year changes generated by the Census Bureau Business Dynamics data[13]. Additional studies by Davidsson, et. al. and Baldwin and Picot based on U.S., Canadian, and European data showed similar results. Unlike earlier studies, the current analysis attempts to document and explain the underlying factors that lead to this large growth in size class 1. Our analysis is also expanded beyond the manufacturing sector to total non-farm private sector.

Single vs. multi-establishment employers—The concept of classifying employers as single- or multi-establishment employer is clearer than size class. In "Employment dynamics of individual companies versus multi-corporations"[14], it is shown that single continuous establishment employers are the driving engine behind job growth during both expansion and contraction periods; while, multi continuous establishments were responsible for virtually all the employment loss during the contraction period. Much of the growth originates with single continuous employers in size class 1 (chart 4). Thus, we concentrated our efforts on the single continuous employers.

Single continuous employers—We began by studying the employment flows in and out of each size class separately for singles, multis, and combined for each March-to-March (over-the-year) change. The rows of our 9 X 9 matrix (table 3A) are the size classes based on the beginning period employment of an E.I.N. and the columns are the size classes based on the ending period employment of an E.I.N. Each cell entry is the sum of employment changes for all the continuous establishments (for single-establishment employers, establishment and E.I.N. are synonymous) belonging to that cell. See table 3A.

For each beginning period size class (i.e., row), we summed across all columns to obtain employment change of the continuous establishments. In table 3B, we included four additional columns: employment generated from openings (Summary Column 2); employment loss from closings (Summary Column 3); net employment from openings minus closings (Summary Column 4); and total employment gain or loss (Summary Column 5) by size class. The examination of data in a matrix format provides a clear understanding of the employment flows between size classes for the continuous

establishments, and the contribution of employment change from openings and closings of establishments.

The data showed very consistent trend for size class 1 single continuous employers. The growth originates with the single-establishment employers in size class 1. There are about 2.5 million employers (table 1). (NOTE: Some of these employers have been in existence for many years while others have just come into existence in March$_t$. This does not imply age.) In the time period March$_t$ to March$_{t+1}$, the vast majority of them remain in size class 1 and create on average about 40,000 jobs; about 7.5 percent consistently move to size class 2 creating about 410,000 jobs; another 0.5 percent move to size class 3 creating about 120,000 jobs; and 0.5 percent move into size classes 4 and higher creating another 100,000 jobs. (Note: These numbers are based on 9 X 9 matrices; they are not shown in any table or chart.) They create a total of about 670,000 jobs annually (chart 4).

Next, we tabulated these single size class 1 employers for an additional two years with three different starting years 1994, 1999, and 2001. Again, there was a very consistent pattern. In the subsequent period March$_{t+1}$ to March$_{t+2}$, the size class 1 employers from March$_t$ who are still in business and remained in size class 1 created an additional 320,000 jobs. In the period March$_{t+2}$ to March$_{t+3}$, the original size class 1 employers from March$_t$ who are still in business and remained in size class 1 again created about 250,000 jobs. The growth of 250,000 to 300,000 jobs is mostly coming from the 5.7 percent of the employers who move to size class 2 (5-9 employees) and 0.3 percent who move to size class 3 (10-19 employees). Thus, each year there is a small percentage of employers in size class 1 that move up in employment into the next two size classes. This small percentage, however, is on a very large base of 2.5 million employers and with just the addition of a few employees each they create a large employment change for size class 1. (Note: Again, these numbers are not displayed in any table or chart; they are based on matrices for time period t+1 to t+2 and t+2 to t+3 condition on employers in size class 1 in time period t.)

NOTE: The decline in job gains for each subsequent time period is coming from a declining base number of size class 1 employers. That is, in each subsequent year about 11 to 13 percent of these employers go out-of-business; additionally, some move to other size classes. At the same time, new employers and those that move into size class 1 from other size classes are not included in this analysis. The statistics in the above two paragraphs are for the time period starting in March 1994 and March 1999. The numbers are somewhat lower for the starting time period 2001.

Industrial sectors—The industrial sectors in which this growth took place are shown in table 4. The growth pattern for each industrial sector is also very consistent from one year to the next and is concentrated in the services including health care, real estate, and construction sectors. This appears to be in sync with the general economy.

Employment change by age and size—Table 5A gives the distribution of employment change by size class and age for all continuous employers. These data provide us with further understanding of whether employment changes by size class are correlated with

age of firm especially for size class 1 employers. Before proceeding any further, we would like to caution the readers that age of firm for multi-establishment employers is rather soft because of mergers, acquisitions, consolidations, breakouts, etc. Our interest however is mostly in size class 1 employers who are predominately single-establishment employers (table 1).

During the expansion period, employers in size class 1 dominate the employment growth for each age group. The overwhelming majority of the growth is coming from firms who are more than 3-years old. This is true for all size classes because there are more firms in this age group as shown by average yearly employment change per firm statistics given in table 5B.

During the contraction period, continuous employers in size class 1 again dominate the growth for each age group while most of the other size classes show relatively small gains or losses for firms with age less than or equal to 3-years (table 5A). Of particular interest is the age group greater than 3-years: the size class 1 continuous employers are the only ones with huge growth followed by modest growth from size class 2 employers, while size class 9 (1000 or more employees) employers who are predominately multi-establishment employers (table 1) contribute to the enormous job losses. In "Employment dynamics of individual companies versus multi-corporations", it was shown the losses during the contraction period from multi-establishment firms are mostly coming from continuous establishments.

Start-up effect—The differences between sum of the quarters under base-sizing annual and over-the-year changes shown in table 2 are due to the classification of new businesses as discussed in the statistical properties section. This difference is the start-up effect within the 1-year reference period; for size class 1 it is 210,000.

Different reference period—The LDB statistics are highly seasonal as shown in chart 5. Because of this seasonality, we thought perhaps the employment changes by size class may differ substantially if the reference period of initial size was based on June, September, or December rather than March, which has the lowest seasonal employment. Thus, there may be a bias towards crediting small employers with job growth. The data for the period 1994 to 1995 were tabulated using four different reference periods: March – March; June – June; September – September; and December – December. The growth for size class 1 for all four periods was about 1.1 million jobs. This is the underlying trend for size class 1 employers on an annual basis.

In essence, the job growth originates with the smallest of the single-establishment employers who are in business 1-year or longer, with the vast majority of the growth coming from single employers who have been in existence more than 3-years simply because there are about 2 million of them. The age of firm analysis for size class 1 employers confirms the job growth results obtained from following the size class 1 employers for an additional 2-years. The result being job growth originates with the small entrepreneurs.

Measurement of "Regression-to-the-Mean-Bias"—Baldwin and Picot have generated estimates of employment change by size class on Canadian and U.S. Manufacturing Sector by incorporating some correction for regression-to-the-mean-bias. They have used several alternative definitions to size the data to measure changes over 2 and 5-year periods. Their results show it is the long term trend and not the temporary fluctuations that yield the positive net employment change for smaller classes and generally negative net employment change for larger size classes.

In this section, we provide some measurements of "regression-to-the-mean-bias" for the U.S. total non-farm private sector for March 1993 – March 1995, March 1995 –March 1997, March 1997 – March 1999, March 1999 – March 2001, and March 2001 – March 2003 time periods. We limited the scope to all single employers who had positive employment for the entire 2-year period. This is because the "regression-to-the-mean bias" does not apply to new businesses and out-of-businesses. Additionally, it is very hard to separate this bias from changes in reporting basis due to mergers, acquisitions, consolidations, breakouts, etc. for multi-establishment employers.

The base-sizing annual methodology was used to classify all single continuous employers by their initial March employment. We then compared their 2-year change (i.e., 2-year cohort analysis) by size class to the sum of the two 1-year changes (i.e.,1-year cohort analysis). In the 2-year change, the size class is fixed at March$_t$ for the entire 2-year period. In the 1-year change, the size class is fixed at March$_t$ to measure the change from March$_t$ to March$_{t+1}$ and then the employers are reclassified according to their March$_{t+1}$ employment to measure the change from March$_{t+1}$ to March$_{t+2}$.

For the combined size classes 1, 2, and 3 (1-19 employees), the average bias is about 5 to 6 percent (table 6); these three size classes were combined since each one has a very small interval length. In conclusion, we see mean-sizing by its nature smoothes the employment change across all size classes (chart 1) but smoothing is not a measurement objective. We also see a small evidence of "regression-to-the-mean-bias" across two consecutive 1-year reference periods when using base-sizing annual. This bias is, however, not large enough to trade off all the desirable statistical properties of base-sizing annual. Our results confirm Baldwin and Picot findings that the trend of the small employers is the major contributor to the employment growth and not the temporary fluctuations.

Longitudinal versus Cross-Sectional Analysis

In order to study the issue of which size employers create the most jobs, longitudinal files must be used for this analysis. An area of confusion for users has been some attempt to use cross sectional analysis (i.e., changes in size class population distribution) to address this issue—such analysis yields misleading results. Under cross-sectional analysis, the biggest gainer in employment distribution by size class from 1992 to 2003 is employers in size class 9 with 1000 or more employees (table 1). The share of employment for size class 9 went from 35.7 percent to 37.5 percent, while the share of employment for size class 1 employers actually declined from 5.6 percent to 5.2 percent. At first, this

statement seems contradictory to our finding that size class 1 employers created overwhelming majority of the jobs during both expansion and contraction periods.

The reason for the large discrepancy between the measures of employment change and employment distribution is that the longitudinal analysis measures of change reflect only the individual firm employment change (i.e., economic change) while the cross-sectional analysis measures of change reflect both the individual firm employment change and the firm's annual reclassification change.

Consider, for example, a tabulation cell that had only size class 1 employers with 10 firms each having two employees in March$_t$ and eight employees in March$_{t+1}$. Then, under longitudinal analysis for the cell, the size class 1 employer category would show an employment growth of 60 employees and size class 2 would show no change. Under cross-sectional analysis, however, size class 1 employers would show a loss of 20 employees and size class 2 would show a gain of 80 employees coming from the reclassification shift and firms employment growth.

The reclassification changes occur for three major reasons. They are: 1) business expansion or contraction as in the above example; 2) business mergers, acquisitions, and consolidations; and 3) business changes in reporting practices, such as when a multi-establishment employer that used to report all of its operations from one location has started to provide data by breaking out its operations into two or more locations.

Summary and Conclusions

Summary—In this paper, we discussed end-sizing, mean-sizing, base-sizing quarterly, base-sizing annual, and dynamic-sizing. The choice of appropriate size class methodology to measure employment change depends upon the measurement objective or concept. The end-sizing measures where employment growth/decline ends up. We have not been able to define a measurement objective for mean-sizing. The base-sizing quarterly is appropriate for measuring change for a short term of one quarter and for measurement of seasonal movement; it is not appropriate for measuring employment change trends over multiple consecutive quarters. The base-sizing annual is an appropriate method for measuring with what size employers does the job growth or decline originates; we also measured the "regression-to-the-mean bias" for this method to be the order of about 5 to 6 percent for employers with 1-19 employees. Whereas, dynamic-sizing is appropriate to measure how job growth or loss evolves over a time period.

During the expansion period, the average yearly growth of about 1,080,000 jobs originates with employers in size class 1 (chart 1, table 2) who are predominately single-establishment employers (table 1). About 320,000 of this growth comes from net of openings minus closings (chart 6); of this amount about 210,000 is the start-up effect (table 2, 1082 vs. 872 for size class 1) and 110,000 is net of openings minus closings that remain in size class 1. The remaining 760,000 (1,080,000 – 320,000) is coming from continuous employers (chart 4, table 5A); these firms have been in existence 1-year or

longer (table 5A). Over half of the 760,000 jobs growth is coming from firms in existence more than 3-years (table 5A). This growth mainly occurs in the services including health care, real estate, and construction sectors (table 4). These employers are the smallest entrepreneurs and their numbers are large, about 2.5 million (table 1).

During the contraction period, the numbers are somewhat lower for size class 1 employers but they still represent substantial growth in jobs. The other big result during this period is the average yearly loss of about 1,390,000 jobs (table 5A) that originated with size class 9 (1000 or more employees) employers who are predominately multi-establishment employers (table 1) and more than 3-years old.

Conclusions—We have selected origination of job growth or decline as the criterion to answer the question: what type of employers create or destroy the most jobs in the economy? In summary, the overwhelming majority of the job growth originates with the size class 1 (1-4 employees) single-establishment employers who are more than 3-years old. This growth takes place irrespective of the expansion and contraction periods. This growth mainly occurs with the very small employers in the services including health care, real estate, and construction sectors. The overwhelming majority of the job losses during the contraction period, however, originate with the size class 9 firms (1000 or more employees) who are predominately multi-establishment employers and more than 3-years old.

References and Footnotes

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[7] Clayton, Faberman, Sadeghi, Spletzer, and Talan, "Business Employment Dynamics," *Monthly Labor Review*, April 2004, pp. 29-42.

[8] When referring to data for all years within an expansion or contraction period, the statistics are derived by summing the annual employment or employment changes within that economic period and domain and then performing appropriate arithmetic operation.

[9] Butani, Clayton, Kapani, Spletzer, Talan, and Werking, "Business employment dynamics: tabulations by employer size," *Monthly Labor Review*, February 2006, pp.3-22.

[10] The population distribution of employment by establishment as given by business employment dynamics statistics is significantly different than that of E.I.N. shown in this paper.

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[14] Butani, Shail, Werking, George, Kapani, Vinod, "Employment dynamics of individual companies versus multi-corporations" *Monthly Labor Review*, December 2005, pp. 3-15.

Chart 1

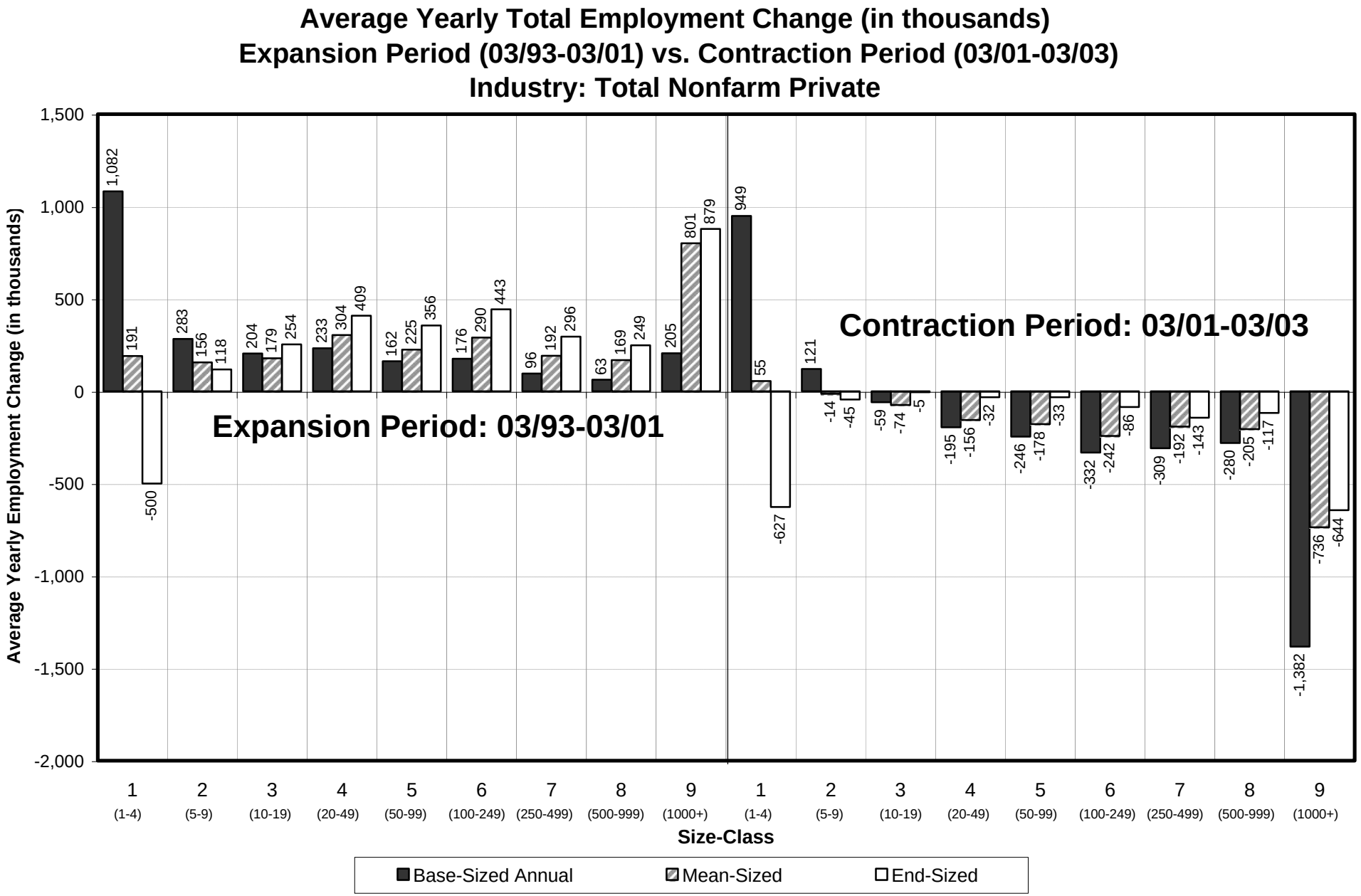
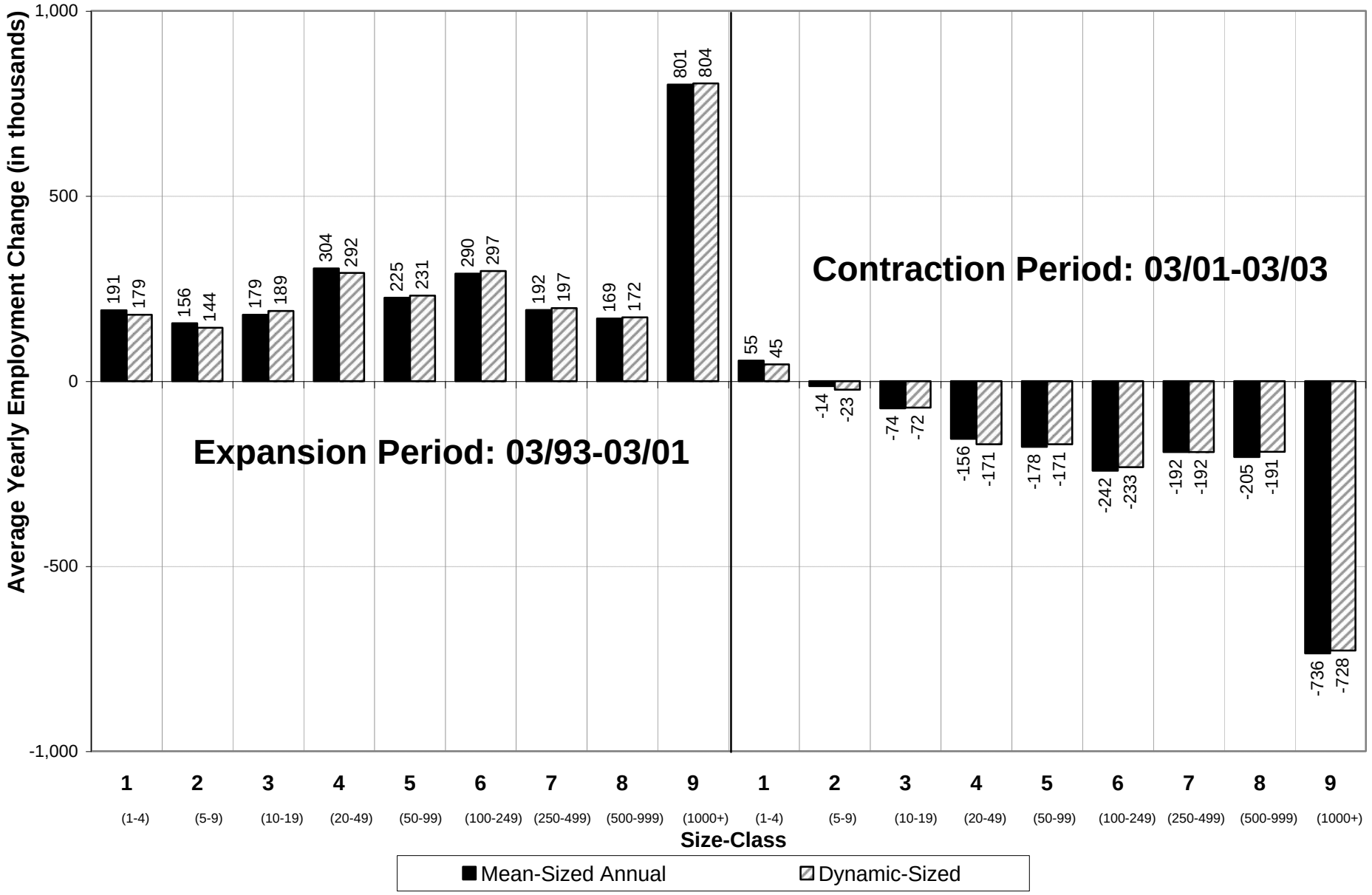

Average Yearly Total Employment Change (in thousands)
Expansion Period (03/93-03/01) vs. Contraction Period (03/01-03/03)
Industry: Total Nonfarm Private
Average Yearly Employment Change (in thousands)
1,500
1,000
500
0
-500
-1,000
-1,500
-2,000
Expansion Period: 03/93-03/01
Contraction Period: 03/01-03/03
1,082
191
-500
283
156
118
204
179
254
233
304
409
162
225
356
176
290
443
96
192
296
63
169
249
205
801
879
949
55
-627
121
-14
-45
-59
-74
-5
-195
-156
-32
-246
-178
-33
-332
-242
-86
-309
-192
-143
-280
-205
-117
-1,382
-736
-644
1 (1-4)
2 (5-9)
3 (10-19)
4 (20-49)
5 (50-99)
6 (100-249)
7 (250-499)
8 (500-999)
9 (1000+)
1 (1-4)
2 (5-9)
3 (10-19)
4 (20-49)
5 (50-99)
6 (100-249)
7 (250-499)
8 (500-999)
9 (1000+)
Size-Class
Base-Sized Annual
Mean-Sized
End-Sized

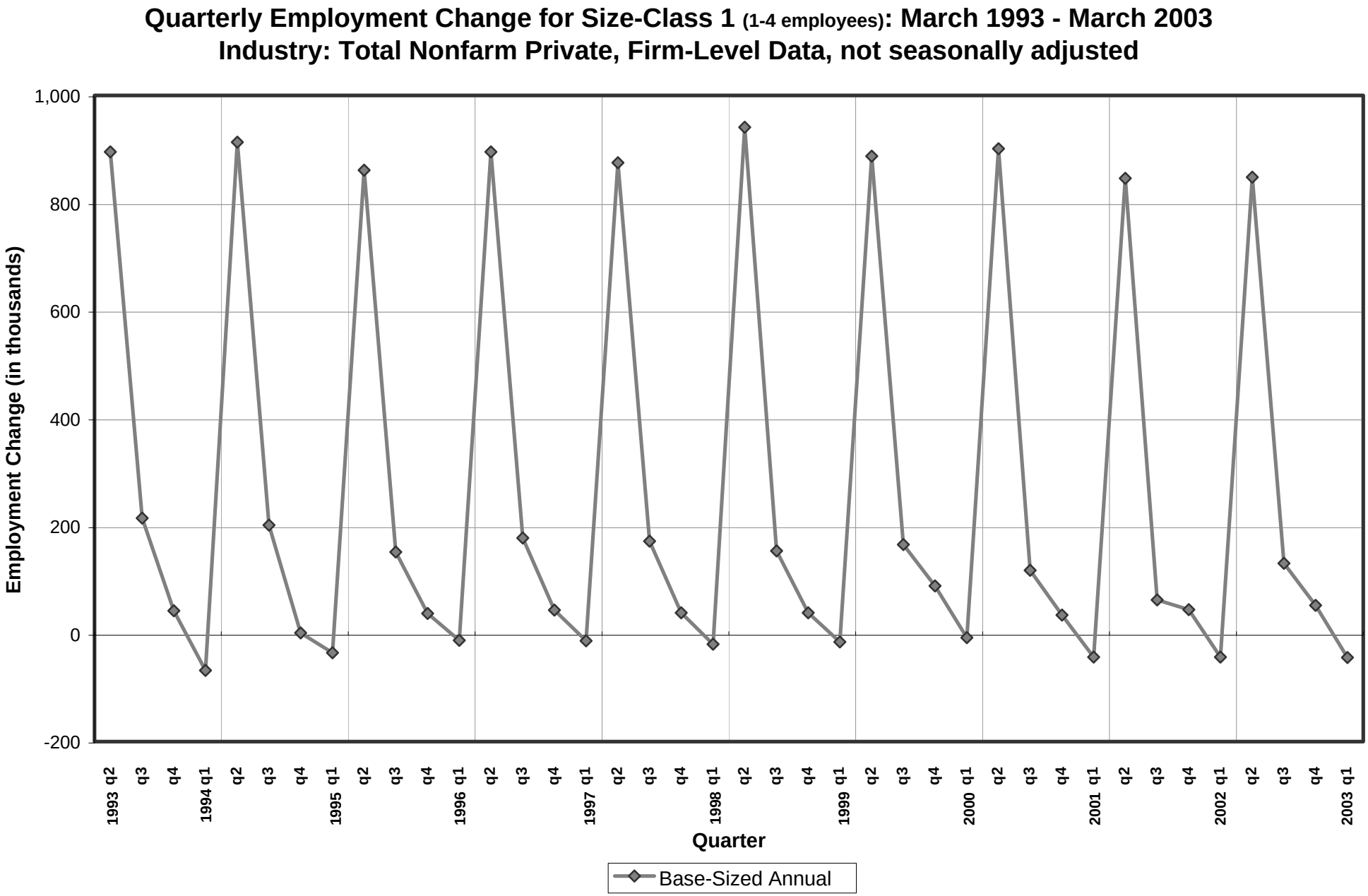
Chart 2

Average Yearly Total Employment Change (in thousands)
Expansion Period (03/93-03/01) vs. Contraction Period (03/01-03/03)
Industry: Total Nonfarm Private



09/09/2004

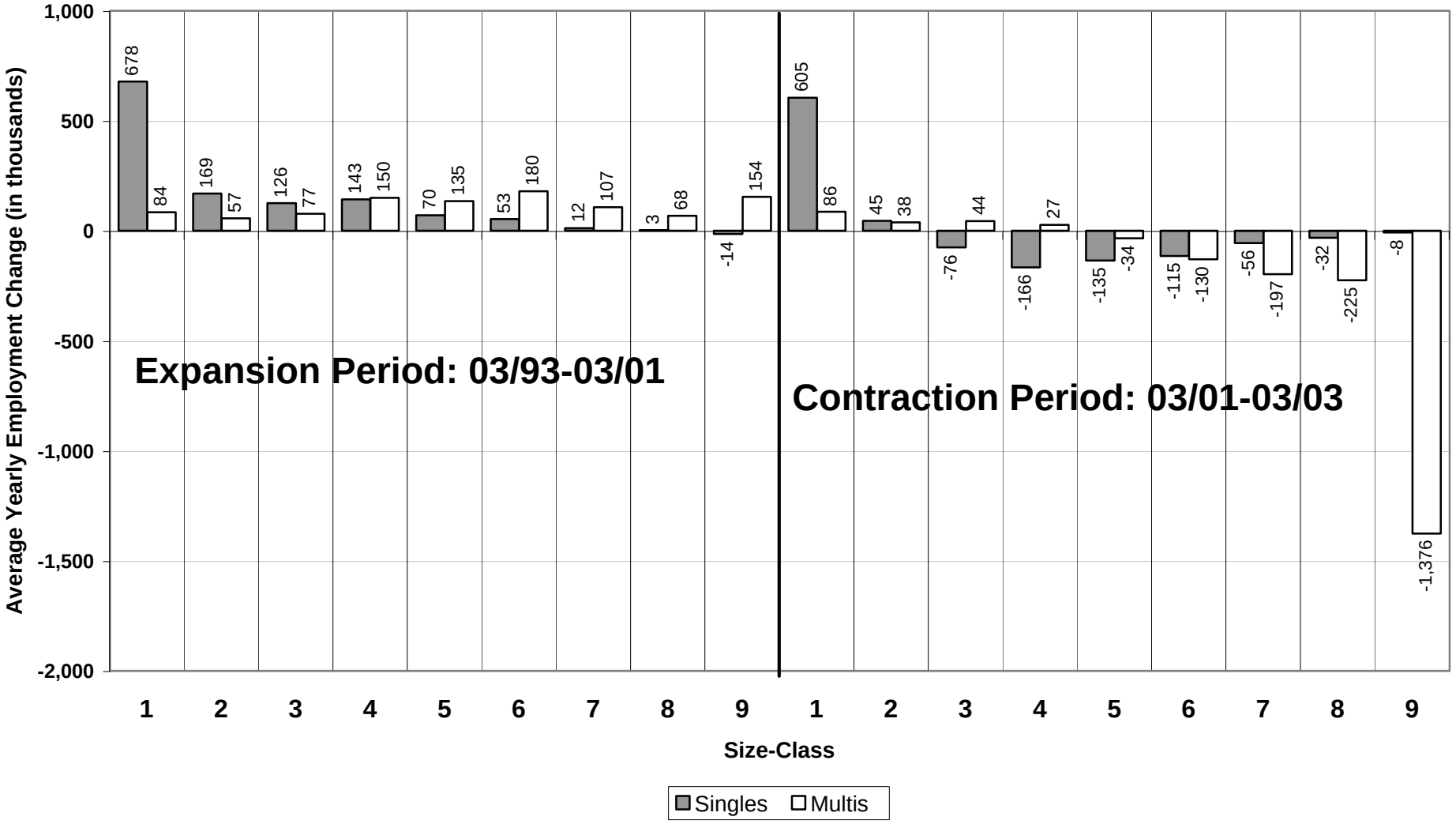
Chart 3



12/23/2004

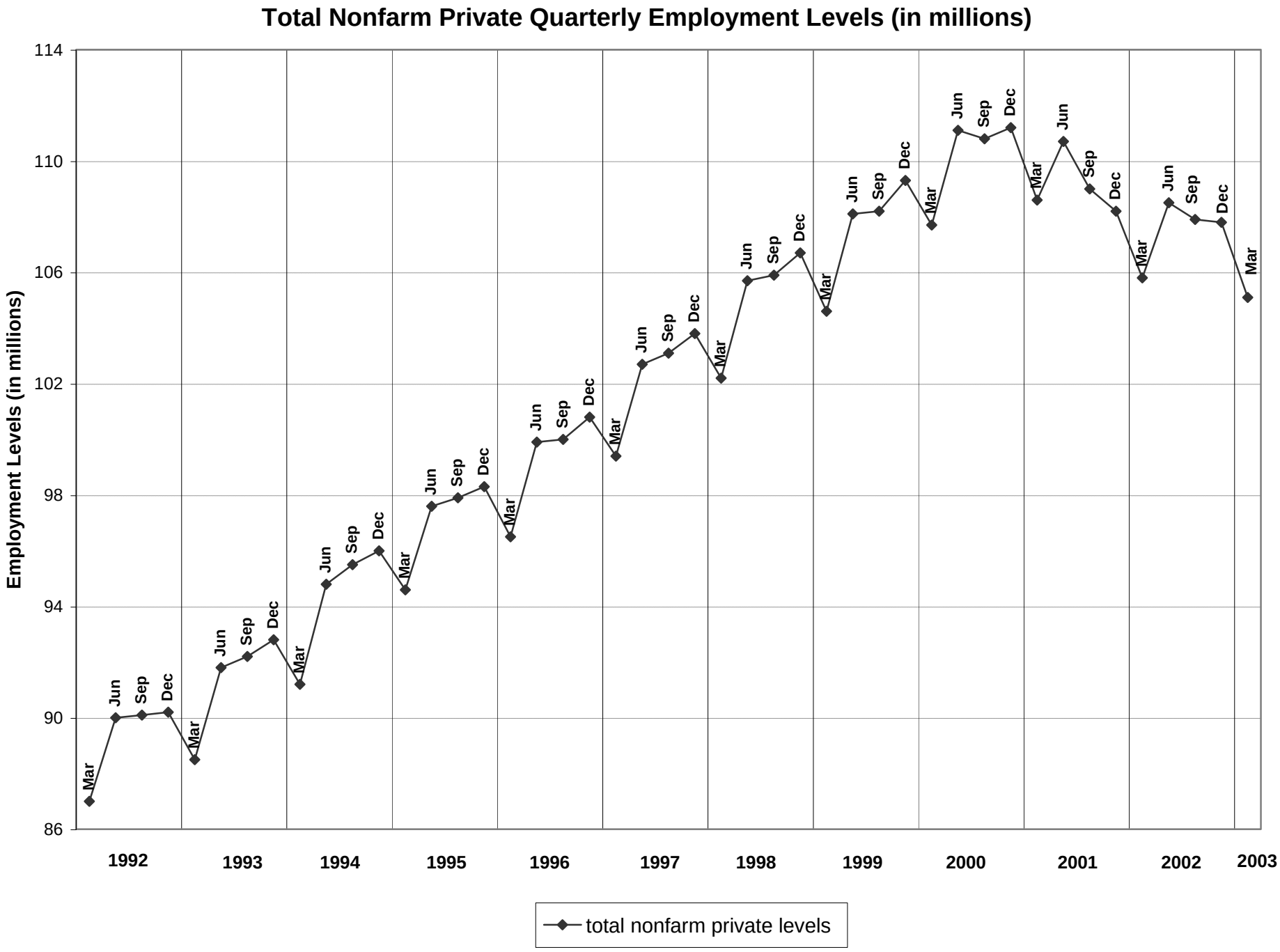
Chart 4

Average Yearly Employment Change by Size:
Expansion Period (03/93-03/01) vs. Contraction Period (03/01-03/03)
Continuous Firms: Singles vs. Multis
(EIN)
Industry: Total Nonfarm Private



(Base-Sized) 05/06/2005

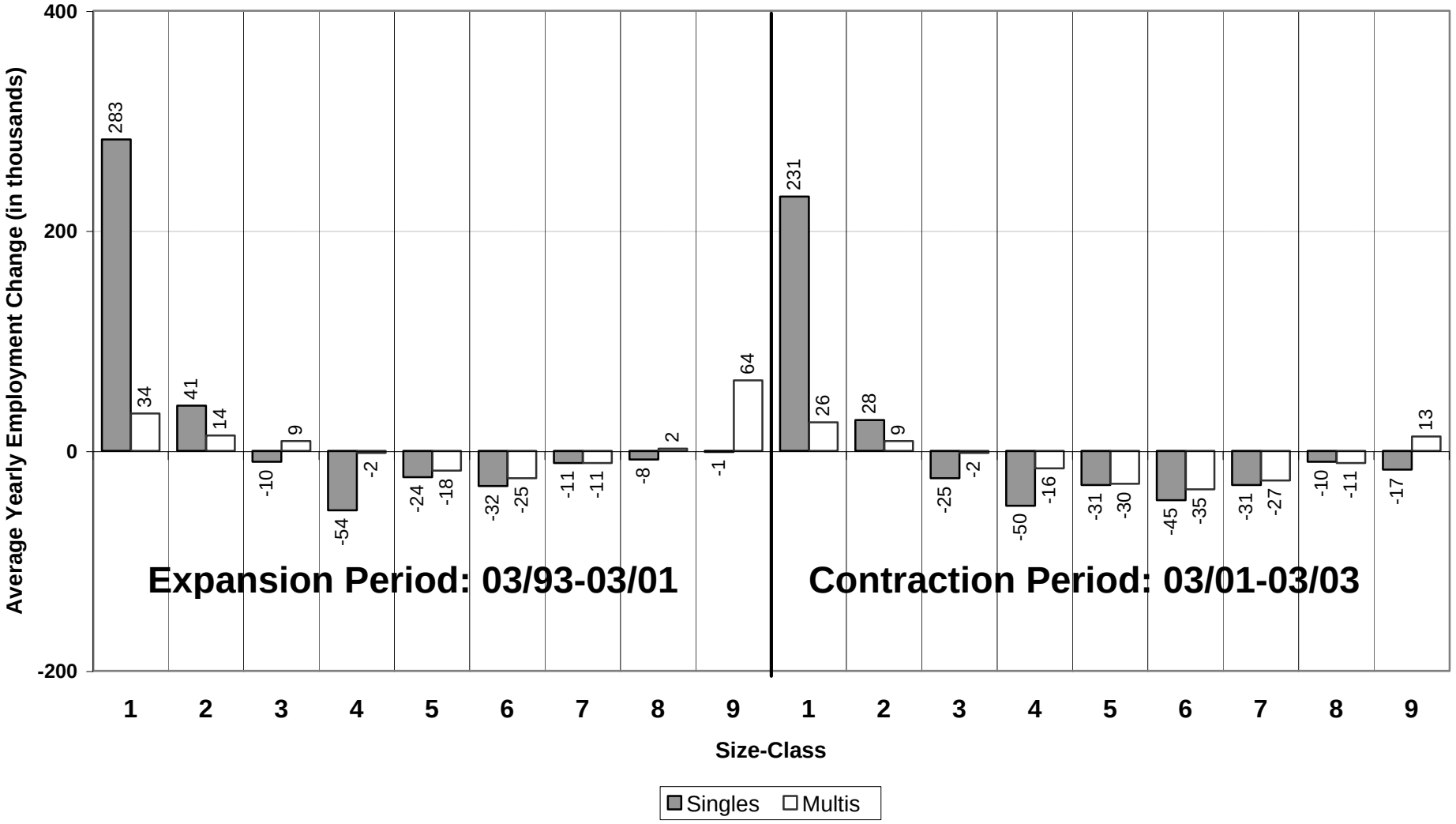
Chart 5



02/22/2005

Chart 6

Average Yearly Employment Change by Size:
Expansion Period (03/93-03/01) vs. Contraction Period (03/01-03/03)
Net Openings-Closings: Singles vs. Multis
(EIN)
Industry: Total Nonfarm Private



(Base-Sized) 05/06/2005

Table 1 **Size-Class Employment as % of Total Employment by Singles and Multis**
Industry: Total Nonfarm Private

SINGLES

size	number of employees	MARCH 1992 initial employment	MARCH 1992 as % of total	MARCH 2001 initial employment	MARCH 2001 as % of total	MARCH 2003 initial employment	MARCH 2003 as % of total
1	1-4	4,788,798	11.99	5,244,024	11.60	5,347,746	12.06
2	5-9	5,679,772	14.22	6,168,623	13.65	6,211,943	14.00
3	10-19	6,482,471	16.23	7,358,931	16.28	7,316,959	16.49
4	20-49	8,058,594	20.18	9,479,997	20.98	9,260,873	20.88
5	50-99	4,918,947	12.32	5,807,903	12.85	5,524,344	12.45
6	100-249	4,378,635	10.96	5,225,076	11.56	4,947,927	11.15
7	250-499	1,911,340	4.79	2,249,879	4.98	2,130,013	4.80
8	500-999	1,284,375	3.22	1,414,565	3.13	1,369,110	3.09
9	1000+	2,437,124	6.10	2,242,563	4.96	2,252,264	5.08
total		39,940,056	100.00	45,191,561	100.00	44,361,179	100.00

MULTIS

size	number of employees	MARCH 1992 initial employment	MARCH 1992 as % of total	MARCH 2001 initial employment	MARCH 2001 as % of total	MARCH 2003 initial employment	MARCH 2003 as % of total
1	1-4	81,835	0.17	99,401	0.16	106,076	0.17
2	5-9	233,618	0.50	276,331	0.44	286,912	0.47
3	10-19	610,825	1.30	705,504	1.11	726,215	1.20
4	20-49	1,875,455	3.98	2,215,638	3.50	2,238,014	3.68
5	50-99	2,486,249	5.28	3,118,292	4.92	3,064,878	5.05
6	100-249	4,672,753	9.92	6,192,954	9.77	5,983,283	9.85
7	250-499	4,156,727	8.83	5,677,723	8.96	5,386,272	8.87
8	500-999	4,336,370	9.21	6,206,902	9.79	5,775,005	9.51
9	1000+	28,630,219	60.81	38,876,771	61.35	37,168,986	61.20
total		47,084,051	100.00	63,369,516	100.00	60,735,641	100.00

COMBINED: SINGLES + MULTIS

size	number of employees	MARCH 1992 initial employment	MARCH 1992 as % of total	MARCH 1992 number of firms	MARCH 1992 as % of total	MARCH 2001 initial employment	MARCH 2001 as % of total	MARCH 2001 number of firms	MARCH 2001 as % of total	MARCH 2003 initial employment	MARCH 2003 as % of total	MARCH 2003 number of firms	MARCH 2003 as % of total
1	1-4	4,870,633	5.60	2,264,276	53.57	5,343,425	4.92	2,535,157	53.34	5,453,822	5.19	2,599,769	54.03
2	5-9	5,913,390	6.80	901,484	21.33	6,444,954	5.94	979,627	20.61	6,498,855	6.18	989,344	20.56
3	10-19	7,093,296	8.15	528,934	12.51	8,064,435	7.43	599,940	12.62	8,043,174	7.65	599,952	12.47
4	20-49	9,934,049	11.42	330,143	7.81	11,695,635	10.77	387,997	8.16	11,498,887	10.94	382,822	7.96
5	50-99	7,405,196	8.51	108,027	2.56	8,926,195	8.22	129,992	2.74	8,589,222	8.17	125,580	2.61
6	100-249	9,051,388	10.40	60,088	1.42	11,418,030	10.52	75,546	1.59	10,931,210	10.40	72,516	1.51
7	250-499	6,068,067	6.97	17,672	0.42	7,927,602	7.30	23,019	0.48	7,516,285	7.15	21,791	0.45
8	500-999	5,620,745	6.46	8,151	0.19	7,621,467	7.02	11,037	0.23	7,144,115	6.80	10,326	0.21
9	1000+	31,067,343	35.70	7,841	0.19	41,119,334	37.88	10,143	0.21	39,421,250	37.51	9,649	0.20
total		87,024,107	100.00	4,226,616	100.00	108,561,077	100.00	4,752,458	100.00	105,096,820	100.00	4,811,749	100.00

Table 2

Comparison of Average Yearly Employment Changes with Sums of Not Seasonally Adjusted Quarterly Changes: Fixed Vs. Resizing
Industry: Total Nonfarm Private

	Expansion Period: 03/93-03/01						Contraction Period: 03/01-03/03					
	Over-The-Year		Base-Sizing Quarterly		Base-Sizing Annual		Over-The-Year		Base-Sizing Quarterly		Base-Sizing Annual	
size	Avg.	% of total	Avg.	% of total	Avg.	% of total	Avg.	% of total	Avg.	% of total	Avg.	% of total
1	872	**34.8**	2,032	**81.1**	1,082	**43.2**	752	**43.4**	1,874	**108.3**	949	**54.8**
2	280	**11.2**	455	**18.1**	283	**11.3**	120	**6.9**	277	**16.0**	121	**7.0**
3	226	**9.0**	201	**8.0**	204	**8.1**	-31	**-1.8**	-78	**-4.5**	-59	**-3.4**
4	280	**11.2**	48	**1.9**	233	**9.3**	-166	**-9.6**	-404	**-23.3**	-195	**-11.3**
5	198	**7.9**	-39	**-1.6**	162	**6.5**	-202	**-11.7**	-415	**-24.0**	-246	**-14.2**
6	218	**8.7**	-65	**-2.6**	176	**7.0**	-305	**-17.6**	-577	**-33.3**	-332	**-19.2**
7	123	**4.9**	-91	**-3.6**	96	**3.8**	-286	**-16.5**	-462	**-26.7**	-309	**-17.8**
8	82	**3.3**	-71	**-2.8**	63	**2.5**	-270	**-15.6**	-420	**-24.3**	-280	**-16.2**
9	225	**9.0**	37	**1.5**	205	**8.2**	-1344	**-77.6**	-1,527	**-88.2**	-1,382	**-79.8**
total	2,504	**100.0**	2,505	**100.0**	2,504	**100.0**	-1,732	**-100.0**	-1,731	**-100.0**	-1,732	**-100.0**

Table 3A: An Example of Flows Between Size-Classes for Continuous Singles+Multis
March 1997 to March 1998
Industry: Total Private

Initial Month: March 1997			Singles+Multis Continuous Units Employment Change between Size-Classes: 03/1997 to 03/1998 March 1998 Size-Classes									
Size Class	**Number of employees**	**Continuous Employment**	**1** (1-4)	**2** (5-9)	**3** (10-19)	**4** (20-49)	**5** (50-99)	**6** (100-249)	**7** (250-499)	**8** (500-999)	**9** (1000+)	**Continuous Gain/Loss**
1	1-4	4,499,750	**24,668**	426,291	117,014							719,600
2	5-9	5,827,721	**-365,048**	**38,540**	384,517	91,743						201,342
3	10-19	7,244,471	**-106,962**	**-294,575**	**75,319**	406,575	46,837					167,041
4	20-49	10,516,112	**-62,258**	**-71,497**	**-288,164**	**168,789**	374,242	81,748				241,887
5	50-99	8,019,605			**-36,860**	**-243,613**	**121,086**	322,465	31,175			168,617
6	100-249	10,135,234				**-55,732**	**-196,026**	**204,325**	266,176	46,097	33,228	245,997
7	250-499	6,951,929					**-25,985**	**-147,491**	**106,355**	194,710	37,480	128,494
8	500-999	6,592,821						**-24,972**	**-116,250**	**97,923**	210,172	144,366
9	1000+	34,484,138							**-20,784**	**-94,875**	**396,536**	232,202
total		94,271,781	**-575,804**	**55,975**	**217,701**	**399,721**	**345,396**	**476,414**	**310,637**	**285,329**	**734,177**	2,249,546

Table 3B: Summary Columns of Total Gain or Loss For Each Size-Class

Initial Month		**Summary Column 1**	**Summary Column 2**	**Summary Column 3**	**Summary Column 4**	**Summary Column 5**
Size Class	number of employees	Continuous Gain/Loss	Openings	Closings	Net open-close	Total Gain/Loss
1	1-4	719,600	798,359	-719,183	79,176	798,776
2	5-9	201,342	488,302	-474,865	13,437	214,779
3	10-19	167,041	457,717	-471,816	-14,099	152,942
4	20-49	241,887	538,154	-602,849	-64,695	177,192
5	50-99	168,617	367,204	-396,697	-29,493	139,124
6	100-249	245,997	444,768	-460,192	-15,424	230,573
7	250-499	128,494	328,307	-291,613	36,694	165,188
8	500-999	144,366	314,391	-300,436	13,955	158,321
9	1000+	232,202	1,943,027	-1,410,948	532,079	764,281
total		2,249,546	5,680,229	-5,128,599	551,630	2,801,176

Table 4

Over-the-year employment change in size 1 singles that are reclassified into size-class 2 the following ye

Industries: 3-digit NAICS for which change>10,000 for at least one year

3-digit NAICS	Description	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002
238	Specialty Trade Contractors	42,390	48,613	48,002	44,101	47,255	45,329	51,105	50,145	42,444	45,072
541	Professional, Scientific, and Technical Services	33,825	36,394	37,739	38,007	39,640	43,327	46,128	46,516	42,956	38,666
621	Ambulatory Health Care Services (includes Offices of Physicians)	32,442	31,699	32,042	30,583	31,250	30,553	33,342	34,137	33,828	33,617
722	Food Services and Drinking Places	25,872	26,619	27,202	26,408	26,780	26,687	27,208	27,169	26,018	25,745
561	Administrative and Support Services	20,282	22,921	24,276	23,017	23,719	23,869	24,620	26,292	22,799	21,650
236	Construction of Buildings	20,188	21,982	20,541	19,408	20,759	19,706	22,820	22,415	19,399	20,681
811	Repair and Maintenance	15,090	16,902	16,846	17,388	16,629	15,638	17,519	17,705	15,991	14,671
812	Personal and Laundry Services	12,363	12,020	11,805	11,851	11,605	11,886	12,927	12,455	11,662	10,956
423	Merchant Wholesalers, Durable Goods	12,210	12,381	13,403	12,710	12,819	12,525	12,213	12,529	11,171	9,426
531	Real Estate	11,033	11,833	10,188	10,759	10,186	10,793	12,935	11,824	10,734	10,363
453	Miscellaneous Store Retailers	9,721	10,040	10,817	10,307	10,188	10,705	11,291	11,300	9,562	8,726

Over-the-year employment change in size 1 singles that are reclassified into size-class 3 the following ye

Industries: 3-digit NAICS for which change>5,000 for at least one year

3-digit NAICS	Description	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002
238	Specialty Trade Contractors	14,298	17,603	18,037	14,842	16,172	14,766	15,608	16,399	13,665	13,242
722	Food Services and Drinking Places	8,944	9,886	9,845	8,912	9,891	9,367	8,615	9,383	8,514	8,611
561	Administrative and Support Services	7,416	8,338	8,230	7,936	8,614	7,262	8,475	9,332	7,304	7,182
236	Construction of Buildings	7,291	7,952	7,470	6,528	7,105	6,760	7,505	6,885	6,007	6,195
541	Professional, Scientific, and Technical Services	6,948	7,899	7,704	8,195	8,965	8,807	9,811	11,662	10,146	8,261
621	Ambulatory Health Care Services (includes Offices of Physicians)	5,106	4,780	5,390	5,887	6,200	5,963	6,395	7,175	6,608	6,248

Table 4

ear

2002-2003
43,421
37,881
31,852
25,286
21,110
19,573
13,782
11,063
9,604
10,628
8,478

ear

2002-2003
13,387
9,294
7,160
5,522
7,617
6,633

Table 5A

Average Yearly Employment Change by Size and Age of Firm
Industry: Total Nonfarm Private
Population: Continuous Firms

	Age of Firm								Sum
	age = 1 year		1 < age = 2 years		2 < age = 3 years		3 < age*		all ag
size	Expansion Period	Contraction Period	Expansion Period	Contraction Period	Expansion Period	Contraction Period	Expansion Period	Contraction Period	Expansion Period
1	22,132	12,485	54,704	43,173	189,515	159,599	492,315	468,886	758,665
2	6,390	2,871	18,478	8,670	64,334	39,539	136,701	30,348	225,903
3	3,840	1,133	15,428	5,075	47,330	21,443	135,494	-61,322	202,091
4	4,354	-325	17,858	1,703	49,512	8,023	219,319	-152,270	291,043
5	3,804	-411	10,519	-1,759	28,994	-523	160,897	-164,748	204,213
6	4,614	-180	13,190	976	27,209	-7,388	186,314	-238,199	231,326
7	1,243	315	5,884	-1,861	14,390	-11,320	92,901	-241,904	114,418
8	776	-1,390	2,940	-3,319	10,957	-11,258	55,680	-238,369	70,353
9	-475	3,043	1,735	-19,313	26,857	-23,418	118,080	-1,342,540	146,197
total	46,678	17,541	140,735	33,346	459,095	174,698	1,597,700	-1,940,117	2,244,208

Table 5B: Average Yearly Employment Change per Firm

	Age of Firm								Sum
	age = 1 year		1 < age = 2 years		2 < age = 3 years		3 < age*		all ag
size	Expansion Period	Contraction Period	Expansion Period	Contraction Period	Expansion Period	Contraction Period	Expansion Period	Contraction Period	Expansion Period
1	0.816	0.609	0.596	0.523	0.782	0.694	0.295	0.263	0.373
2	0.578	0.318	0.519	0.266	0.950	0.612	0.178	0.038	0.256
3	0.692	0.248	0.851	0.295	1.421	0.658	0.283	-0.120	0.377
4	1.558	-0.130	1.946	0.190	2.887	0.468	0.693	-0.447	0.842
5	4.678	-0.510	4.054	-0.690	6.065	-0.109	1.491	-1.421	1.758
6	9.609	-0.386	9.299	0.668	11.084	-2.873	2.975	-3.499	3.454
7	8.921	2.658	15.115	-5.008	19.138	-16.137	4.901	-11.545	5.655
8	11.328	-28.649	16.933	-21.482	30.964	-32.351	6.191	-23.529	7.336
9	-11.547	88.203	14.105	-212.225	90.350	-72.278	13.786	-142.331	16.196
all sizes	0.971	0.461	0.883	0.229	1.243	0.495	0.464	-0.529	0.558

Expansion Period: March 1993 to March 2001
Contraction Period: March 2001 to March 2003

02/28/2006

Table 5A

Average Yearly Employment Change by Size and Age of Firm
Industry: Total Nonfarm Private
Population: Continuous Firms

mary
es = 1
Contraction Period
684,142
81,427
-33,672
-142,869
-167,440
-244,790
-254,770
-254,335
-1,382,228
-1,714,533

mary
es = 1
Contraction Period
0.323
0.089
-0.060
-0.387
-1.349
-3.373
-11.505
-23.810
-139.873
-0.408

Expansion Period: March 1993 to March 2001
Contraction Period: March 2001 to March 2003

Table 6

Measurement of Regression-to-the-Mean Bias
Comparison of 2-Year Change with Sum of 2 Yearly Changes by Size
Industry: Total Nonfarm Private

March 1993 - March 1995				
size class	number of employees	2-Year Employment Change	Sum of 2 Yearly Employment Changes	Difference
1+2+3	1-19	1,803,650	1,881,242	-77,592
4	20-49	545,542	502,489	43,053
5	50-99	333,421	314,213	19,208
6	100-249	236,156	235,489	667
7	250-499	87,151	96,868	-9,717
1 to 7	1-499	3,005,920	3,030,301	-24,381
8	500-999	39,673	29,395	10,278
9	1000+	-56,505	-70,608	14,103
total		2,989,088	2,989,088	0

March 1995 - March 1997				
size class	number of employees	2-Year Employment Change	Sum of 2 Yearly Employment Changes	Difference
1+2+3	1-19	1,578,379	1,673,607	-95,228
4	20-49	405,255	361,981	43,274
5	50-99	211,701	177,905	33,796
6	100-249	148,205	149,115	-910
7	250-499	34,233	38,069	-3,836
1 to 7	1-499	2,377,773	2,400,677	-22,904
8	500-999	23,107	17,791	5,316
9	1000+	-43,181	-60,769	17,588
total		2,357,699	2,357,699	0

March 1997 - March 1999				
size class	number of employees	2-Year Employment Change	Sum of 2 Yearly Employment Changes	Difference
1+2+3	1-19	1,649,550	1,756,863	-107,313
4	20-49	443,883	401,900	41,983
5	50-99	236,097	221,709	14,388
6	100-249	169,705	160,929	8,776
7	250-499	52,207	59,127	-6,920
1 to 7	1-499	2,551,442	2,600,528	-49,086
8	500-999	21,733	12,968	8,765
9	1000+	-45,386	-85,707	40,321
total		2,527,789	2,527,789	0

Table 6

Measurement of Regression-to-the-Mean Bias
Comparison of 2-Year Change with Sum of 2 Yearly Changes by Size
Industry: Total Nonfarm Private

March 1999 - March 2001				
size class	number of employees	2-Year Employment Change	Sum of 2 Yearly Employment Changes	Difference
1+2+3	1-19	1,505,032	1,598,533	-93,501
4	20-49	368,588	328,837	39,751
5	50-99	209,315	185,418	23,897
6	100-249	159,301	153,294	6,007
7	250-499	26,674	13,801	12,873
1 to 7	1-499	2,268,910	2,279,883	-10,973
8	500-999	9,403	6,049	3,354
9	1000+	-34,591	-42,210	7,619
total		2,243,722	2,243,722	0

March 2001 - March 2003				
size class	number of employees	2-Year Employment Change	Sum of 2 Yearly Employment Changes	Difference
1+2+3	1-19	1,057,394	1,165,161	-107,767
4	20-49	-17,278	-56,658	39,380
5	50-99	-57,471	-93,224	35,753
6	100-249	-65,889	-79,613	13,724
7	250-499	-44,838	-57,363	12,525
1 to 7	1-499	871,918	878,303	-6,385
8	500-999	-30,643	-40,050	9,407
9	1000+	-68,044	-65,022	-3,022
total		773,231	773,231	0

March 1993 - March 2001				
size class	number of employees	2-Year Employment Change	Sum of 2 Yearly Employment Changes	Difference
1+2+3	1-19	6,536,611	6,910,245	-373,634
4	20-49	1,763,268	1,595,207	168,061
5	50-99	990,534	899,245	91,289
6	100-249	713,367	698,827	14,540
7	250-499	200,265	207,865	-7,600
1 to 7	1-499	10,204,045	10,311,389	-107,344
8	500-999	93,916	66,203	27,713
9	1000+	-179,663	-259,294	79,631
total		10,118,298	10,118,298	0