

Establishment Employment Change and Survival, 1992-1996 *

Analyses Based on a New, Longitudinal Database with a Special Focus on Information Technology Industries

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Dr. Richard J. Boden, Jr.
Associate Professor of Business Economics
College of Business Administration
The University of Toledo
Toledo, Ohio 43606-3390
e-mail: rboden@utnet.utoledo.edu

* The data analyses presented in this report were conducted on-site at the U.S. Bureau of the Census' Center for Economic Studies in Suitland, Maryland. All views expressed in this paper are those of the author and not necessarily those of the U.S. Small Business Administration or the U.S. Bureau of the Census.

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Executive Summary

This report demonstrates the analytical capabilities of a new, longitudinal business and establishment database. This new database is called the Business Information Tracking Series (BITS) and was funded by the Office of Advocacy of the U.S. Small Business Administration and developed with the cooperation of the U.S. Bureau of the Census.

The report contains tabulations and data analyses for three industry groups: information technology (IT) industries, goods-producing industries, and service producing industries. The first section presents tabulations of establishment employment change by firm employment size and industry group between 1992 and 1996 and for all annual intervals in between. The next section presents net establishment employment change between 1992 and 1996 by firm employment size, industry group, and relative establishment growth quartile. The third section of the report presents regression models of the determinants of establishment employment change between 1992 and 1996. The fourth section presents models of establishment survival duration for a cohort of establishments that were started in 1992.

The BITS indicates that, between 1992 and 1996, total, non-farm, private-sector U.S. employment increased by 9.4 million jobs, or 10 percent. Over this same interval, employment in goods-producing industries rose by 4.35 percent, employment in service-producing industries increased by 11.66 percent, and employment in IT industries rose by 19.14 percent.

Small firms--firms with fewer than 500 employees--accounted for 69 percent of the total 1992-1996 employment change. Small firms accounted for 59 percent of the net employment growth in service-producing industries, 72 percent of the employment growth in information technology industries, and *all* of the employment growth in goods-producing industries.

Multivariate analyses of the BITS data reveal that establishment employment change is negatively related to base-year establishment employment size and age, findings consistent with many other studies. Median survival duration of independent establishments (i.e., firms) started in 1992 was found to be positively related to 1992 employment size, other things equal. Also, the survival duration of new establishments located in MSAs was found to be less than that of establishments not located in MSAs, again, other things equal. Curiously, analyses of the BITS data indicate that the survival duration of new, dependent establishments--establishments that are parts of multi-establishment firms--is, other things equal, negatively related to the 1992 employment size of their parent firms.

The analyses of the BITS data that are presented in this report only hint at the ability of these data to support empirical inquiries into a number of industrial organization issues. Most notably, the BITS permit the extension of analyses of longitudinal business and establishment data to virtually all industries, whereas virtually all previous longitudinal data analyses had been confined to the manufacturing industry division.

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I. Introduction

In this study, a new and unique longitudinal business database is used to analyze U.S. establishment employment change and survival between 1992 and 1996, and for annual intervals within the 1992 and 1996 interval. This new database is called the Business Information Tracking Series (BITS).¹ The BITS is a database containing longitudinal data on virtually all non-farm U.S. business establishments with positive payrolls. Funded by the Office of Advocacy of the U.S. Small Business Administration (SBA) and developed with the cooperation of the U.S. Bureau of the Census, the BITS currently spans 1989 through 1996 at annual intervals. The unit of analysis in the BITS is the individual establishment.² Variables in the BITS include: establishment employment; firm employment; standard industrial classification (SIC) code; geographic identification codes for state, metropolitan statistical area (MSA), and county; establishment payroll; establishment start year; and a code permitting linkage of members of multi-establishment firms.³

¹BITS was formerly known as the Longitudinal Establishment and Enterprise Microdata (LEEM) file.

²From an organizational perspective, there are two types of establishments: independent establishments (firms that consist of just one establishment) and dependent establishments (establishments that are members of multi-establishment firms). The BITS permits dependent establishments to be grouped into firms. Hence, the BITS is both an establishment file as well as an enterprise or firm file.

³For more complete documentation of the contents and construction of the BITS, see Robb (1999).

The BITS is unique among longitudinal business/establishment databases in its coverage of nearly all U.S. industries. To date, virtually all studies based upon longitudinal business databases have been restricted to the manufacturing industry because suitable data were only available for that industry.⁴

All tabulations and data analyses presented in this report are disaggregated into three industry groups, defined as follows. Information technology (IT) industries are comprised of some 38 4-digit SIC goods- and service-producing industries identified by the U.S. Department of Commerce. (See Appendix B for a list of industries classified as IT industries.) Goods-producing industries include the following industries (less the IT industries): agriculture services; construction; and manufacturing. Service-producing industries include (again, less IT industries): transportation, communications, and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and services. Because IT industries are excluded from the goods- and service-producing sectors (for the purposes of this report), aggregating numbers across the three industry groups obtains corresponding numbers for the entire U.S. private-sector economy. (Further industrial disaggregation was essentially precluded by the Census Bureau's necessarily strict rules about data disclosure.)

This study presents tabulations of establishment employment change by firm employment size and

⁴Development of the BITS was an initiative of the SBA, whose constituency obviously includes business in all industries, if not predominantly outside the manufacturing industry. The SBA needed a source of data that would allow for tabulations of employment change by firm size and industry, and turned to the vast data resources of the Census Bureau.

industry group between 1992 and 1996 and each intervening annual interval.⁵ Estimates of multivariate models of establishment employment change and establishment survival are also presented.

⁵ Although the first year of data on the BITS is 1989, 1992 was selected as the initial years for these analyses because it is the BITS' earliest economic census year--i.e., the first year of truly complete information.

II. U.S. Establishment Employment Change by Firm Employment Size and Industry Group, 1992-1996

Table 1(a) summarizes net establishment employment change by firm employment size and industry group between 1992 and 1996, as well as each annual interval in between.⁶ Between 1992 and 1996, aggregate U.S. private-sector employment grew by 9,357,756, an increase of 10.08 percent.⁷ Clearly the 1994-1995 period represents the annual interval with the strongest employment growth across industries as well as for each industry group.

Clearly, service-producing industries accounted for the largest proportion (84 percent) of total private-sector employment change between 1992 and 1996. All of the net employment growth in goods-producing industries between 1992 and 1996 can be attributed to establishments in firms with fewer than 500 employees.

⁶Employment change is calculated at the establishment level. Firm employment size is the firm size to which establishments belonged at the beginning of each time interval. There are some researchers, notably Davis, Haltiwanger, and Schuh (1994), who make a strong case for defining employment size as average employment size over the time interval in question. This latter definition is much more straightforward operationally when dealing with establishment employment size than when dealing with firm employment size, however. That's because establishment divestitures and acquisitions by firms implies that, over time, establishments need not be owned by the same firm. How much establishment ownership changes muddy the use of average firm employment size for classifying employment change is an issue that needs to be addressed.

⁷Industries not covered by the BITS include federal, state, and local government, farms, railroads, the U.S. Postal Service, private households, large pension, health, and welfare funds, and some other financial funds.

The 1992-1996 increase of 518,525 jobs in IT industries may seem small, yet in 1992, IT employment represented just 2.92 percent of total employment (covered by the BITS) but accounted for 5.54 percent of total employment growth between 1992 and 1996.⁸ And employment growth in IT industries truly burgeoned between 1994 and 1996. In fact, IT industries accounted for 11.57 percent of total employment growth between 1995 and 1996.

⁸For the record, in 1992, goods-producing and service-producing industries accounted for 24.51 percent and 72.58 percent of total private-sector employment, respectively.

Table 1(a). Net Employment Change by Industry Group and Firm Employment Size, 1992-1993, 1993-1994, 1994-1995, 1995-1996, and 1992-1996

Industry Group	Firm Employment Size	1992-1993	1993-1994	1994-1995	1995-1996	1992-1996
Goods-Producing *	1 - 19	394,515	396,824	511,063	342,924	1,058,904
	20 - 99	-108,618	-18,721	140,756	-45,564	301,524
	100 - 499	-32,845	-48,792	67,396	-94,006	45,706
	500 +	-190,461	-182,705	90,150	-228,912	-417,797
	All Sizes	62,591	146,606	809,365	-25,558	988,337
Service-Producing *	1 - 19	1,021,818	864,626	1,106,269	1,016,118	2,745,876
	20 - 99	146,249	172,790	387,503	79,074	1,106,030
	100 - 499	22,949	112,539	218,482	-31,777	783,703
	500 +	452,139	634,891	850,899	613,363	3,215,285
	All Sizes	1,849,675	1,784,846	2,563,153	1,676,778	7,850,894
Information Technology	1 - 19	38,769	41,152	57,962	68,827	197,084
	20 - 99	8,031	13,035	30,438	28,886	110,894
	100 - 499	10,249	3,330	25,969	21,013	65,737
	500 +	-17,954	-44,509	107,803	97,299	144,810
	All Sizes	39,095	13,008	222,172	216,025	518,525
All Industries	1 - 19	1,455,102	1,302,602	1,675,294	1,427,869	4,001,864
	20 - 99	45,662	167,104	558,697	62,396	1,518,448
	100 - 499	206,873	67,077	311,847	-104,770	895,146
	500 +	243,724	407,677	1,048,852	481,750	2,942,298
	All Sizes	1,951,361	1,944,460	3,594,690	1,867,245	9,357,756

* Excludes information technology industries.

Note: Because businesses and establishments can change firm employment size category from year to year, 1992-1996 employment changes need not equal the sum of intervening, annual employment changes.

Source: Special tabulations of the 1989-1996 Business Information Tracking Series (BITS) file data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Table 1(b) presents the percent distribution of employment change by firm employment size for the same time intervals presented in Table 1(a). Note the surprisingly large share of employment growth in goods-producing industries that is attributable to firms in the smallest (1-19 employee) firm employment size class. As discernable in Table 1(a), there was actually a net decline in total employment (of 25,558 jobs) in the goods-producing sector between 1995 and 1996.

For the IT industries, the annual interval for which the smallest firms accounted for the largest share of net employment growth was 1993-1994. (As Table 1(a) indicates, between 1993 and 1994, IT firms in the largest firm-size category experienced an employment decline of 44,509 jobs, compared to an increase of 41,152 jobs for IT firms in the smallest size class.)

More detailed information on employment change for the 1992-1993, 1993-1994, 1994-1995, 1995-1996, and 1992-1996 intervals can be found in Appendix A. These appendix tables indicate that between 1992 and 1996, employment in goods-producing industries increased by 4.35 percent, employment in service-producing industries increased by 11.66 percent, and employment in IT industries grew by 19.14 percent.

Table 1(b). Percent Distribution of Net Employment Change by Industry Group and Firm Employment Size, 1992-1993, 1993-1994, 1994-1995, 1995-1996, and 1992-1996

Industry Group	Firm Employment Size	1992-1993	1993-1994	1994-1995	1995-1996	1992-1996
Goods-Producing *	1 - 19	630.31	270.00	63.14	1,341.45	107.14
	20 - 99	-227.00	-12.77	17.39	-178.28	30.51
	100 - 499	-52.48	-33.28	8.33	-367.81	4.62
	500 +	-304.29	-124.62	11.14	-895.66	-42.27
	All Sizes	100.00	100.00	100.00	100.00	100.00
Service-Producing *	1 - 19	55.24	48.44	43.16	60.60	34.98
	20 - 99	7.91	9.68	15.12	4.72	14.09
	100 - 499	12.41	6.31	8.52	-1.90	9.98
	500 +	24.44	35.57	33.20	36.58	40.95
	All Sizes	100.00	100.00	100.00	100.00	100.00
Information Technology	1 - 19	99.17	316.36	26.09	31.86	38.01
	20 - 99	20.54	100.21	13.70	13.37	21.39
	100 - 499	26.22	25.60	11.69	9.73	12.68
	500 +	-45.92	-342.17	48.52	45.04	27.93
	All Sizes	100.00	100.00	100.00	100.00	100.00
All Industries	1 - 19	74.57	66.99	46.60	76.47	42.77
	20 - 99	2.34	8.59	15.54	3.34	16.23
	100 - 499	10.60	3.45	8.68	-5.61	9.57
	500 +	12.49	20.97	29.18	25.80	31.44
	All Sizes	100.00	100.00	100.00	100.00	100.00

* Excludes information technology industries.

Source: Special tabulations of the 1989-1996 Business Information Tracking Series (BITS) file data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

III. Regression Models of Establishment Employment Change

The tables in the preceding section show what has happened in terms of establishment employment change by firm size between 1992 and 1996. They do not, however, provide any insight into the determinants of establishment employment change. Regression analysis is a statistical technique that can be used to explain the variation in one variable--in this case, relative establishment employment change--resulting from variations in one or more related, explanatory variables. For policy analysis purposes, it would be useful to have data on explanatory variables pertaining to policy instruments, such as business income tax and employment tax rates. Unfortunately, the BITS doesn't currently contain such data, but it does contain data on variables known to affect employment change--viz., base-year establishment age, employment size, and location (including state, region, and MSA).

The BITS was used to estimate regression models of establishment employment change between 1992 and 1996. These equations were estimated separately by industry group and for independent establishments (single-establishment firms) and dependent establishments (members of multi-establishment firms). In all, then, six regression equations of employment change were estimated. In each of these equations, the unit of analysis is the individual establishment, and the dependent variable is 1996 establishment employment minus 1992 establishment employment divided by average establishment employment in 1992 and 1996.⁹ Estimation of these models was restricted to observations on establishments that existed in both 1992 and 1996.¹⁰

⁹Establishment employment change is frequently negative between 1992 and 1996, thus precluding the use of the natural logarithm of employment change as the dependent variable for these equations.

¹⁰In employment change regression models, inclusion of new establishments (births) poses problems for

obtaining unbiased estimates for the effect of establishment age. A common practice is to exclude establishment births from models where age is an explanatory variable. In the interest of symmetry, both establishment births and deaths or closures were excluded from the employment-change regression models presented in this section of this report.

Table 2(a) shows the regression results for independent establishments. In these equations, establishment employment change between 1992 and 1996 is modeled as a function of the following explanatory variables:

LN_EMP92	the natural logarithm of 1992 establishment employment;
LN_AGE	the natural logarithm of establishment age in years (LN_AGE);
AGEMAX	a dummy variable for establishments started in or before 1977;
LN_RSIZ	the natural logarithm of 1992 establishment employment divided by average 4-digit SIC employment; and
MSA	a dummy variable for establishments located in metropolitan statistical areas.

According to Table 2(a), the estimated coefficients for LN_EMP92 indicate that 1992-1996 establishment employment change is negatively related to (the natural logarithm of) establishment employment in 1992 for all three industry groups, although the coefficient for LN_EMP92 is not statistically significant for IT industries. The negative relationship between establishment size and subsequent employment growth is not without precedent; Acs, Armington, and Robb (1999) report similar findings for employment change regression models (estimated with grouped data from the BITS).

For all three industry groups, Table 2(a) indicates that establishment employment change is negatively related to establishment age, other things equal. That is, the older the establishment, the lower its relative employment growth tends to be. Again, this is a common finding and a similar result is reported by Acs, et. al.

LN_RSIZ^E was specified to assess how industry variations in economies of scale impact establishment employment change. It was hypothesized that the smaller an establishment is relative to mean (4-digit SIC) industry establishment employment size, the greater its employment growth would have to be, other things equal, in order for it to survive. (Recall that these equations were estimated for establishments that existed in both 1992 and 1996.) This "catching-up" process would imply a negative coefficient for LN_RSIZ^E. In fact, as Table 2(a) indicates, negative and significant coefficients for LN_RSIZ^E were obtained for the service-producing and IT industries. Interestingly, however, the estimated effect of LN_RSIZ^E on employment change is positive for goods-producing industries. One would expect scale effects to be especially relevant in the comparatively capital-intensive goods-producing sector. On the other hand, the specification of these regression equations are preliminary, and rather than speculate on the observed signs of the coefficients for LN_RSIZ^E across industry groups, other specifications should be evaluated.¹¹

¹¹In retrospect, instead of LN_RSIZ^E, it would have probably been more appropriate to simply specify the log of mean establishment employment size (calculated at the 4-digit SIC level). That's because the natural logarithm of 1992 establishment employment was already specified as a regressor (LN_EMP92) in these equations.

Table 2(a). Relative Employment Change Regressions for Independent Establishments, 1992-1996

Variable	Industry Group								
	Goods-Producing			Service-Producing			Information Technology		
	Parameter Estimate	Standard Error †	Variable Mean	Parameter Estimate	Standard Error †	Variable Mean	Parameter Estimate	Standard Error †	Variable Mean
INTERCEPT	0.23627*	0.00344		0.15830*	0.00187		0.31398*	0.01669	
LN_EMP92	-0.05354*	0.00102	1.71071	-0.03491*	0.00062	1.48337	-0.00551	0.00452	1.71396
LN_AGE	-0.07184*	0.00113	2.06721	-0.05969*	0.00049	2.07385	-0.16686*	0.00468	1.77853
AGEMAX	0.02151*	0.00472	0.02561	0.00827*	0.00213	0.02317	0.03767	0.02252	0.01665
LN_RSIZE	0.07533*	0.00103	-0.81579	-0.08008*	0.00065	-0.75765	-0.06093*	0.00467	-1.36455
MSA	0.02582*	0.00188	0.78151	0.00209**	0.00083	0.79252	0.05577*	0.00919	0.88657
	Dep. Var. Mean: 0.07835 R-Squared (adj.): 0.07000 N: 593,806			Dep. Var. Mean: 0.04525 R-Squared (adj.): 0.06340 N: 2,345,350			Dep. Var. Mean: 0.14099 R-Squared (adj.): 0.06760 N: 39,406		

† Standard errors were calculated from White's heteroskedasticity consistent variance-covariance matrix.

* Significant with a p-value ≤ 0.01 .

** Significant with a p-value ≤ 0.05 .

Source: Special tabulations of the 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Table 2(b) shows the regression results for dependent establishments--i.e., establishments that are members of multi-establishment firms. The explanatory variables in these equations are the same as those in the independent-establishment regressions. However, for the dependent-establishment regressions, 1992 *firm* employment size is included as an additional explanatory variable.¹² As was the case for independent establishments, the 1992-1996 employment change of dependent establishments in the goods- and service-producing sectors is negatively related to the log of 1992 establishment employment (LN_EMP92), other things equal. However, for IT industries, the estimated coefficient for LN_EMP92 is positive and significant.

For all three industry groups, the 1992-1996 employment change of dependent establishments is negatively related to the log of establishment age (LN_AGE), other things equal, as was the case for independent establishments. In the case of dependent establishments, the coefficient for LN_RSIZE is negative and significant for all industry groups. This latter finding is consistent with the hypothesis (advanced earlier) that the smaller an establishment is compared to the average establishment size in the industry in which it operates, the greater its employment growth will be, if it is to survive.

Finally, as Table 2(b) indicates, 1992-1996 dependent establishment employment change is positively related to the log of 1992 *firm* employment size (LN_FMP92) for goods-producing industries. However, for the service-producing and information-technology industries, dependent establishment employment change is slightly, negatively related to firm employment size. Acs, Armington, and Robb (1999), in their regression models (estimated with grouped BITS data on dependent establishments for all industries), obtained weak, negative relationships between firm size and establishment employment change, other factors held constant.

¹²For independent establishments, establishment employment size and firm employment size are, of course, the same, by definition.

Table 2(b). Relative Employment Change Regressions for Dependent Establishments, 1992-1996									
	Industry Group								
	Goods-Producing			Service-Producing			Information Technology		
Variable	Parameter Estimate	Standard Error †	Variable Mean	Parameter Estimate	Standard Error †	Variable Mean	Parameter Estimate	Standard Error †	Variable Mean
INTERCEPT	0.16937*	0.01179		0.07614*	0.00243		-0.02071	0.02746	
LN_EMP92	-0.02409*	0.00238	3.85013	-0.01641*	0.00073	2.41091	0.02708*	0.00666	2.97682
LN_FMP92	0.00185**	0.00096	6.81983	-0.00314*	0.00018	6.62217	-0.00895*	0.00189	6.74403
LN_AGE	-0.02976*	0.00337	2.25229	-0.02171*	0.00067	1.83855	-0.02905*	0.00592	1.59371
AGEMAX	-0.01747*	0.00455	0.41009	0.01354*	0.00139	0.18105	-0.12657*	0.01666	0.08965
LN_RSIZ	-0.03480*	0.00250	0.09659	-0.07146*	0.00081	-0.20998	-0.11021*	0.00754	-0.24577
MSA	-0.00065	0.00432	0.74237	0.01470*	0.00127	0.82118	0.04558*	0.01326	0.88628
	Dep. Var. Mean: 0.01121 R-Squared (adj.): 0.3080 N: 78,538			Dep. Var. Mean: 0.00541 R-Squared (adj.): 0.04330 N: 963,218			Dep. Var. Mean: 0.00937 R-Squared (adj.): 0.05240 N: 18,615		
† Standard errors were calculated from White's heteroskedasticity consistent variance-covariance matrix. * Significant with a p-value ≤ 0.01. ** Significant with a p-value ≤ 0.05.									
Source: Special tabulations of the 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.									

IV. Establishment Employment Change by Firm-Size, Industry, and Relative Establishment Employment Change Quartile

Some researchers define high-growth firms and establishments according to an arbitrary growth rate (e.g., a 20-percent or greater average annual sales-growth rate over a four-year period) that is applied to firms in all industries.¹³ Over any given time interval, though, there will obviously be differences in industry employment growth rates, and what constitutes a high-growth firm is a relative concept, varying from industry to industry. Therefore, it seems more meaningful to consider establishment employment growth rates within the context of individual industrial sectors. To this end, the BITS data were sorted into four quartiles according to relative establishment employment change between 1992 and 1996.¹⁴

Relative employment change was calculated (for each establishment) as 1996 employment minus 1992 employment divided by the average of 1992 and 1996 employment. Table 3 displays net (absolute) employment change arrayed by relative establishment employment growth quartile and firm employment size for each of the three industry groups, as well as all industries.¹⁵ This table permits, for example, examination of small firms' contribution to net employment change in the highest establishment-employment-growth-rate quartile.

¹³See, for example, Birch, Haggerty, and Parsons (1998).

¹⁴Relative employment change is defined as 1992-1996 establishment employment change divided by mean establishment employment in 1992 and 1996. Establishments with declining employment were included in this tabulation, hence establishments in the lower two quartiles exhibit negative net employment growth.

¹⁵Census' disclosure provisions required the largest firm-employment-size class for this table to be 250 or more employees.

Examining the quartile with the fastest establishment employment-growth rate, it's notable that the smallest (1-19 employee) firms accounted for 37.29 percent of net, 1992-1996 employment change in goods-producing industries (compared to 27.25 percent for service-producing industries and 22.65 percent for IT industries, and 28.63 percent for all industries). Small firms are more popularly associated with playing important roles in service-sector employment and job growth. But, as Table 1(a) indicated, large-firm employment in the goods-producing sector was generally on the decline over the 1992-1996 time period.

Looking at IT industries, Table 3 indicates that firms with 250 or more employees accounted for 57.43 percent of net employment growth in the highest establishment-employment-growth-rate quartile. This is a larger proportion than corresponding figures for goods-producing industries, service-producing industries, and all industries. One may think of IT employment growth as being driven by small, start-up firms. But there are some very large communications, software, and high-tech manufacturing firms that grew at a rapid clip during the 1990s.

Table 3. Absolute Employment Change by Industry Group, Firm Employment Size, and Relative Establishment Employment Growth Quartile, 1992-1996

		Firm Employment Size					
Industry Group	Quartile		< 20	20 - 99	100-249	250 +	Total
Goods-Producing *	1	Employment Δ	-1,130,761	-965,913	-442,356	-1,949,005	-4,488,035
		Row Percent	25.20	21.52	9.86	43.43	100.00
	2	Employment Δ	-265,989	-290,252	-145,938	-1,218,035	-1,920,214
		Row Percent	13.85	15.12	7.60	63.43	100.00
	3	Employment Δ	1,238,555	922,419	390,597	1,580,910	4,132,481
		Row Percent	29.97	22.32	9.45	38.26	100.00
	4	Employment Δ	1,217,099	635,270	220,426	1,191,310	3,264,105
		Row Percent	37.29	19.46	6.75	36.50	100.00
	Total	Employment Δ	1,058,904	301,524	22,729	-394,820	988,337
		Row Percent	107.14	30.51	2.30	-39.95	100.00
Service-Producing *	1	Employment Δ	-4,284,882	-3,155,855	-1,425,582	-7,695,769	-16,562,088
		Row Percent	25.87	19.05	8.61	46.47	100.00
	2	Employment Δ	-963,467	-753,273	-332,935	-2,255,810	-4,305,485
		Row Percent	22.38	17.50	7.73	52.39	100.00
	3	Employment Δ	3,309,130	2,330,208	1,006,956	4,880,182	11,526,476
		Row Percent	28.71	20.22	8.74	42.34	100.00
	4	Employment Δ	4,685,095	2,684,950	1,172,588	8,649,358	17,191,991
		Row Percent	27.25	15.62	6.82	50.31	100.00
	Total	Employment Δ	2,745,876	1,106,030	421,027	3,577,961	7,850,894
		Row Percent	34.98	14.09	5.36	45.57	100.00
Information Technology	1	Employment Δ	-96,382	-112,358	-60,955	-455,886	-725,581
		Row Percent	13.28	15.49	8.40	62.83	100.00
	2	Employment Δ	-791	4,609	2,112	-69,873	-63,943
		Row Percent	1.24	-7.21	-3.30	109.27	100.00
	3	Employment Δ	120,223	110,519	57,367	251,539	539,648
		Row Percent	22.28	20.48	10.63	46.61	100.00
	4	Employment Δ	174,034	108,124	44,958	441,285	768,401
		Row Percent	22.65	14.07	5.85	57.43	100.00
	Total	Employment Δ	197,084	110,894	43,482	167,065	518,525
		Row Percent	38.01	21.39	8.39	32.22	100.00
All Industries	1	Employment Δ	-5,512,025	-4,234,126	-1,928,893	-10,100,660	-21,775,704
		Row Percent	25.31	19.44	8.86	46.38	100.00
	2	Employment Δ	-1,230,247	-1,038,916	-476,761	-3,543,718	-6,289,642
		Row Percent	19.56	16.52	7.58	56.34	100.00
	3	Employment Δ	4,667,908	3,363,146	1,454,920	6,712,631	16,198,605
		Row Percent	28.82	20.76	8.98	41.44	100.00
	4	Employment Δ	6,076,228	3,428,344	1,437,972	10,281,953	21,224,497
		Row Percent	28.63	16.15	6.78	48.44	100.00
	Total	Employment Δ	4,001,864	1,518,448	487,238	3,350,206	9,357,756
		Row Percent	42.77	16.23	5.21	35.80	100.00

* Excludes information technology industries.

Source: Special tabulations of 1989-1996 Business Information Tracking Series (BITS) file data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

V. Determinants of New Firm and Establishment Survival Duration

This section of the report discusses the role played by certain variables in the determination of the survival duration of new firms and establishments. Models of 1992-1996 establishment survival duration were estimated for establishments that were started in 1992. These models were estimated separately by industry group and for independent and dependent establishments, as were the regression models of employment change. In all, then, six survival models were estimated.¹⁶ The covariates for the models that were estimated for new, independent establishments are:

LN_EMP92	the natural logarithm of 1992 establishment employment;
LN_AGE	the natural logarithm of establishment age in years (LN_AGE);
AGEMAX	a dummy variable for establishments started in or before 1977;
LN_RSIZE	the natural logarithm of 1992 establishment employment divided by average 4-digit SIC employment; and
MSA	a dummy variable for establishments located in metropolitan statistical areas.

The models estimated for new, dependent establishments include all of the above variables, as well as a variable for *firm* employment size (LNFEMP92).

¹⁶Standard regression techniques--such as ordinary least squares--were unsuitable for estimation of these models. That's because many observations on survival duration in the BITS are right-censored. That is, many establishments in the BITS that were started in 1992 were still in existence in 1996 (the last year for which BITS data are available), and there is no way of knowing how many more years those establishments will survive. A full-parametric (maximum-likelihood) technique was used to estimate the parameters presented in Tables 4(a) and 4(b). These models assume that establishment survival distributions are of the Weibull form.

Table 4(a) presents the maximum likelihood estimates for the survival models estimated for new, independent establishments--i.e., new businesses. A positive (negative) parameter estimate in this table means that the associated covariate has a positive (negative) effect on establishment survival duration.¹⁷ In all three industry groups, establishment survival duration is positively (and statistically significantly) related to initial (1992) establishment employment size. This makes sense for a couple of reasons. First, larger establishments have more room for contraction before they may ultimately be forced to close. Second, larger establishments are probably better able to compete with other establishments, depending, of course, upon the degree of economies of scale in the industries in which they operate.

The covariate LN_RSIZE is defined precisely as it was in the employment-change regressions that were presented earlier in this report. That is, LN_RSIZE is the natural logarithm of establishment employment divided by mean establishment employment calculated at the 4-digit SIC industry level. It was hypothesized that establishment survival duration would be positively related to LN_RSIZE. However, the parameter estimates for LN_RSIZE are statistically insignificant for the goods-producing and IT sectors and, curiously, negative and statistically significant for service-producing industries.¹⁸

The MSA dummy was specified as a control variable. For all industry groups, the median survival duration of new establishments located in MSAs is less than those that are not located in MSAs, other things

¹⁷ Because the model was estimated with the natural logarithm of survival time (in years) as well as the natural logarithm of all continuously valued covariates, the parameter estimates are essentially scaled elasticities.

¹⁸ As in the case of the employment change regression equations, it may have been better to have simply specified the log of mean (4-digit SIC) employment as a covariate instead of LN_RSIZE.

equal. In lieu of further data analyses, one can only speculate on the reasons why this is the case. One possibility is that the explicit and opportunity costs of owning and operating establishments in MSAs are greater than they are for establishments located in rural areas. If true, this could result in a higher turnover rate among establishments located in MSAs.

Table 4(a) also reports estimated median establishment survival durations (M). Estimated median survival duration is very similar--about four and a half years--across all three industry groups. Recall that Table 4(a) displays estimates for models estimated for independent establishments only. As we shall see, the median survival duration of new establishments owned by multi-establishment firms is considerably greater.

Table 4(b) presents the maximum likelihood estimates for the models estimated for new, *dependent* establishments. As in the case of new, independent establishments, for all three industry groups, the survival duration of new, dependent establishments is positively and significantly related to initial (1992) establishment employment size. However, for all three industry groups, establishment survival duration is negatively related to 1992 *firm* employment size. In other words, the median survival duration of dependent establishments started in 1992 declines with the 1992 employment size of the firms that own them. However, separate, unreported survival models estimated with data on both dependent and independent establishments indicate that, for all industry groups, median survival duration of dependent establishments is greater than that of independent establishments, other things equal.¹⁹

¹⁹Estimates for models estimated with data on all establishments are available from the author.

Table 4(a). 1992-1996 Establishment Survival Model Maximum-Likelihood Estimates for Independent Establishments, by Industry Group

Variable	Industry Group								
	Goods-Producing			Service-Producing			Information Technology		
	Parameter Estimate	Standard Error	Variable Mean	Parameter Estimate	Standard Error	Variable Mean	Parameter Estimate	Standard Error	Variable Mean
INTERCEPT	1.82870*	0.02270		1.62430*	0.01323		1.79520*	0.10060	
LNEMP92	0.04495*	0.00876	0.98221	0.13588*	0.00543	0.90204	0.07179**	0.02943	0.85866
LNRSIZE	-0.00628	0.00779	-1.38170	-0.08671*	0.00514	-1.33980	-0.05500	0.02739	-2.01630
MSA	-0.08107*	0.01538	0.78975	-0.04892*	0.00795	0.81532	-0.17400**	0.06825	0.91721
σ^\dagger	0.86119*	0.01056		0.86983*	0.00531		0.84747*	0.02983	
λ^\dagger	0.16243*	0.00115		0.16151*	0.00057		0.16395*	0.00331	
M^\dagger	4.49001*	0.03181		4.50134*	0.01589		4.47077*	0.09027	
	Dep. Var. Mean: 1.05419 Log-Likelihood: -40,989.93 N: 33,803			Dep. Var. Mean: 1.04986 Log-Likelihood: -171,083.10 N: 140,971			Dep. Var. Mean: 1.05931 Log-Likelihood: -4,782.35 N: 3,962		

* Significant with a p-value ≤ 0.01 .

** Significant with a p-value ≤ 0.05 .

\dagger Calculated at mean values of covariate variables.

Note: Parameter estimates assume an underlying Weibull survival distribution. **M** is estimated median establishment survival duration in years.

Source: Special tabulations of the 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Finally, Table 4(b) indicates that, for all industry groups, the estimated median survival durations of dependent establishments are much greater than those of independent establishments. Also, recall that the estimated median survival durations of independent establishments were virtually identical across industry groups. In the case of dependent establishments, however, the median survival duration of IT establishments is notably less than the median survival durations of establishments in the goods- and service-producing industry groups.

So how do these findings compare with other published findings? There have been two notable and technically similar multivariate studies of establishment survival. Each of these studies also report the fairly intuitive finding that firms' or establishments' risk of dissolution is negatively related to their initial employment size. Of course, the survival models presented in this report are very basic and were presented more in the interest of demonstrating the BITS's ability to entertain such analyses. The BITS does contain information that can be used to create additional covariates analogous to those specified in the studies described below, thereby permitting more complete replications.

Audretsch and Mahmood (1995) use longitudinally linked data (from the Dun and Bradstreet Corporation) on U.S. manufacturing establishments started in 1976. These researchers estimated proportional hazard models for all establishments, including a small proportion of dependent establishments. They report that the risk of dissolution declines with initial establishment employment size. They do not report separate estimates for dependent establishments, however, probably due to the small number of dependent establishments in their sample. Thus, Audretsch and Mahmood cannot corroborate our finding that dependent establishments' survival duration is negatively related to the employment size of their parent firms.

Table 4(b). 1992-1996 Establishment Survival Model Maximum-Likelihood Estimates for Dependent Establishments, by Industry Group

	Industry Group								
	Goods-Producing			Service-Producing			Information Technology		
Variable	Parameter Estimate	Standard Error	Variable Mean	Parameter Estimate	Standard Error	Variable Mean	Parameter Estimate	Standard Error	Variable Mean
INTERCEPT	2.26690*	0.08655		2.81930*	0.01637		2.49390*	0.09319	
LNEMP92	0.16451*	0.02255	2.74760	0.10877*	0.00506	1.79020	0.09356*	0.02531	1.76660
LNRSIZE	0.00246	0.02107	-0.79614	0.08227*	0.00474	-0.73670	0.03020	0.02433	-1.17560
LNFEMP92	-0.05662*	0.00710	6.11170	-0.06961*	0.00111	5.28820	-0.06805*	0.00416	5.95670
MSA	0.04087	0.04022	0.70465	-0.20702*	0.00953	0.82971	-0.24433*	0.05414	0.91816
σ^\dagger	0.78826*	0.02921		0.71211*	0.00490		0.64973*	0.01865	
λ^\dagger	0.09075*	0.00329		0.08950*	0.00059		0.13615*	0.00244	
M[†]	8.25465*	0.29908		8.60681*	0.05641		5.78846*	0.10377	
	Dep. Var. Mean: 1.33544 Log-Likelihood: -4,881.04 N: 5,651			Dep. Var. Mean: 1.38500 Log-Likelihood: -130,204.30 N: 166,585			Dep. Var. Mean: 1.28411 Log-Likelihood: -5,579.74 N: 5,682		

* Significant with a p-value ≤ 0.01 .

** Significant with a p-value ≤ 0.05 .

[†] Calculated at mean values of covariate variables.

Note: Parameter estimates assume an underlying Weibull survival distribution. **M** is estimated median establishment survival duration in years.

Source: Special tabulations of the 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Mata and Portugal (1994) estimated models of *firm* survival using data on Portuguese firms that were started in 1983. (Their data span the 1983-1988 time period.) Mata and Portugal's models are fundamentally different from those presented in this report insofar as their unit of analysis is the firm. That is, they estimated their models with data on independent establishments (single-establishment firms) and dependent establishments aggregated into firms. They report, among other things, that firms' risk of dissolution is negatively related to their initial employment size. In separate, descriptive tabulations, they also report estimated n-year survival rates separately for independent and dependent establishments. Across the board, their estimated survival rates for dependent establishments exceed those of independent establishments. This latter finding is consistent with the estimated median survival durations reported in Tables 4(a) and 4(b).

VI. Concluding Remarks

The BITS is a novel and important source of longitudinal data on firms and establishments, covering virtually all private-sector industries. This report demonstrates only some of the potential uses of these data.

One of the major reasons for the BITS's development was to track employment growth by firm size for all industries. Clearly, the BITS has provided this capability. Indeed, as an annual file, it allows for tabulations of employment growth within annual intervals, an important attribute. Recall, for instance, the interesting finding that virtually all of the 1992-1996 employment growth in IT industries occurred in the 1994-1995 and 1995-1996 intervals.

The BITS can also be used to support multivariate empirical analyses of establishment/firm employment growth and survival. The models presented in this paper are quite rudimentary, and only hint at the potential of the BITS. The strength of this file and the sophistication of analyses of its contents can and surely will be elevated by augmenting the BITS with additional variables. These variables would include those derived from its existing contents, as well as variables from other sources that can be merged into the BITS by matching on its various industry and geography codes.

VII. References

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Appendix A. Detailed Establishment Employment Change Tables, 1992-1996

Table A.1. Establishment Employment Change by Industry Group and Firm Employment Size, 1992-1993

Industry Group	Firm Employment Size	1992 Employment	Births	Deaths	Expansions	Contractions	Net Change	Net Change, Column Percent
Goods-Producing *	1 - 19	3,763,058	330,867	-300,105	883,365	-519,612	394,515	630.31
	20 - 99	4,145,719	139,068	-196,584	485,893	-536,995	-108,618	-173.54
	100 - 499	3,445,917	111,085	-116,626	338,568	-365,872	-32,845	-52.48
	500 +	11,384,136	253,615	-295,253	751,680	-900,503	-190,461	-304.29
	All Sizes	22,738,830	834,635	-908,568	2,459,506	-2,322,982	62,591	100.00
Service-Producing *	1 - 19	14,719,165	1,229,719	-1,064,450	2,397,322	-1,540,773	1,021,818	55.24
	20 - 99	12,578,650	642,843	-624,257	1,379,068	-1,251,405	146,249	7.91
	100 - 499	9,447,333	580,044	-457,125	1,043,261	-936,711	229,469	12.41
	500 +	30,598,725	1,748,987	-1,304,136	2,832,167	-2,824,879	452,139	24.44
	All Sizes	67,343,873	4,201,593	-3,449,968	7,651,818	-6,553,768	1,849,675	100.00
Information Technology	1 - 19	267,875	32,949	-24,817	61,916	-31,279	38,769	99.17
	20 - 99	387,598	15,170	-20,900	52,610	-38,849	8,031	20.54
	100 - 499	411,254	16,967	-18,480	51,182	-39,420	10,249	26.22
	500 +	1,642,095	74,740	-71,460	145,967	-167,201	-17,954	-45.92
	All Sizes	2,708,822	139,826	-135,657	311,675	-276,749	39,095	100.00
All Industries	1 - 19	18,750,098	1,593,535	-1,389,372	3,342,603	-2,091,664	1,455,102	74.57
	20 - 99	17,111,967	797,081	-841,741	1,917,571	-1,827,249	45,662	2.34
	100 - 499	13,304,504	708,096	-592,231	1,433,011	-1,342,003	206,873	10.60
	500 +	43,624,956	2,077,342	-1,670,849	3,729,814	-3,892,583	243,724	12.49
	All Sizes	92,791,525	5,176,054	-4,494,193	10,422,999	-9,153,499	1,951,361	100.00

* Excludes information technology industries.

Source: Special tabulations of 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Table A.5. Establishment Employment Change by Industry Group and Firm Employment Size, 1992-1996

Industry Group	Firm Employment Size	1992 Employment	Births	Deaths	Expansions	Contractions	Net Change	Net Change, Column Percent
Goods-Producing *	1 - 19	3,762,045	1,172,688	-944,750	1,285,997	-455,031	1,058,904	107.14
	20 - 99	4,145,593	621,237	-717,423	947,441	-549,731	301,524	30.51
	100 - 499	3,445,917	355,048	-492,676	643,769	-460,435	45,706	4.62
	500 +	11,384,136	1,041,464	-1,176,377	1,401,340	-1,684,224	-417,797	-42.27
	All Sizes	22,737,691	3,190,437	-3,331,226	4,278,547	-3,149,421	988,337	100.00
Service-Producing *	1 - 19	14,720,248	4,217,079	-3,591,458	3,777,146	-1,656,891	2,745,876	34.98
	20 - 99	12,578,796	2,571,324	-2,374,593	2,443,834	-1,534,535	1,106,030	14.09
	100 - 499	9,447,333	1,960,575	-1,666,424	1,714,236	-1,224,684	783,703	9.98
	500 +	30,598,725	7,432,592	-4,709,377	4,601,681	-4,109,611	3,215,285	40.95
	All Sizes	67,345,102	16,181,570	-12,341,852	12,536,897	-8,525,721	7,850,894	100.00
Information Technology	1 - 19	267,805	171,472	-81,761	136,370	-28,997	197,084	38.01
	20 - 99	387,578	106,869	-88,776	138,725	-45,924	110,894	21.39
	100 - 499	411,254	76,760	-73,395	120,560	-58,188	65,737	12.68
	500 +	1,642,095	406,797	-278,807	313,369	-296,549	144,810	27.93
	All Sizes	2,708,732	761,898	-522,739	709,024	-429,658	518,525	100.00
All Industries	1 - 19	18,750,098	5,561,239	-4,617,969	5,199,513	-2,140,919	4,001,864	42.77
	20 - 99	17,111,967	3,299,430	-3,180,792	3,530,000	-2,130,190	1,518,448	16.23
	100 - 499	13,304,504	2,392,383	-2,232,495	2,478,565	-1,743,307	895,146	9.57
	500 +	43,624,956	8,880,853	-6,164,561	6,316,390	-6,090,384	2,942,298	31.44
	All Sizes	92,791,525	20,133,905	-16,195,817	17,524,468	-12,104,800	9,357,756	100.00

* Excludes information technology industries.

Source: Special tabulations of 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Table A.2. Establishment Employment Change by Industry Group and Firm Employment Size, 1993-1994

Industry Group	Firm Employment Size	1993 Employment	Births	Deaths	Expansions	Contractions	Net Change	Net Change, Column Percent
Goods-Producing *	1 - 19	3,782,241	341,377	-290,060	854,723	-509,216	396,824	270.67
	20 - 99	4,160,671	135,778	-196,372	541,917	-500,044	-18,721	-12.77
	100 - 499	3,497,995	86,624	-147,880	355,193	-342,729	-48,792	-33.28
	500 +	11,293,097	243,488	-316,372	758,714	-868,535	-182,705	-124.62
	All Sizes	22,734,004	807,267	-950,684	2,510,547	-2,220,524	146,606	100.00
Service-Producing *	1 - 19	14,957,501	1,238,056	-1,106,020	2,350,264	-1,617,674	864,626	48.44
	20 - 99	12,827,991	654,645	-644,758	1,421,556	-1,258,653	172,790	9.68
	100 - 499	9,881,772	466,906	-488,523	1,038,292	-904,136	112,539	6.31
	500 +	31,497,311	1,637,606	-1,253,802	2,866,474	-2,615,387	634,891	35.57
	All Sizes	69,164,575	3,997,213	-3,493,103	7,676,586	-6,395,850	1,784,846	100.00
Information Technology	1 - 19	309,191	36,796	-29,224	69,993	-36,413	41,152	316.36
	20 - 99	424,259	15,829	-23,300	63,005	-42,499	13,035	100.21
	100 - 499	443,415	14,839	-24,439	52,301	-39,371	3,330	25.60
	500 +	1,667,442	60,867	-87,780	166,918	-184,514	-44,509	-342.17
	All Sizes	2,844,307	128,331	-164,743	352,217	-302,797	13,008	100.00
All Industries	1 - 19	19,048,933	1,616,229	-1,425,304	3,274,980	-2,163,303	1,302,602	66.99
	20 - 99	17,412,921	806,252	-864,430	2,026,478	-1,801,196	167,104	8.59
	100 - 499	13,823,182	568,369	-660,842	1,445,786	-1,286,236	67,077	3.45
	500 +	44,457,850	1,941,961	-1,657,954	3,792,106	-3,668,436	407,677	20.97
	All Sizes	94,742,886	4,932,811	-4,608,530	10,539,350	-8,919,171	1,944,460	100.00

* Excludes information technology industries.

Source: Special tabulations of 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Table A.3. Establishment Employment Change by Industry Group and Firm Employment Size, 1994-1995

Industry Group	Firm Employment Size	1994 Employment	Births	Deaths	Expansions	Contractions	Net Change	Net Change, Column Percent
Goods-Producing *	1 - 19	3,827,614	362,192	-293,481	895,221	-452,869	511,063	63.14
	20 - 99	4,206,151	133,093	-163,576	587,566	-416,327	140,756	17.39
	100 - 499	3,530,267	87,094	-113,164	388,376	-294,910	67,396	8.33
	500 +	11,290,755	300,554	-241,677	806,842	-775,569	90,150	11.14
	All Sizes	22,854,787	882,933	-811,898	2,678,005	-1,939,675	809,365	100.00
Service-Producing *	1 - 19	15,025,192	1,278,750	-1,093,923	2,413,361	-1,491,919	1,106,269	43.16
	20 - 99	13,046,241	682,924	-631,206	1,465,837	-1,130,052	387,503	15.12
	100 - 499	10,121,128	515,390	-450,600	1,071,850	-918,158	218,482	8.52
	500 +	32,783,627	1,864,676	-1,166,904	2,902,604	-2,749,477	850,899	33.20
	All Sizes	70,976,188	4,341,740	-3,342,633	7,853,652	-6,289,606	2,563,153	100.00
Information Technology	1 - 19	321,402	39,387	-28,973	80,944	-33,396	57,962	26.09
	20 - 99	433,509	16,955	-24,420	74,403	-36,500	30,438	13.70
	100 - 499	462,508	18,911	-24,190	67,619	-36,371	25,969	11.69
	500 +	1,638,952	117,701	-48,598	187,946	-149,246	107,803	48.52
	All Sizes	2,856,371	192,954	-126,181	410,912	-255,513	222,172	100.00
All Industries	1 - 19	19,174,208	1,680,329	-1,416,377	3,389,526	-1,978,184	1,675,294	46.60
	20 - 99	17,685,901	832,972	-819,202	2,127,806	-1,582,879	558,697	15.54
	100 - 499	14,113,903	621,395	-587,954	1,527,845	-1,249,439	311,847	8.68
	500 +	45,713,334	2,282,931	-1,457,179	3,897,392	-3,674,292	1,048,852	29.18
	All Sizes	96,687,346	5,417,627	-4,280,712	10,942,569	-8,484,794	3,594,690	100.00

* Excludes information technology industries.

Source: Special tabulations of 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Table A.4. Establishment Employment Change by Industry Group and Firm Employment Size, 1995-1996

Industry Group	Firm Employment Size	1995 Employment	Births	Deaths	Expansions	Contractions	Net Change	Net Change, Column Percent
Goods-Producing *	1 - 19	3,954,465	342,771	-333,903	802,320	-468,264	342,924	1341.75
	20 - 99	4,445,222	138,455	-185,140	499,670	-498,549	-45,564	-178.28
	100 - 499	3,699,906	95,597	-120,870	308,976	-377,709	-94,006	-367.81
	500 +	11,601,422	290,180	-336,633	731,903	-914,362	-228,912	-895.66
	Total	23,701,015	867,003	-976,546	2,342,869	-2,258,884	-25,558	100.00
Service-Producing *	1 - 19	15,254,175	1,292,456	-1,220,122	2,386,033	-1,442,249	1,016,118	60.60
	20 - 99	13,512,224	671,720	-723,437	1,362,408	-1,231,617	79,074	4.72
	100 - 499	10,473,311	482,040	-504,263	997,775	-1,007,329	-31,777	-1.90
	500 +	34,259,853	2,075,369	-1,410,015	3,049,410	-3,101,401	613,363	36.58
	Total	73,499,563	4,521,585	-3,857,837	7,795,626	-6,782,596	1,676,778	100.00
Information Technology	1 - 19	338,747	49,751	-32,834	85,667	-33,757	68,827	31.86
	20 - 99	456,128	22,629	-25,759	73,695	-41,679	28,886	13.37
	100 - 499	485,422	21,173	-25,354	73,578	-48,384	21,013	9.73
	500 +	1,801,161	129,530	-76,886	209,959	-165,304	97,299	45.04
	Total	3,081,458	223,083	-160,833	442,899	-289,124	216,025	100.00
All Industries	1 - 19	19,547,387	1,684,978	-1,586,859	3,274,020	-1,944,270	1,427,869	76.47
	20 - 99	18,413,574	832,804	-934,336	1,935,773	-1,771,845	62,396	3.34
	100 - 499	14,658,639	598,810	-650,487	1,380,329	-1,433,422	-104,770	-5.61
	500 +	47,662,436	2,495,079	-1,823,534	3,991,272	-4,181,067	481,750	25.80
	Total	100,282,036	5,611,671	-4,995,216	10,581,394	-9,330,604	1,867,245	100.00

* Excludes information technology industries.

Source: Special tabulations of 1989-1996 Business Information Tracking Series (BITS) data. Prepared for the Office of Advocacy of the U.S. Small Business Administration.

Appendix B. List of Information Technology (IT) Industries

Hardware Industries

SIC

Computers and equipment	3571, 2, 5, 7
Wholesale trade of computers and equipment	5045
Retail trade of computers and equipment	5734
Calculating and office machines, n.e.c.	3578, 9
Magnetic and optical recording media	3695
Electron tubes	3671
Printed circuit boards	3672
Semiconductors	3674
Passive electronic components	3675 - 9
Industrial instruments for measurement	3823
Instruments for measuring electricity	3825
Laboratory analytical instruments	3826

Software/Services Industries

Computer programming services	7371
Prepackaged software	7372
Wholesale trade of software	5045
Retail trade of software	5734
Computer integrated systems design	7373
Computer processing, data preparation	7374
Information retrieval services	7375
Computer services management	7376
Computer rental and leasing	7377
Computer maintenance and repair	7378
Computer-related services, n.e.c.	7379

Communications Equipment Industries

Household audio and video equipment	3651
Telephone and telegraph equipment	3661
Radio, TV, and communications equipment	3663

Communications Services Industries

Telephone and telegraph communications	481, 22, 99
Radio broadcasting	4832
Television broadcasting	4833
Cable and other pay TV services	4841

Source: "The Emerging Information and Communications Technology Industry." U.S. Department of Commerce, 1998.