LONGITUDINAL ANALYSIS OF ECONOMIC IMPACTS:
A CASE STUDY OF THE RUST BELT

R. Jason Faberman
Bureau of Labor Statistics* and the University of Maryland, College Park
*2 Massachusetts Avenue NE, Suite 4945, Washington, DC 20212

1) Introduction

A vast amount of research emerged over the last decade on firm-level employment dynamics. This work underscored the importance of acknowledging the heterogeneity and dynamics that underlie macroeconomic fluctuations. For instance, there are considerable amounts of job destruction during times of expansion, and considerable amounts of job creation during times of contraction. Differences both within and across industries, firm ages, and firm sizes help create this environment of constant churning. Consequently, macroeconomic models have increasingly focused on this heterogeneity and churning when attempting to explain aggregate dynamics. Some models stress a creative destruction process (e.g., Caballero and Hammour, 1994, 1996; Aghion and Howitt, 1992, 1994) where technology growth leads to a constant replacement of older vintage firms by entrants with the latest technology. Other models stress churning due to firm learning and selection (e.g., Jovanovic, 1982; Ericson and Pakes, 1995). In these models, firms begin with expectations on their capabilities and learn about their true efficiency over time, choosing either to grow or exit as they do so. Another class of models stress worker search and matching (e.g., Mortensen and Pissarides, 1994). In these models, heterogeneous workers and firms simultaneously engage in labor market search and face an uncertain quality of a worker-job match. These models focus mainly on the cyclical behavior of the economy, which parallels most empirical work on employment dynamics. However, the empirical work also finds tremendous cross-sectional variation in the data. This variation occurs across industries, size classes, and age groups, to name a few. This variation is important to the movements of the aggregate economy and in better understanding the theoretical models.

This paper explores both regional and cyclical variations in employment dynamics. Differences across regions can be thought of as differences across labor markets, rather than just differences across certain firm categorizations (e.g., industry, firm size, etc.) The study focuses on the metropolitan areas within Michigan, Ohio, and Pennsylvania, from March 1992 to March 2000. These states are in the "Rust Belt" region of the U.S, which gets its name from its large concentration of manufacturing activity. When manufacturing underwent a steep decline during the 1970's and 1980's, many of the region's local economies followed suit. It was not until the latter part of the 1980's that employment growth in the Rust Belt picked up. Throughout the economic expansion of the 1990's, the Rust Belt still lagged the rest of the nation in employment growth. However, the outcomes within the Rust Belt varied substantially. Several local areas expanded while others maintained the trend of prior decades. This variation in growth makes the Rust Belt a favorable setting for a study of regional employment dynamics.

Results indicate that job flows were relatively stable between 1992 and 2000, reflective of the steady employment growth during this period. In addition, job flows were highly seasonal, with 56 percent of quarterly fluctuations being transitory. The average size and age of establishments increased over the period, also a consequence of the steady employment expansion. Cross-sectionally, metropolitan areas with high employment growth had high rates of both job creation and job destruction, and hence higher turnover. Differences in job creation accounted for most of the higher turnover. In addition, high-growth areas had larger, younger establishments, on average. The cyclical and cross-sectional patterns of job creation and job destruction have contrasting patterns—over time, periods of high creation are also periods of low destruction, implying a negative cyclical relationship. However, across areas, places with high creation also have high destruction, implying a positive cross-sectional relationship.

TABLE 1.
SUMMARY STATISTICS: LDB SAMPLE (MI, OH, PA METROPOLITAN AREAS)

Variable	Quarterly Tabulations		Annual Tabulations	
	Mean	Std. Deviation	Mean	Std. Deviation
Employment (000's)	11,257	---	11,036	---
Employment Growth	0.47	2.05	1.87	0.82
Job Creation	7.15	1.10	13.10	0.44
Job Destruction	6.68	1.17	11.23	0.50
Job Reallocation	13.82	1.00	24.33	0.47
Average Establ. Size	18.9	0.25	17.8	0.22
Average Establ. Age	44.1	1.93	43.8	1.88

2) Data

Previous data sources for the United States made this study practically impossible—either samples were too small to allow a rich analysis across metropolitan areas, or they focused on a specific industry (e.g., manufacturing). The Bureau of Labor Statistics has a new set of linked establishment microdata. The Longitudinal Database (LDB) contains quarterly employment and wage data for nearly all establishments in the U.S. economy. The Unemployment Insurance (UI) records from the Bureau's ES-202 program provide the raw data for the LDB[1]. The longitudinal nature of the data allows one to observe when establishments start up, shut down, expand their employment, or contract. The microdata nature of the LDB allows one to observe an establishment's various characteristics, such as its industry, age, number of employees, and wages offered. The LDB is unique in its coverage (approximately 98 percent of all employees) and frequency (quarterly). This study covers the 35 Metropolitan Statistical Areas (MSA's) of Michigan, Ohio, and Pennsylvania, from March 1992 to March 2000. Data are all private sector establishments obtained from the LDB within these areas. They include approximately 18.8 million observations on 1.03 million unique establishments. In the average quarter, the sample has 11.26 million employees in 587,000 active establishments. MSA's vary widely in their average employment, from 40,000 (Sharon, PA) to 1.88 million (Philadelphia, PA), and in their long run growth, from 0.1 percent (Steubenville, OH) to 26.6 percent (Grand Rapids, MI).

Job flows are calculated from the LDB for every MSA both quarterly and annually. Job creation is the total number of jobs created at continuing establishments expanding their workforce and at establishments just starting up. Similarly, job destruction is the total number of jobs lost at continuing establishments contracting their workforce and at establishments shutting down. Job reallocation, or turnover, is the sum of creation and destruction. The rates of these statistics use the average of the current and previous quarters' employment levels as the denominator, as in Davis, Haltiwanger and Schuh (1996). The employment growth rate is simply the difference between the job creation and job destruction rates. The paper reports both quarterly and annual job flows. Quarterly flows use the third-month employment, while annual flows use March employment[2]. Establishment characteristics include their average size (in workers) and age (in quarters). An establishment's age is based on its initial date of UI liability[3].

3) General Findings

Table 1 summarizes results for all establishments in the 35 MSA's. Due to seasonal variations, job flows are much more volatile in the quarterly rather than the annual data. In addition, much of the quarterly flows are transitory—a 13.8 percent quarterly job reallocation rate translates to only a 24.3 percent annual rate, implying that 56 percent of the sample's quarterly job turnover is short-term. Table 1 also shows the average establishment in the sample to have about 19 workers and be just over 11 years (44 quarters) old.

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[1] Pivetz, Searson, and Spletzer (2001) provide a detailed description of the data, its creation, and its uses.

[2] Pinkston and Spletzer (2002) discuss the methodology used for creating annual statistics with the LDB

[3] See Faberman (2002) for issues related to using the liability date as a measure of age.
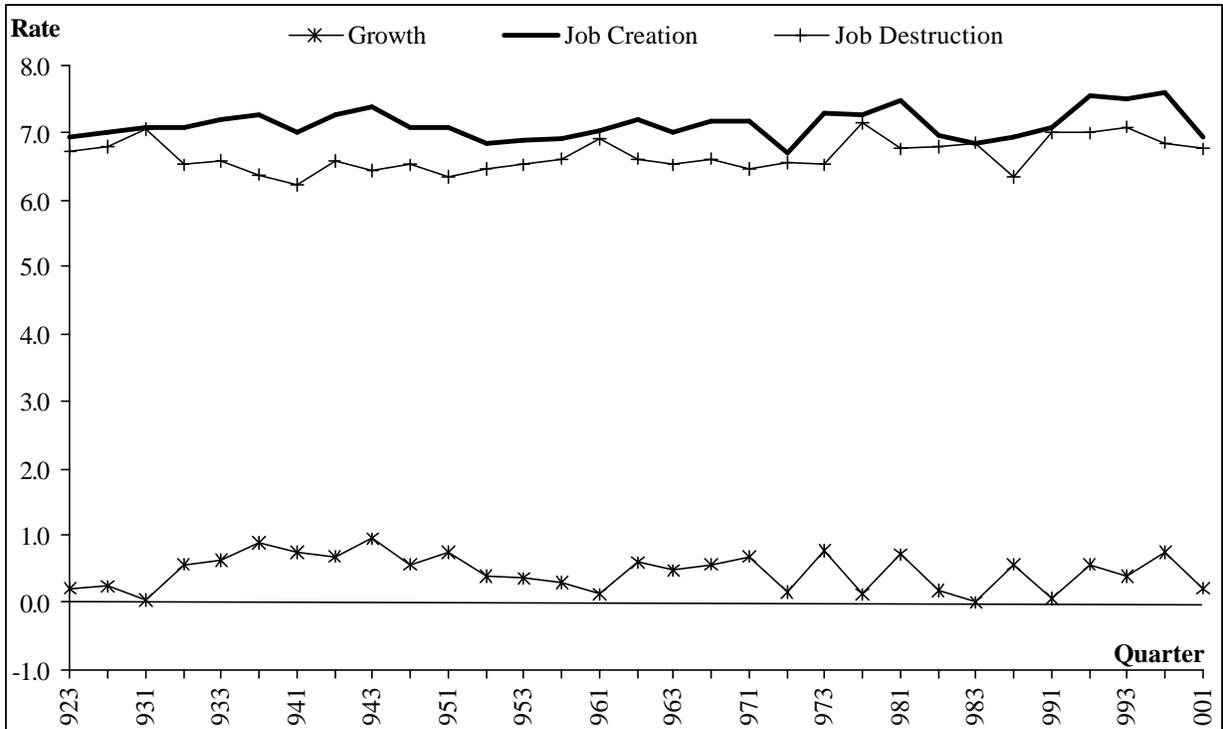
Figure 1. Quarterly Growth and Job Flows, Seasonally Adjusted
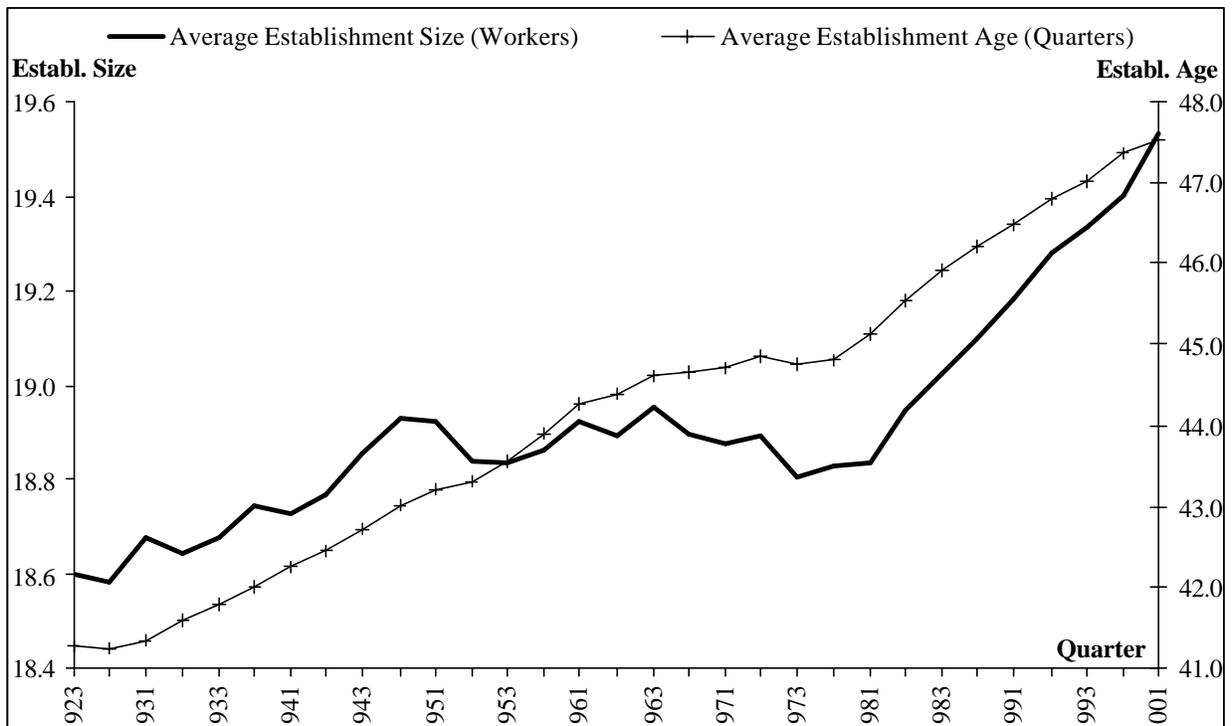
Figure 2. Average Establishment Size and Age, Seasonally Adjusted

Charts 1 and 2 present the cyclical behavior of the data for the full sample. Chart 1 depicts the seasonally adjusted quarterly patterns of job creation, job destruction and employment growth. Employment growth was relatively stable and positive throughout the period, with lower levels in 1992 and 1995 and lower and more volatile growth between 1997 and 1998. This primarily reflects the recovery from the 1990-91 recession and subsequent economic expansion. Consequently, job creation and job destruction have relatively stable rates throughout the period. Job creation rises above 7 percent between 1993 and 1994 and again toward the end of the sample period. Job destruction averages 6.5 percent between 1993 and 1997, and increases to an average of 6.9 percent from 1997 on. Chart 2 depicts the cyclical patterns of average establishment age and size, also seasonally adjusted. The mean age of establishments in the sample increases by 19 months (15 percent) over the period. The increase is steady, save for slight slowdowns in 1992, early 1995, and early 1997. These slowdowns coincide with periods of low employment growth. Average establishment size trends mostly upward over the period, rising by 0.9 workers (5 percent). Average size decreases notably in 1992, 1995, and 1997—again, these coincide with periods of lower employment growth. Average size increases dramatically from 1998 on.

Table 2 orders MSA's by their employment growth over the sample period and groups them into thirds. These groups are referred to simply as the "high", "middle", and "low" growth groups[4]. Quarterly averages are in the top panel and annual averages are in the bottom panel. Statistics represent weighted averages across all MSA's within a group[5], and include a t-statistic for a test of equality of high-growth versus low-growth group means. The quarterly an annual data show qualitatively similar results. Areas with higher growth had substantially higher rates of job creation and somewhat higher rates of job destruction, leading to higher overall reallocation. The differences in job destruction across the groups were statistically negligible at both the quarterly and annual frequencies. Thus, high employment growth occurred through relatively higher job turnover, due mostly to job creation. On average, establishments were about 10 percent larger in the high growth MSA's, significantly larger then in low-growth areas. These areas had 1.6 to 1.9 more workers per establishment than MSA's in the other groups. High-growth MSA's also had the youngest firms, on average; low growth MSA's had the oldest. The 3.1 quarter (19 month) difference in average age between the two groups was statistically significant.

Table 3 lists the Pearson correlation coefficients for both the cross-sectional and cyclical characteristics of the data. The most evident contrasts are in the first two rows. Cross-sectionally, job creation and job destruction move together—places with high job creation also have high job destruction. However cyclically, the two flows move in opposite directions—times of high job creation are also times of low job destruction and vice versa. The relation between growth and reallocation bears a similar pattern, albeit with a much weaker correlation. Places with high growth have high job reallocation, but periods of high growth are times of relatively lower job reallocation. In addition, the relation between growth and size is positive, while the relation between growth and age is negative, consistent with the results in Table 2. Cyclically, average establishment size and age tend to move together, as is evident in Chart 2.

4) Conclusions

Using a new source of longitudinal microdata, this study explored the dynamics of employment growth, job flows, and establishment characteristics at the metropolitan area level of detail. Job creation and job destruction moved in opposite directions cyclically, and did so with a strong seasonal pattern. In fact over half of quarterly job flows are transitory. Contrarily, within the Rust Belt region of the U.S., job creation and destruction generally occur in parallel levels across MSA's—places with high job creation also had high job destruction. In addition, areas with high employment growth had higher job turnover and larger, younger establishments, on average. These findings are consistent with the macro models noted earlier. In those models, high growth and high turnover occur together within an employment distribution skewed towards younger firms.

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[4] Statistics by MSA are available from the author by request.
[5] The weighting is done with either average employment (for employment growth and job flows) or establishments (for average size and age).

TABLE 2.
METROPOLITAN AREA TIME-SERIES MEANS – GROUPED BY EMPLOYMENT GROWTH

Panel A. Quarterly Statistics

Group	Employment Growth	Job Creation	Job Destruction	Job Reallocation	Average Establ. Size	Average Establ. Age
High-Growth MSA's	0.60	7.36	6.76	14.13	20.0	43.1
Mod.-Growth MSA's	0.40	6.98	6.58	13.56	18.2	43.9
Low-Growth MSA's	0.29	6.98	6.68	13.66	18.1	46.2
t-Statistic: High ≠ Low	0.56	1.25	0.28	1.68	29.06**	5.90**

Panel B. Annual Statistics

Group	Employment Growth	Job Creation	Job Destruction	Job Reallocation	Average Establ. Size	Average Establ. Age
High-Growth MSA's	2.41	13.7	11.2	24.9	18.8	42.7
Mod.-Growth MSA's	1.61	13.0	11.4	24.3	17.2	43.6
Low-Growth MSA's	1.19	12.2	11.0	23.2	17.1	46.0
t-Statistic: High ≠ Low	2.26*	4.74**	0.73	5.07**	14.11**	2.97*

** Denotes significance at the 5 percent level.   * Denotes significance at the 10 percent level.

TABLE 3.
PEARSON CORRELATIONS , QUARTERLY STATISTICS

Correlation between:	*Cross-Sectional*	*Cyclical*
Job Creation, Job Destruction	0.91	-0.62
Growth, Job Reallocation	0.16	-0.08
Growth, Average Size	0.41	0.12
Growth, Average Age	-0.52	-0.10
Job Reallocation, Average Size	-0.18	-0.26
Job Reallocation, Average Age	-0.27	0.08
Average Size, Average Age	-0.33	0.75

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