Estimates of Turnover from BLS Establishment Data

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Abstract:
This paper details the potentials for researching employment and establishment turnover using various establishment data sources from the Bureau of Labor Statistics. It focuses on its two newest programs. The Business Employment Dynamics program uses longitudinal administrative records to estimate job creation, job destruction, and establishment turnover quarterly. The Job Openings and Labor Turnover Survey samples 16,000 establishments for monthly estimates of vacancies, hires and separations. The aggregate statistics and underlying microdata for these programs are both well suited to researching labor market dynamics. Each source has unique research potential, though with limitations. The paper also discusses the research potential of microdata from older BLS surveys.

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Introduction

In recent years, the Bureau of Labor Statistics (BLS) has released several new data products which describe the dynamics of the labor market. The Business Employment Dynamics program uses longitudinally linked administrative data to estimate gross job gains (i.e., job creation), gross job losses (i.e., job destruction), and the turnover of establishments. The size and scope of the data and its longitudinal nature make it a valuable data resource for studying both firm and business cycle dynamics. The Job Openings and Labor Turnover Survey (JOLTS) is a program that measures vacancies, hires, and separations with a monthly survey of establishments. The survey is relatively small and evolving, yet it can add to the understanding of the role firm behavior plays in job posting and worker turnover. The two surveys represent the first timely, nationally representative estimates of their kind, and consequently greatly add to our knowledge of the labor market.

This paper discusses these and other sources of establishment data at the BLS. The discussion focuses on the research potential these data have for studying turnover in the labor market. I discuss both the new aggregate statistics and the underlying microdata. The latter are particularly important to academic research, so I present detailed descriptions of their scope, contents, research potential, and limitations. I highlight the findings already gained from the new data. The reader should regard the paper as a primer for future empirical work with the data. As such, it compliments previous discussions of other data from the BLS, Census Bureau, and other sources.[1]

[1] These discussions include Manser (1998), Davis and Haltiwanger (1998, 1999), Davis, Haltiwanger, and Schuh (1996) Hamermesh (1999), and Abowd, Haltiwanger, and Lane (2004). They detail other surveys

The following section defines the concepts and terminology used throughout the paper. The next section describes the BED, and the section after that details the JOLTS data. A brief overview of other establishment surveys, such as the BLS Current Employment Statistics (CES) program, follows. Information on accessing the microdata comes next and the final section concludes.

Concepts and Definitions

To avoid confusion, I first define the important concepts and definitions used in this paper. The primary unit of observation for all surveys is the *establishment*, which covers the operations of a firm at a single physical location. *Firms* have one or more establishments. *Employment* measures how many individuals are employed and receiving either a wage or salary at a particular establishment. For all surveys described here, the BLS measures employment during the pay period that includes the 12th of the month. Since the data in this paper use establishment surveys, employment statistics will double-count multiple jobholders. These surveys also exclude self-employed individuals not covered under a state unemployment insurance program.

Job flows are aggregate statistics of employment changes at the establishment level. They sum up net changes at the establishment level based on the type of change. As such, they do not account for within-establishment changes in employment.[2] In general, there are two types of job flows. *Job creation* refers to the sum of all jobs gained at either continuous establishments expanding their employment or opening

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important to labor market research not listed here, namely the Longitudinal Research Database of the Census Bureau, and the Linked Employer-Household Dynamics program.

[2] For example, an establishment that gains three workers and loses three workers within a period would not record any job flows, since there is no net change. Consequently, the frequency at which job flows are measured is important, since lower frequencies will measure relatively fewer transitory employment changes.

establishments. *Job destruction* refers to all jobs lost at establishments either contracting their employment or closing entirely. *Job reallocation* is the sum of job creation and job destruction—it is a measure of the churning of jobs across establishments. The net change in employment is simply the difference between job creation and job destruction.

Worker flows are aggregate statistics of the employment changes of all workers. They include job gains and losses both within and between establishments. *Hires* are new additions to the workforce of an establishment, while *separations* are removals from its workforce. These removals may be voluntary (i.e., *quits* or other separations, such as retirement) or involuntary (i.e., *layoffs* and *discharges*). Note that, given these definitions, an individual who was stops working at an establishment may not count as part of employment, but also may not count as a separation. The clearest examples of this occurrence are teachers on summer break and unassigned workers at a temporary help agency or other on-call workers. I discuss these occurrences and their measurement in the discussion of the JOLTS data. In this paper, *worker turnover* refers to the sum of all hires and separations in a period. In some sense, job flows are a subset of worker flows, though definitional differences across surveys of hires, separations, and employment make a direct comparison difficult. The JOLTS data also have statistics on *job openings* (i.e., *vacancies*), which are unfilled employment positions posted by an establishment.

Establishment "flows" are measured in terms of entrants and exits. In this paper, entering establishments are called *openings*. Openings include establishment *births* (i.e., establishments opening for the first time) as well as well as establishments opening after a temporary closing. Exiting establishments are called *closings*. Closings include *deaths*

(i.e., permanently shut down establishments) as well as establishments that are temporarily closing. *Establishment turnover* is the sum of all opening and closing establishments.

The BED, JOLTS, and other programs have detailed data on various other statistics. These include measures of employee payrolls, establishment age, worker hours, and earnings. I describe these statistics in detail within each relevant program's section.

Finally, the programs described in this paper have industry designations that use the North American Industry Classification System (NAICS). This system replaced the older Standard Industrial Classification (SIC) system. The SIC system had four tiers: major industry sectors (i.e., manufacturing, services, etc.), major "two-digit" industries, then detailed "three-digit" and "four-digit" industry classifications. The NAICS system follows the same format, but with six-digits of industrial detail. In general, two-digit NAICS sectors correspond to SIC industry sectors, three-digit major NAICS industries correspond to two-digit major SIC industries, and four-, five-, and six- digit NAICS industries correspond to detailed three- and four-digit SIC industries. The most notable change in the NAICS system is its classification of the service sector into several separate sectors, such as information, professional and business services, education and health, and travel and hospitality.

Business Employment Dynamics

Data Description

The BED program publishes statistics on gross job gains (i.e., job creation) and gross job losses (i.e., job destruction) for the nonfarm private sector. The statistics are

quarterly. They begin in the third quarter of 1992 and their most recent data are for the third quarter of 2003. Job flows are broken out into employment changes at opening, expanding, closing, and contracting establishments. Currently, the data are available nationally by NAICS two-digit industry sector. The data also include statistics on the numbers of opening, expanding, closing, and contracting establishments. Both the employment and establishment statistics are reported as their levels and as rates, which are percentages of their respective totals.

The data come from state unemployment insurance (UI) records. These records include nearly all establishments and employment, with the primary exceptions being the self-employed, certain nonprofit organizations, and the military. The basic form of these data, commonly known as the ES-202 data, come from the Quarterly Census of Employment and Wages (QCEW).[3] The BED uses a form of the private sector QCEW data that is enhanced by linking records for the same reporting unit over time to create a longitudinal history for each establishment. This allows the BLS to measure net employment changes for each establishment, and consequently create aggregate job flow statistics. The linkage algorithm is critical to job flow estimation. It is a three-stage process detailed in both Pivetz et al. (2001) and Spletzer et al. (2004). The algorithm must deal with a wide variety of changes firms make to their UI accounts. The linkage process identifies most of these changes, but some special cases arise that have large effects on job flow estimates. Suffice it to say, the BLS takes precautions (such as a manual review of the estimates) to identify and deal with these cases as best as possible.

[3] The QCEW represents the universe of establishments to which all BLS establishment surveys are benchmarked. It is a useful source of data for research in its own right, but since the only difference between the QCEW and the BED is the linkage of establishment records, I exclude a description of the QCEW to avoid replication.

The BED covers approximately 98 percent of private wage and salary employment. In the latest quarter, the published job flow and establishment statistics represent over 107 million employees in 6.4 million establishments. Of these establishments, approximately 95 percent are continuous (i.e., employ at least one worker in both the current and previous quarters). For all statistics, quarterly employment is based on the third month, so that first quarter changes are from December to March, second quarter changes from March to June, etc. The published statistics exclude government, though government records exist in the microdata. The microdata also date back to 1990. In both cases, issues with firms' reporting and restructuring of UI accounts make it difficult to link establishment records with algorithms used with the published data.

Public Statistics

The BED became public data in September 2003. At that time, it only included national statistics on job flows and establishments. Statistics by major industry sector became available in May 2004. The BLS plans to have statistics by state and establishment size class in future BED releases.

The current statistics already shed new light on employment dynamics. Previous research (for example, see Davis, Haltiwanger and Schuh, 1996) uses the Census Bureau's LRD to provide basic facts on job flows and establishment dynamics in manufacturing. The most notable of these are their surprising magnitude and persistence, their variation across various sectors and categories, and their relation to the business cycle. Others (e.g., Anderson and Meyer, 1994; Foote, 1998; Burgess, Lane and Stevens, 2000) have expanded on this work with other data sources. The BED represents the first

comprehensive source of data on job flows that covers all states and industries for the U.S. In addition, it is the timeliest data for studying job flows and establishment turnover, with each quarter of data available within eight months.

Among its primary benefits is the BED's ability to provide information on employment dynamics over the business cycle. The BED data cover job flows over the past 11 years. Spletzer et al. (2004) and Clayton and Spletzer (2004) discuss the data in more detail. I summarize the most notable findings below:

- Job flows are pervasive. In the third quarter of 2003, the private sector created 7.4 million jobs and destroyed 7.3 million jobs. The number of jobs either created or destroyed amounted to 13.7 percent of private employment. This rate of job reallocation—though low relative to previous quarters—is considerably higher than that found in the manufacturing sector with the LRD (see Davis, Haltiwanger, and Schuh, 1996).
- Typically, most jobs (nearly 80 percent) are either created or destroyed at continuing establishments.[4] Job flows are more cyclical at continuing rather than opening and closing establishments.
- Opening and closing establishments have a small contribution to job reallocation and employment losses, yet their turnover is substantial. Over 5 percent of establishments either open or close each quarter, and do so with a relatively small response to the business cycle.

[4] This is true of the quarterly data. As the frequency studied decreases, the relative importance of job flows at opening and closing establishments increases. As a comparison, Pinkston and Spletzer (2002) estimate annual job flows with the BED and find that openings and closings make account for 42 percent of annual job reallocation.

- Job flow rates vary greatly by industry. Job reallocation is relatively low in industries such as utilities (6.0 percent in the third quarter, 2003) and manufacturing (8.7 percent), and relatively high in seasonal industries like natural resources and mining (34.1 percent), construction (23.1 percent), and leisure and hospitality (18.3 percent).

Research Uses and Potential

The BED provides a wealth of research opportunities. The new publicly available data will no doubt be a useful tool for economists in several fields of labor market research. Previous articles have detailed these areas (e.g., Davis and Haltiwanger, 1998), so I focus here on some recent studies and future research avenues using the BED microdata.

The works of Dunne, Roberts, and Samuelson (1989a,b) and others have shown the value of establishment microdata for understanding firm dynamics. With its longitudinal nature and its quarterly frequency, the BED data provide excellent opportunities to further this understanding. As an example, Spletzer (2000) uses the data to explore the contribution of establishment births and deaths to job reallocation. The BED has data usable for measuring establishment age and wages. The initial date of an establishment's UI liability is a suitable proxy for establishment age and allows a detailed study of firm life-cycle dynamics.[5] Data on quarterly payrolls allow (when divided by employment) one to estimate wages and track their growth and profiles within establishments as they age.

The BED microdata can also allow a better understanding of labor demand and the business cycle. Davis and Haltiwanger (1990, 1992) and Davis, Haltiwanger, and

[5] For an example, see Faberman (2003).

Schuh (1996) document the cyclical patterns of manufacturing job flows with the Census Bureau's LRD. The BED's coverage of the entire private sector allows a much broader understanding of the relation between job flows and the business cycle, but its relatively short time frame (11 years) limits its usefulness in studying job flows over several business cycles. In a recent study (Faberman, 2004), I estimate job flows using establishment data from 1990-92 and an algorithm that deals with linkage issues. Figure 1, which shows the main result of this study, illustrates that job flow patterns, particularly for job creation, were quite different during the last two recessions (boxed areas) and subsequent recovery periods.

Figure 2 and Table 1 highlight the differences between the distributions of net employment growth rates for establishments at difference points in the business cycle. The fourth quarter of 1999 is the most recent peak of job creation and the third quarter of 2001 is the most recent peak of job destruction. The private sector gained 1.10 million jobs in the former period and lost 1.38 million jobs in the latter period. The growth rates use the average of the previous and current quarters' employment in the denominator, which produces a symmetric growth rate between -2 and 2.[6] The extreme points represent closings and openings, respectively. Distributions are weighted by the average employment measure.

The exercise highlights two key features of establishment dynamics. First, there is vast heterogeneity in establishment behavior, regardless of whether the economy is at the height of an expansion or the heart of a recession. Figure 2 shows that, although most employment changes are relatively small (half of establishments in either period change

[6] The growth rates are based on seasonally adjusted employment, using factors estimated at the three-digit NAICS industry level.

employment less than 7 percent) the growth distribution in both periods spans a wide range. Relative to this wide range, differences in the distribution over the two quarters are subtle. Second, the distribution shifts in response to an aggregate shock. While the distribution differences in Figure 2 appear subtle, the growth rates in Table 1 for 2001 are more skewed to the left. The recession period also has a greater density of establishments without employment changes. The skewness is not a lateral shift left of the distribution. The growth distribution in late 1999 has a higher variance, mostly through a greater density of higher-growth establishments. Growth rates of the bottom 25 percent of each period's distribution (which contract employment 5 percent or more) are remarkably similar. These findings imply that the primary differences between the fourth quarter of 1999 and the third quarter of 2001 are the latter's a) greater density of establishments with small employment contractions, b) greater density of establishments with no employment change, and c) smaller density of establishments with growth rates of 5 percent or more.

Finally, the industry (4-digit SIC and 6-digit NAICS) and geographic (county-level) detail of the BED data allow analyses that can integrate the existing research on business cycles and firm dynamics with research in other fields. For example, Eberts and Montgomery (1995) use a variety of establishment data sources to study geographic variations in job flows. I use BED data in a recent paper (Faberman, 2003) to study these geographic variations at a richer detail with an analysis of both job flows and establishment life-cycle dynamics. Foote (1998) and others have illustrated the need to study job flows outside of manufacturing. Consequently, the BED can greatly aid

research on industrial organization and related fields with its broad, detailed industrial scope.

Data Limitations

The BED is a major improvement over existing establishment surveys, but it is not without its limitations. While it is an excellent research tool for studying the cyclical behavior of the labor market, the eight-month lag in the release of its latest data does not allow it to be a timely economic indicator. Its quarterly frequency also makes comparisons to monthly surveys (such as the CES or JOLTS) somewhat difficult. Also, while the data are excellent for researching labor demand, they do not include information on other establishment characteristics, such as sales, capital investments, and other input usages.

The primary concern for researchers, however, is the quality of longitudinal linkages for continuous establishments. Sample surveys usually keep track of continuous establishments through a unique identifier. The BED data come from state UI programs, and as such, the primary establishment identifier is the UI account number. Unfortunately, this number can change for a variety of administrative reasons, which can lead to spurious overstatements of openings and closings. The BLS has several methodologies in place to deal with this issue, and other checks (e.g., using detailed industry, location, and other characteristics in matching) are possible, but linkage quality is a concern for any potential researcher using BED data.

The Job Openings and Labor Turnover Survey

Data Description

The JOLTS program publishes monthly statistics on job openings, hires, and separations for all nonfarm establishments. The program also reports separations broken out into quits, layoffs and discharges, and other separations (e.g., retirements). The data start in December 2000 and are updated monthly, with the latest statistics available for April 2004.[7] The time series is notably short, and the data and seasonal adjustment are still evolving. The data are available nationally and for four major regions by 2-digit NAICS sector. Worker flows and job openings are reported in levels and as rates, which are percentages of employment.

The JOLTS data are a sample of roughly 16,000 establishments surveyed each month. The survey is made up of overlapping panels that remain in the sample for 18 months. The sample is designed to be compatible with the CES survey. As such, its employment statistics (which are not available publicly) are benchmarked to the CES estimates. The survey asks establishments to list their employment during the pay period that includes the 12th of the month, its hires and separations between the first and end of the month, and the number of vacancies it has at the end of the month. Respondents are also asked to categorize separations into quits, layoffs and discharges, or other separations. There are three different reference periods for the data collected. The employment reference period is standard for all BLS surveys and allows the data to be benchmarked to the CES estimates. The reference period for hires, separations, and vacancies are chosen to maximize reporting accuracy. The survey also has each respondent's state and industry codes, plus an identifier that allows a match to the same establishment's record in the QCEW data.

[7] Currently, only certain statistics are available seasonally adjusted, since the current time series is too short to allow a complete seasonal adjustment of the data.

The definitions of hires, separations, and vacancies pertain to specific occurrences to avoid confusion in reporting. Hires include new hires, re-hires, seasonal and short-term hires, recalls after a layoff, and transfers from other worksites. Separations include quits, layoffs lasting more than 7 days, firings and other discharges, terminations of short-term and seasonal workers, retirements, and transfers to other worksites. These definitions can create discrepancies with the employment estimates in other series, particularly because of individuals considered employed but not working. I discuss them in detail below. Vacancies are all unfilled, posted positions available on the last day of the month. The vacancy must be for a specific position that could start within 30 days, and an active recruiting process must be underway for the position. Clark and Hyson (2001) provide comprehensive information on the data, its definitions, and its uses.

Public Statistics

The JOLTS data provide new evidence on job openings and worker turnover. As the series continues, it will add to the findings of previous research in this area, building on the work of Abraham (1987), Blanchard and Diamond (1989, 1990), Burgess, Lane, and Stevens (2000), and Shimer (2004), among others. In addition to estimates of hires and separations, the JOLTS statistics have two characteristics that make them particularly attractive for studying employment dynamics. The first is its reporting of job openings, or vacancies, which are reported directly by the survey establishments. When used with the unemployment statistics from the Current Population Survey (CPS), the vacancy data allow a monthly tracking of the Beveridge Curve, which plots the co-movement of the two statistics. Theory predicts that vacancies and unemployment should have an inverse cyclical relation—e.g., periods of higher unemployment are also times with fewer

vacancies. Figure 3 shows that the JOLTS data are consistent with this notion over their survey period. The figure plots the vacancy rate (defined as vacancies divided by the sum of employment and vacancies) versus the CPS unemployment rate. The solid line represents the quadratic trend of the monthly vacancy-unemployment relation from December 2000 through April 2004. The dotted line charts the path of the vacancy-unemployment relation. Vacancies fall as unemployment rises, leading to a movement downward along the trend line. This pattern continues until mid-2003, when the unemployment rate reaches a peak of 6.3 percent and the vacancy rate reaches a trough of 2.0 percent. At this point, the relation "loops" around and moves back up along the trend line. These movements are consistent with the short- and medium-run movements along the Beveridge Curve described by Blanchard and Diamond (1989).

With JOLTS worker turnover, separations are grouped into one of three classes: quits, layoffs and discharges, and other separations. Distinction between the first two categories is particularly important since the former is believed to be procyclical while the latter is believed to be countercyclical. The JOLTS statistics in Figure 4 are consistent with these expectations. The figure illustrates seasonally adjusted and filtered (using a 3-month centered moving average) estimates of quits and all other separations (including layoffs, discharges, and other separations).[8] The NBER recession period is outlined. The estimates show that quits indeed follow a procyclical pattern, decreasing through the recession, and then increasing (parallel with employment growth) in the fall of 2003. Layoffs, discharges, and other separations exhibit the expected countercyclical

[8] The series of layoffs and discharges and other separations are not able to be seasonally adjusted. The estimates in Figure 4 represent an aggregate measure of these two series derived from subtracting the seasonally adjusted quits from the seasonally adjusted total separations.

pattern, reaching a peak at the height of the recession in late 2001 and gradually declining throughout the second half of 2003 and early 2004.

Table 2 presents the monthly averages of worker flow and vacancy rates. The rate is each flow's share of monthly employment. For vacancies, the rate is the vacancies' share of combined employment and vacancies. The averages use the seasonally unadjusted data for December 2000 through April 2004. I do not list "Other Separations" separately, but they are included in "Total Separations". Separations other than quits, layoff, or discharges make up about 0.2 percent of employment, on average, with little variation across industries or regions. The top row of Table 2 lists the averages for all nonfarm establishments. The vacancy rate averages 2.4 percent and the hires and separations rates each average 3.2 percent. Interestingly enough, the majority of separations, 54 percent, are quits.

As one may expect, vacancy and turnover rates vary by industry. Worker flow rates are highest in seasonal sectors, such as construction and leisure and hospitality, and low in other sectors, such as manufacturing and government. Note that high turnover industry sectors are not necessarily the ones with the highest vacancy rates. Instead, sectors that expand over this period, such as professional and business services, and education and health services, have the highest vacancy rates. Education and health has the highest vacancy rate despite also having one of the lowest rates of worker turnover. Manufacturing, which underwent a large employment decline over this period, has the lowest vacancy rate. Unlike most other sectors, the majority of manufacturing separations are layoffs and discharges. These patterns may be consistent with a pattern of sectoral reallocation, like that described by Groshen and Potter (2003). The construction

industry (which had relatively minor losses over the period) exhibits similar vacancy and separation patterns, however, suggesting that the patterns may instead be consistent with sectoral differences in job posting and staffing practices.

To a lesser extent, vacancy and worker flow rates vary by region. In general, the South and West, which have relatively high employment growth, have higher rates of vacancies, hires, and separations. Higher separation rates in these two regions occur primarily though higher quit rates. Though further research is needed on the subject, a positive correlation between regional growth and worker turnover would be consistent with Eberts and Montgomery (1995), Schuh and Triest (2002), and Faberman (2003), who find a similar across-area relation between job reallocation and growth.

Research Uses and Potential

Given its status as relatively new and developmental data with a short time series, there is little existing research using JOLTS.[9] As JOLTS becomes more developed, its value as a resource for labor market research will increase, for both its aggregate statistics and its microdata. The data can aid research in three areas, the first of which deals with its information on vacancies. Using the data, researchers can build on earlier works, such as Abraham (1987) and Blanchard and Diamond (1989, 1990) that studied vacancies and their relation to unemployment using estimates from the Help Wanted Index. The JOLTS vacancy data has several advantages over the Help Wanted Index in the sense that it is data reported directly by firms, rather than an aggregate index of job postings across selected newspapers. The two series, however, have so far shown similar patterns since

[9] An exception is Shimer (2004). The JOLTS data have also become popular with the press and various industry and policy groups.

the inception of JOLTS. With JOLTS, there is the added advantage that vacancies are collected at the establishment level, so one can study their micro-level behavior.[10]

The data also aid research on worker turnover. Data on hires and separations are national and have both regional and industrial detail. This will allow future work to expand on the studies of Anderson and Meyer (1994) and Burgess, Lane, and Stevens (2000), whose studies on worker turnover focus on only a handful of states. Since vacancy, employment, and turnover data are reported for each establishment, researchers can better study firm behavior within the framework of search models and the business cycle (e.g., Mortensen and Pissarides, 1995; Andolfatto, 1996), and gain a better understanding of worker turnover within firms in general. Research on the relation between worker flows and firm behavior relates naturally to research on the relation between worker turnover and job reallocation. Figure 5 shows quarterly rates of hires, separations, job creation, and job destruction for private employment from the JOLTS and BED. By definition, job flows are less than worker flows, since the former do not measure within-establishment employment changes. The flows show similar, though not identical, patterns over the sample period.[11] Both hires and job creation decline during the NBER recession period (outlined by the dotted box), and continue to gradually decline afterwards. Separations and job destruction follow similar patterns, though the latter has a more pronounced increase during the recession. Note that the difference between JOLTS hires and separations does not provide a precise measure of the net

[10] Holzer (1994) has one such study using a detailed survey of several thousand firms.
[11] Given definitional differences between the two series, namely that an individual can move into and out of employment (as measured by the administrative data) without a hire or separation, and that worker flows cover the entire quarter while job flows cover only a net change between the third months, one should expect the two series to differ somewhat.

change in employment. This is due to definitional and measurement issues, described below.

Finally, the JOLTS data differentiate between quits and layoffs. This is particularly important for macroeconomic analyses of worker turnover, since quits tend to be procyclical, while layoffs tend to be countercyclical. Models such as those in Akerlof, Rose and Yellen (1988) and McLaughlin (1991) highlight the importance of this distinction. For this line of research, the JOLTS data have an advantage over other data sources that may have a larger sample size but cannot disaggregate separations by type (e.g., UI wage record data).

Data Limitations

As a relatively small and relatively new survey, the JOLTS data have several limitations. As the survey evolves, many of these limitations will be mitigated. Most notably, the lengthening of JOLTS series with the passage of time will greatly increase its usefulness in understanding the cyclical behavior of vacancies and worker turnover, although the data to date already display some interesting patterns. Some limitations, such as the relatively small sample size (16,000 establishments), are simply characteristics of the data. While the sample is representative and has a broad range of industrial and regional detail, a finer analysis of the microdata would face issues with precision. The survey does not have data on wages or other establishment characteristics, though the possibility exists for linking JOLTS data to other microdata sources (such as the BED) to obtain this information.

A significant concern for JOLTS is the measurement of hires and separations. The BLS is continuously researching its estimation of these statistics with a goal of both

understanding and improving their measurement. One of the chief findings of this research is that the measurement of hires and separations is not as simple as theory would dictate. In the general sense, one would expect to measure a hire when an individual moves from either non-employment or a previous job to a new job and measure a separation when an individual leaves a job. Complicating matters, however, is that employed workers exist empirically in one of *two* states: employed and working, or employed but not working. Workers can fall into the latter category for a variety of reasons, though the most common examples are educators on summer break and temporary help workers retained but not assigned to a particular job (i.e., "on call"). Another example is a temporary layoff with the full expectation of recall, which is most prevalent in manufacturing and construction. Other complications also exist—for instance, hires may occur months prior to the start of work.[12] These nuances make measuring hires and separations more difficult to measure than employment. In other BLS employment surveys, individuals are counted as employed only if they are employed and working, making the measurement into and out of "employment" relatively straightforward.

The JOLTS data have precise definitions for hires and separations; these definitions permit individuals to be employed but not working without incurring a hire or separation. Thus, there is a more complex pattern, empirically, of worker flows into and out of job matches that the JOLTS data must deal with. The pattern is depicted in Figure 6. Next to each flow, I note the relative difficulty of its measurement, based on the analysis of JOLTS program staff. As one might expect, the easiest flows to measure are

[12] The JOLTS defines a hire when the work is actually started, and asks respondents to not to count a hire until that time.

those where an employed and working individual is either hired or separated. Flows that deal with employed individuals not currently working are where measurement difficulties arise, with the greatest difficulties occurring where an individual separates from a job match during a period of non-work. One can arguably compare difficulties differentiating between employed non-workers and separations to those incurred when trying to identify an individual as either unemployed or not in the labor force. This measurement issue can be exacerbated by individuals who are hired to employment and work, only to transition to employment without work and incur a separation from that state (with all but the separation reported in the data). This is not uncommon in the temporary help industry, which has high transition rates of job matches and employees into and out of work. The JOLTS program is constantly researching these issues, and has taken steps (such as the creation of separate survey forms for schools and temporary help firms) to improve data measurement.

Research by JOLTS staff (Wohlford et al., 2003) finds that separations are disproportionately harder to measure, creating an asymmetry between the measurement issues of hires and separations. This asymmetry in turn limits the ability of JOLTS to precisely measure the aggregate net change in employment. As one might expect, if one were to calculate the cumulative difference between hires and separations over the JOLTS sample period it would overstate employment growth (relative to CES or BED estimates). Further research on these measurement issues is obviously important to improve data quality over time, however, it can also prove useful in understanding how job matches are created, maintained, and severed. In particular, this research can further the understanding of worker-job matching in segments of the labor market (e.g., the

temporary help industry) where non-traditional labor arrangements occur. As these segments grow in importance, so too will the need to understand their empirical patterns.

Other Establishment Surveys

The BLS has several other establishment surveys, not specifically designed for measuring employment turnover. Nevertheless, their microdata provides several unique resources for studying employment and firm dynamics. This section provides information on the microdata and their characteristics for several BLS surveys, with a focus on the Current Employment Statistics survey (also known as the 790 series, or simply the payroll survey).

Current Employment Statistics

The CES survey is the BLS's primary source of employment estimates. Along with the unemployment rate from the CPS, it makes up the Bureau's monthly employment situation report. The survey has data on 400,000 establishments representing approximately 160,000 firms. Firms represent all nonfarm industries and government. The survey consists of a virtual census of the largest firms and a probability sample of smaller firms.[13] Firms are in the sample for at least two years, allowing a limited longitudinal analysis with the microdata. The data contain information on each establishment's industry and location. In addition, since the CES estimates are benchmarked to the QCEW data, identifiers exist to match an establishment's CES record to its BED data (which are derived from the QCEW). The data are among the most timely in the BLS, with preliminary estimates for a given month available by the first

[13] The probability sample is a relatively new feature of the CES. Prior to June 2003, much of the data were based on quota sampling techniques.

week of the following month. Official estimates are available within three months, with a final estimate (based on a benchmark to the QCEW data) available within a year.

The primary economic variables in the CES are employment, hours, and earnings. The data include both total employment and the number of production or non-supervisory workers for each establishment. Hours and earnings are available for the latter group only. Hours include both regular and overtime hours. The program has a methodology to estimate earnings as both hourly and weekly averages.

The most promising feature of the CES data, for research on employment dynamics, is the potential to create monthly, timely estimates of job creation and job destruction. Researchers could use the CES employment data to create job flow estimates that are comparable to the published employment estimates. Since the CES is a sample, it would require more sophisticated estimation methods than the BED. Methodologies already in place for employment estimation, which include the tracking of employment at continuing establishments and a model to impute the net effects of establishment births and deaths, would facilitate the development of these methods. Data on hours provide an opportunity to measure employment dynamics along the intensive margin in addition to the extensive margin. The CES program already estimates aggregate indexes of weekly hours worked. The available microdata would allow one to decomposing these hours by type of employment change (e.g., establishments expanding vs. contracting employment, or establishments expanding vs. contracting total hours.) Finally, the monthly availability of earnings and the ability to estimate them both weekly

and hourly allow a richer joint analysis of wage and employment dynamics and than either the JOLTS or BED.[14]

Occupational Employment Statistics

The second data source of note is the microdata for the Occupational Employment Statistics (OES) program. This program has data on a sample of 1.2 million establishments rotated over a three-year span, with a panel of 200,000 establishments surveyed every six months. The data are available semi-annually (for May and November of each year). OES began using the 2000 Standard Occupational Classification system with estimates for 1999, and the NAICS industry codes with estimates for 2002. With these and other changes that have been implemented over time, OES is currently viewed as providing a cross-sectional picture rather than as a source of time-series information. The detailed industry, location, and occupational data, however, allow an unusually rich analysis. In addition, for each detailed occupation within each establishment there is data on the number employed as well as the distribution of earnings across broad categories. These data are, in effect, within-establishment, within-occupation employment counts and wage distributions. Data such as this can greatly aid the understanding of employment and wage structures both across and within firms.

Mass Layoff Statistics

The third data source is the Mass Layoff Statistics program. These data are a select sample that includes all establishments who incur a layoff of at least 50 workers in a five-week period. All establishments of 50 or more workers fall within the scope of the program, although information is obtained about the events and not the establishments.

[14] While the BED has monthly data on employment, it only has an aggregate measure of an establishment's total quarterly payroll, complicating a higher-frequency analysis of wage and employment dynamics.

The data are more likely to capture layoffs in manufacturing, since establishments in this industry are larger and more likely to meet the criteria for inclusion than those in other industries.[15] Nevertheless, for the establishments that are included, the survey provides a wealth of information on the size and causes of these large layoffs, providing insight on issues such as plant closure, plant relocation, and worker displacement. The data can also be matched to the BED records, allowing the creation of a longitudinal history for an establishment that undergoes a mass layoff.

Accessing the Data

While surveys such as the BED and JOLTS provide a wealth of new aggregate data on employment dynamics, the future of research in this area lies in accessing the confidential microdata described throughout this discussion. The BLS has opportunities available for researchers form colleges and universities, government, and eligible nonprofit organizations to access this data exclusively for statistical research. The program also allows graduate and undergraduate students to apply for data access. All data work is undertaken at the BLS National Office in Washington, DC, with various controls to protect the data from disclosure.

Potential users of the data submit formal, written proposals to access the data. The proposals are reviewed on a case-by-case basis to determine whether they have technical merit, whether they are of significant interest to the BLS, and whether they further the BLS mission of providing objective economic and social research. The proposals include detailed information on the research agenda and the expected output produced. Once proposals are accepted, the BLS provides researchers with adequate

[15] In another paper (Faberman, 2003), I find that the average manufacturing establishment has 57 workers, while the average size for all private sector establishments (including manufacturing) is 19 workers.

computing resources to perform their work, and staff are available to answer questions about individual data sources. No confidential data can be removed from the building. Once research is completed, it is subject to a final BLS review to ensure that no confidentiality rules have been breached.

Several research projects have already been undertaken with the BED/QCEW data (notably Card and Kruger, 2000), and several more are approved for the near future. The BLS welcomes data access by the research community, as it will only help to further our understanding of employment and establishment dynamics, and the labor market in general.

Conclusion

The BLS has several sources of establishment microdata well suited for the study of establishment and employment dynamics. Its two newest programs, the BED and JOLTS, provide a wealth of labor market information at both the aggregate and micro levels. The BED data provide information on job flows and establishment dynamics with a scope that far exceeds earlier data sources. As a virtual census of establishments, it allows research by detailed location, industry, and other characteristics that would not be statistically feasible with smaller data samples. The longitudinal nature of the data allows studies of establishment behavior over business cycles and firm life-cycles. Data available for establishment age and wages further enhance these analyses.

The JOLTS data have a relatively short time series and are still evolving, yet their aggregate statistics have already shed new light on the behavior of vacancies and worker turnover over the business cycle. The data are the most comprehensive data source for vacancies, which further the understanding and measurement of the Beveridge Curve.

The data are also the broadest ranging measure of worker turnover. Aggregate estimates of its hires and separations aid in policy and give a better understanding of labor dynamics over the business cycle, while micro-level estimates provide insight into the relation between worker turnover and firm behavior. The data are also unique in its distinction between quits, layoffs, and other types of separations. This distinction has important macroeconomic implications, since quits tend to be procyclical and layoffs tend to be countercyclical. The JOLTS staff continues to work to better understand and measure worker turnover, but even these issues are providing insight into both the measurement of worker turnover and the behavior of workers and firms, particularly within newer and less traditional labor arrangements.

Other establishment surveys also have the potential to further the understanding of employment and establishment dynamics. Timely, monthly estimates of job flows are feasible with the Current Employment Statistics survey. The CES can also allow a joint microanalysis of employment, hours, and earnings dynamics. The Occupational Employment Statistics provide valuable data on the intrafirm occupational and wage structures. The Mass Layoff Statistics survey provides detailed information on the causes and occurrences of large worker displacement events, making it an important resource for understanding the dynamics of firm closure and firm restructuring. Finally, the development of a national wage records program, with longitudinal histories, of workers, firms, and their interactions will provide an even more complete picture of labor market dynamics.

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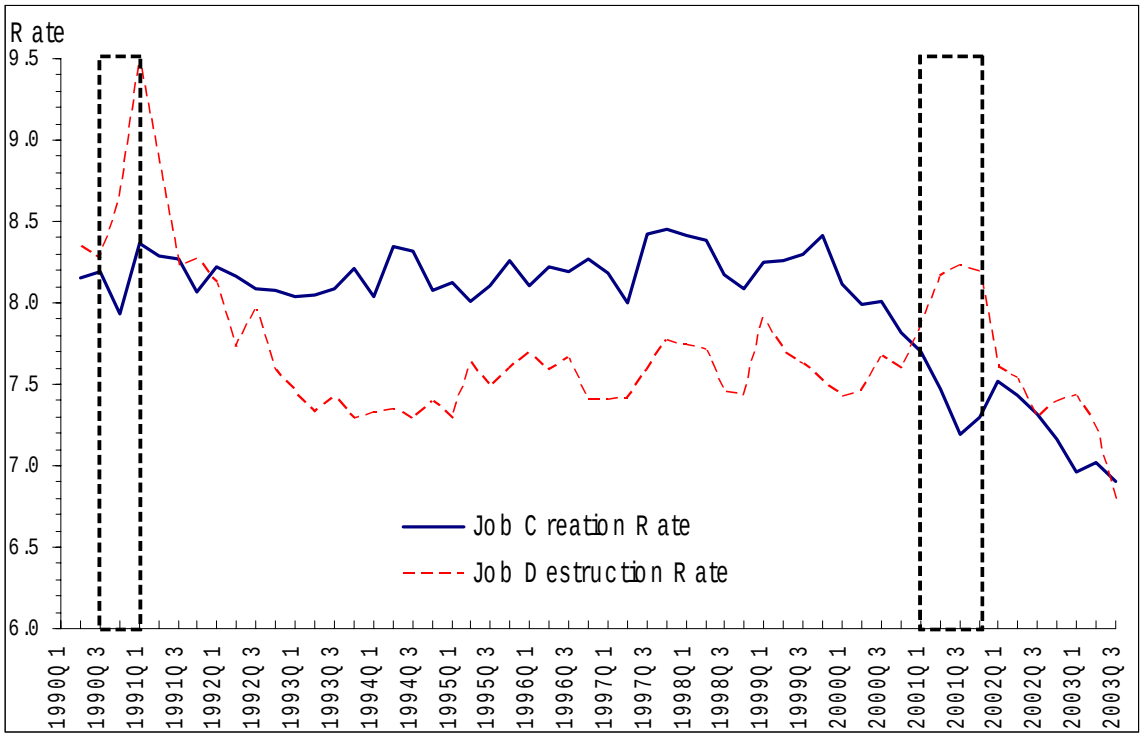
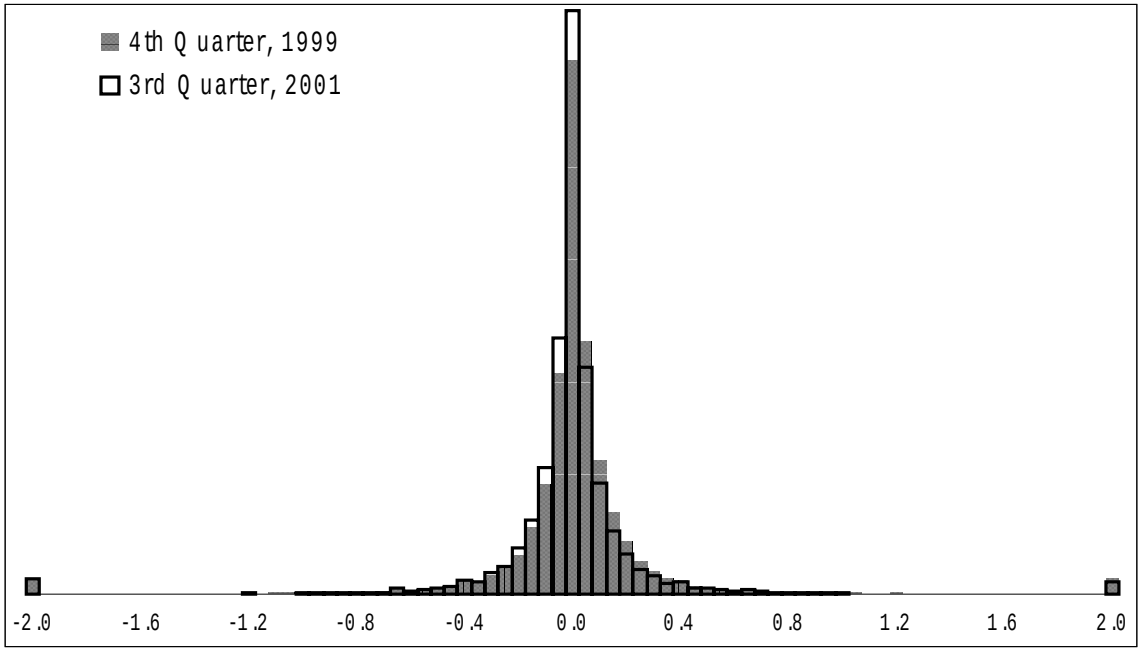
Figure 1.
Job Flow Rates, Private Employment, 1990-2003



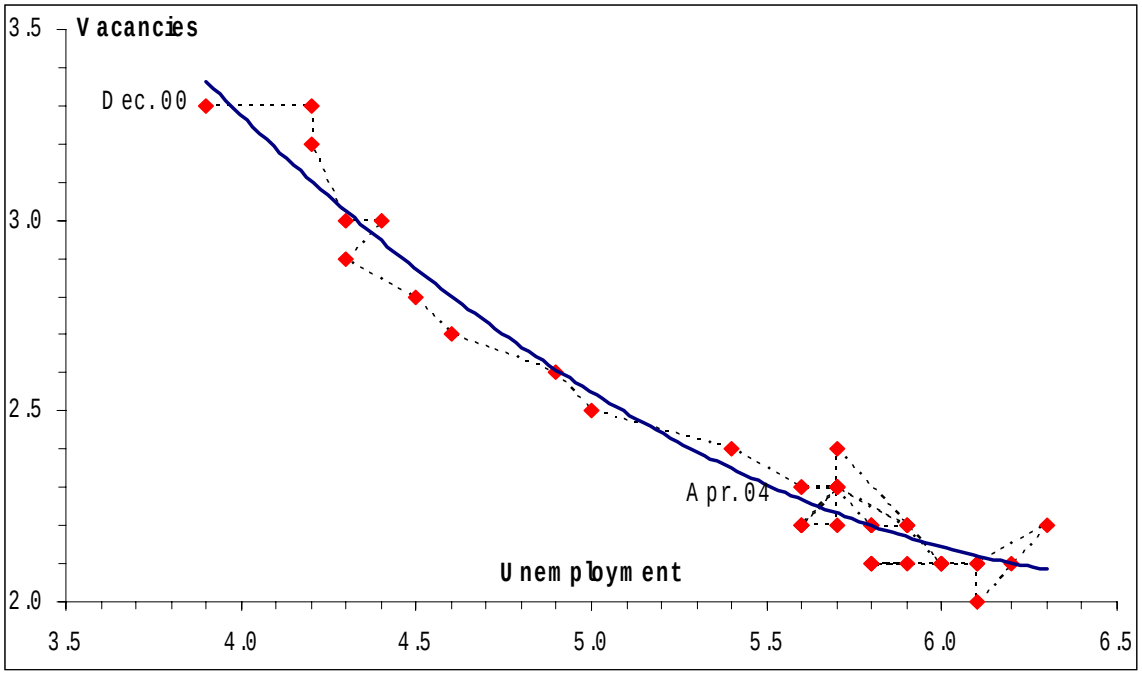
Source: Author's tabulations from Faberman (2004). Job flow rates are seasonally adjusted.

Figure 2.
Distribution Plot of Establishment Employment Growth Rates



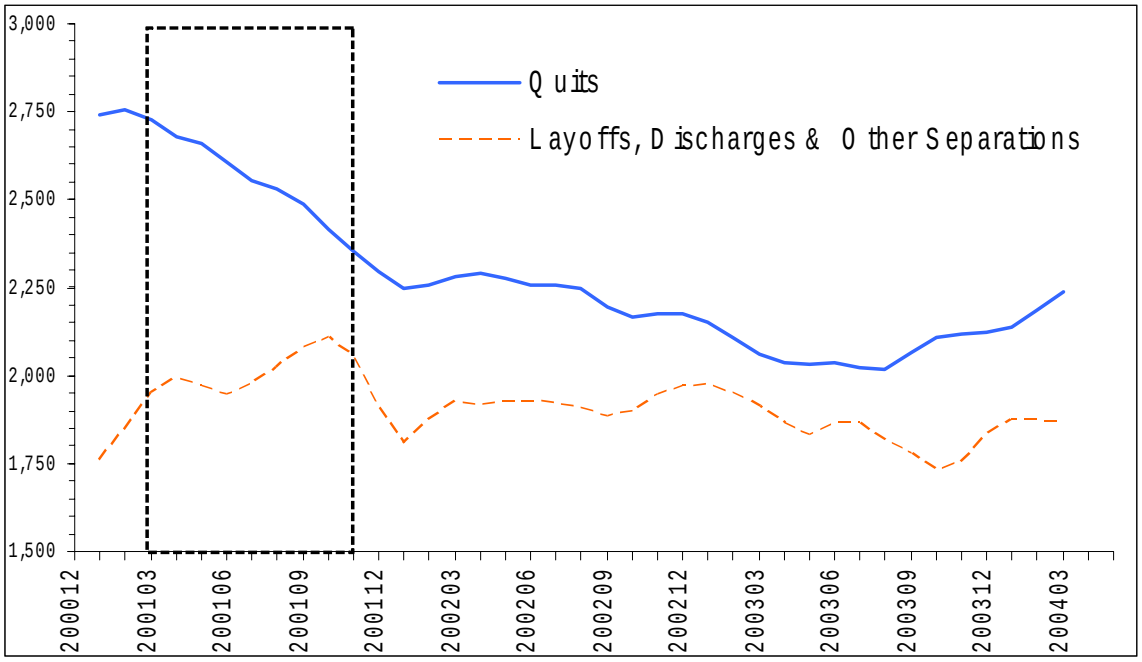
Source: Author's tabulations using BED data. Each histogram plots the frequency distribution of establishment growth rates, weighted by the average of the previous and current months' employment and seasonally adjusted using industry factors at the establishment level.

Figure 3.
The Beveridge Curve: Vacancy Rate vs. Unemployment Rate, Dec. 2000 – Apr. 2004



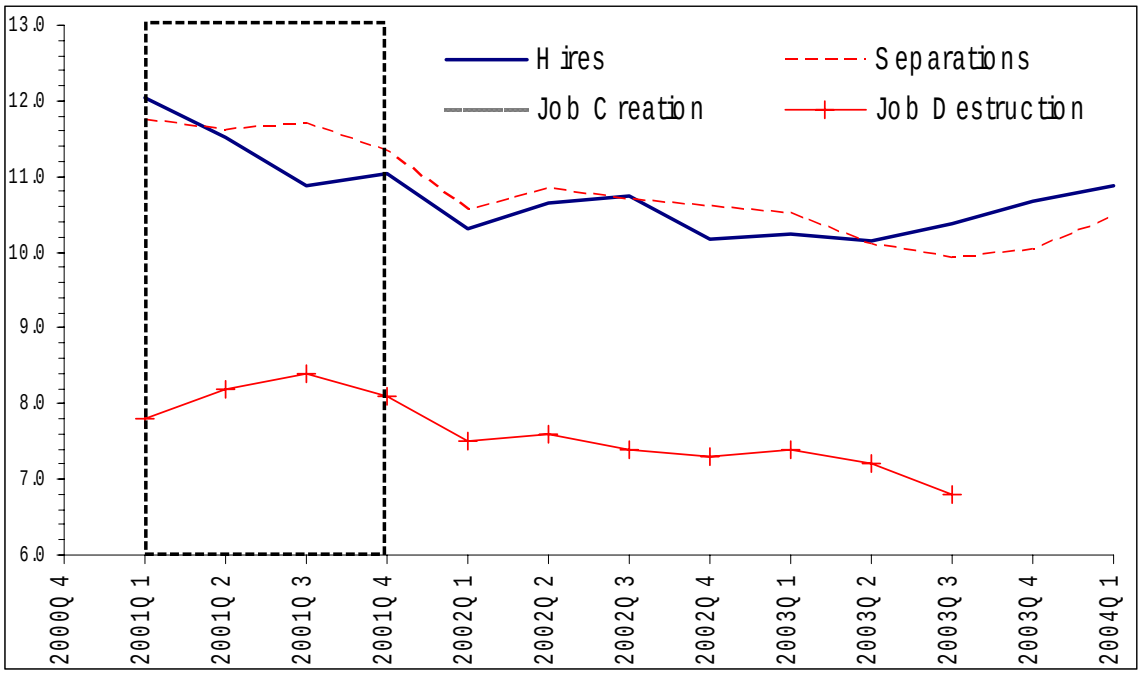
Source: Job opening rate from JOLTS, and the unemployment rate from the Current Population Survey. Both series are seasonally, adjusted. The dotted line represents the time-series path of the unemployment-vacancies relation, while the solid line represents the quadratic trend of the relation.

Figure 4.
Separations by Type, Dec. 2000 – Apr. 2004



Source: Separations data from JOLTS, seasonally adjusted. Each series is smoothed with a centered three-month moving average. Flow levels are in thousands of workers.

Figure 5.
Quarterly Worker and Job Flows, Private Employment, 2001 Q1 – 2004 Q1



Source: Data from BED (job flows), and JOLTS (hires and separations), seasonally adjusted. Rates are the share of the average of the current and previous months' employment for each quarter. Quarterly hires and separations are sums of their relevant monthly estimates.

Figure 6.
Measurement Issues with Worker Flows and Employment

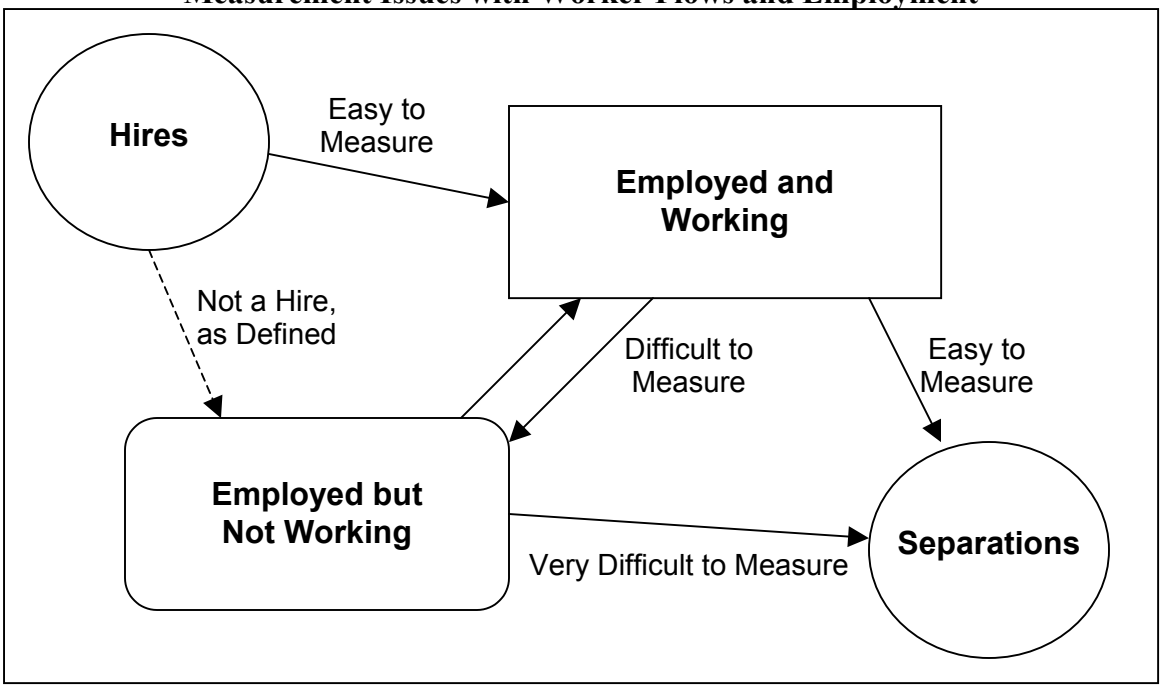


Table 1.
The Distribution of Establishment-Level Employment Growth

Fourth Quarter, 1999 Growth Rates by Percentile								
1st	**5th**	**10th**	**25th**	**50th**	**75th**	**90th**	**95th**	**99th**
-1.399	-0.304	-0.163	-0.049	0.003	0.069	0.195	0.334	1.353
Third Quarter, 2001 Growth Rates by Percentile								
1st	**5th**	**10th**	**25th**	**50th**	**75th**	**90th**	**95th**	**99th**
-1.258	-0.309	-0.177	-0.060	0.002	0.046	0.156	0.282	1.069

Distribution Statistics								
	1999:4	**2001:3**		**1999:4**	**2001:3**		**1999:4**	**2001:3**
Mean	0.009	-0.009	**Variance**	0.113	0.100	**Skewness**	-0.077	-0.204

Source: Author's tabulations with BED data. The table lists the percentile distribution and distributional statistics for establishment-level growth rates (employment-weighted and seasonally adjusted as noted in Figure 2).

Table 2.
Vacancy and Worker Flow Rates, Monthly Averages, December 2000 – April 2004

	Vacancies	*Hires*	*Total Separations*	*Quits*	*Layoffs & Discharges*
Total Nonfarm	2.4	3.2	3.2	1.7	1.2
	Major Industry				
Construction	1.6	5.6	5.8	2.1	3.5
Manufacturing	1.5	2.2	2.8	1.2	1.4
Trade, Transportation, Utilities	1.9	3.5	3.7	2.1	1.3
Information	2.0	2.0	2.4	1.3	0.9
Financial Activities	2.2	2.2	2.1	1.2	0.7
Prof. & Business Services	3.2	4.0	3.6	1.9	1.5
Education & Health	3.7	2.7	2.4	1.5	0.7
Leisure & Hospitality	3.2	6.3	6.1	4.0	1.9
Government	1.9	1.5	1.2	0.6	0.4
	Region				
Northeast	2.3	2.7	2.8	1.4	1.2
Midwest	2.2	3.1	3.1	1.7	1.2
South	2.5	3.4	3.3	1.9	1.2
West	2.4	3.3	3.3	1.8	1.3

Source: Author's tabulations of JOLTS data. Rates are shares of monthly employment.