

## Using Worker Flows to Measure Firm Dynamics

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**Abstract**

This paper uses a novel approach to measure firm entry and exit, mergers and acquisition. It uses information about the flows of clusters of workers across business units to identify longitudinal linkage relationships in longitudinal business data. These longitudinal relationships may be the result of either administrative or economic changes and we explore both types of newly identified longitudinal relationships. In particular, we develop a set of criteria based on worker flows to identify changes in firm relationships – such as mergers and acquisitions, administrative identifier changes and outsourcing. We demonstrate how this new data infrastructure and this cluster flow methodology can be used to better differentiate true firm entry/exit and simple changes in administrative identifiers. We explore the role of outsourcing in a variety of ways but in particular the outsourcing of workers to the temporary help industry. While the primary focus is on developing the data infrastructure and the methodology to identify and interpret these clustered flows of workers, we conclude the paper with an analysis of the impact of these changes on the earnings of workers.

**Keywords:** Successor/Predecessor Firms; Matched employer/employee data; Worker Flows

## **Introduction**

Economists recognize that resource allocation and reallocation is fundamental to the process of wealth creation. And since the basic building-block of such reallocation is the firm, accurately tracking firm dynamics is critical to understanding the process. Recent empirical analysis of firm-level micro data has confirmed this. The U.S. economy is characterized by substantial turbulence - firms incessantly enter and exit, merge, acquire other firms, and reallocate workers – and this turbulence significantly affects productivity and economic growth. Yet that same empirical analysis has also identified serious measurement challenges to those in the datasets that are used to measure and analyze these important events.

These measurement challenges are a consequence of both the data collection approach used by statistical agencies *and* the ubiquitous restructuring process of the population of firms. The standard approach to measuring firm demographics is to collect either administrative or survey data on establishments and firms and in turn to longitudinally link these business entities with establishment and firm identifiers. It has long been recognized that the use of administrative data to capture firm entry, exit and merger/acquisition, while providing excellent coverage and consistency, does pose important technical challenges to the accurate measurement of firm transitions. Because administrative identifiers are typically used to identify firms, spurious transitions may result from administrative, rather than economic changes. While many agencies use surveys to complement administrative business frames, these surveys are not only difficult to design and implement but statistical agencies are rightly concerned about the burden on respondents.

Underlying both the administrative and economic changes are rich firm dynamics

as firms are constantly reinventing themselves through the entry and exit of establishments, the entry and exit of firms, mergers and acquisitions, outsourcing, changes in ownership, changes in legal form of organization and changes in the products and services produced by the establishments and the firms. As noted, administrative identifiers typically change along with these changes as they should but it is important to understand the source of the underlying change. For example, a firm that simply changes ownership or changes legal form of organization may have a change in administrative identifiers but no other change in economic activity so it is important to follow that link. Alternatively, a spin-off or outsourcing activity obviously involves an economic change but it is also important and useful to follow that link as well.

In this paper, we explore these administrative and economic changes using a novel approach that takes advantage of the development of new datasets that incorporate the interrelationship between workers and firms. These new datasets integrate employer and employee data so that both firms and workers and their relationships can be followed over time. In this paper we describe how these new datasets can use information about the flows of clusters of workers across business units to identify longitudinal linkage relationships in the longitudinal business data. These longitudinal relationships may be the result of either administrative or economic changes and we explore both types of newly identified longitudinal relationships. In particular, we develop a set of criteria based on worker flows to identify changes in firm relationships – such as mergers and acquisitions, administrative identifier changes and outsourcing. We demonstrate how this new data infrastructure and this cluster flow methodology can be used to better differentiate true firm entry/exit and simple changes in administrative identifiers. We

explore the role of outsourcing in a variety of ways but in particular the outsourcing of workers to the temporary help industry<sup>2</sup>. While the primary focus is on developing the data infrastructure and the methodology to identify and interpret these clustered flows of workers, we conclude the paper with an analysis of the impact of these changes on the earnings of workers. The ongoing restructuring of firms through all of these channels (e.g., outsourcing or changes in ownership, mergers and acquisitions) potentially impact workers earnings as these changes imply some change in the way that firms are organizing themselves and doing business.

The paper proceeds as follows. Section 2 provides some more background motivation. Section 3 provides an overview of the LEHD Program at Census and the data infrastructure at LEHD. Section 4 describes the data used for this particular study and an overview of the approach taken here. Section 5 presents results from this analysis of the flows of clusters of workers. Section 6 presents concluding remarks.

## **2. Background**

### *a) Tracking changes in firm ownership*

Accurately tracking firm mergers and acquisition activity is important for a number of reasons. First, such events represent a substantial restructuring of economic activity: the acquiring firm changes its size and scope; the acquired firm often loses its corporate identity. Second, they account for a substantial portion of the economy - in 1995, the value of mergers and acquisitions was equal to 5 percent of GDP, and was equivalent to 48 percent of nonresidential gross investment (Andrade et al., 2001). In addition, Jovanovic and Rousseau (2002) note that mergers play an important reallocation

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<sup>2</sup> The sense that outsourcing has been increasing has been noted by many scholars but the evidence and studies on this topic are slim. Exceptions include Abraham and Taylor (1996) and Autor (2000).

role – particularly for capital. Indeed, in particular sectors such as health care (Gaynor and Haas-Wilson, 1998) and finance (Hunter et. al, 2001) mergers and acquisitions are in many ways changing the very structure of the industry and of the types of services produced.

Similarly, although firm entry and exit occur at the fringes of the economy, an accumulation of evidence suggests that the importance of this activity in promoting economic change is disproportionately important. The reallocation of jobs from exiting firms to entering firms contributes positively to economic growth (Foster et al., 2002) – and successful entering businesses grow at a much faster pace than do existing firms. As one would expect, this has far reaching labor market affects - changes in the demand for unskilled workers are also disproportionately affected by the net entry of firms (Abowd et al 2004).

An extremely extensive analysis of the issues associated with identifying firm entry and exit simply using administrative data is provided by Acs and Armington (1998). The primary source of problems is that changes in firms' identities are difficult to track using simply changes in administrative identifiers. Although many of the problems are reduced by coupling an administrative records approach with a resource intensive Company Ownership Survey, they are not obviated.

The notion of using employer/employee data to identify the relationships across firms is not a new one. Scandinavian and French statistical agencies have begun implementing such approaches (see Persson, 2002 for an example). In addition, an early U.S. demonstration was quite successful (Pivetz et al., 2000). And Spletzer (1998) found that

the accurate measurement of the links between firms is important both for series that estimate firm entry and exit data and for series that estimate job creation and destruction.

Both the U.S. Census Bureau and the Bureau of Labor Statistics have developed longitudinal business databases which rely on the links across firms (Faberman (2001), Clayton et al. (2003), Jarmin and Miranda (2002)). These data series are of more than esoteric interest: they can help academic researchers and policy makers understand the driving forces of economic activity (see Dunne et al. (1998 and 1999) and Davis, Haltiwanger and Schuh (1996)).

*b) Tracking changes in firm functions via outsourcing*

Firms also reallocate economic functions to other businesses in less obvious ways than completely changing their identities in the fashion described above. One way in which this is done is to outsource peripheral functions to other firms. However, despite the interest of policy-makers in this phenomenon (Economic Report of the President, 2004), there is little empirical evidence. The most frequently used approach is to measure the growth in the temporary help services industry, and it is clear that there have been substantial changes in the nature of the employment relationship. In particular, employment in temporary help services grew five times as fast as overall non-farm employment between 1972 and 1997—an average annual growth rate of 11 percent (Autor, 2001 and Esteveo and Lach, 1999). By the 1990s this sector accounted for 20 percent of all employment growth.

The growth in the usage of these different forms of production is fairly pervasive. Houseman (1997) reports that the Upjohn Survey found that 27 percent of surveyed firms used on-call workers, 46 percent used agency temporaries, and 44 percent used contract

workers in 1995 – although this varies by size and industry. Firms use workers in alternative work arrangements for a variety of reasons: cost effectiveness, flexibility, and the ability to screen workers prior to hiring are the most widely cited factors.<sup>3</sup> However, the empirical evidence suggests that while there are many reasons for firms to use alternative work arrangements, firms' staffing needs—primarily short term—are the main source of demand for on-call workers and agency temporaries.

In any event, while the growth and pervasiveness of this phenomenon clearly represents an important change in the way in which production is taking place, most empirical evidence is based on worker-based surveys, such as the Contingent Worker Supplement to the Current Population Survey. With the exception of relatively small surveys, such as the Houseman survey<sup>4</sup> little is known about which businesses are outsourcing employment, and why this is occurring.

### **3. Using Integrated Employer-Employee Data to Identify Cluster of Workers**

#### *a) An overview of the dataset*

It has long been argued that in order to truly understand the relationship between firms and workers, it is necessary to have universe longitudinal data on firms, workers and the match between the two (Hamermesh 1999, Lane et al. 1998). The Longitudinal Employer Household Dynamics (LEHD) program at the Census Bureau has done just this. It brings the household and business data together at the micro level using state level wage record data to create a comprehensive and unique resource for new data products and analysis (Abowd et al., 2000). Briefly, the records that integrate the worker

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<sup>3</sup> Abraham, Katherine G. and Susan K. Taylor, "Firms' Use of Outside Contractors: Theory and Evidence" *Journal of Labor Economics*, 14:3, pp. 394-424.

<sup>4</sup> This nationally representative survey of employers, conducted by the Upjohn Institute for Employment Research, asked 550 private sector employers with five or more employees questions about their use of workers in alternative work arrangements.

and firm information at the Census Bureau are derived from state unemployment insurance wage records from (currently) 23 partner states covering some 70% of US employment. Each covered employer in each state files quarterly records for each individual in their employment, covering about 98% of employment in each state<sup>5</sup>.

These data have a number of key characteristics. They are both universal and longitudinal for firm and worker information, resulting in very large sample sizes. The data are extensive and current. For most states the data series begins in the early 1990's and are updated on a quarterly basis (six months after the transaction date). The rich state data are complemented by the extensive micro level data at the Census Bureau: data on firms, such as technology, capital investment and ownership and data on workers, such as date of birth, place of birth, race and sex.

There are also a number of drawbacks, which are extensively documented in Abowd et al 2002. Most important in this study is the fact that the filing unit is an administrative entity (identified by a state employer identification number – or SEIN), which, if a firm is a multiunit entity (about 30% of cases), may or may not correspond to a firm. However, we are able to directly investigate the consequences of this possibility by linking to the Census Business Register.

#### *b) Identifying clusters of workers*

A major advantage of the UI wage record data is that they permit the identification of the ways in which clusters of employees transition from one business unit to another. For flows of clusters of workers, we track workers from one SEIN (the predecessor) to another SEIN (the successor) over a small period of time. In order to

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<sup>5</sup> More information is available on <http://lehd.dsd.census.gov>

simplify the analysis and presentation of the data here, we make a few arbitrary rules to categorize the links in a meaningful way. We only look at SEINs with more than 5 employees so that the data is not dominated by very small firms where defining the movement of a cluster of workers is unclear. It is also important to determine how large the cluster of workers should be to be considered a “significant” movement. In the absence of theoretical guidance, we choose two thresholds: an absolute and a relative threshold.

Table 1 reports the relative frequency of the movements of worker clusters from one SEIN to another by size of worker cluster - as observed in all SEIN pairs for 18 of the states in our partnership for the period 1992 – 2001.<sup>6</sup> The total number of worker/firm job changes in these states over this time period was 2,668,127,897.

Number in cluster	Percent	Cumulative Percent
1	98.07%	98.07%
2	1.17%	99.24%
3	0.33%	99.57%
4	0.15%	99.72%
5	0.08%	99.80%
6	0.05%	99.85%
7	0.03%	99.88%
8	0.02%	99.90%
9	0.02%	99.92%
10	0.01%	99.93%
>10	0.07%	100.00%

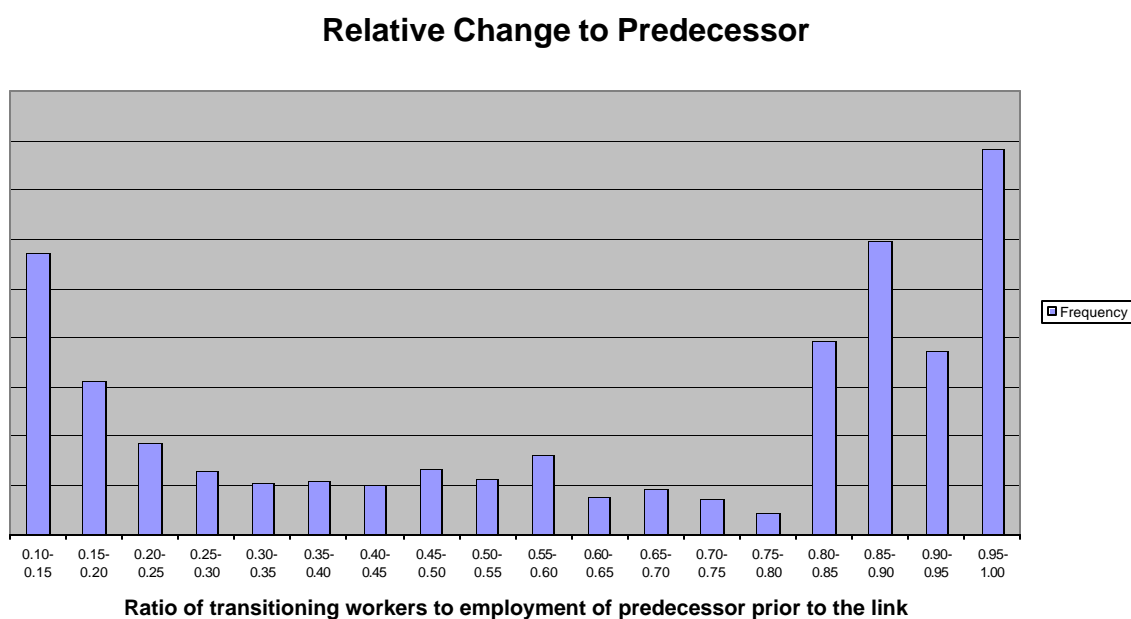
It is clear from Table 1 that the movement of clusters of workers that number 5 or more is quite rare – accounting for about .2% of all movements – but given the large number of

<sup>6</sup> CA, CO, FL, ID, IL, KS, MD, MN, MO, MT, NC, NJ, NM, OR, PA, TX, VA, and WV. Data for OK, IA, WA and WI have been received, but are not included in this analysis. Additional partner states include: DE, GA, KY, MI, and ND. This is an ongoing project and additional states are expected to join.

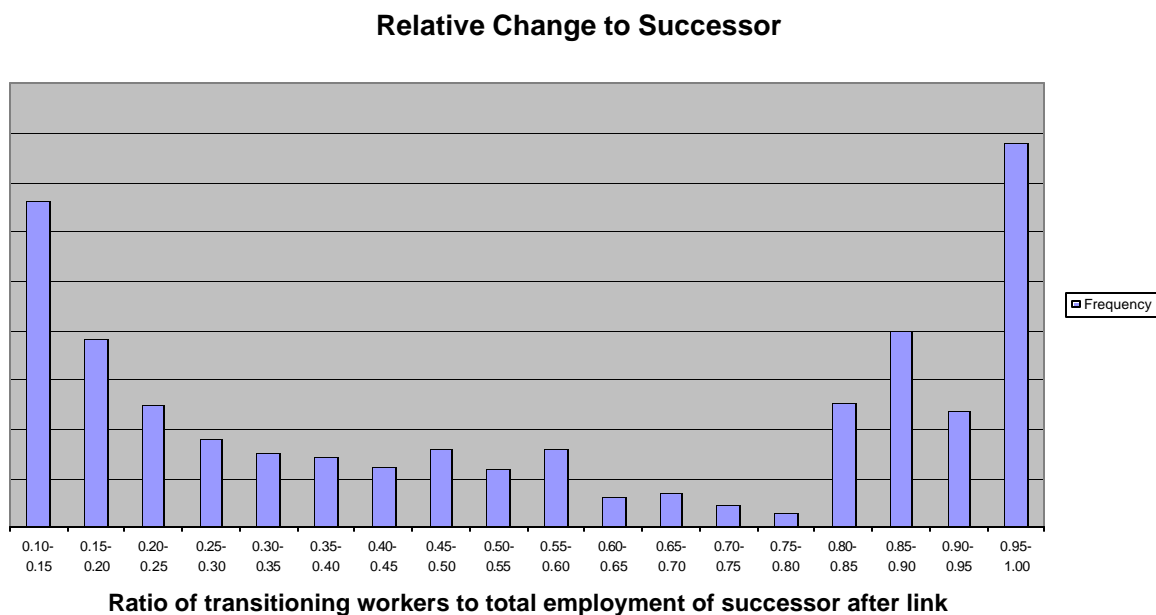
transitions and number of workers involved in the transitions, this constitutes a large number of workers. In what follows, we use five as our absolute threshold as we argue that the clustered movement of five or more workers reflects either some measurement problem, such as an id variable linkage issue or an important economic event.

The following charts show the distributions of the ratio of the number of transitioning workers to the total employment of the predecessor and successor respectively<sup>7</sup>. The frequency decreases as the ratio increases until 0.8 where there is a dramatic jump upwards – leading us to choose 80% as the relative threshold.

Figure 1



<sup>7</sup> The vast majority of the links have ratios under 0.1, so only those links with ratios over 0.1 are shown



We therefore identify four conditions (two based on the predecessor and two based on the successor) that will allow us to identify movement categories:

Condition 1: The predecessor exits (i.e., predecessor's employment becomes less than 5 in each of the two quarters after the transition), and the average employment at the predecessor over the course of those two quarters is less than 10% of the predecessor's employment prior to the transition.

Condition 2: 80% of the predecessor's current employees transition to the successor.

Condition 3: The successor is an entrant (i.e., the successor's employment is less than 5 in each of the two quarters prior to the transition), and the average employment at the successor over the course of those two quarters is less than 10% of the successor's employment after the transition.

Condition 4: 80% of the successor's employees after the transition came from the predecessor.

From these conditions, the following two variables are formed:

LINK\_UI = 1 if condition 1 and condition 2 are both true  
 = 2 if condition 1 is true but condition 2 is false  
 = 3 if condition 1 is false but condition 2 is true  
 = 4 if condition 1 and condition 2 are false

SUCC\_LINK\_UI = 1 if condition 3 and condition 4 are both true  
 = 2 if condition 3 is true but condition 4 is false

- = 3 if condition 3 is false but condition 4 is true
- = 4 if condition 3 and condition 4 are false

Three sets of conditions are of interest here – the identification of successor/predecessor relationships; the identification of merger/acquisition activity; and the identification of outsourcing – we leave other analyses to later research.

#### 4. Using Clusters of Workers to Identify Firm Dynamics

The focus of this paper is to investigate three dimensions of firm dynamics: firm entry/exit; mergers and acquisitions and outsourcing. Table 2 describes how the different combinations of links identified by the movements of clusters of workers can be interpreted<sup>8</sup>.

<b>Table 2: Possible Interpretations of Successor/Predecessor Flow Combinations</b>					
Link Description		SUCC_LINK_UI			
		1. 80% of Succ comes from Pred and Succ is entrant	2. Less than 80% of Succ comes from Pred and Succ is entrant	3. 80% of Succ comes from Pred and Succ was in existence	4. Less than 80% of Succ comes from Pred and Succ was in existence
LINK UI	1. 80% of Pred. Moves to Succ and Pred exits	ID change	Acquisition / Merger	ID change	Acquisition / Merger
	2. Less than 80% of Pred moves to Succ and Pred exits	Spin-off / Breakout	Reason unclear	Spin-off / Breakout	Reason unclear
	3. 80% of Pred moves to Succ and Pred lives on	ID change	Acquisition / Merger	ID change	Acquisition / Merger
	4. Less than 80% of Pred moves to Succ and Pred lives on	Spin-off / Breakout	Reason unclear	Spin-off / Breakout	Reason Unclear

Firm entry and exit are clearly identified through a successor/predecessor relationship in the (1,1) cell (using row, col to identify cells): namely, when link\_ui=1 and succ\_link\_ui=1. Since Link\_ui=1 reflects a shut-down of the administrative entity, where a significant portion of workers move to another administrative entity, if this is

<sup>8</sup> Note that the arguments underlying the classifications in Table 2 stem in part from the relative infrequency of type 3 compared to type 1 and the relative infrequency of type 2 compared to type 4 for both the successor and predecessor (or in other words, conditions 2 and 4 dominate the movements of clusters of workers).

associated with a `succ_link_ui=1` then this is a strong indication that the change in SEIN is an administrative, rather than an economic change.

Table 2 can also be used to identify acquisition and merger activity. The (1, 2) and (1,4) cell, for example, identifies either a firm shutdown combined with the move of over 80% of their workers into a newly born firm (column 2) or a continuing firm (column 4) – suggesting an acquisition or a merger. Similarly, the (3,2) and (3,4) cells identifies a continuing firm that has more than 80% of its workers going to a newly born firm (column 2) or a continuing firm (column 4) – also suggesting that either a merger or an acquisition took place.

Four cells are labeled “reason unclear” because substantial clusters of workers, but fewer than 80%, move from the predecessor to the successor firm – and account for fewer than 80% of the workers at the successor firm. Since Table 1 provided evidence that these movements of clusters are very rare events, it is likely that there is some economic event underlying such transitions – we investigate the possibility that this is related to outsourcing in the subsequent sections.

#### **4. Empirical Analysis of Flows of Clusters**

##### *a) General Results*

The importance of each of these categories in terms of percentages is reported in Table 3. Clearly, the largest percentages is the movement of large clusters of workers from one firm to another (the (4,2) and (4,4) again using (row,col) to identify cells) for reasons that are at, first glance, unclear. In what follows, we will make some progress in resolving this unclear status. As we will see below, some parts of this turn out to be some form of outsourcing in terms of movements in and out of personnel supply firms. Before

proceeding to that analysis, it is worth emphasizing two other categories that stand out both in terms of size and economic interpretation. In row 1, the first element comprises about 40% of the cases in which the predecessor firm exits and 80% or more of employment goes to a successor firm – suggesting a true/successor predecessor relationship. The second category is reflected in the (1,4) and (2,4) elements which reflects mergers/acquisition

<b>Table 3: Relative Frequency of Successor/Predecessor Combinations</b>						
Elements of Cells:		SUCC_LINK_UI				
Percent		<i>1. 80% of Succ comes from Pred and Succ is born</i>	<i>2. Less than 80% of Succ comes from Pred and Succ is born</i>	<i>3. 80% of Succ comes from Pred and Succ was in existence</i>	<i>4. Less than 80% of Succ comes from Pred and Succ was in existence</i>	<i>Total</i>
Row %						
Column %						
LINK UI	<i>1. 80% of Pred. Moves to Succ and Pred dies</i>	2.81 44.12 56.29	1.32 20.83 13.34	0.17 2.75 10.05	2.05 32.31 2.47	6.36
	<i>2. Less than 80% of Pred moves to Succ and Pred dies</i>	0.85 9.47 17.12	1.56 17.29 15.68	0.26 2.91 15.08	6.33 70.32 7.60	9.01
	<i>3. 80% of Pred moves to Succ and Pred lives on</i>	0.10 37.70 1.91	0.05 19.89 0.51	0.03 10.45 1.52	0.08 31.96 0.10	0.25
	<i>4. Less than 80% of Pred moves to Succ and Pred lives on</i>	1.23 1.46 24.68	7.00 8.30 70.47	1.28 1.51 73.35	74.87 88.74 89.84	84.38
	<b>Total</b>	4.98	9.93	1.74	83.34	

The data permit us to examine the patterns in the data in more detail – both by examining whether there are substantial trends in the identified outcomes over time, and also examining the degree to which firms outsource regular employees to the payroll of a personnel supply service (7363), and hiring leased/temporary employees onto the regular payroll (potentially a form of “insourcing”). We thus create two broad categories: those transitions that involve at least one 7363 firm and those that do not. Those transitions that involve a 7363 firm are then broken down into three groups: (1) the predecessor is a 7363

firm and the successor is not (2) the successor is a 7363 firm and the predecessor is not and (3) both firms are 7363 firms. Those links that do not involve a 7363 firm are broken down into the 4 categories identified in Table 2. We present the percentages of all yearly links in Table 4 accounted for by these 7 disjoint groups.

Elements of Cells: Row Pct	ID Change	Merge / Acquisition	Breakout / Spin-off	Reason Unclear	Hiring 7363 employees to regular payroll	Outsourcing regular employees to 7363 payroll	Transition between two 7363 firms
1993	3.31%	3.31%	4.97%	65.72%	7.51%	6.09%	9.09%
1994	2.87%	3.00%	4.10%	63.43%	8.78%	7.11%	10.72%
1995	2.92%	3.26%	3.61%	60.21%	10.03%	7.91%	12.07%
1996	2.86%	3.36%	3.35%	60.01%	10.14%	7.99%	12.30%
1997	4.72%	3.40%	3.03%	57.29%	10.63%	8.42%	12.51%
1998	2.65%	3.22%	2.77%	56.74%	11.89%	9.59%	13.13%
1999	2.40%	2.92%	2.57%	55.27%	11.93%	10.49%	14.42%
2000	2.43%	2.88%	2.62%	54.88%	12.87%	10.18%	14.15%
2001	2.74%	2.77%	2.63%	58.44%	11.19%	9.48%	12.75%
Total	3.05%	3.15%	3.31%	58.63%	10.70%	8.69%	12.47%

Several outcomes are immediately apparent. First, the procedure clearly captures a substantive administrative change in SEINs that occurred in 1997 – as evidenced by a jump in the number of ID changes. Second, there is enormous churning of workers in the temporary help sector – not just to and from regular jobs, but also within temporary help. The merger/acquisition activity that was so heavily documented in the mid 1990’s is apparent. Most intriguing is the large number of large clusters of workers moving across workplaces – we speculate (and investigate below) that this is due to actual physical migrations from one workplace to another within the same firm, which is reporting under different SEINs. Also, apparent is the increasing role of outsourcing (and insourcing) through the movements of clusters of workers to and from the temporary help industry.

This table, however, simply reports the percentages of occurrences. In order to capture the significance of the links to the entire state economy, we calculate the ratio of accessions due to successor-predecessor transitions to all the accessions in the state (here “accession” is defined as the event of a worker having positive earnings at an SEIN in the UI wage records in the current quarter after having zero earnings at that SEIN in the previous quarter).<sup>9</sup> The results are reported in Table 5

Elements of Cells: Links (weighted by affected employees) as a percentage of accessions	ID Change	Merge / Acquisition	Breakout / Spin-off	Reason Uncertain	Hiring 7363 employees to regular payroll	Outsourcing regular employees to 7363 payroll	Transition between two 7363 firms	Total
1993	1.0%	0.8%	0.9%	5.5%	0.5%	0.4%	1.0%	10.2%
1994	1.0%	0.8%	0.9%	6.2%	0.7%	0.6%	1.3%	11.4%
1995	1.2%	1.0%	0.8%	5.8%	0.9%	0.7%	1.5%	11.9%
1996	2.1%	1.2%	0.8%	6.6%	1.0%	0.7%	1.8%	14.0%
1997	2.0%	1.0%	0.6%	5.4%	0.9%	0.7%	1.5%	12.0%
1998	1.5%	1.2%	0.7%	6.1%	1.1%	0.9%	2.2%	13.6%
1999	1.3%	1.0%	0.7%	5.7%	1.1%	0.9%	2.2%	12.9%
2000	1.4%	1.1%	0.7%	5.7%	1.2%	0.9%	2.3%	13.3%
2001	1.3%	0.7%	0.6%	5.2%	0.9%	0.8%	1.5%	11.0%

A significant percentage of apparent worker flows (ranging from about 10% to 13%) are a result of these links, unfortunately due in a large part to the hardest category to say anything about (“reason uncertain”). Once again, 1996 and 1997 stick out in the probable identifier changes, illustrating the importance of taking these links into account when working with job flows.

b) *Comparison of the UI wage record links to the ES-202 successor-predecessor data*

<sup>9</sup> The years 1993 and 2001 have been left out because links cannot be formed at the sample boundaries while accessions as defined here are unaffected causing the ratios to be unusually small.

While these UI wage record links from flows of clusters strongly suggest evidence of events that may not be actual economic job flows in the traditional sense, it is an open question how to treat these links in longitudinal files (and how they should be treated in the measurement of worker and job flows). To provide some further perspective on these cluster-based links, we compare these links to links from data on official successor-predecessor relationships between establishments in the ES-202. The ES-202 program attempts to identify such administrative changes and to code predecessor-successor relationships. These “official” links reflect organizational (e.g., change of ownership) changes reported in the ES-202 survey by the businesses involved and, therefore, should represent the truth when available, although some such events probably do go unreported while other administrative changes may also be accompanied by major overhauls of employees (thus going undetected in our links). Comparing the two sources of information may shed a great deal of light on whether our working assumptions about the interpretation of the link categories are appropriate. Table 6 gives us a broad overview of how the data match up – split into the pre-1998 and post-1998 periods to reduce the impact of a 1997 change in the processing of administrative records.

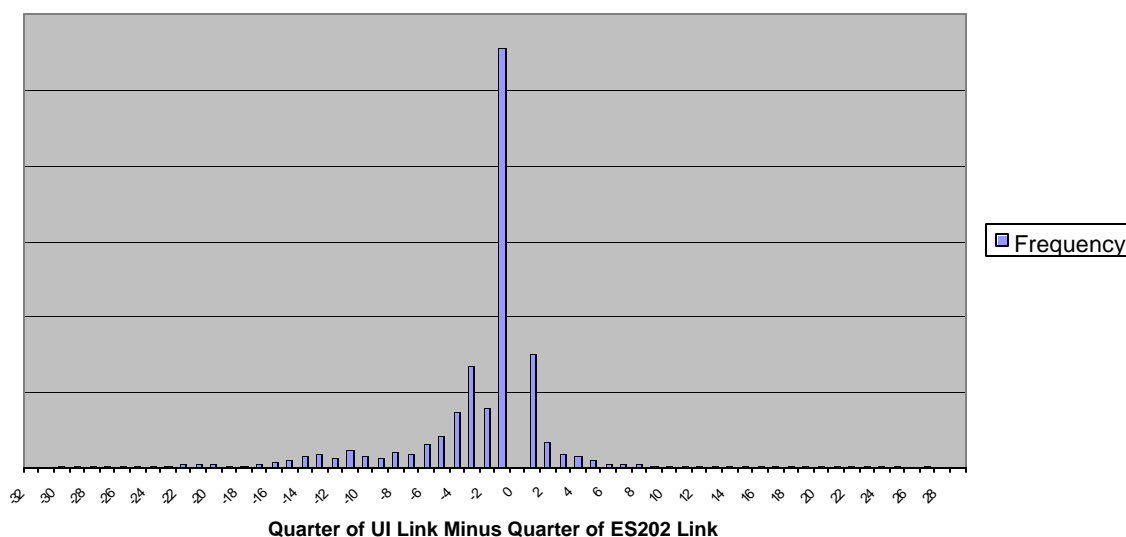
Table 6: Comparing the UI Links with the Es -202 Definitions								
Elements of Cells: Percent Row % Column %	ID Change	Merge / Acquisition	Breakout / Spin -off	Reason Uncertain	Hiring 7363 employees to regular payroll	Outsourcing regular employees to 7363 payroll	Transition between two 7363 firms	Total
Prior to 1998								
<i>SEIN pair Found Only in UI Links</i>	2.1%	2.2%	3.4%	59.9%	9.3%	7.4%	11.1%	95.4%
	2.2%	2.3%	3.6%	62.8%	9.8%	7.7%	11.7%	
	58.8%	65.0%	86.1%	97.9%	99.7%	99.5%	99.3%	
<i>SEIN pair Found in Both UI And ES202 Links and Agree on Quarter</i>	1.0%	0.7%	0.3%	0.5%	0.0%	0.0%	0.0%	2.6%
	37.4%	28.4%	12.6%	19.7%	0.3%	0.5%	1.1%	
	27.5%	22.2%	8.3%	0.8%	0.1%	0.2%	0.3%	
<i>SEIN pair Found in Both UI And ES202 Links but Disagree on Quarter</i>	0.5%	0.4%	0.2%	0.8%	0.0%	0.0%	0.1%	2.0%
	24.6%	21.5%	11.2%	38.1%	1.0%	1.0%	2.6%	
	13.7%	12.8%	5.6%	1.2%	0.2%	0.3%	0.5%	
Total	3.6%	3.3%	4.0%	61.2%	9.3%	7.4%	11.2%	100.0%
After 1998								
<i>SEIN pair Found Only in UI Links</i>	1.2%	1.9%	2.2%	54.8%	12.1%	9.9%	13.7%	95.7%
	1.3%	2.0%	2.2%	57.2%	12.6%	10.4%	14.3%	
	48.5%	63.4%	81.2%	97.8%	99.7%	99.4%	99.4%	
<i>SEIN pair Found in Both UI And ES202 Links and Agree on Quarter</i>	0.6%	0.5%	0.2%	0.3%	0.0%	0.0%	0.0%	1.7%
	36.5%	27.8%	12.8%	20.0%	0.4%	0.9%	1.6%	
	25.0%	16.3%	8.4%	0.6%	0.1%	0.2%	0.2%	
<i>SEIN pair Found in Both UI And ES202 Links but Disagree on Quarter</i>	0.7%	0.6%	0.3%	0.9%	0.0%	0.0%	0.1%	2.6%
	26.3%	23.6%	10.8%	34.3%	1.0%	1.7%	2.4%	
	26.5%	20.3%	10.4%	1.6%	0.2%	0.4%	0.4%	
Total	2.5%	3.0%	2.6%	56.0%	12.1%	10.0%	13.8%	100.0%

The vast majority (96 percent) of the UI wage record links are not found in the ES-202 predecessor-successor links. Almost all of the links categorized as “reasons unclear” or transitions to/from Personnel Supply Service firms occur in the set only found in the UI wage records. When the link is present in both data sources, we find a very high percentage of strong links that appear to be ID changes, acquisitions, and spin-offs, and we find very few links to Personnel Supply Service firms. Thus, this form of outsourcing is apparently not captured in the ES-202 predecessor-successor links.

There is more information when we consider, in addition, the timing of the link and how this might differ across the UI-wage records and the ES-202. Chart 2 shows the distribution of the difference in timing for those links found in both files.

Figure 2

When ES202 and UI Agree on SEIN Pair But Not the Timing of the Link



The majority of this subset only disagrees by one quarter, but it appears that when there is a disagreement, the UI link tends to take place after the ES-202 link. This finding is sensible as workers may still receive checks (severance pay or bonuses) from an employer after their actual separation, therefore appearing in the UI wage records matched to the old employer ID after the employer has ceased reporting that worker in its ES-202 employment counts.

### *c) Differences across industries*

The 4-digit SIC from the ES-202 data provides another valuable piece of information to our set of UI links. Examining the industry codes of the linked SEINs opens up a

number of interesting economic issues as well as another means of improving data quality. Moreover, these data may help us understand the role of the rather enigmatic industry of personnel supply firms in the economy and in the use of administrative data. Unfortunately, the UI wage-records contain only the SEIN to identify an employer, while the ES-202 reports data at an establishment level. Fortunately about 85% of all the SEIN-YEAR-QUARTER records in our links have only one unit and of the 15% that have more than one unit, about 62% of those have the same 4-digit sic across all their units. For the small percentage of SEINs in our links that have multiple units with varying SICs in the ES-202 data, the linking strategy is to attach the employment modal SIC (based on reported ES-202 employment) to the SEIN from the wage records.<sup>10</sup>

Table 7 breaks down the sixteen categories formed by the previously defined variables (LINK\_UI and SUCC\_LINK\_UI) based on whether the link is across or within 4-digit SICs giving SIC 7363 special treatment.

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<sup>10</sup> More sophisticated methods that LEHD has been using to input place of work to workers will be used in future research.

<b>Table 7: Panel 1: Successor/Predecessor Comparisons When Transitions are within the Same 4-digit Industry</b>					
		SUCC_LINK_UI			
		<i>1. 80% of Succ comes from Pred and Succ is born</i>	<i>2. Less than 80% of Succ comes from Pred and Succ is born</i>	<i>3. 80% of Succ comes from Pred and Succ was in existence</i>	<i>4. Less than 80% of Succ comes from Pred and Succ was in existence</i>
L I N K  U I	<b>1.</b> 80% of Pred Moves to Succ and Pred dies	<i>ID change</i> 75.77 0.32	<i>Acquisition / Merger</i> 62.51 0.92	<i>ID change</i> 53.88 0.48	<i>Acquisition / Merger</i> 36.59 0.64
	<b>2.</b> Less than 80% of Pred moves to Succ and Pred dies	<i>Spin-off / Breakout</i> 62.21 0.74	<i>Reason unclear</i> 48.14 6.37	<i>Spin-off / Breakout</i> 37.63 2.33	<i>Reason unclear</i> 29.08 10.27
	<b>3.</b> 80% of Pred moves to Succ and Pred lives on	<i>ID change</i> 62.04 0.77	<i>Acquisition / Merger</i> 49.97 1.66	<i>ID change</i> 58.86 0.49	<i>Acquisition / Merger</i> 34.99 1.35
	<b>4.</b> Less than 80% of Pred moves to Succ and Pred lives on	<i>Spin-off / Breakout</i> 39.60 0.97	<i>Reason unclear</i> 29.59 12.01	<i>Spin-off / Breakout</i> 32.06 4.78	<i>Reason unclear</i> 25.40 13.90
All numbers are percentages of cell First Element: Same SIC, SIC≠7363 Second Element: Same SIC, SIC=7363 Value of "D" means cell has been suppressed for disclosure reasons					
<b>Table 7: Panel 2: Successor/Predecessor Comparisons When Transitions are across 4-digit Industries</b>					
		<i>1. 80% of Succ comes from Pred and Succ is born</i>	<i>2. Less than 80% of Succ comes from Pred and Succ is born</i>	<i>3. 80% of Succ comes from Pred and Succ was in existence</i>	<i>4. Less than 80% of Succ comes from Pred and Succ was in existence</i>
L I N K  U I	<b>1.</b> 80% of Pred Moves to Succ and Pred dies	<i>ID change</i> 23.36 0.54	<i>Acquisition / Merger</i> 30.55 6.02	<i>ID change</i> 42.52 3.12	<i>Acquisition / Merger</i> 47.08 15.69
	<b>2.</b> Less than 80% of Pred moves to Succ and Pred dies	<i>Spin-off / Breakout</i> 33.97 3.08	<i>Reason unclear</i> 34.63 10.86	<i>Spin-off / Breakout</i> 55.84 4.20	<i>Reason unclear</i> 41.20 19.44
	<b>3.</b> 80% of Pred moves to Succ and Pred lives on	<i>ID change</i> 35.84 1.34	<i>Acquisition / Merger</i> 43.34 5.04	<i>ID change</i> 39.93 0.73	<i>Acquisition / Merger</i> 48.12 15.55
	<b>4.</b> Less than 80% of Pred moves to Succ and Pred lives on	<i>Spin-off / Breakout</i> 50.52 8.91	<i>Reason unclear</i> 40.79 17.61	<i>Spin-off / Breakout</i> 57.21 5.95	<i>Reason unclear</i> 39.72 20.98
All numbers are percentages of cell First Element: Different SICs, neither SIC=7363 Second Element: Different SICs, when either succ or pred is 7363 Value of "D" means cell has been suppressed for disclosure reasons					

On examining the table, it is clear that the links identified as ID changes are mostly within-SIC relationships giving further credence to the assertion that these are probably ownership or data collection changes that result in employer ID changes. The

changes identified as spinoffs/breakouts or as acquisitions/mergers are much more likely to go across industry lines. This is particularly true when the SEIN that breaks out lives on after the link (or, in the case of mergers, the SEIN that absorbs the predecessor was already in existence prior to the link). This latter result is not surprising if one considers the following example: Suppose firm A performs tasks that fall under industries I and II, but is recorded as an industry I firm. Then firm A decides it would be more efficient to reorganize into two firms thus producing a breakout. If the resulting firms both have new identifiers, B and C, then two links would be found in the data, one of which is across-SIC (I to II) and one of which is within-SIC (I to I). However, if the new firm, which takes on the industry I tasks, keeps A as its identifier while the other firm, which takes on the industry II tasks, gets a new identifier, B, then only one link will be formed in the data (A to B) which will be across-SIC (I to II). Under this scenario, one would expect to see a higher percentage of across-SIC links in breakouts where the predecessor ID lives on then in breakouts where the predecessor ID dies off (similarly for mergers).

It is particularly informative to note the importance of personnel supply companies – industry 7363. When we examine the cells which otherwise would have been identified as “reason unclear” and where transitions are within industry, about half of the firm-firm transitions are within the single four digit industry 7363. When we examine the cells that have been identified as “reason unclear” and transitions are across industry, about half of the firm-firm transitions have 7363 as either the source or the predecessor industry.

We then turned to examine the industry-to-industry changes between predecessor and successor firms. These changes can happen for a variety of reasons. One obvious

possibility is that as businesses evolve, the focus of production may shift or become more specialized, especially after an ownership change. In the case of industrial reorganization, we may be seeing branches that are performing the same tasks they have always performed suddenly reporting as their own firm or being absorbed into the reporting of another firm with a different SIC. The most likely candidates for such horizontal/vertical integration/dis-integration are the cases listed as potential mergers and breakouts.

Most of the across-SIC changes are very subtle such as: 5812 (Eating Places) to/from 5813 (Drinking Places); 5311 (Department Stores) to/from 5411 (Grocery Stores); 6021 (Federal Reserve Banks) to/from 6022 (National Commercial Banks); 8011 (Offices and Clinics of Doctors of Medicine) to/from 8062 (General Medical and Surgical Hospitals); 0741 (Veterinary Services for Livestock) to/from (Veterinary Services for Animal Specialties); 0781 (Landscape Counseling and Planning) to/from 0782 (Lawn and Garden Services). Links 0761 (Farm Labor Contractors and Crew Leaders) and various other agriculture firms are probably the results of outsourcing. Thus, it may be possible to use these industry links (beyond 7363) to identify various forms of outsourcing (and in-sourcing) that is occurring.

Some odd combinations emerge. For example, when we examine the transitions that are attributed to mergers/acquisitions, a common combination is 1711 (Plumbing, Heating, and Air-Conditioning) to 5812 (Eating Places) and 1731 (Electrical Work) to 5812 (Eating Places). These could potentially be vertical integrations where large dining establishments decide it would be more efficient to have their own fulltime maintenance staff. As far as links to/from SIC 7363, eating establishments, grocery stores, and

department stores are most frequently observed outsourcing and hiring on temporary/leased employees.

*d) Match to Census Business Register*

Another possible reason for the firm to firm transitions is that the observed transitions reflect administrative changes within a broader firm structure – particularly since the SEIN may or may not directly correspond to an individual firm. This possibility can be directly investigated by matching the ES202 files to the Census Business Register, which has the advantage of being able to identify complex firm relationships<sup>11</sup>. We report these results in Table 8.

<b>Table 8: Transitions Type within and across Firms</b>								
	ID Change	Merge / Acquisition	Breakout / Spin-off	Reason Uncertain	Hiring 7363 employees to regular payroll	Outsourcing regular employees to 7363 payroll	Transition between two 7363 firms	Total
Different Firm on Census Business Register	2.16%	2.50%	2.92%	56.99%	10.61%	8.66%	12.51%	96.35%
Same Firm on Census Business Register	0.57%	0.38%	0.20%	2.34%	0.04%	0.03%	0.09%	3.65%

An investigation of this table demonstrates that about one quarter of the observed ID changes are, in fact, within firm ID changes – accounting for .57% of the observed transitions. However, the Merger/Acquisition and Breakout/Spinoff categories are much more likely to reflect different firm relationships – 87% of the transitions as identified as possible merger/acquisition transitions are across firms that are different on the business register, and 97% of those identified as possible break/outs or spinoffs. Almost all of the temporary help flows are across different economic entities as well.

<sup>11</sup> The Census Bureau receives information on firm parent/subsidiary relationships from the IRS, and combines this with information on the Company Ownership Survey to track the inter-relationships across firms - about 90% of these firm interrelationships are captured by means of a common identifier on the ES202 data (EIN) and the balance by a Census identifier (ALPHA).

## 5. The consequences of clustered flows on worker earnings

The effects of these transitions on workers are of interest for a variety of reasons. One reason is that much public policy is targeted at supporting the incomes of workers who are negatively affected by the “creative destruction” that characterizes the U.S. economy. Another reason is that to the extent that these transitions are a productive reallocation of resources from one sector of the economy to another, we would expect earnings to increase, rather than decrease. However, these changes may be changing the nature of the employer-employee relationship and the associated wage practices for firms engaged in such clustered flows of workers. Finally, in the special case of the temporary help industry, there has been some intriguing evidence from other work (Holzer et al. 2004, Lane et al. 2003) that work in the temporary help industry leads to subsequent improvement in earnings outcomes.

In order to examine the empirical evidence, we first document the proportion of workers whose earnings decrease as a result of moving from one firm to another where there is a successor/predecessor relationship (the first group of five columns in Table 9).<sup>12</sup> The first row of Table 9 shows that about 45.1%, 47.6%, and 45.2% of what we have called mergers, breakouts, and ID changes respectively result in decreased earnings. The percentage of decreasers is significantly (more than 5 percentage points) smaller for workers found in the weaker links at 39.8%. This probably is because a greater share of the weaker links are actual job changes by workers, and we would expect more favorable outcomes for workers switching employers by choice than for workers caught in some administrative change. Perhaps surprisingly, workers moving into 7363 in our

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<sup>12</sup> In the following discussion, all differences in proportions are statistically significant, due to the enormous sample size.

successor/predecessor links also seem to have more favorable wage outcomes (only 40.7% were wage decrease) than those in the merge/breakout/ID change categories. This may be because the primary savings an employer receives by outsourcing employees typically lie in employee benefit costs which are not captured in the UI wage record data. Therefore, these workers may actually be much worse off in total compensation though their UI wages do not reflect it.

We then turn to examining whether the earnings decrease patterns differ depending on the origin industry and find some striking variation. For example, when the origin industry is public administration, we see a much smaller percentage of decrease in most of the links, but a much higher percentage for employees transitioning into 7363 (almost half). Moreover, origin industries such as mining, construction, manufacturing, wholesale trade, FIRE, nursing homes, and hospitals have approximately the same or slightly higher than average proportions of decrease for most link types, but significantly higher proportions of decrease for those sent to 7363.

The second set of five columns allows us to compare relative outcomes of workers found in our links to workers making the same industry transitions outside of the links. The numerator is the proportion of earnings decrease in the associated successor-predecessor link, and the denominator is the proportion of earnings decrease among workers making the same transition by themselves (i.e. not with a large cluster of workers). A brief perusal of columns six through nine reveals that the successor/predecessor reallocation results in high proportions of earnings decrease regardless of the origin industry – although the greatest differences are in department stores, employment agencies, temp help/employee leasing, and hospitals. The sole

exceptions are when the origin industries are agriculture, mining, or public administration.

The pattern is very different yet again when we examine the tenth column. Workers moving from non-7363 to 7363 firms via successor-predecessor links have a lower proportion of earnings decreasers than those making the same transition on their own. This may show that workers being outsourced into 7363 by some firm decision do better than workers who make the same transition on their own. This could be because those workers seen making this switch outside of our links have lost their previous job and are using temp help to avoid unemployment and possibly as a pathway back to standard employment. Meanwhile, looking at the row associated with “Employee Leasing/Help Supply” we actually see that there is a higher percentage of earnings decreasers in the links where the workers transitioned from 7363 to non-7363 firms than there is amongst workers making the same transition but not associated with a successor-predecessor link. Perhaps the story here is that workers moving out of 7363 into standard firms on their own do better (pathways to work) than workers being insourced by some firm organization decision that is out of their control.

Table 9: Earnings Changes for Transitioning Workers

Origin Industry	Proportion of Successor/Predecessor Accessions with earnings decreases					Proportion of S/P Accessions with Earnings Decreases relative to proportion of all transitions with earnings decreases				
	All Merge	All Breakout	All ID Changes	All Reason Unknwn	7363	All Merge	All Breakout	All ID Changes	All Reason Unknown	7363
Total	45.1%	47.6%	45.2%	39.8%	40.7%	114.9%	121.4%	115.3%	101.3%	85.4%
Agriculture	42.6%	51.9%	44.9%	40.2%	41.0%	97.5%	118.7%	102.8%	91.9%	83.3%
Mining	46.2%	52.7%	54.4%	43.1%	49.0%	97.8%	111.6%	115.2%	91.3%	84.4%
Construction	45.1%	51.6%	46.6%	42.5%	47.0%	101.4%	116.1%	104.7%	95.6%	88.9%
Manufacturing	46.9%	47.5%	46.4%	44.9%	49.1%	109.9%	111.4%	108.8%	105.3%	91.7%
Transportation, Communication, Utilities	47.7%	47.5%	43.4%	42.4%	43.5%	117.7%	117.3%	107.2%	104.7%	85.7%
Wholesale Trade	45.6%	46.5%	45.3%	44.7%	47.9%	109.5%	111.7%	108.7%	107.3%	90.7%
Retail Trade	45.0%	47.6%	44.8%	39.2%	42.5%	117.4%	124.1%	116.9%	102.2%	94.7%
- Department Stores	51.8%	48.6%	44.5%	38.0%	41.2%	146.2%	137.1%	125.6%	107.2%	99.3%
- Grocery Stores	42.7%	47.2%	46.1%	38.8%	42.3%	110.9%	122.6%	119.7%	100.7%	94.0%
- Eating and drinking	44.9%	46.5%	45.6%	39.7%	43.2%	116.7%	120.8%	118.5%	103.0%	97.3%
- Other	44.3%	48.8%	43.7%	39.8%	42.8%	114.5%	126.2%	113.1%	103.0%	93.1%
FIRE	44.9%	46.1%	44.6%	42.7%	47.2%	114.0%	117.0%	113.4%	108.5%	91.5%
Services	44.2%	47.4%	45.2%	38.4%	39.9%	119.3%	127.8%	121.8%	103.5%	88.3%
- Employment agencies	43.4%	48.0%	43.2%	30.9%	37.6%	142.1%	157.0%	141.3%	101.3%	93.3%
- (7363) Employee Leasing/Help supply	43.9%	46.3%	49.0%	30.1%	39.7%	136.8%	144.2%	152.5%	93.9%	95.1%
- Nursing Homes	45.7%	45.5%	44.2%	42.5%	45.8%	110.2%	109.7%	106.7%	102.5%	91.3%
- Hospitals	44.3%	50.6%	47.1%	42.8%	52.4%	118.9%	135.9%	126.6%	115.0%	112.4%
- Other	44.2%	47.4%	44.8%	42.1%	42.2%	115.9%	124.4%	117.7%	110.6%	89.8%
Public Admin	34.2%	33.3%	40.2%	40.4%	49.3%	96.5%	94.0%	113.3%	113.9%	105.1%

What are we to make of these results? This brief analysis suggests that the clustered flow of workers as a result of firm changes has, for the most part, positive effects – the majority of workers experience earnings increases as a result. However, not surprisingly, since the clustered flow is highly likely to be involuntary, a higher proportion of workers experience decreases as a result of successor/predecessor changes than those who transition singly, except in the case where a worker transitions singly into temp help as that is likely a sign of job loss.

## **7. Conclusion**

This new approach has uncovered new sets of facts for the analysis of worker/firm transitions. We show that following clusters of workers across business units provides a new means to identify longitudinal linkages between business units and in turn a window on the changing structure of the firm. In particular, we find that a small but important fraction of the identified predecessor-successor links from the movements of the cluster of workers appear to “fix” linkage problems in the administrative data. The ES-202 program does have a formal process for identifying predecessor-successor links and the UI wage record cluster flows are consistent with these links. However, the vast majority of cluster-flow links are not captured by the formal ES-202 program. A larger and more important portion of the clustered flow of workers appears to be due to some form of outsourcing and “in”-sourcing. An important part of this outsourcing and “in”sourcing is movements of clusters of workers into and out of personnel supply firms.

The consequences of the clustered flow of workers from one firm to another on worker earnings are, by and large, positive. The majority of workers experience increases in earnings in the subsequent period, although this varies by industry.

However, the proportion that experiences earnings increases is lower than that for workers who transition without such a precipitating event – except in the case of the temporary help industries.

The consequences of these findings for the statistical data collection are quite substantial. Our analyses suggests that fewer than 10% of large flows of workers from firm to firm are captured by traditional approaches, representing more than 53 million worker transitions over the 10 year period analyzed.

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