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The Ups and Downs of Jobs in Georgia: What Can We Learn about Employment Dynamics from State Administrative Data?

Julie L. Hotchkiss, M. Melinda Pitts, and John C. Robertson

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Julie L. Hotchkiss, Federal Reserve Bank of Atlanta
M. Melinda Pitts, Federal Reserve Bank of Atlanta
John C. Robertson, Federal Reserve Bank of Atlanta

Abstract: This paper demonstrates how state administrative data (from Georgia) can be used to decompose net employment growth in order to track establishment births, deaths, contractions, and expansions over time. Even though net employment growth can look quite similar across industries, the composition of that employment change can look quite different. The panel nature of the data allow the authors to see that overall lack of expansion and continued contraction among large establishments were the driving forces behind the weak employment growth immediately following the 2001 recession.

JEL classification: E24, J6, C35

Key words: job creation, job destruction, ES202, employment flows, jobless recovery

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Please address questions regarding content to Julie L. Hotchkiss, Research Department, Federal Reserve Bank of Atlanta, 1000 Peachtree Street, NE, Atlanta, GA 30309-4470, 404-498-8198, julie.l.hotchkiss@atl.frb.org, M. Melinda Pitts, Research Department, Federal Reserve Bank of Atlanta, 1000 Peachtree Street, NE, Atlanta, GA 30309-4470, 404-498-7009, melinda.pitts@atl.frb.org, or John C. Robertson, Research Department, Federal Reserve Bank of Atlanta, 1000 Peachtree Street, NE, Atlanta, GA 30309-4470, 404-498-8782, john.c.robertson@atl.frb.org.

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What can we learn about employment dynamics from state administrative data?

I. Introduction

A closely watched statistic used to gauge the health of the economy is employment growth. Employment growth, or lack thereof, has paid a particularly prominent role in discussions of recovery since the last recession. While GDP grew at an annual average of about 3.8 percent from the fourth quarter of 2001 to the second quarter of 2003, the U.S. economy has lost an additional one million jobs. The term "Jobless Recovery" has been used in academic and popular press alike to describe the time period since the most recent recession. While useful to appreciate movements in the aggregate labor market, overall employment growth masks nuances of the labor market condition across industries and details of employment dynamics within industries. The purpose of this paper is to illustrate what information might be gleaned from establishment-level employment data gathered by states' Departments of Labor for the purposes of administering the Unemployment Insurance system. The analysis will demonstrate that while the aggregate employment pictures across industries can look quite similar, the employment dynamics that generated those pictures can be very different. These differences in dynamics can also explain how similar aggregate patterns can lead to differences in industry structure. Identifying the different dynamics within an industry may also result in more effective industry-specific policy initiatives.

II. The Data

The data used for the analyses in this paper come from the administrative data gathered by the Georgia Department of Labor (GADOL) for the purposes of administering the state's

Unemployment Insurance (UI) program. These data are referred to as the ES202 data. UI-covered firms are required to submit quarterly reports to the state indicating the level of employment and wages (total payroll) for the quarter.[1] This reporting is required at the establishment level and each report contains information on the establishment's SIC/NAICS classification and physical address. The establishment can be traced over time through a unique firm, establishment (within the firm), and owner code. For the purposes of this paper, an establishment will retain its identity through multiple owners, but each establishment within a firm will be considered a unique entity (although firm-level characteristics will be retained for each establishment).

The establishment-level reporting and the longitudinal nature of the data source make it ideal for analyzing job creation and destruction. Like any secondary-source data set, however, the ES202 data has some undesirable features that must be acknowledged. First, the employment reported in the ES202 data reflect employment only of workers covered by UI. Nationally, this represented 96 percent of all jobs (93 percent of earnings) in 2002.[2] Second, firms were not

[1] White et al. (1990) provide an extensive discussion about the use of these data. Further details can be found in Spletzer (2000). These are the UI records being used by the BLS to construct their Business Employment Dynamics data file introduced at a BLS briefing 30 September 2003 (NEWS 2003). There is a companion data file that is not exploited in this paper, but will be in future work, that records quarterly pay for individual workers.

[2] Further details about who is legally covered by the UI system in Georgia are found in Appendix A. These ES202 files are used by the BLS to benchmark the official payroll employment statistics released every month. The monthly employment numbers that are released by the BLS come from the Establishment Survey. In general, firms with more than 250 employees will be asked to participate in the Establishment Survey in addition to a sample of smaller firms. However, in some industries, where the average firm size is small, the size criteria will be lowered. Thus, larger firms will be disproportionately represented in the Establishment Survey. The employment data are collected on employees in nonfarm establishments who were working in any part of the pay period that included the 12th of the month. This includes temporary workers, workers on paid sick leave or holiday and workers who only work part of the payroll period. Proprietors, self-employed, unpaid family members, and domestic workers in households are not included as employees. Furthermore, workers on unpaid leave, strike, or

required to report employment and wages at the establishment level until 1990Q1. The implication of this is that there will be a higher incidence of births recorded in this quarter (and perhaps for a few quarters as firms may not comply instantaneously to the new requirement); these births don't reflect job creation, but merely the breakouts of establishment from the previous firm-level reporting.[3] The effect of this is most apparent in sectors in which multi-establishment firms employ a large percent of the workers in that industry, such as retail trade (nearly 60 percent of the jobs in retail trade firms in Georgia in 2002 were in multi-establishment firms). The impact will be less apparent in sectors with a small proportion of employment located in multi-establishment firms, such as manufacturing (roughly 32 percent of manufacturing jobs in Georgia in 2002 were in multi-establishment firms).[4]

One should also be aware that the GADOL (Georgia is not unique in this respect) estimates, or imputes, employment levels for establishments that did not file a report, but for whom the agency has reason to believe the establishment does have positive employment. This imputation is performed based on the following strategy: (1) if an establishment has been actively reporting, the computer will use an algorithm based on previous reports to estimate employment and wages for up to two quarters of non-reporting; (2) if an establishment does not file a report for a third quarter in a row, it is flagged and the staff investigates to see whether the

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workers who have been hired but not yet started work are also not included. So, while the ES202 files and the Establishment Survey measure employment the same way (as the number of jobs in the economy), in any given quarter, the ES202 will be more accurate as it contains data for the population of establishments rather than a sample.

[3] There will also be a higher incidence of establishment deaths, although the effect is not expected to be as pronounced as for births, since a change in reporting that breaks out establishments will be counted as one death, but more than one birth.

[4] It is also of interest to note that only 2.4 percent of firms in the service industry employ the 60 percent of workers found in multi-establishment firms, and that only two percent of the firms in manufacturing are multi-establishment, employing 32 percent of workers in that industry. The share of employment in multi-establishment firms is as low as 5.8 percent in agriculture.

firm has really shut down, or if further estimations are warranted; and (3) the previous quarters' estimated employment and wage levels are adjusted to reflect any new information gathered from attempts to contact each flagged establishment. Because of this extended effort on the part of the GADOL, the final employment and wage numbers received are treated as accurate.[5] The good news of this effort on the part of the GADOL is that we have greater confidence in the employment and wage records received; the bad news is that there is about a seven-month lag from the reporting quarter to when the data are received.

Employment and wages are reported for each month during the quarter the report covers. Following Spletzer (2000, 2001), we use employment reported in the third month of the quarter as the employment during that quarter.[6] In addition, only privately-owned establishments are included in the analysis, and for the analysis pertaining to all industries combined, agriculture, forestry, and fishing are excluded from the totals.[7]

III. Decomposing Net Employment Growth

The employment level in any one period derives from the stock employment in the previous period minus any job destruction between periods plus any job creation between periods. Job destruction, in turn, can be decomposed into jobs lost due to establishment deaths

[5] This is consistent with others who have made use of these data (for example, see Winders 2000).

[6] The argument for doing this is that, "comparisons between specific points in time are easier to interpret than are comparisons of quarterly averages, [and that] averaging monthly employment within a quarter distorts the timing of when changes in employment actually occurred...," (Spletzer, 2000: 114).

[7] UI coverage of workers in these industries is particularly low, representing only 47 percent of all workers in these industries in 2002.

and jobs lost due to establishment contractions.[8] Job creation can be decomposed into jobs gained due to establishment births and jobs gained due to establishment expansions. The relationship between net employment growth and its dynamic components can be expressed as:

$$E_t - E_{t-1} = \begin{pmatrix}\text{Jobs created}\\ \text{by births}\end{pmatrix} + \begin{pmatrix}\text{Jobs created}\\ \text{by expansions}\end{pmatrix} - \begin{pmatrix}\text{Jobs destroyed}\\ \text{by deaths}\end{pmatrix} - \begin{pmatrix}\text{Jobs destroyed}\\ \text{by contractions}\end{pmatrix}, \quad (1)$$

where E_t is employment in period t, and E_{t-1} is employment in the previous period. For the analysis in this paper, the previous period refers to the same quarter in the previous year.

An establishment birth is defined as occurring in a quarter that is preceded by four quarters of zero employment. An establishment death is defined as occurring in a quarter of zero employment, followed by three additional quarters of zero employment, preceded by positive employment one year ago. Since employment is compared with employment a year ago, an establishment birth or death is indicated for a maximum of 4 quarters in a row. The requirement of four quarters of zero employment before defining a birth and three quarters of zero employment following a death ensures that a short period of non-activity is not mistaken for a death or birth and reduces the usable data by seven quarters (four at the beginning of the series and three at the end).[9] In addition, it is possible for an establishment to experience multiple births and deaths in the event of spells of inactivity lasting four quarters or more. It follows, then, that an establishment experiences a contraction in any non-death quarter in which employment in that quarter is less than employment a year ago. An establishment experiences an

[8] Terms used to describe employment dynamics in this paper are borrowed from Spletzer (2000). The term "establishment" corresponds to the business entity that exists in one location. A firm may consist of several establishments.

[9] This four and three quarters of zero employment is clearly arbitrary, but follows earlier work by Spletzer (2000). Since employment is measured in the third month of the quarter, it makes sense that non-zero employment in quarter t, followed by zero employment in quarter t+1 means that the death occurs during quarter t+1.

expansion in any non-birth quarter in which employment in that quarter is greater than employment a year ago.

A. Aggregate Employment Decomposition for All of Georgia

Job creation and job destruction can be examined on both a firm and establishment level. Naturally, there is more action, particularly in births and deaths, at the establishment level, as births and deaths of establishments are more common than births and deaths of potentially multi-establishment firms. Figure 1 depicts the year-over-year percentage change in employment for all private, non-agricultural firms in Georgia. The figure also shows how firm-level job destruction and creation contributes to this net employment change. Clearly, as the percentage of jobs being destroyed exceed the percent the jobs being created, net employment growth is negative, and vice versa. The panel nature of the data allows us to decompose the job destruction and creation into the four components described above. These components for all of Georgia (at the firm level) are presented in Figure 2. Over the sample period, the rate of firm deaths is typically half of the rate of firm-level contractions (the latter including establishment deaths within a persisting firm). The rate of firm birth is about one third the rate of firm expansions (the latter includes new establishment within an existing firm).

Figures 3 and 4 present the same calculations as Figures 1 and 2 at the establishment level. The greater and more volatile birth and death activity at the establishment level is apparent from comparing Figures 2 and 4. Interestingly, firm- and establishment-level expansion patterns are quite similar over much of the sample period, as are contraction patterns. However, firm-level death rates exceed firm birth rates in the latter 1990s whereas the rate of *establishment* births exceeds that of deaths over the entire 1990s. This phenomena probably reflect an increase

in firm merger activity in Georgia in the second half of the 1990s, especially since this was a period of quit rapid establishment creation. At the very least, it is clear that employment dynamics at the firm level are different than dynamics at the establishment level.[10]

Note also that, although it is not possible to isolate the exact contribution, the spike of births and deaths between 1990Q1 and 1991Q4 is likely mostly the result of the shift in reporting requirements from firm to establishment level as mentioned earlier, and not an actual simultaneous increase in the rate of births and deaths of establishments.

One thing that becomes apparent from these figures is that the percent of employment affected by births and deaths typically move in sync with one another and that births and deaths contribute less to the overall employment picture than do contractions and expansions.[11] Before quantifying the contributions of these components to employment growth over the business cycle, this section first explores the implications of differences in these components across different industries, then looks more closely at the determinants of the employment dynamics of a couple industries over the business cycle. All analyses will be performed using establishment-level data.

B. The Same Outcome from Different Dynamics: Mineral and Manufacturing

The importance of breaking overall employment growth into its different creation and destruction components becomes apparent when comparing the experience of distinct industries over the 1990-2002 time period. The first comparison is between the Mineral (0.2 percent of

[10] On this point, see, for example, Schuh and Triest (2000), who examine job creation and destruction at the firm level in U.S. Manufacturing.

[11] Since we require three post-quarters of data to classify employment destruction as either resulting from a contraction or from a death, these components are not computed beyond 2002Q1.

Georgia employment in 2001) and Manufacturing (14 percent of employment in 2001) industries.[12] Figure 5 depicts the year-over-year employment change in these two industries. From Figure 5 we see these two industries appear to have had the same employment change experience over the time period. In addition, the average employment growth over the period is similar, with the mineral industry registering an average -1.73 percent net employment change and manufacturing experiencing a -0.78 percent change.

Table 1 breaks down this overall experience into the percent of the creation and destruction that was contributed by deaths, births, contraction, and expansion. Comparing the relative contributions of the creation and destruction components over the entire time period, the experience of the two industries was the same: the contribution of deaths and births was equal and the contribution of establishment contractions exceeded that of expansions. Looking more closely at the two recessionary periods, the contribution of contractions exceeded expansions in both periods, but deaths played a more important role in the mining industry during the first recession and in the manufacturing industry during the most recent recession. So, while these two industries pretty much ended up in the same place over the entire time period, the dynamics that got them there differed. In addition, if establishment deaths lead to more permanent job loss in an industry, the role of deaths in manufacturing, versus minerals, suggests that manufacturing may experience more difficulty than the mineral industry recovering from the most recent recession.

[12] Food processing and textiles represent a large amount of the manufacturing in Georgia, whereas kaolin (fine clay used in making china and sheetrock) is the leading mineral mined in Georgia.

C. The Same Outcome Leads to Different Market Structure: Service and TCU

It is also possible that differences in employment dynamics can help explain changes in market structure that would not be readily apparent from comparing aggregate employment pictures. Like the mineral and manufacturing industries, the service (representing 29 percent of employment in Georgia in 2001) and the transportation, communications, and utilities (TCU) (6.7 percent of employment in 2001) industries experienced similar overall employment growth between 1990-2002, as can be seen in Figure 6. Table 2 quantifies the employment changes and the dynamics of those changes. Again, over the whole time period, the lower contribution of deaths (relative to births) and lower contribution of contractions (relative to expansions) is seen in both industries, however, the dynamics during the two recessions differ. The different dynamics in this case led to different structural change in the two industries. While the average firm size in the TCU industry declined over the time period, the average firm size in the service industry increased.

IV. Explaining Expansions and Contractions

One thing that is fairly clear looking at firm and establishment behavior in all of Georgia is that the disparity in contractions and expansions (with some exceptions) is the driving force between observed employment change, particularly during recessionary periods. While establishment deaths grab most of the headlines during recessions, the degree to which employment is affected through expansions and contractions is typically greater than employment changes affected through births and deaths. Table 3 shows that for each industry, except TCU and (marginally) FIRE, the percent of overall establishment-level employment in any quarter affected by contractions and expansions exceeds that affected by births and deaths.

Being able to understand the factors that contribute to establishment expansions and contractions, then, will likely yield the greatest insight into the overall dynamics of net employment change, and perhaps yield greater insight into the differences in recovery experienced after the two most recent recessions.

There is reason to believe that different types of adjustments to recessionary pressures may be more or less difficult to recover from post-recession. On the one hand, employment losses due to deaths in an industry may be more difficult to regain than employment losses due to contractions. On the other hand, if contractions in an industry are the result of technological changes in the industry, rather than mere responses to cyclical declines in product demand, these jobs may be just as difficult to regain as those caused by establishment deaths. Nonetheless, job loss due to an establishment death must be considered at that point in time as a permanent loss of those jobs, whereas job loss due to contraction can either be considered by the employer as either permanent or temporary. Groshen and Potter (2003) report that temporary layoffs played a weak role in the 1990 recession and even weaker role in the 2001 recession. This could result either from an increase in establishment deaths, or an increase in contractions considered permanent. In either case, less temporary and more permanent job loss implies more of a structural, rather than cyclical, adjustment to recessionary pressures. And, as shown by Groshen and Potter (2003), this adjustment can differ in serverity across different industries.

Whether employment loss is more structural or cyclical in nature will also have implications for job recovery following the recession. The labor market will take longer and require greater increases in product demand to recover from permanent job losses than temporary job losses, as it is more costly for establishments to make production adjustments on the extensive margin (start-ups or increasing capacity) than to make production adjustments on the

intensive margin (increasing capacity utilization). Groshen and Potter (2003) use data on lower post-recession vacancy rates to provide further evidence of structural, rather than cyclical, job losses during the recessions. The implication is that the structural losses result in much slower recovery, as demonstrated by lack of hiring. This section will quantify establishment contractions, expansions, and deaths over the business cycle to provide further evidence on the nature of the two most recent recessions and on the recoveries that followed.

A. Modeling Expansions, Contractions, and Deaths

Establishments make expansion, contraction, and shut-down (death) decisions based on their assessment of its impact on profit (or loss minimization in the case of a death).[13] Assume that the *i*th establishment is faced with the choice of expanding or contracting employment, keeping employment unchanged from one year to the next, or shutting down (which is basically an extreme version of employment contraction). The net profit choice of *j* (*j*=unchanged, expand, contract, shut-down) is

$$\pi_{ij} = \beta' X_{ij} + \varepsilon_{ij} . \quad (2)$$

If the establishment makes choice *j* in particular, then we assume that π_{ij} yields the maximum profit among the *J* profit outcomes. Hence, the statistical model is driven by the probability that choice *j* is made, which is

$$\Pr\left(\pi_{ij} > \pi_{ik}\right) \text{for all other } k \neq j . \quad (3)$$

If we let Y_i be a random variable that indicates the establishment's decision, and if the *J* disturbances are independent and identically distributed with Weibull distribution, then

[13] Setting up this empirical model in a decision-making framework necessitates that we abstract from explaining the birth of a firm. The results are, therefore, generalizable only to firms that are in existence making employment decisions from one year to the next.

$$\Pr[Y_i = j] = \frac{e^{\beta_j' X_i}}{\sum_{k=1}^{4} e^{\beta_k' X_i}}. \quad (4)$$

This is the multinomial logit model (see Greene 2000: 859). The estimated equations provide J sets of probabilities for each of the possible choices (employment unchanged, expanded, contracted, or shut-down). Since establishments are potentially observed over multiple quarters, the estimation procedure allows the decision in each quarter for one establishment to be correlated with the decisions that establishment makes in other periods (i.e., independence across observations is assumed between establishment, but not within establishments).[14]

The bottom line is that we are trying to explain annual variation in employment levels across establishments. There are a variety of factors that we believe influence the decision to expand or contract employment. The data at hand is limited, most notably in the area of revenue or capital cost information. The focus of this analysis will be on the timing of employment changes as it relates to the business cycle, controlling for as many establishment-level and firm-level characteristics as possible; the analysis is restricted to private establishments only. The conditions of unchanged, expansion, contraction, and death for each establishment in each quarter will be defined based on the change in employment from the same quarter one year ago. Looking at year-to-year changes in employment allows us to abstract from seasonal variations in employment. The following establishment-level regressors will be used:

- indicators of employment level of the establishment last year--this will control for the size of the establishment;

[14] An alternative approach would be to explicitly model the correlation (or random error component) between the different observations for the same establishment. This approach would lead to more efficient estimates. However, given the large sample sizes of the analyses here, we don't expect to gain much value added from estimating the more complicated model, which, also because of the large sample sizes, have proven to be impractical to estimate.

- the average (per capita) quarterly wage paid during this quarter last year--this will provide some limited cost information;[15] and
- an indicator of whether the establishment had a different owner one year ago.

The following time-specific indicators are included in the regression:[16]

- an indicator if the current quarter is pre-recession one (1990.1-1990.2);
- an indicator if the current quarter is during recession one (1990.3-1991.1);
- an indicator if the current quarter is post-recession one (1991.2-1992.1);
- an indicator if the current quarter is pre-recession two (2000.3-2000.4);
- an indicator if the current quarter is during recession two (2001.1-2001.4); and
- an indicator if the current quarter is post-recession two (2002.1-2002.4).

In addition, two of firm-level variables are constructed with the expectation that establishments that are part of a multi-level firm may behave differently than single-establishment firms.:

- total employment level of the firm, and
- the share of firm employment that the establishment's employment represents.

Table 4 provides sample statistics for the manufacturing and service industries. These industries are chosen for illustrative purposes since their employment experience over this time period are quite divergent. On the whole, the service industry is much larger in Georgia than the manufacturing industry, average establishment employment is smaller, average pay is larger, and service establishments are much less likely to be part of a multi-firm organization.

B. Multinomial Logit Results: Manufacturing and Service

Table 5 contains predicted probabilities of no employment change, contraction, expansion, and death for the manufacturing and service industries.[17] One observation that stands out immediately is that there is not a dramatic variation in employment probabilities within

[15] Dollar values have been adjusted over time using the CPI for all urban consumers in Atlanta, GA (1982-84=1).
[16] The two-quarter pre-recession time periods are dictated by the restriction of the beginning of the data and the four-quarter post-recession time periods are dictated by the restriction of the end of the data set.
[17] The complete multivariate probit estimates are contained in the Appendix.

outcome over the business cycle. This observation makes it apparent that even small variations in the probabilities of contracting or expanding lead to dramatic changes in employment levels. In addition, as expected, the probability of death in any quarter across both industries is the lowest among the four outcomes. Throughout the time period, the probability of contraction exceeds the probability of expansion in manufacturing and vice versa for service. The probability of no change in employment from one year to the next is much larger in service than in manufacturing, making employment in the manufacturing industry more volatile.

Manufacturing Outcomes over the Business Cycle:

The greater probability of contraction in recession two (R2) suggests that this recession cut deeper into job losses in manufacturing than recession one (R1). Contractions, however, do not help explain differences in the recoveries from the two recessions. Consistent with the findings of Groshen and Potter (2003), it is the lack of expansion post-R2 that explains part of the difference in recoveries. The most dramatic jump in probabilities is that of No Change, post-R2. Perhaps having fallen further during this recession, manufacturing establishments are not eager to miscalculate post-R2 increases in product demand.

Service over the Business Cycle:

In contrast to manufacturing, R2 does not appear to have been as deep in the service industry; there is same probability of expansion during the two recessions and smaller probability of contraction. However, the probability of death is slightly higher in R2. Similar to manufacturing, the post-R2 recovery story also appears to lie in the lack of expansion. We also see continued contraction in service post-R2 that didn't appear in manufacturing, suggesting that

the recovery may be even slower for service, although the losses were not as deep. Also, like manufacturing, the probability of No Change, post-R2, is dramatic. Establishments are wary of responding too quickly to signs of overall economic recovery.

Outcomes by Establishment Size:

Table 6 calculates outcome probabilities over the business cycle for a subset of establishments of different sizes. The smallest establishment size consists of establishments with fewer than five employees. This accounts for 36 percent of manufacturing establishment and 64 percent of service establishments. The largest establishment size (100 workers or more) accounts for 12 percent of manufacturing establishments and 2 percent of service establishments.

Small establishments are more likely to shut-down and do nothing in any quarter relative to a year ago than large establishments. In fact the probability of no change in employment among large establishments (in both manufacturing and service) is two percent or less. The lack of expansion post-R2 we saw in Table 5 holds across establishment size; the probability of both small and large manufacturing and service establishments expanding declined post-R2. However, the stable contraction probabilities seen for manufacturing in Table 5 do not hold across establishment size. While the probability of small manufacturing establishments to contract declined post-R2, the probability of contracting increased rather dramatically among large manufacturing establishments. In addition, the increase in the probability of contraction was considerably larger among the largest service establishments.

Outcomes by Change in Ownership:

One might imagine that a change in establishment ownership would bring about rather dramatic changes in employment. Table 7 looks at the outcome probabilities across the business cycle for subsets of establishments that had a different owner than one year ago and those that had the same owner one year ago. Roughly three percent of manufacturing and of service establishments in the sample experienced a new owner from one year to the next.

The most dramatic affect of ownership change is that the probability of death among establishments that change owners is much higher than among establishment that do not change owners. Additionally, the probability of expanding post-R2 increases among establishments that have new owners, but declines among establishments that do not change owners.

Impact of Other Characteristics on Outcomes:

Table 8 examines the relative importance of a variety of establishment-level and firm-level characteristics in determining employment change. This table presents average probabilities over the entire 1990-2002 time period. The patterns seen in Table 6 and 7 for establishment size and ownership change are seen here for the entire sample: (1) large establishments are more likely to contract than expand and much less likely to shut-down (die) than small establishments, and (2) having a new owner increases an establishment's probability of contracting and dying. Additionally, this table indicates that establishments that represent a larger share of their firm's employment have less of a probability of being shut-down in manufacturing, and more of a probability of expanding in service, relative to establishment's that represent a small percent of the firm's total employment.

V. Conclusion

The purpose of this paper was to demonstrate what knowledge can be gained from having access to establishment-level panel data in order to examine employment dynamics. Panel data allow one to decompose net employment growth into establishment deaths, births, contractions, and expansions. Knowing the relative size and movement of these components can provide insight into the nature of employment dynamics across the business cycle. For example, it was discovered that lack of expansion (as opposed to further contractions) explains the overall weak post-2001 recession job growth in manufacturing and service industries in Georgia. Basically, this should be taken as better news than if we were to have found that jobs were continuing to be destroyed through contraction or death.

Additionally, it was found that while the average probability of contracting among manufacturing establishments did not rise post-recession, that among large establishments (100 or more workers) the probability of contracting did continue to rise. In addition, it was among the largest establishments where the probability of contracting in the service industry increased the greatest. These types of details, disaggregated by establishment characteristics would not be available only with access to aggregate payroll data.

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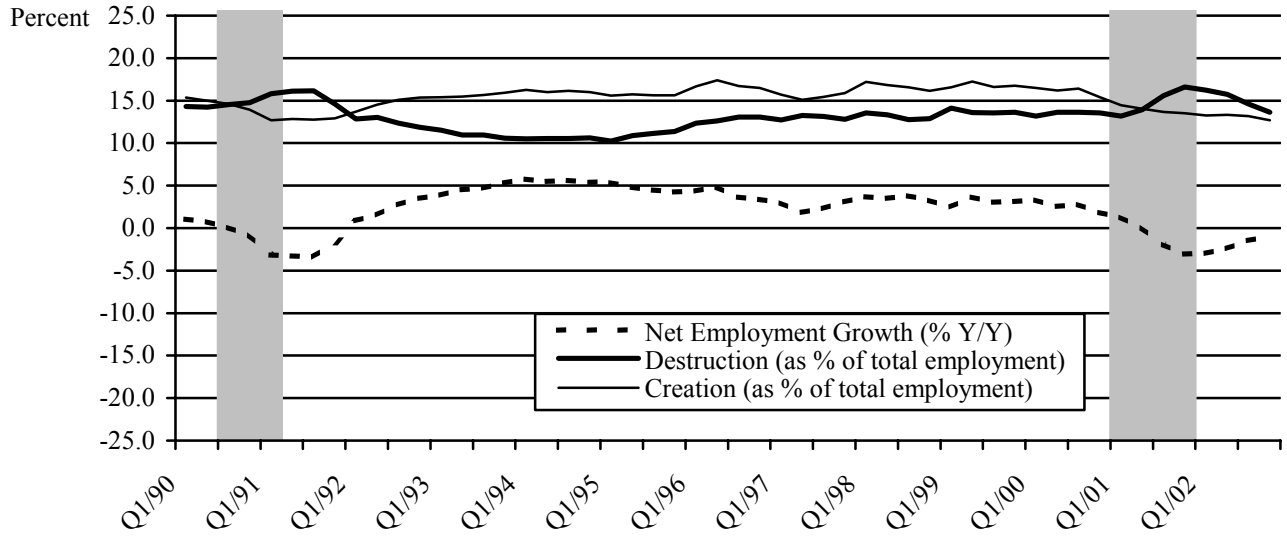

Figure 1. Year-to-year Net Employment Growth and Number of Jobs Created and Destroyed as Percent of Total Employment; all Private, Non-agricultural Firms in Georgia.

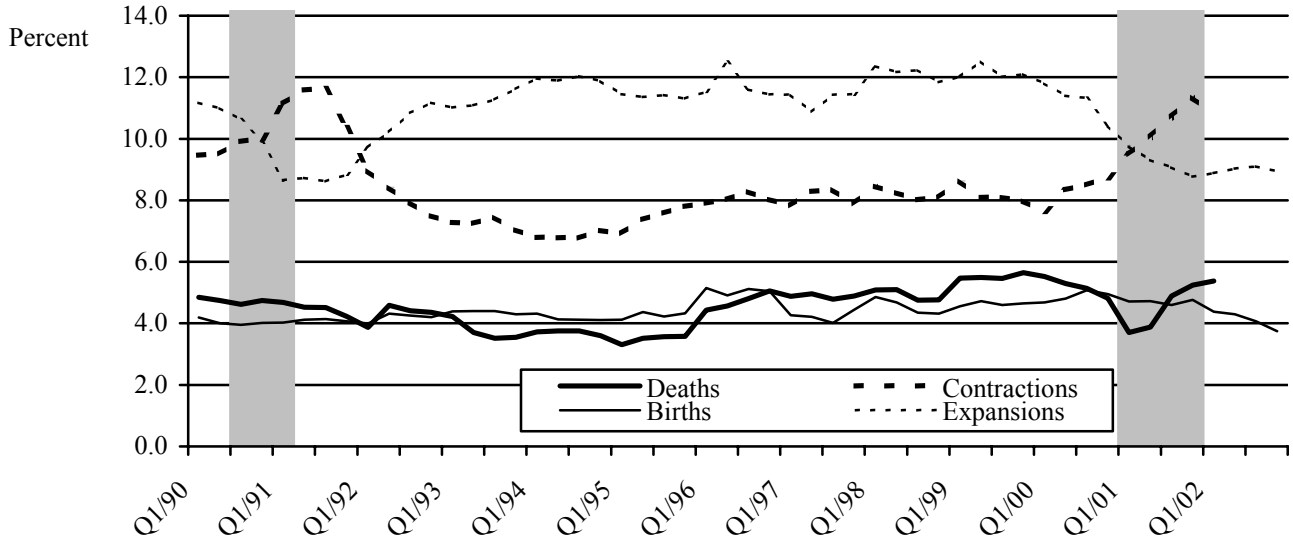

Figure 2. Employment Affected by Firm Deaths, Births, Contractions, and Expansions, as Percent of Total Employment (year-to-year comparisons).

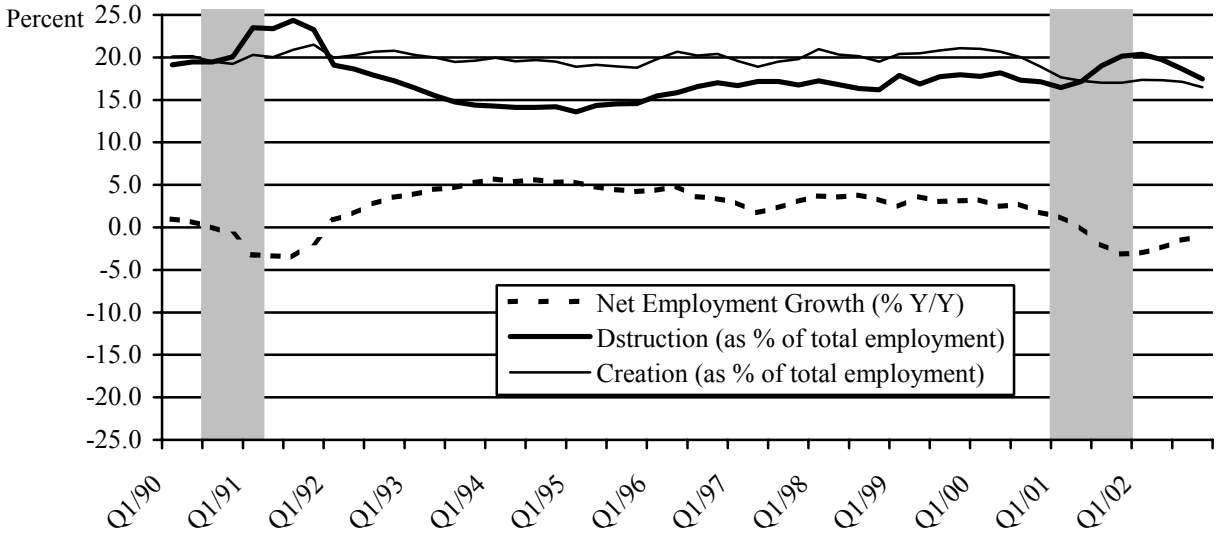

Figure 3. Year-to-year Net Employment Growth and Number of Jobs Created and Destroyed as Percent of Total Employment; all Private, Non-agricultural Establishments in Georgia.

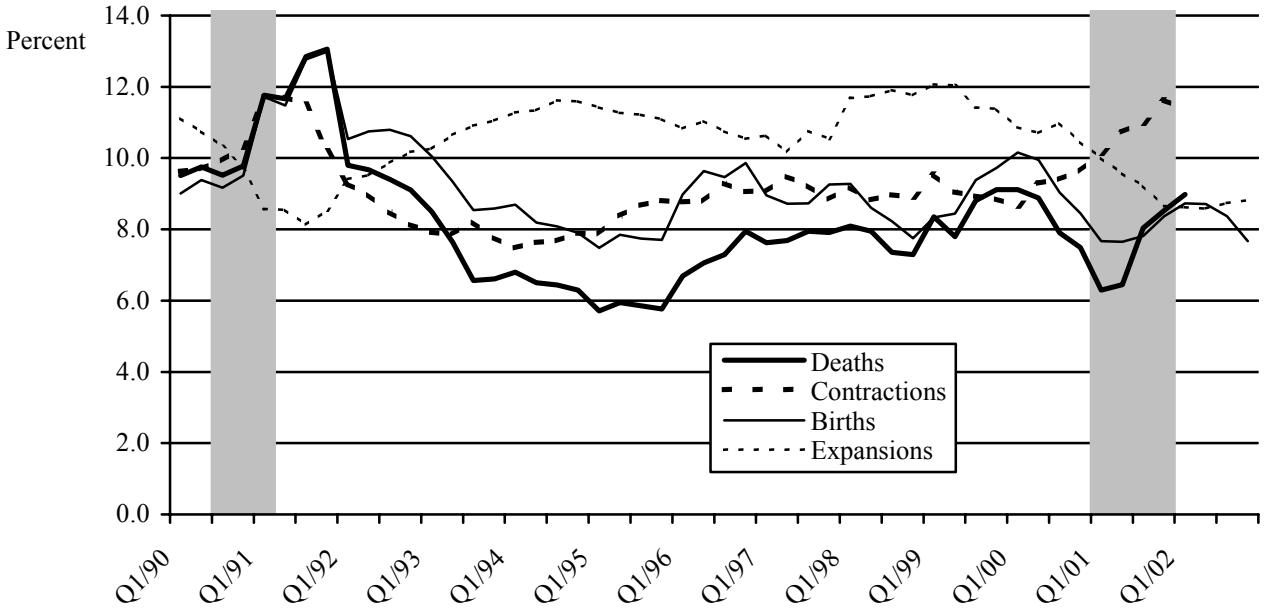

Figure 4. Employment Affected by Establishment Deaths, Births, Contractions, and Expansions, as Percent of Total Employment (year-to-year comparison).

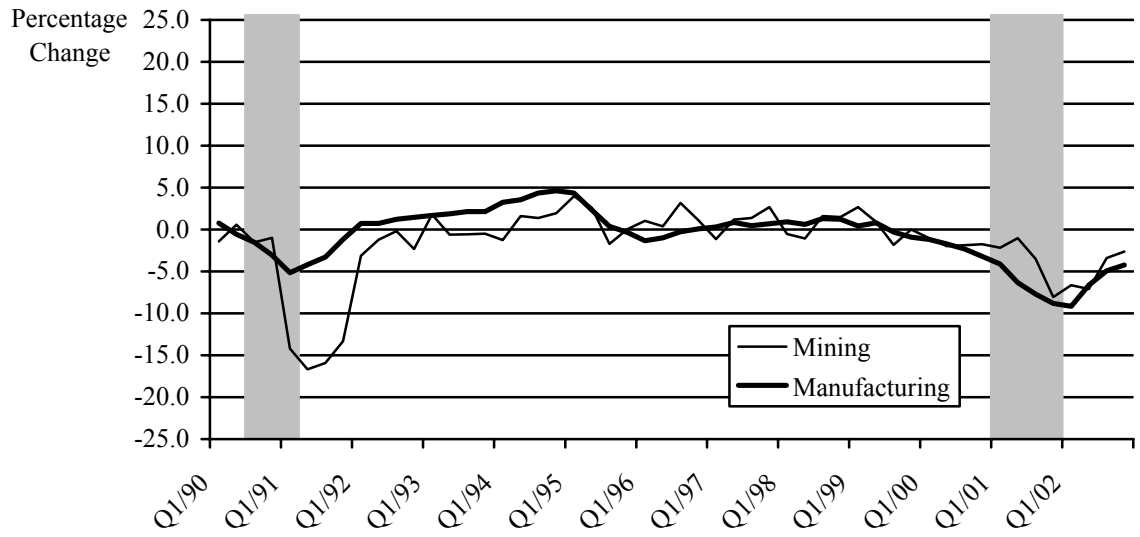

Figure 5. Year-over-year Employment Change in Mining and Manufacturing, 1990-2002.

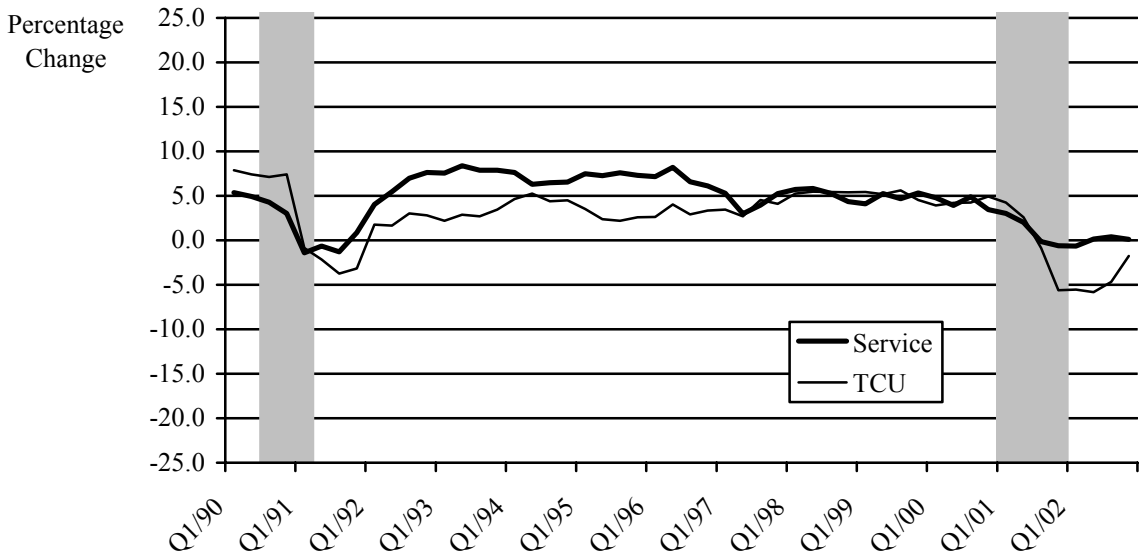

Figure 6. Year-over-year Employment Change in Service and TCU, 1990-2002.

Table 1. Employment Change and Contributions to Employment Creation and Destruction as Percent of Total Employment, Mineral and Manufacturing.

	Manufacturing			Mineral		
	1990-2002	1990/91	2001	1990-2002	1990/91	2001
Year-over-Year Employment Change	-0.78%	-3.26%	-6.74%	-1.73%	-5.57%	-3.70%
	(3.26)	(1.82)	(2.01)	(4.57)	(7.46)	(3.08)
Average Firm Size	51.90	54.04	48.75	35.94	41.82	29.15
	(2.14)	(1.65)	(1.42)	(4.19)	(3.04)	(1.52)
As Percent of Total Employment:						
Job Destruction	14.18	15.17	17.26	11.81	17.44	11.83
	(2.36)	(1.21)	(2.14)	(7.48)	(14.70)	(2.11)
Job Destruction due to Death	6.20	6.28	6.26	5.29	9.56	4.07
	(1.95)	(0.03)	(1.17)	(6.99)	(14.02)	(1.25)
Job Destruction due to Contraction	7.99	8.89	11.00	6.52	7.88	7.76
	(2.90)	(1.22)	(1.03)	(3.06)	(0.70)	(1.71)
Job Creation	13.41	11.91	10.52	10.08	11.88	7.76
	(1.59)	(0.63)	(0.25)	(3.64)	(7.24)	(1.71)
Job Creation due to Birth	6.71	6.07	5.66	5.20	8.26	4.41
	(1.08)	(0.25)	(0.53)	(3.47)	(6.02)	(0.93)
Job Creation due to Expansion	6.70	5.84	4.86	4.88	3.62	3.72
	(1.03)	(0.39)	(0.38)	(1.76)	(1.22)	(1.11)

Table 2. Employment Change and Contributions to Employment Creation and Destruction as Percent of Total Employment, Service and TCU.

	Service			Transportation, Communication, & Utilities		
	1990-2002	1990/91	2001	1990-2002	1990/91	2001
Year-over-Year Employment Change	4.52%	1.97%	1.07%	2.51%	4.27%	-0.21%
	(2.82)	(2.99)	(1.74)	(3.63)	(4.67)	(4.68)
Average Firm Size	12.22	11.05	13.28	27.19	32.18	26.15
	(0.91)	(0.39)	(0.33)	(2.10)	(1.35)	(1.00)
As Percent of Total Employment:	18.45	18.97	19.01	18.11	14.46	20.08
Job Destruction	(2.75)	(4.10)	(1.24)	(5.33)	(2.17)	(5.05)
	8.43	8.70	7.78	9.77	6.73	10.36
Job Destruction due to Death	(3.07)	(3.90)	(0.84)	(4.58)	(0.56)	(3.51)
	10.01	10.26	11.23	8.34	7.74	9.72
Job Destruction due to Contraction	(2.40)	(0.26)	(0.47)	(1.53)	(1.75)	(1.60)
	22.96	20.93	20.08	20.62	18.74	19.87
Job Creation	(2.03)	(1.13)	(0.58)	(4.00)	(2.54)	(0.51)
	10.71	10.16	9.01	10.25	6.57	11.25
Job Creation due to Birth	(1.92)	(2.24)	(0.34)	(4.69)	(1.03)	(2.08)
	12.25	10.77	11.08	10.36	12.17	8.62
	(1.27)	(1.13)	(0.65)	(2.30)	(3.57)	(1.74)

Table 3. Employment Change due to Births and Deaths versus Expansions and Contractions as Percent of Total Employment

Industry	Employment Change due to Births and Deaths	Employment Change due to Expansions and Contractions
Minerals	10.49%	11.40%
Construction	17.84	33.91
Manufacturing	12.91	14.68
Transportation, Communications, Utilities (TCU)	20.02	18.70
Wholesale Trade	19.66	20.87
Retail Trade	21.15	18.53
Finance, Insurance, Real Estate (FIRE)	19.73	19.71
Service	19.14	22.26

Table 4. Means and Standard Deviations of Establishment Characteristics, Manufacturing and Service, 1990-2002.

Variable	Manufacturing	Service
Quarterly employment this year	61.03	14.85
	(217.33)	(80.32)
Quarterly employment last year	58.93	13.92
	(212.12)	(75.65)
Average Quarterly Pay this year	$4,846.33	$5,722.65
	(8373.72)	(10899.33)
Average Quarterly Pay last year	$4,690.09	$5,577.95
	(8117.11)	(10827.21)
Firm representation	88.87%	92.95%
	(29.10)	(24.75)
Firm-level employment	247.24	69.90
	(1160.57)	(335.69)
Newowner = 1	0.03	0.03
Multi-firm establishment = 1	0.14	0.08
Establishment size:		
empl <5	0.36	0.64
5 ≤ empl < 10	0.16	0.16
10 ≤ empl < 100	0.36	0.18
100 ≤ empl	0.12	0.02
Sample Size	562,201	3,420,351

Note: Employment and wages are averaged over observations with non-zero values.

Table 5. Probability of No Change in Employment, Contraction, Expansion, and Death over the Business Cycle, Manufacturing and Service.

	Manufacturing				Service			
	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death
Pre-Recession One (1990.1-1990.2)	0.25	0.32	0.33	0.10	0.43	0.22	0.25	0.09
Recession One (1990.3-1991.1)	0.26	0.35	0.29	0.09	0.44	0.22	0.23	0.10
Post-Recession One (1991.2-1992.1)	0.26	0.35	0.29	0.10	0.44	0.22	0.22	0.12
Pre-Recession Two (2000.3-2000.4)	0.28	0.32	0.30	0.10	0.44	0.20	0.24	0.12
Recession Two (2001.1-2001.4)	0.27	0.37	0.27	0.09	0.45	0.21	0.23	0.11
Post-Recession Two (2002.1-2002.4)	0.36	0.37	0.24	--	0.52	0.25	0.21	--

Note: Probabilities calculated using parameter estimates from a multinomial logit. The probability of each outcome is calculated for each establishment as if were in each of the time periods listed, then averaged over all establishments. While standard errors were not calculated, the high precision of the multinomial parameter estimates gives us confidence in the precision of these predicted probabilities. The probability of death is not reported for the post-recession two period since it takes three quarters of post-data to designate a death leading to an undercounting of deaths during this period. For the same reason, the probabilities of contraction in the post-recession two period will be modestly over-stated.

Table 6. Probability of No Change in Employment, Contraction, Expansion, and Death over the Business Cycle, Manufacturing and Service, by Establishment Size.

	Manufacturing				Service			
	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death
Establishment Employment < 5	(N=255,055)				(N=2,205,313)			
Pre-Recession One (1990.1-1990.2)	0.50	0.13	0.22	0.14	0.59	0.12	0.19	0.11
Recession One (1990.3-1991.1)	0.53	0.14	0.20	0.13	0.60	0.12	0.17	0.12
Post-Recession One (1991.2-1992.1)	0.53	0.14	0.20	0.13	0.59	0.11	0.16	0.14
Pre-Recession Two (2000.3-2000.4)	0.55	0.12	0.19	0.14	0.59	0.11	0.17	0.14
Recession Two (2001.1-2001.4)	0.55	0.15	0.18	0.13	0.60	0.11	0.16	0.12
Post-Recession Two (2002.1-2002.4)	0.70	0.13	0.14	--	0.70	0.13	0.15	--
Establishment Employment ≥ 100	(N=65,225)				(N=64,179)			
Pre-Recession One (1990.1-1990.2)	0.01	0.50	0.42	0.07	0.01	0.46	0.44	0.08
Recession One (1990.3-1991.1)	0.01	0.55	0.38	0.06	0.02	0.47	0.42	0.09
Post-Recession One (1991.2-1992.1)	0.01	0.55	0.37	0.07	0.02	0.47	0.41	0.11
Pre-Recession Two (2000.3-2000.4)	0.02	0.51	0.40	0.07	0.02	0.44	0.43	0.11
Recession Two (2001.1-2001.4)	0.02	0.57	0.35	0.06	0.02	0.47	0.42	0.10
Post-Recession Two (2002.1-2002.4)	0.02	0.62	0.33	--	0.02	0.56	0.40	--

Note: See notes to Table 5. The time period probabilities are averaged across the sub-sample listed.

Table 7. Probability of No Change in Employment, Contraction, Expansion, and Death over the Business Cycle, Manufacturing and Service, by Change in Ownership.

	Manufacturing				Service			
	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death
New Owner	(N=17,529)				(N=118,808)			
Pre-Recession One (1990.1-1990.2)	0.19	0.12	0.08	0.61	0.29	0.13	0.08	0.51
Recession One (1990.3-1991.1)	0.21	0.14	0.07	0.58	0.28	0.12	0.07	0.53
Post-Recession One (1991.2-1992.1)	0.20	0.13	0.07	0.59	0.26	0.11	0.06	0.58
Pre-Recession Two (2000.3-2000.4)	0.21	0.11	0.07	0.61	0.26	0.10	0.06	0.58
Recession Two (2001.1-2001.4)	0.21	0.14	0.07	0.58	0.28	0.11	0.06	0.54
Post-Recession Two (2002.1-2002.4)	0.47	0.23	0.10	--	0.52	0.20	0.09	--
Same Owner	(N=544,672)				(N=3,301,543)			
Pre-Recession One (1990.1-1990.2)	0.25	0.33	0.34	0.08	0.44	0.22	0.26	0.08
Recession One (1990.3-1991.1)	0.26	0.36	0.30	0.08	0.45	0.23	0.24	0.09
Post-Recession One (1991.2-1992.1)	0.26	0.36	0.30	0.08	0.44	0.22	0.23	0.11
Pre-Recession Two (2000.3-2000.4)	0.28	0.32	0.31	0.09	0.44	0.21	0.24	0.11
Recession Two (2001.1-2001.4)	0.27	0.37	0.28	0.08	0.46	0.22	0.23	0.09
Post-Recession Two (2002.1-2002.4)	0.36	0.38	0.24	--	0.52	0.25	0.21	--

Note: See notes to Table 5. The time period probabilities are averaged across the sub-sample listed.

Table 8. Impact of Various Establishment and Firm Characteristics on the Probability of No Change in Employment, Contraction, Expansion, and Death Manufacturing and Service; Average over entire time period, 1990-2002.

	Manufacturing				Service			
	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death	Probability of No Change	Probability of Contraction	Probability of Expansion	Probability of Death
Full Sample, Own Characteristics	0.27	0.31	0.32	0.09	0.45	0.21	0.24	0.10
Same Owner	0.28	0.32	0.33	0.08	0.46	0.21	0.25	0.08
New Owner	0.20	0.16	0.10	0.55	0.28	0.14	0.08	0.50
Establishment size:								
Empl < 5	0.53	0.13	0.22	0.12	0.60	0.11	0.18	0.11
100 ≤ Empl	0.02	0.51	0.40	0.08	0.02	0.47	0.41	0.11
Establishment represents 10% of firm employment	0.32	0.30	0.26	0.11	0.45	0.21	0.22	0.11
Establishment represents 90% of firm employment	0.28	0.31	0.32	0.09	0.45	0.21	0.24	0.10

Note: Probabilities calculated using parameter estimates from a multinomial logit. The probability of each outcome is calculated for each establishment as if it had the characteristic listed , then averaged over all establishments. While standard errors were not calculated, the high precision of the multinomial parameter estimates gives us confidence in the precision of these predicted probabilities. See Table 4 for percent of establishments these characteristics represent.

Appendix A: Details of UI Coverage[18]

The federal criteria for coverage under Unemployment Insurance includes anyone who: 1) works in an employer-employee relationship; 2) performs services for an employer; 3) perform services while in employment; and 4) was paid for those services. Approximately half of states, including Georgia, utilize this federal definition UI coverage. However, the exact definition of employer, employee, and employment can vary from state to state.

According to the federal definition, which the State of Georgia follows, an employer (except for agricultural labor and domestic service) is considered to be an employer unit, and thus subject to UI tax liability, if "during any calendar quarter in the current or immediately preceding calendar year, paid wages of $1,500 or more…" or if the employing unit employs "…one or more workers on at least 1 day in each of 20 weeks during the current or immediately preceding calendar year (p. 1.3). An agricultural employer is covered by UI if the unit "… paid wages in cash of $20,000 or more for agricultural labor in any calendar quarter in the current or preceding year…" or if the unit "…employed 10 or more workers on at least one day in each of 20 different weeks in the current of immediately preceding calendar year." Domestic service is considered to be UI covered if the employers "… paid wages in cash of $1,000 or more for domestic service in a private home, local college club, or a local chapter of a college fraternity or sorority" (pp. 1.5-1.6).

Georgia also follows the federal guidelines for determining if a worker is an employee or an independent contractor. A worker is determined to be an independent contractor, and thus not covered by UI if the following criteria is met: 1) The worker is free from control or direction in

[18] The source for this appendix is the *Comparison of State Unemployment Insurance Laws 2002* U. S. Department of Labor and the Employment and Training Administration. This is available online at www.workforcesecurity.doleta.goc (verified October 2, 2003).

the performance of the work under the contract of service and in fact; 2) The service is performed either outside the usual course of the business for which it is performed or is performed outside of all places of business of the enterprise for which it is performed; and 3) The individual is customarily engaged in an independent trade, occupation, profession, or business (p. 1.6)

The federal definition for employment is as the "… performance of any services, of whatever nature, by an employee for the person employing him or her" (p. 1.8). There are, however, several exceptions. In general, federal employees are not covered by state UI plans, as states cannot tax the federal government. Most states, including Georgia, follow the federal guidelines for exclusions which include the exclusion from UI coverage of Insurance and Real Estate agents on commission, casual labor not in course of employer's business, part-time service for nonprofit organizations exempt from Federal income tax, family members, students working for schools, student nurses and interns working in hospitals, and those who are self-employed. Furthermore, though it varies from state to state, Georgia excludes elected officials, legislators, members of the judiciary, members of state National Guard and Air National Guard, and individuals in policymaking and advisory positions that require less than eight hours per week.

Appendix B: Supplemental Tables

Table B1. Employment Change and Contributions to Employment Creation and Destruction as Percent of Total Employment, Construction, Wholesale Trade, Retail Trade, FIRE.

	Construction			Wholesale Trade			Retail Trade			Fincnace, Insurance, and Real Estate		
	1990-2002	1990/91	2001	1990-2002	1990/91	2001	1990-2002	1990/91	2001	1990-2002	1990/91	2001
%Y/Y Employment Change	0.83	-10.98	-2.07	0.60	-3.41	-3.41	2.32	-1.24	0.29	1.79	-0.96	3.04
	(8.04)	(4.54)	(2.59)	(3.18)	(2.43)	(2.66)	(2.73)	(0.76)	(1.24)	(2.28)	(0.74)	(0.14)
Average Firm Size	9.13	9.57	9.24	10.31	10.87	10.19	15.57	14.85	16.79	10.71	12.14	10.15
	(0.47)	(0.78)	(0.34)	(0.29)	(0.15)	(0.28)	(1.03)	(0.83)	(0.20)	(0.70)	(0.26)	(0.10)
As Percent of Total Employment:												
Job Destruction	25.46	35.88	23.76	18.69	23.28	20.35	18.68	29.86	17.08	18.82	18.06	18.28
	(5.93)	(2.31)	(2.10)	(2.70)	(2.01)	(2.06)	(4.43)	(2.76)	(1.23)	(2.48)	(1.39)	(0.43)
Job Destruction due to Death	8.86	14.66	8.93	9.37	13.10	10.57	9.09	19.15	7.19	9.34	7.14	8.62
	(3.56)	(2.72)	(1.01)	(3.12)	(3.27)	(1.33)	(4.39)	(2.21)	(1.09)	(3.32)	(1.74)	(0.47)
Job Destruction due to Contraction	16.60	21.22	14.83	9.33	10.17	9.78	9.59	10.71	9.90	9.49	10.92	9.66
	(4.58)	(5.03)	(1.09)	(2.51)	(1.70)	(0.79)	(2.04)	(0.57)	(0.30)	(2.75)	(0.51)	(0.15)
Job Creation	26.29	24.89	21.69	19.29	19.87	16.95	21.00	28.62	17.37	20.61	17.10	21.32
	(3.60)	(2.42)	(0.58)	(1.86)	(0.98)	(0.61)	(3.24)	(2.05)	(0.21)	(2.84)	(2.11)	(0.47)
Job Creation due to Birth	8.98	7.80	6.68	8.11	9.56	7.12	12.06	20.64	9.51	10.39	7.61	10.20
	(1.34)	(0.31)	(0.21)	(1.45)	(0.87)	(0.13)	(3.44)	(2.60)	(0.49)	(2.65)	(1.91)	(0.39)
Job Creation due to Expansion	17.31	17.09	15.01	11.18	10.31	9.83	8.94	7.98	7.86	10.22	9.49	11.12
	(2.63)	(2.51)	(0.77)	(1.37)	(0.20)	(0.64)	(0.99)	(0.68)	(0.46)	(1.42)	(0.23)	(0.13)

Table B2: Multinomial Logit Parameter Estimates for Manufacturing.

	Probability of No Change	Probability of Contraction	Probability of Death
Intercept	1.4979*** (0.0464)	-0.4049*** (0.0493)	0.1162 (0.1199)
Ave. wage last year	5.1×10^{-5}*** (5.6×10^{-6})	-2.7×10^{-5}*** (3.0×10^{-6})	1.3×10^{-6}*** (4.8×10^{-7})
Firm representation	-0.0058*** (0.0004)	-0.0020*** (0.0005)	-0.0063*** (0.0012)
Firm employment	-4.1×10^{-5}** (2.1×10^{-5})	-4.7×10^{-5}*** (1.7×10^{-5})	-0.0005*** (0.0002)
5<=Empl<10	-1.2613*** (0.0232)	0.6130*** (0.0182)	-0.8312*** (0.0278)
10<=Empl<100	-2.3400*** (0.0244)	0.6339*** (0.0164)	-1.2319*** (0.0278)
100<=Empl	-4.2018*** (0.0518)	0.7646*** (0.0248)	-1.1679*** (0.0757)
Pre R1	-0.0709** (0.0281)	0.1304*** (0.0229)	0.0320 (0.0589)
R1	0.1137*** (0.0244)	0.3360*** (0.0213)	0.0845** (0.0448)
Post R1	0.1173*** (0.0210)	0.3385*** (0.0211)	0.1268*** (0.0346)
Pre R2	0.2012*** (0.0300)	0.1963*** (0.0225)	0.1953*** (0.0400)
R2	0.2570*** (0.0232)	0.4627*** (0.0224)	0.1854*** (0.0422)
Post R2	0.7477*** (0.0200)	0.5854*** (0.0210)	-1.1948*** (0.0430)
Newowner	1.0785*** (0.0362)	0.4469*** (0.0422)	3.3684*** (0.0326)

Notes: Standard errors in parentheses. *** => significant at the 99 percent confidence level, **=> significant at the 95 percent confidence level, *=> significant at the 90 percent confidence level. Pre R1: 1990.1-1990.2; R1: 1990.3-1991.1; Post R1: 1991.2-1992.1; Pre R2: 2000.3-2000.4; R2: 2001.1-2001.4; Post R2: 2002.1-2002.4.

Table B3: Multinomial Logit Parameter Estimates for Service.

	Probability of Contraction	Probability of Expansion	Probability of Death
Intercept	-1.7387*** (0.0356)	-1.3566*** (0.0491)	1.6661*** (0.0607)
Ave. wage last year	9.8×10^{-6}*** (8.6×10^{-7})	2.2×10^{-5}*** (1.1×10^{-6})	1.6×10^{-5}*** (1.0×10^{-6})
Firm representation	0.0002 (0.0004)	0.0013** (0.0005)	-0.0015** (0.0006)
Firm employment	1.8×10^{-5} (3.6×10^{-5})	0.0002*** (8.16×10^{-5})	-0.0003** (0.0001)
5<=Empl<10	2.0294*** (0.0081)	1.4669*** (0.0094)	0.4306*** (0.0154)
10<=Empl<100	3.0325*** (0.0107)	2.5082*** (0.0117)	1.3119*** (0.0204)
100<=Empl	5.0219*** (0.0510)	4.4390*** (0.0481)	3.5067*** (0.0740)
Pre R1	0.1003*** (0.0115)	0.0357*** (0.0107)	-0.0860*** (0.0162)
R1	0.0821*** (0.0107)	-0.0775*** (0.0104)	-0.0187 (0.0149)
Post R1	0.0609*** (0.0098)	-0.1121*** (0.0094)	0.1789*** (0.0164)
Pre R2	-0.0105 (0.0117)	-0.0691*** (0.0102)	0.1657*** (0.0191)
R2	0.0177* (0.0097)	-0.1236*** (0.0094)	0.0065 (0.0175)
Post R2	0.0062 (0.0093)	-0.3737*** (0.0085)	-1.6577*** (0.0202)
Newowner	-0.0705*** (0.0142)	-0.7413*** (0.0155)	2.2783*** (0.0108)

Notes: Standard errors in parentheses. *** => significant at the 99 percent confidence level, **=> significant at the 95 percent confidence level, *=> significant at the 90 percent confidence level. Pre R1: 1990.1-1990.2; R1: 1990.3-1991.1; Post R1: 1991.2-1992.1; Pre R2: 2000.3-2000.4; R2: 2001.1-2001.4; Post R2: 2002.1-2002.4.