

**The Appalachian Economy,
Establishment and Employment Dynamics, 1982-1997:
Evidence from the Longitudinal Business Database**

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Executive Summary

The objective of this report is to describe the Appalachian Region's economy in terms of the entry and exit of establishments and their wage and employment dynamics and to compare these to the rest of the U.S. economy from 1982 to 1997. While the report provides a detailed description of the entire economy of Appalachia, special attention is paid to the producer services portion of the economy. Producer services are services sold primarily to other establishments to be used as inputs in production and include such activities as financial services, insurance and real estate services, advertising, building maintenance services, equipment rentals, employment services, computer and data processing services, legal services, engineering, and management. Producer services are an increasingly important component of the U.S. economy. In addition, the three subregions of Appalachia are also analyzed. The main results of the four levels of comparison can be summarized as follows:

Comparing Appalachia to the U.S. for the Total Economy

- **Wages, as measured at the establishment level, are about 10 percent lower in Appalachia than in the United States**, even when controlling for differences in industry composition and other characteristics across the two areas. This wage discrepancy has not narrowed over the time period studied.
- **Establishment birth and death rates are lower in Appalachia than in the United States** (a difference that has not decreased over time). The lower birth and death rates for Appalachia are apparent in most industries in the economy except in mining (and to a lesser extent manufacturing and construction). The lower birth and death rates relative to the U.S. are especially noticeable in the Finance, Insurance, and Real Estate (FIRE) and Service sectors.
- **Establishment entrants in Appalachia are smaller and pay lower wages than do their counterparts in the rest of the U.S.** Similarly, establishment exiters in Appalachia are smaller and pay lower wages than do their counterparts in the rest of the U.S. The wage gap for entrants is only slightly lower than it is for exiters and for continuing establishments.
- **Job creation and destruction rates had a slight downward trend over the study period for both the U.S. and Appalachia.** Job creation and destruction rates are lower in Appalachia than in the U.S. The U.S. job creation rate exceeds 45 percent, while the Appalachian job creation rate is 43 percent in all three time periods. Similarly, the U.S. job destruction rate is about 35 percent, while the Appalachian job destruction rate is about 33 percent. Even when controlling for industry, branch activity, year, and size differences, job creation rates are 1.2 percentage points lower and job destruction rates are 3.4 percentage points lower in Appalachia relative to the rest of the U.S.

Comparing Appalachia to the U.S. for Producer Services

- **Wages in Appalachia in the producer services sector are about 16 percent lower than those in the same sector for the rest of the U.S.**, even when controlling for other differences between Appalachia and the U.S. Thus, the wage gap is larger in producer

services than in the rest of the economy. However, in contrast to the economy as a whole, this gap narrows over the study period.

- **Establishment birth rates are higher and death rates are lower in producer services relative to the economy as a whole for both the U.S. and Appalachia.** Nevertheless, the establishment birth and death rates are still lower in Appalachia than they are in the rest of the U.S. Wages at newly entering establishments are 18 percent lower than their U.S. counterparts. This wage gap for entrants is even higher than it is for the total economy.
- **A similar pattern emerges on the employment margin.** Net employment growth in producer services is strong in both the U.S. and Appalachia over all the time periods. Underlying these strong growth rates, is greater establishment and employment churning in the U.S. relative to Appalachia.

Comparing Subregions of Appalachia to the U.S. for the Total Economy

- **Compared to the rest of the U.S. the Central subregion's wages are about 20 percent lower, and Northern and Southern subregion's wages are about 10 percent lower,** on average, over the study period, even when controlling for differences in industry, size, and branch activity. Only the Central subregion's wage gap has improved over the study period.
- **The Southern subregion has the highest birth rate of establishments, followed by the Central and Northern subregions.** The death rates for the Northern and Southern subregions are relatively similar. The wage gaps for employees at entering establishments are roughly the same for the Northern and Southern subregions but only when controlling for other differences. Otherwise, the wage gap is larger for the North.
- **Net employment growth in the Southern subregion has fared well.** When controlling for differences in industry, the Central subregion's net employment growth rate is actually higher than the growth rate for the rest of the U.S. This is not the case for the Northern subregion, which suggests that the Northern subregion's problems are more diverse than the Central subregion's over-reliance on slow growth industries. The Southern subregion's establishment birth and death rates, and job creation and destruction rates are more closely aligned with those of the U.S. as a whole than are either of the other two subregions. When controlling for other factors, the Northern subregion's low net employment growth relative to the rest of the U.S. results from low job creation rates.

Comparing Subregions of Appalachia to the U.S. for Producer Services

- **The Southern subregion has very high birth rates relative to the other subregions.** As was the case in general, the Southern subregion appears to enjoy especially strong net employment growth in producer services. Underlying the net employment growth are strong job creation rates.

1. Introduction

The general consensus, based on studies of the Appalachian Region's socioeconomic health, is that the region has made great progress in some areas since the Presidential Commission first studied the area in 1964, but that the region still lags behind the rest of the United States in a variety of dimensions. This report focuses on the economic health of the region, specifically on the ability of the region to reallocate resources in response to changing economic conditions.

Three Major Focuses of the Report:

1. Reallocation Activity in Appalachia
2. The Importance of Strong Producer Services
3. Accounting for the Heterogeneity of the Region

The U.S. economy has undergone tremendous changes in the last twenty years. One of the major changes has been a shift in economic activity away from the manufacturing sector to the trade, service, and financial sectors. This shift has necessarily involved the large-scale reallocation of economic activity. More generally, growing empirical literature in economics documents the tremendous amount of *ongoing* reallocation in the U.S. economy. One question is whether the Appalachian Region, which has historically relied heavily on the manufacturing sector, has also experienced this shift in economic activity.

This report addresses the question of whether the Appalachian Region experiences the same type of ongoing reallocation activity as the U.S. economy does. Using the newly developed *Longitudinal Business Database* (LBD), this report documents the reallocation of activity across establishments and across jobs in Appalachia and the U.S. One of the concerns about the reallocation of economic activity across establishments and jobs is whether the new establishments and created jobs have high or low wages. This concern has great resonance in the Appalachian Region, which has historically struggled with very low-income rates. This report also addresses this question.

A second focus of the report reflects the school of thought in regional economics literature that emphasizes the importance of the producer services sector for a region's growth. Many articles have argued that the presence of producer services can explain growth differentials across geographic locations as well as differing growth and productivity rates for industrial activities. Beyers (1989) notes that "the producer services have emerged as an important new key sector, joining agriculture, mining, and manufacturing as an important basic component of regional economies (p. ii)." Goe (1996) offers a review of the literature concerning the impact of producer services industries on a region, including producer services growing role in inter-regional trade.

With the broad scope of data, this report provides a detailed description of producer services in Appalachia compared with the U.S. The basic features of this sector of the economy, such as the number of establishments and employees, are described and the wage dynamics and establishment and employment reallocation patterns are examined. Although it is beyond the scope of this report to test the hypothesis that producer services are essential for the economic health of a region, the development of

the LBD clearly holds the promise that this hypothesis could be tested.

A third focus of the report is to account for the heterogeneity of the Appalachian Region. The Appalachian Regional Commission (ARC) divides the region into three subregions based on the location of the county: Central, Northern, and Southern. Numerous studies have found that the Southern subregion has experienced more positive outcomes compared to the other two subregions in several ways. These studies have also found that Northern subregion appears to have declined over time while Central subregion has remained mostly unchanged.

Isserman (1996) summarizes these differences: “Central Appalachia has the most poverty, and Northern Appalachia the least growth (p.13).” In his study of the manufacturing sector of Appalachia, Jensen (1998) finds that “there is considerable variation within the Region, with the South experiencing the most favorable outcomes over the period and the North slipping relative to the national experience (p.i).”

More specifically, Jensen (1998) finds that relative to the U.S., the Northern subregion has lower entry rates and increasingly lower wages and productivity, the Central subregion has higher entry rates and lower (but relatively unchanged) wages and productivity, and the Southern subregion has higher entry rates and lower (but less so) wages and productivity. Accordingly, this report examines the reallocation dynamics of these three subregions and compares them to the U.S.

Four Major Themes Emerge

1. The Appalachian Region experiences far less reallocation of establishments and employment than the U.S. does.

This is evident in the lower establishment formation and attrition rates, and the lower job creation and destruction rates. This is partly due to the industry composition of Appalachia, but differences in industry composition do not explain all of the differences. The over-reliance on branch activity apparent in other studies is not as apparent here, and does not seem to greatly explain the differences in reallocation rates. The Brandow Company has also examined these issues in Appalachia. Brandow (2001) summarizes their findings as “Appalachia had done well in retaining existing firms, but remains caught in a cycle of low levels of entrepreneurship, low growth among existing firms, and a continued over-reliance on branch facilities (p. 24).” The results in this report strengthen the view that Appalachia lacks sufficient economic vitality.

2. Low wages continue to be a problem in the Appalachian Region.

Wages are about 10 percent lower in Appalachia than in the U.S., even when controlling for differences in industry composition and other establishment characteristics across the two areas. This wage discrepancy has not narrowed over the time of the study. Wages at newly entering establishments are 10 percent lower than their U.S. counterparts, even when controlling for other differences. The wage gap is most apparent in the Central subregion. Compared to the rest of the U.S. on average over the study period, the Central subregion’s wages are about 20 percent lower even when controlling for differences in industry, size, and branch activity. However, the Central subregion’s wage gap has

improved over the study period. In contrast, the Northern and Southern subregions' wages are about 10 percent lower—a gap relatively constant over the study period.

3. The producer services sector fares better than the rest of the economy in some dimensions but worse in other dimensions.

While the job creation rates are higher in this sector, the gap between the wages for Appalachian employees at establishments in Appalachia as compared to employees at establishments in the rest of the U.S. is much larger. This wage gap is even higher still for new establishments in producer services.

4. The three subregions of Appalachia are tremendously heterogeneous.

The Central subregion most closely approximates the conventional view of Appalachia, where most of its activity is in non-metropolitan areas and relies on mining and manufacturing. In much of the analysis, the results for Central subregion change dramatically for the better once industry controls are applied. Yet industry composition is not the whole story. For example, the Central subregion suffers from low wages even when controlling for industry differences.

The Northern subregion seems to face a different set of concerns. Here the establishment birth rates and job creation rates are markedly low. Controlling for industry mitigates some of this, but nevertheless the Northern subregion seems to lack economic vitality that encourages establishment births and job creation. On the other hand, the wage gap in the North is not as severe as it is for the Central subregion.

Finally, the Southern subregion is most similar to the rest of the U.S. This subregion's net employment growth rates exceed those of the rest of the U.S. When controlling for other differences, it is apparent that this is partly due to high job creation rates and low job destruction rates. Nevertheless, wages in the Southern subregion are still lower than the wages in the rest of the U.S. The wage gap for the Southern subregion is about 10 percent, even when controlling for other differences. This gap is relatively steady over the study period.

The report is organized as follows:

Section 1: Introduction

Section 2: Discussion of measurement issues and the data used in the study.

Section 3: Comparison of the Appalachian Region with the U.S. over the entire economy. The section is divided into three subsections.

1. Describes the overall characteristics of the comparison areas. The differences that are uncovered motivate the structure of the analyses in the subsequent sections. For example, the differences in industry composition described in the first subsection are controlled for in the subsequent subsections when analyzing establishment and employment dynamics.
2. Examines establishment births and establishment deaths.
3. Extends the dynamic analysis to the margin of job creation and job destruction. This three-part

format is used in each of the subsequent sections.

Section 4: The comparison is narrowed to the producer services sector of the economy.

Section 5: The economies of the three subregions of Appalachia are compared to the U.S.

Section 6: The focus is narrowed again to the producer services sector, where producer services sectors in the three subregions are compared to the sectors in the U.S.

Section 7: Concluding remarks.

2. Data and Measurement Issues

The data used in this study are from *the Longitudinal Business Database (LBD)*, a recently developed establishment-level database linking the Census Bureau's business register list (the Standard Statistical Establishment List).¹ As such, the data cover nearly all of the non-farm private U.S. economy. The researchers who developed the LBD supplemented the Census longitudinal numeric identifiers with name and address matching to ensure the highest quality links over time (and thus avoid spurious establishment births and deaths).

The LBD contains information on location, industry classification, parent firm, employment, and payroll. Employment data on the LBD is measured as employment at the establishment during the pay period that includes March 12th. Payroll data on the LBD is measured as annual non-farm payroll derived from the wages and salaries of employees at an establishment. From these data, we create an annual measure of wages: annual payroll divided by (March 12th) employment. The LBD does not contain information on hours and thus establishment-level wages cannot be adjusted for variation in hours. Thus the wage measure is an approximation of the average wage earned at an establishment.

After carefully analyzing all years in the LBD, a decision was made to use data only in years covered by an Economic Census (specifically, 1982, 1987, 1992, and 1997), to maintain high data quality. Similarly, the study includes data only for establishments covered by an Economic Census. Thus establishments in agriculture, forestry, fishing, railroads, educational establishments, labor unions, religious or political organizations, and government are all excluded (see Data Appendix, section A1.1 for a more complete discussion).

In addition to these two constraints, the LBD data were edited over two dimensions. First, missing industry codes were filled in where possible using data from non-Census years (see section A1.2 for a discussion). Second, data that appeared suspicious in terms of employment size of new establishments and magnitude of wages were deleted (see section A1.3 for a discussion). The final dataset consists of approximately six million establishments and 87 million employees in each census year.

To consistently measure births and deaths at establishments and in terms of employment flows, births and deaths are designated based upon establishment employment. The status of an establishment is defined for a pair of years (1982-87, 1987-92, and 1992-97) based on the values of employment in those two years.

The rules are as follows:

- 1) Births have zero employment in the start year and positive employment in the end year.

¹ For a more detailed description of this database, see "The Longitudinal Business Database" by Ron Jarmin and Javier Miranda (2002), available at <http://www.ces.census.gov/ces.php/papers>.

- 2) Continuers have positive employment in both the start and end years.
- 3) Deaths have positive employment in the start year and zero employment in the end year. Since employment is measured as of the week including March 12 and payroll is measured as an annual average, there are many establishments with zero employment but positive payroll (see section A1.4 for a discussion of the impact of designation rules). Finally, because the focus is on five-year intervals, these measures will by construction miss any establishments that are created and then destroyed within the five-year interval. The pooled paired-census years dataset consists of over 21 million observations.

As noted above, much of the analysis is for establishment dynamics over five-year intervals. Two of the three five-year intervals are periods of economic expansion in the U.S. (1982-87 and 1992-97). The remaining interval, 1987-92, encompasses a recession and the early part of the recovery.

The comparisons of general economic trends in this report are for Appalachia (or its subregions) compared with the U.S., since the U.S. is the most meaningful base of comparison. When using econometric techniques to compare the differences between Appalachia and the U.S., the comparison is for Appalachia and *the rest of* the U.S. The estimation specifications for these comparisons are discussed in the Methodology Appendix with appropriate cites in the main text.

To allow for easier comparisons across the four main sections of the report, figures with similar concepts are produced with the same scales, wherever possible.

3. Comparison of Appalachia to the U.S. for the Entire Economy

The Appalachian economy is compared to the rest of the U.S. economy in this section. Section 3.1 compares the geography, industry distribution, branch activity, establishment size, and wages of the two economies. Section 3.2 examines the two areas' economic dynamics in terms of their establishment births and deaths. Section 3.3 extends this analysis of dynamics by examining the employment flows.

3.1 Characteristics of Appalachia

The Appalachian Region, as defined in Fiscal Year 2002 by Congress for the Appalachian Regional Commission (ARC), consists of 406 counties in 13 states running from New York to Mississippi.² There are approximately six million establishments and 87 million employees in the U.S. and 400,000 establishments and six million employees in the Appalachian Region on average in the dataset.

Figures 1A and 1B show employment and the number of establishments in the U.S. (left-scale) and the Appalachian Region (right-scale) for each census year.³ As is evident from the figures, employment and the number of establishments are growing over time for both areas. The number of establishments increases by 30 percent for both the U.S. and Appalachia, while employment increases by 40 percent for the U.S. and 34 percent for Appalachia from 1982 to 1997. The characteristics of Appalachia are described in the next subsections.

3.1.1. Appalachia is relatively rural.

The common perception of the Appalachian Region is of a relatively rural area. According to ARC, 42 percent of the population in Appalachia lives in rural areas, compared with 20 percent for the U.S. However, while metropolitan areas account for only 28 percent of the counties, these areas account for about 60 percent of establishments and 65 percent of employment in Appalachia. The LBD does not have a measure of metropolitan and non-metropolitan areas; thus, it is not possible to control for these differences in the analysis. Instead, metropolitan and non-metropolitan areas of Appalachia are compared to each other (rather than to their the U.S. counterparts) where possible.

² These counties are based on the Bureau of Economic Analysis FIPS codes that yield 406 counties in Appalachia, compared with the Census FIPS codes, which yields 414 counties and independent cities to cover the same geography. Although Appalachia consisted of 399 counties (BEA convention vs. 404 for the Census method) over much of the sample period, the definition of Appalachia used in this paper is fixed at 414 counties based on the Census method.

Figure 1-A. Establishment Trends in U.S. and Appalachia, 1982-1997

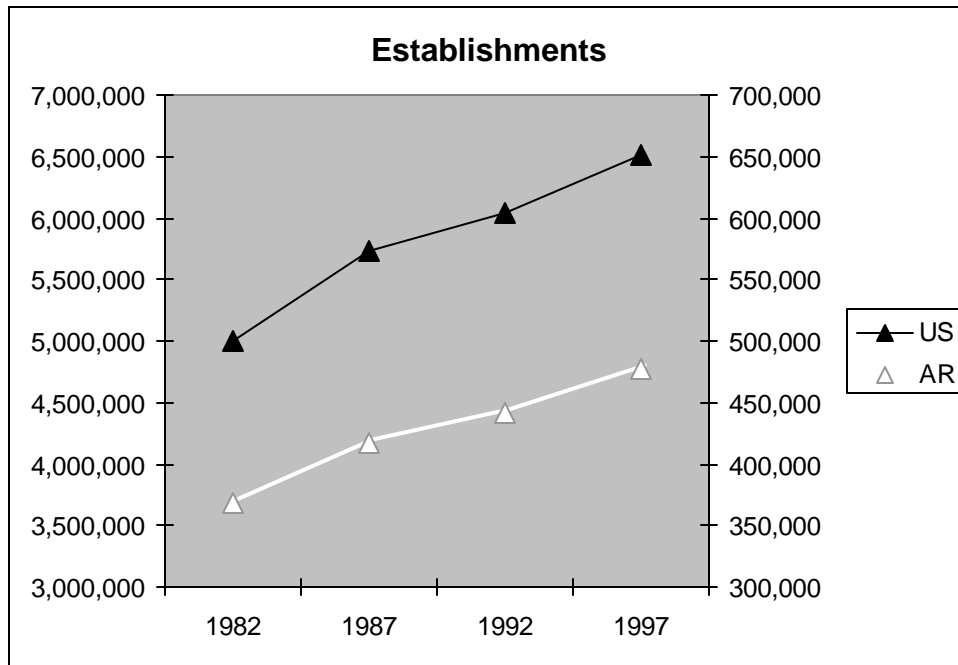


Figure 1-B. Employment Trends in U.S. and Appalachia, 1982-1997

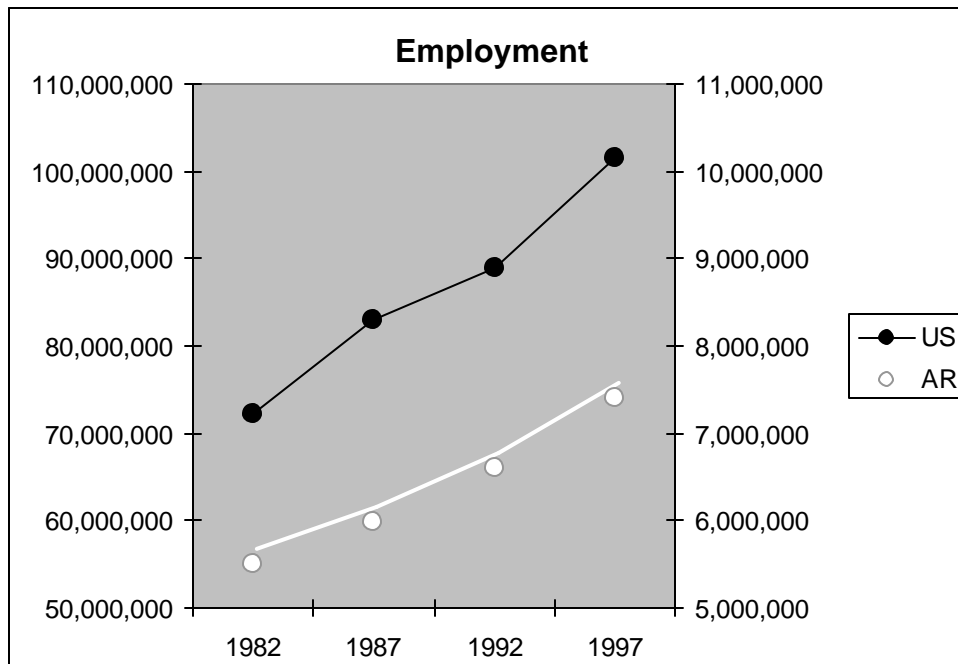


Figure 2-A. U.S. Employment Trends by Sector, 1982 and 1997

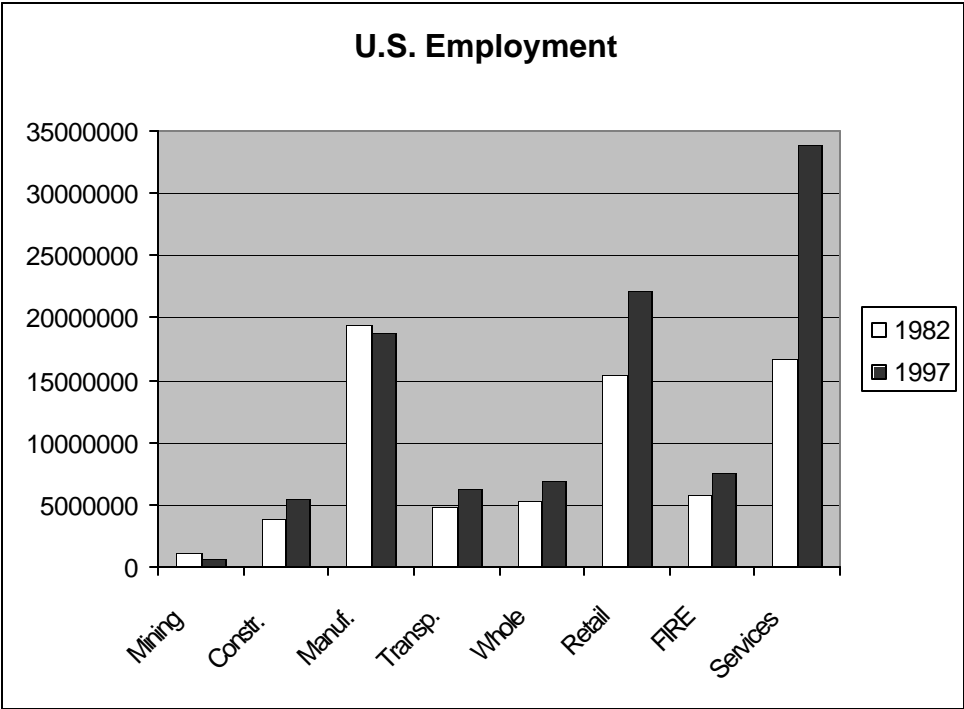
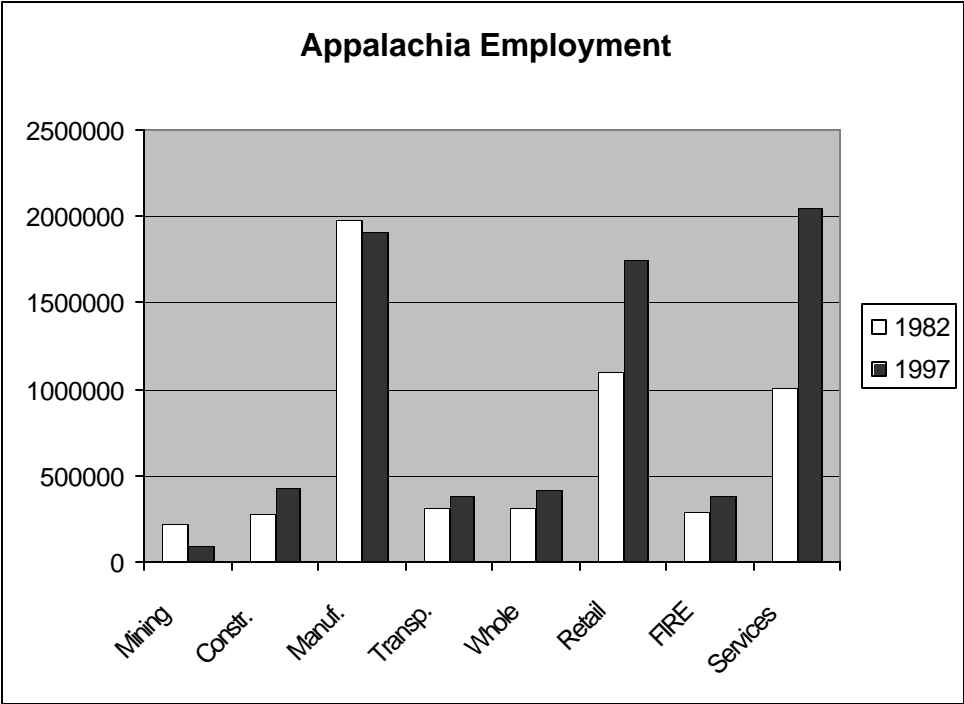


Figure 2-B. Appalachian Employment Trends by Sector, 1982 and 1997

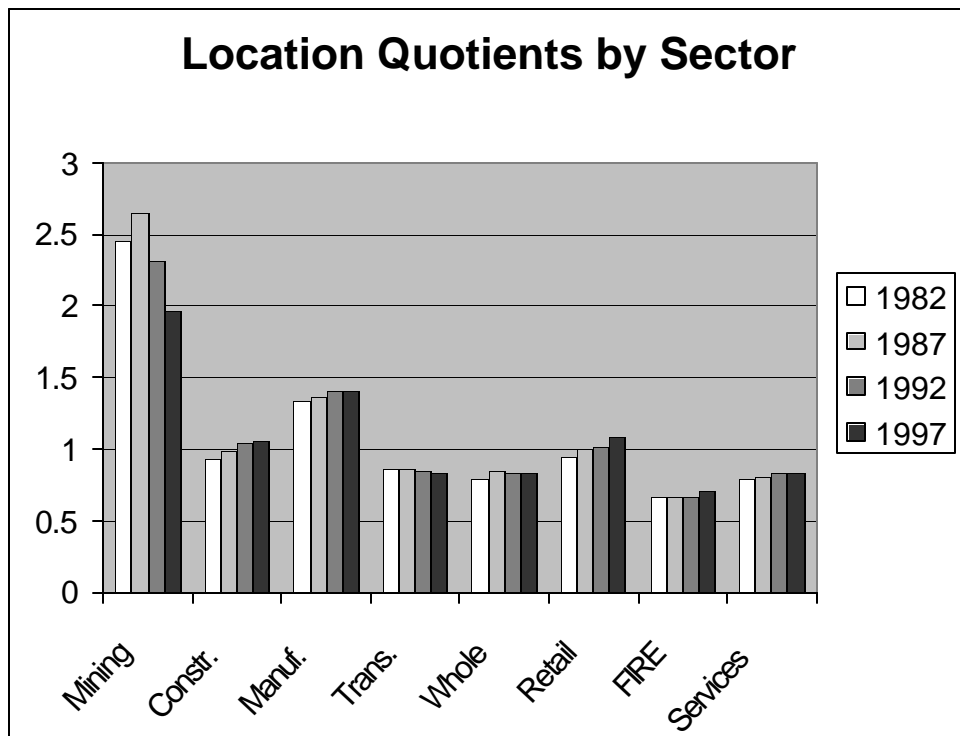


3.1.2. Industry Shifts Away from Traditional Sectors in Appalachia

The Appalachian Region has historically been reliant on mining, agriculture, and manufacturing for economic activity. However, economic activity in the U.S. shifts away from these sectors during the period of this study. A similar shift in economic activity for Appalachia is apparent in Figures 2-A and 2-B, which show the distribution of employment by industry for the U.S. and Appalachia at the start and end of the sample period. Employment in services and retail trade grow steadily over time both in the U.S. and in Appalachia. An examination of the years 1982 to 1997 (not shown) reveals the manufacturing sector was dominant in the U.S. until 1982, but dominant in Appalachia until 1992. In terms of establishments (not shown) from 1982 to 1997, the service sector dominates the U.S., and dominates Appalachia starting in the 1990s.

The industry distributions suggest that the changes in industry composition are similar for Appalachia and the U.S. However, important differences between Appalachia and the U.S. can be seen by looking at the location quotient (the ratio of the share of employment in an industry in Appalachia to the share of employment in the same industry in the U.S.). When the location quotient is greater than one, the share of employment in an industry in Appalachia is disproportionately large relative to the U.S. The location quotient for each of the census years in the study is shown in Figure 3.

Figure 3. Appalachian Employment Share by Sector Compared to U.S., 1982-1997



Not surprisingly, the location quotient for mining is significantly greater than one every year. Manufacturing also has a location quotient greater than one for Appalachia. Appalachia's shares of

employment in construction and retail trade become greater than the U.S. shares over time. The location quotient is strikingly low for the FIRE sector. As will be seen in the analysis of establishment and employment dynamics, the difference in the industry distribution between Appalachia and the U.S. impacts many of the comparisons.

Manufacturing Sector

To recognize the historical importance of the manufacturing sector in Appalachia, this section provides more details about manufacturing.

The number of establishments in manufacturing increases over the sample period by about 20 percent in the U.S. and by about 30 percent in Appalachia. Employment in manufacturing falls at the start of the sample period and then increases. The turnaround in employment in manufacturing occurs first in Appalachia (some time between 1987 and 1992) and later in the U.S. (between 1992 and 1997). On a net basis, however, employment in manufacturing fell by 3 percent for both the U.S. and Appalachia between 1982 and 1997.

There is more employment in durable manufacturing than in nondurable manufacturing for both areas, though this difference is slightly more pronounced in the U.S. than in Appalachia. The employment decline in manufacturing for the U.S. is almost entirely in the durable sector, while for the Appalachia the decline is almost entirely in the nondurable sector.

The manufacturing sector contains twenty major groups.⁴ Figures 4-A and 4-B show the employment for each of these industry groups at the beginning and end of the sample period for the U.S. (upper panel) and for the Appalachian Region (lower panel). To ease comparison across the U.S. and Appalachia, the scale for Appalachia is one-tenth that of the U.S. The figures show that the relative size and time series patterns of most Appalachian industries are similar to their U.S. counterparts. However, some industries are strikingly different over the two areas.

Moving from left to right, the first most obvious difference is that the textile industry is relatively much larger in Appalachia than in the rest of the U.S. (though both areas experienced declines in employment in these industries). Apparel is relatively more important in Appalachia at the start of the sample period, but the declines in employment seen in both the U.S. and Appalachia are much more dramatic in Appalachia. Employment in lumber grows for both the U.S. and Appalachia, but the increase is more dramatic in Appalachia. Like employment in apparel, employment declines in primary metals for both the U.S. and Appalachia, but the decline in Appalachia is far more dramatic. Finally, employment in the industrial machinery and transport equipment industries falls in the U.S. but rises in Appalachia over the sample period.

⁴ In order to avoid disclosure problems, the tobacco industry group (SIC 21) is combined with the foods, feeds, and beverages group (SIC 20) in all of the analysis that follows.

Figure 4-A. U.S. Manufacturing Employment by Sector, 1987 and 1997

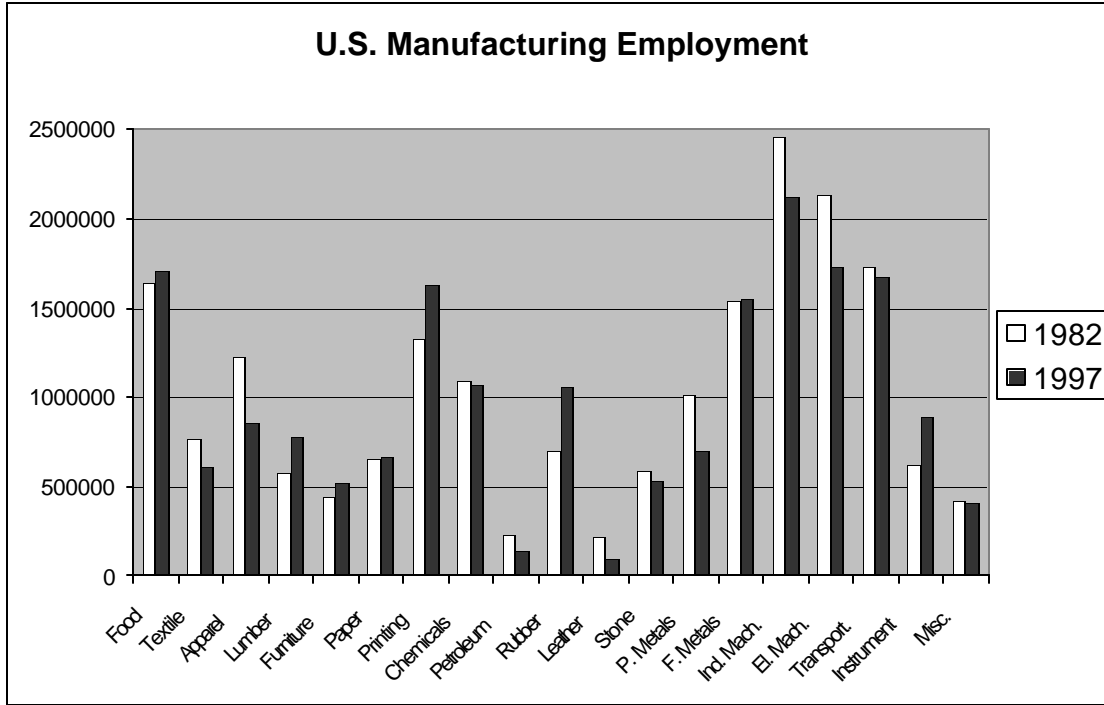
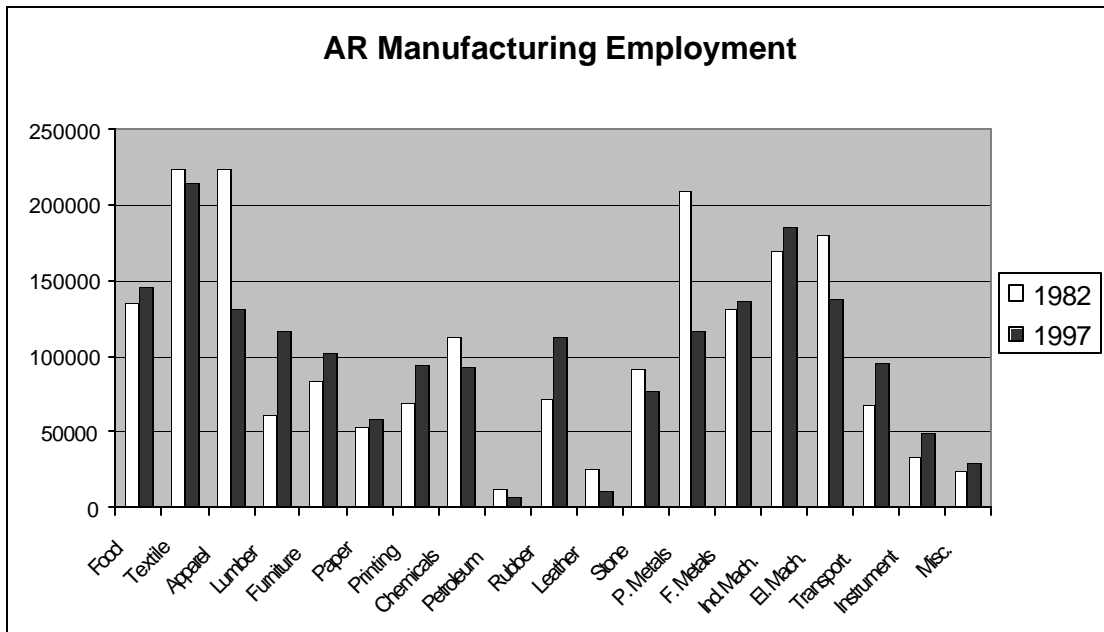


Figure 4-B. Appalachian Manufacturing Employment by Sector, 1982 and 1997



3.1.3. *Employment Activity of Branch Locations*

The LBD contains information on whether the establishment is part of a single-unit firm or is part of a multi-unit firm. Jensen (1998) found that manufacturing multi-unit establishments in Appalachia tend to pay higher wages (and have higher productivity) than single unit establishments. Davis, Haltiwanger, and Schuh (1996) found that in manufacturing, multi-unit establishments experience less employment churning relative to single unit establishments. Thus, whether the share of multi-unit activity in Appalachia is comparable to that of the U.S. is interesting. The shares are in fact very similar. For years 1982 to 1997, approximately 25 percent of establishments in the U.S. are part of a multi-unit firm and employ about 60 percent of all employees. These shares increase only slightly over the time period of the study. The shares of multi-unit establishments and employment are only slightly higher in the Appalachian Region.

3.1.4. *Establishment Size*

The size of an establishment (as measured by the number of its employees) reveals something about the preferred scale of operation and the technology of the establishment. Concerning employment dynamics, the existing literature shows that employment churning decreases as establishment size increases.⁵ The average size of establishments in the U.S. rises to 16 employees in 1997 from 14 employees in 1982. The median U.S. establishment has four employees over this time period. The average size of establishments in Appalachia is about the same as that for the U.S. (slightly higher in two of the years, and slightly lower in the other two years). The median size of establishments in Appalachia is the same as that for the U.S. for all four years. If attention is restricted to establishments with positive employment, the averages and medians are slightly higher but the relationship between the U.S. and Appalachia remains the same.

The measure of size typically used for employment flows is employment averaged over the start and end period for establishments that have positive employment in either period. (This measure will be referred to as the flows measure of size in the rest of the report.) Using this flows measure of size, establishments in Appalachia are about 1 percent larger than those in the rest of the U.S. (see section A2.1 in the Methodology Appendix for a description of the specification used to estimate these differences). However, when controlling for differences in industry distribution, years, and branch activity, establishments in Appalachia are slightly *smaller* than those in the U.S. (about 4 percent smaller). As will be discussed later in this report, controlling for differences in the composition of birth, death, and continuer establishments in Appalachia versus the U.S. also affects the differences in size between the two areas.

3.1.5. *The Gap in Wages Between Appalachia and the United States*

⁵ See Davis, Haltiwanger, and Schuh (1996) for evidence from the manufacturing sector and Foster, Haltiwanger, and Krizan (2002) for evidence from the retail trade sector.

A persistent concern for Appalachia is the gap between the region's wages and the wages in the rest of the U.S. For example, the average wage for employees in the U.S. in 1982 is \$16, while for Appalachia it is \$15. In 1997, the average wage for the U.S. is \$29, while for Appalachia it is \$24.⁶ One of the concerns about the reallocation of economic activity across establishments and jobs is whether the *new* establishments and jobs have high or low wages. This question is examined later.

Table 1 shows the differences in wages for establishments in Appalachia versus the rest of the U.S. (see A2.2 for details on the estimates). As can be seen from the first row, wages in the Appalachian Region are about 10 percent below those for the rest of the U.S. This wage gap does not narrow over the time period. This wage gap may, in part, reflect differences in the industry, branch activity, and size composition of establishments in Appalachia compared with the U.S. The second row of Table 1 shows the wage gap when controlling for differences in these characteristics. Notice that controlling for differences in characteristics does not uniformly narrow the wage gap (compare rows 1 and 2 at each point in time). Industry control is the most influential, suggesting that changes in industry composition are affecting wages. Controlling for industry might widen the wage gap in the early part of the sample when employment in Appalachia was more concentrated in manufacturing compared with the rest of the U.S. Manufacturing traditionally has higher wages compared with other sectors of the economy. As manufacturing becomes less important in Appalachia, some of the wage advantage of the industry composition differences disappears so that the wage gap controlling for other factors is smaller than when not controlling for these differences.

Table 1: Wage Comparison (Differences Between Appalachia and Rest of U.S.)

Type of Comparison	1982	1987	1992	1997
Average Employee	-0.10	-0.09	-0.12	-0.13
Controlling for other Factors*	-0.12	-0.10	-0.11	-0.11

* The factors are industry, branch activity, and establishment size. All differences are statistically significant.

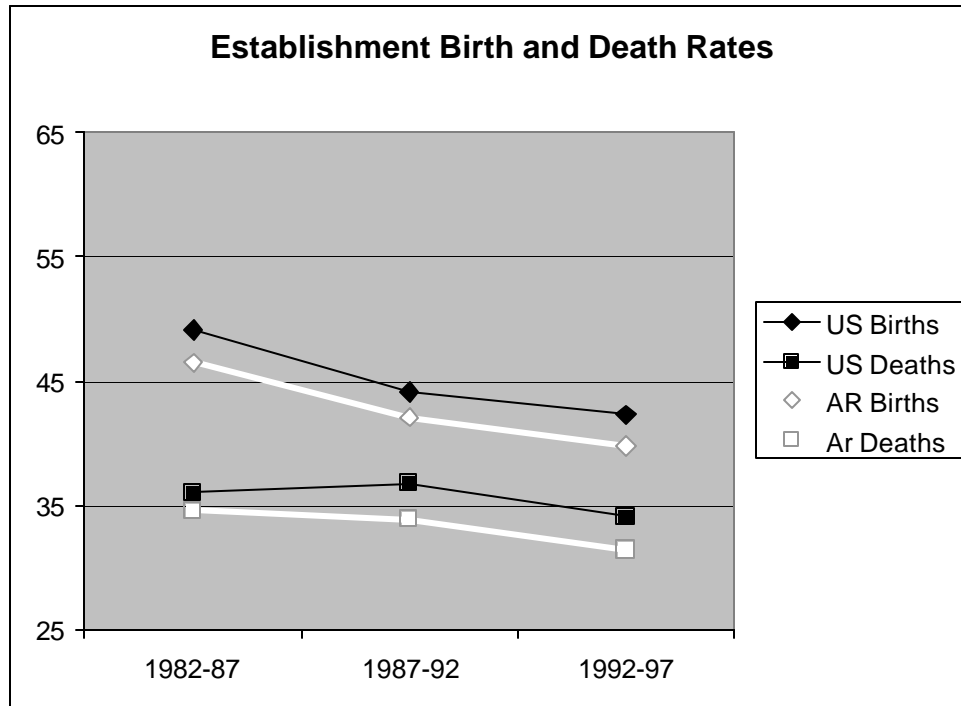
3.2 Establishment Births and Deaths

An indicator of the general economic health of an economy is the rate at which establishments are opening and closing. Accordingly, the first analysis of the dynamics of the Appalachian economy concerns the birth and death rates of establishments. (See section A2.3 of the Methodology Appendix for how these rates are calculated.) Carefully interpreting the results of the comparison between the U.S. and Appalachia is important, since the pace of reallocation will also reflect differences in shocks that the two areas face. Figure 5 shows the establishment birth and death rates for the U.S. and for

⁶ In 1982, the median wage for the U.S. \$14 while for Appalachia it is \$13. In 1997, the median wage for the U.S. is \$24 while for Appalachia it is \$21.

Appalachia. Both areas see a decline in establishment birth rates, and to a lesser extent, establishment death rates. The establishment birth rates are lower in Appalachia than in the U.S. The difference between the two rates narrows slightly for 1987-92 but is about the same size over the time period. The establishment death rates are lower in Appalachia than in the U.S., but the gap widens between Appalachian and U.S. rates after the first period.

Figure 5. Establishment Birth and Death Rates for U.S. and Appalachia, 1982-1997



Another way to compare the prevalence of establishment births and deaths is to compare the probabilities that an establishment is a birth (or death) for Appalachia and the U.S. (see A2.4 for a description of how these probabilities are calculated). Note that this comparison is between Appalachia and the rest of the U.S. The probability of an establishment being an entering establishment is 0.32 for the rest of the U.S. and is 0.31 for Appalachia. Similarly, the probability of an establishment being an exiting establishment is 0.25 for the rest of the U.S. and is 0.24 for Appalachia. When differences in industry composition, years, establishment size, and branch activity are accounted for, the probability that an establishment is a birth is still about 1 percentage point lower for Appalachia. Similarly, when controlling for these characteristics, the probability that an establishment is a death is again about 1 percentage point lower for Appalachia.

3.2.1 Birth and Death Rates by Industry

The analysis above has shown that the establishment birth and death rates for the total economy for Appalachia are consistently below those for the U.S. The analysis in this section examines how these rates compare by sectors of the economy. Figures 6A-6H show the establishment birth and death rates

for Appalachia and the U.S. for each sector of the economy. In contrast to all of the other sectors of the economy, the birth and death rates for mining in Appalachia exceed those in the U.S. in every period (except the death rate in the last period). For construction, the death rates for Appalachia are similar to those for the U.S., but the births rates for Appalachia are lower than for the U.S. (although by the end of the period, the birth rates are almost identical). And for manufacturing, the birth rates for Appalachia are close to those for the U.S., but the death rates are lower in Appalachia, compared to the U.S. (see below for more details). Interestingly, the birth and death rates of establishments in Appalachia are lower than those for the U.S. in wholesale trade, retail trade, FIRE, and services. The largest discrepancy between Appalachia and U.S. birth and death rates occurs in the FIRE sector. Another large discrepancy is in the Service sector. FIRE and service sectors are the two sectors of the economy in which producer services are located.

Figure 6-A. U.S. & Appalachian Mining Establishment Birth & Death Rates

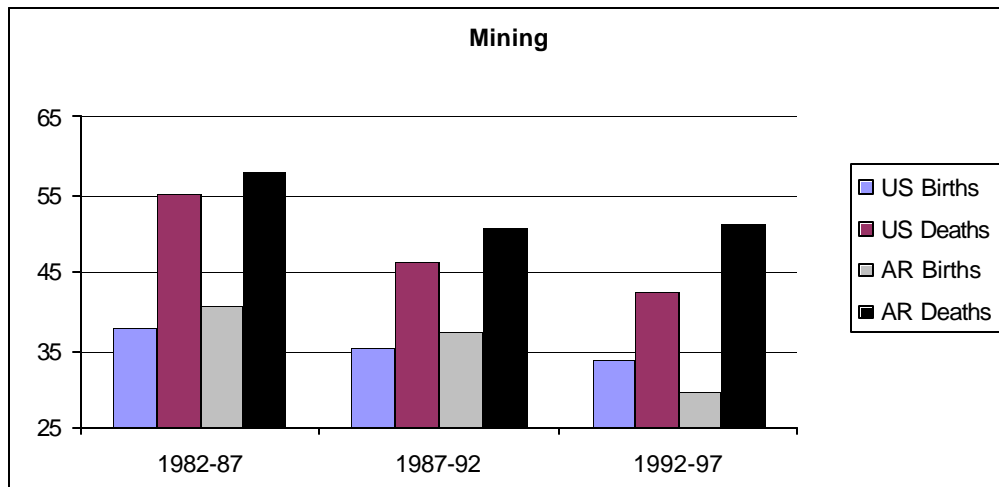


Figure 6-B. U.S. & Appalachian Construction Establishment Birth & Death Rates

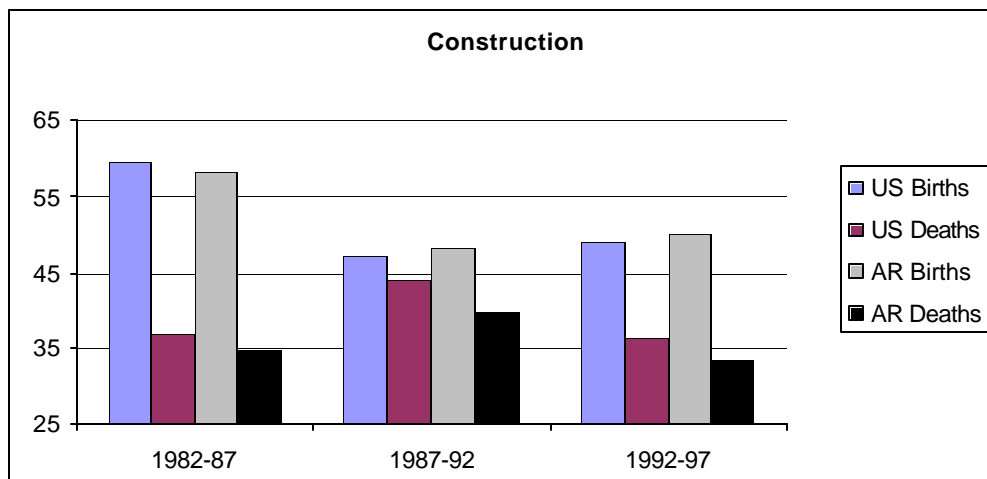


Figure 6-C. U.S. & Appalachian Manufacturing Establishment Birth & Death Rates

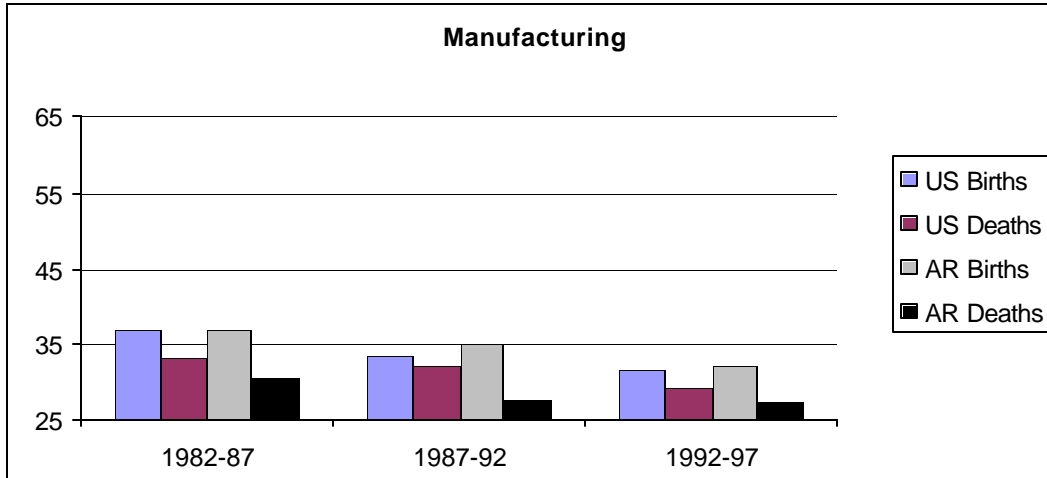


Figure 6-D. U.S. & Appalachian Transportation Establishment Birth & Death Rates

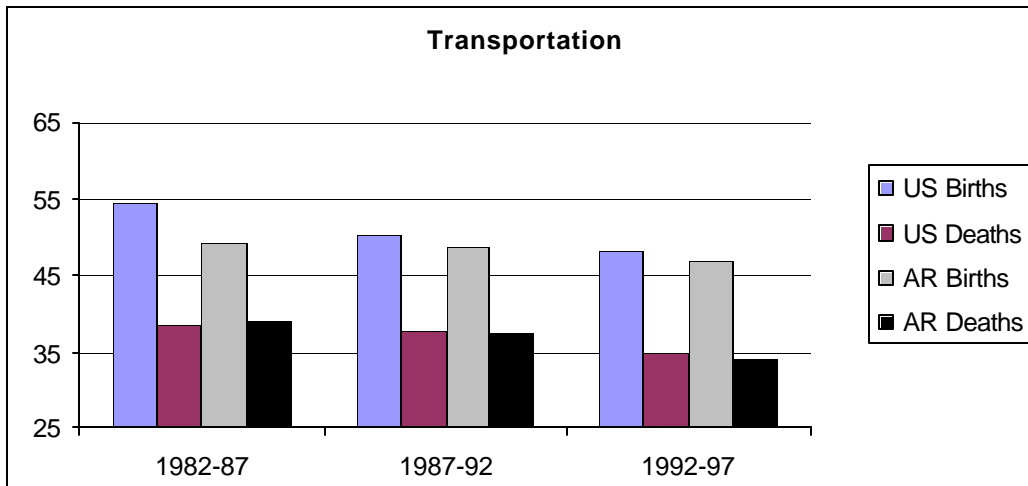


Figure 6-E. U.S. & Appalachian Wholesale Establishment Birth & Death Rates

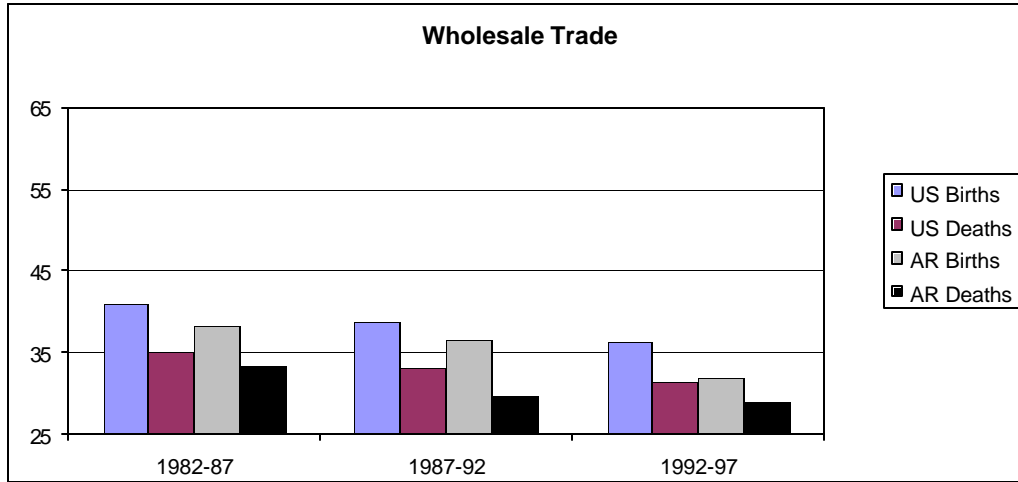


Figure 6-F. U.S. & Appalachian Retail Establishment Birth & Death Rates

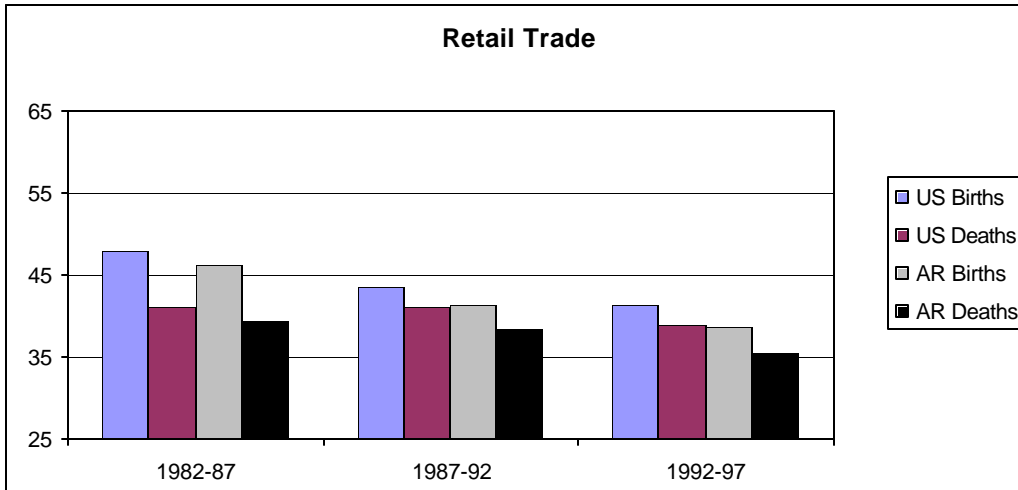


Figure 6-G. U.S. & Appalachian FIRE Establishment Birth & Death Rates

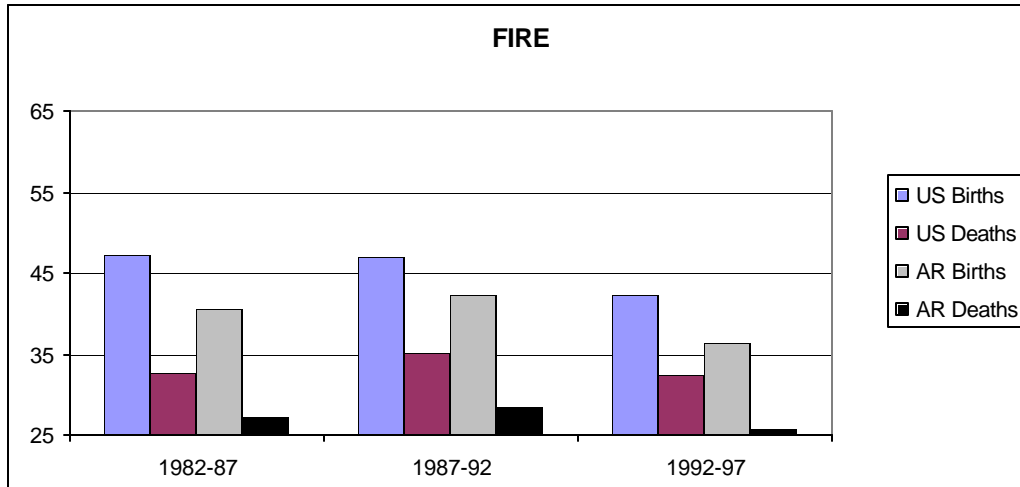
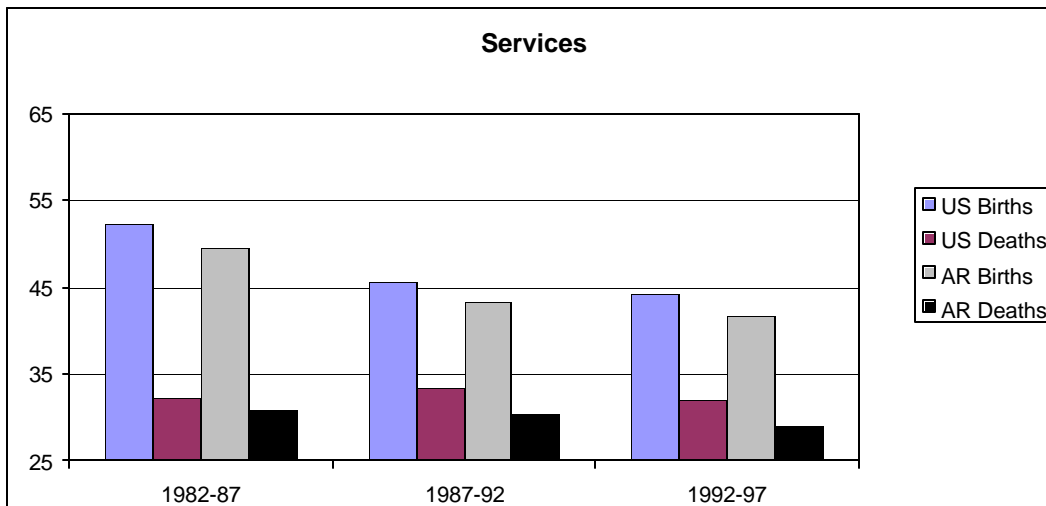


Figure 6-H. U.S. & Appalachian Services Establishment Birth & Death Rates



3.2.1.1 Birth and Death Rates in the Manufacturing Sector

As noted above, the birth rates for manufacturing in Appalachia are close to those for the U.S., but the death rates are lower in Appalachia. Figure 7 shows the establishment birth and death rates for manufacturing disaggregated into nondurable and durable subsectors. In the nondurable sector, the establishment birth and death rates are lower for Appalachia than for the U.S. Over the sample period, the nondurable establishment birth rates for Appalachia are falling and diverging from the U.S. rates,

while the death rates for Appalachia are rising and converging to the U.S. death rates. In the durable sector, the death rates are lower for Appalachia than for the U.S., but the birth rates are higher for Appalachia than for the U.S. The durable establishment birth and death rates are falling for both the U.S. and Appalachia over the sample period. The difference between the two areas' rates for durables remains relatively constant over the time period (apart from the 1987-92 period). In sum, the similarity of the birth rates for the U.S. and Appalachia at the manufacturing level masks interesting differences at the subsector level.

3.2.2 Birth and Death Rates by Appalachian Metropolitan and Non-Metropolitan Areas

The birth rates for metropolitan and non-metropolitan areas in Appalachia are nearly identical, with non-metro birth rates slightly lower than metro birth rates. On the other hand, death rates for non-metro areas are higher than for metro areas in Appalachia. This gap between the death rates for metro and non-metro areas in Appalachia is relatively wide at the start of the study period, but narrows over time.

3.2.3 Characteristics of Births and Deaths in Appalachia

Having established that the birth and death rates are lower in Appalachia than in the U.S., this section expands the analysis to see whether the births and deaths in Appalachia are qualitatively different from their U.S. counterparts. Jensen (1998) finds that for manufacturing, new entrants in Appalachia have lower wages and lower productivity than their counterparts in the rest of the U.S., even when controlling for differences in industry mix. In addition Jensen (1998) finds that for manufacturing, new entrants in Appalachia are larger than new entrants in the rest of the U.S.

Existing literature shows that new establishments are smaller and pay lower wages than continuing establishments. The LBD data confirm this: for the U.S. as a whole, the average birth establishment has 11 employees while the average continuing establishment for the same years has 21 employees. The average birth establishment pays \$20 while the average continuing establishment for the same years pays about \$23. Similarly, the average death establishment has 11 employees while the average continuing establishment for the same years has 20 employees. The average death establishment pays \$15 while the average continuing establishment for the same years pays about \$20.⁷ Thus the comparisons here are for Appalachia versus the U.S. holding the status of the establishments constant (birth, death, or continuer).

⁷ Continuing establishments used for comparison differ for births and deaths because they cover different years. These births and deaths are not necessarily being observed at the time in which they are occurring. When using the preferred measure of size, the average over the two time periods, the differences between births, deaths, and continuers will be starker by construction (since the births and deaths are being averaged with zero in one of the periods).

Figure 7-A. Birth and Death Rates for Nondurable Goods Establishments in the U.S. and Appalachia for 1982–1987; 1987–1992; 1992–1997

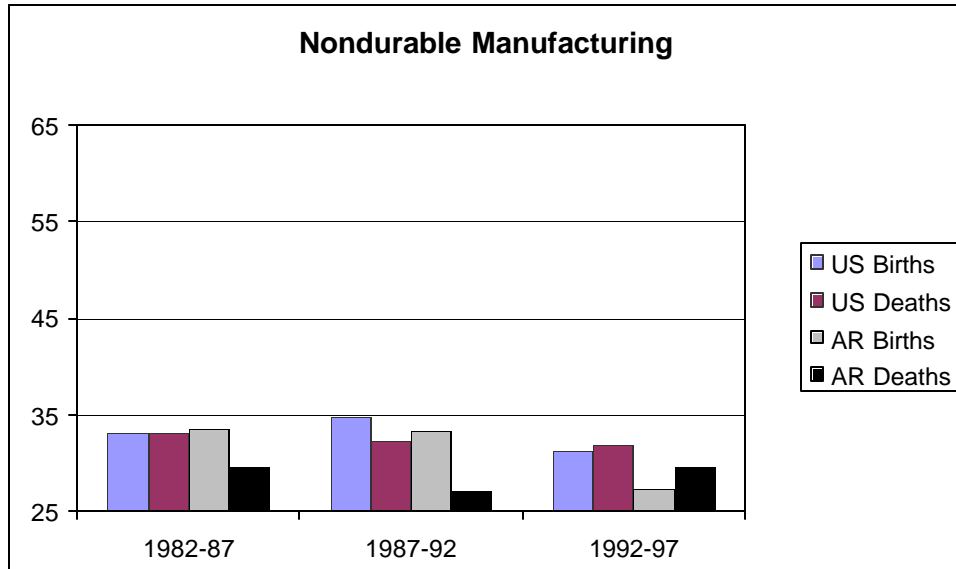
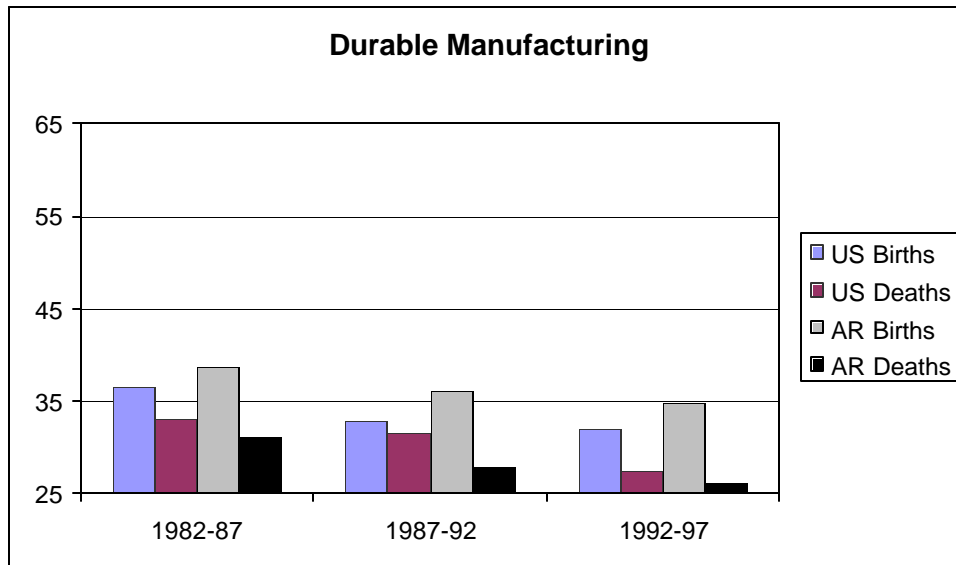


Figure 7-B. Birth & Death Rates for Durable Goods Establishments in the U.S. and Appalachia for 1982–1987; 1987–1992; 1992–1997



3.2.3.1 Wages

This section compares wages for employees in Appalachia to employees in the rest of the U.S. for all the years in the sample, specifically looking at the wages for entering and exiting establishments (see A2.5 for a description). Table 2 shows that the average employee at an establishment in Appalachia earns 10 percent less than an employee in the rest of the U.S. over the years in the sample (this is the pooled year sample analog to the results shown in Table 1). When controlling for differences in characteristics for the two areas, this wage gap falls slightly to about 9 percent. When establishments are divided up by their status (as entrants, exiters, or continuing establishments), the results show that compared with their U.S. counterparts, establishments in Appalachia have wages that are 10 percent lower for entrants and 12 percent lower for exiters. Note that the wage differences are generally smaller when controlling for differences in other characteristics.

Thus, not only does Appalachia have lower birth rates than the rest of the U.S., but the births tend to have lower wages than their U.S. counterparts, even when controlling for industry and other characteristics. It is perhaps hopeful that the exiting establishments have an even larger wage gap than do continuers or entrants.

**Table 2: Wages of Births and Deaths Comparison
(Differences Between Appalachia and Rest of U.S.)**

Type of Comparison	Establishment Type			
	Total	Continuers	Exiters	Entrants
Average Employee	-0.10	-0.13	-0.12	-0.11
Controlling for other Factors*	-0.09	-0.11	-0.12	-0.10

* Factors include industry, branch activity, year, and size.
All differences are statistically significant.

3.2.3.2 Size of Establishments When Classified as Births, Deaths, or Continuers

As noted above, the average U.S. entering and exiting establishments have 11 employees. The average Appalachian entering and exiting establishments are slightly smaller. The total sample of establishments showed that establishments in Appalachia are *larger* than those in the U.S. That entrants and exiters are smaller is not inconsistent with the finding that establishments in general are larger (even when noting that continuers in Appalachia are also smaller than their U.S. counterparts). The apparent inconsistency (each of the three groups of establishments are smaller than their counterparts but the total group of establishments in larger than their counterpart) reflects the difference in composition across Appalachia and the U.S. There are fewer births and deaths in Appalachia than in the rest of the U.S.; thus, as a

whole, establishments are larger in Appalachia.

Jensen (1998) found that in Appalachia, the average sizes of entrants and exiters in manufacturing are *larger* than for the rest of the U.S. Since this runs counter to the results noted above for the *entire* economy, a consistency check is run that constrains the current analysis to the manufacturing sector. The results show that for manufacturing the average size of entrants and exiters in Appalachia are noticeably *larger* than their counterparts in the U.S.⁸ Thus the apparent contradiction between the current findings and Jensen’s earlier results is due to differences in the scope of the analyses (the manufacturing sector compared to the entire economy).

Table 3 shows the results of the comparison when using the preferred measure of size—the flows measure of size (see A2.6 for description of the estimation specification). There is no significant difference in the size of entrants in Appalachia compared to the rest of the U.S. However, exits and continuers are slightly smaller in Appalachia than in the rest of the U.S. (about 3 percent and 2 percent, respectively). When other controls are used, the differences are a bit starker. Entrants are about 5 percent smaller and exiters and continuers are about 7 percent smaller in Appalachia than in the rest of the U.S.

Table 3: Size of Births and Deaths Comparison (Differences Between Appalachia and Rest of U.S.)

Type of Comparison	Establishment Type			
	Total	Continuers	Exiters	Entrants
Average Establishment	0.01	-0.02	-0.03	** -0.00
Controlling for other Factors*	-0.04	-0.07	-0.07	-0.05

* Factors include industry, branch activity, and years.

All differences are statistically significant except that denoted by **.

3.3 Employment Creation and Destruction

Another important indicator of the health of an economy is the number of jobs in the economy. The net employment growth rate can tell us much about the health of a region. However, the net employment data cannot completely capture the reallocation of employment that occurs within an area. To get a complete picture, we also look at the gross employment flows in the areas (see A2.7 for a description of how these are calculated). The job creation rate shows the rate at which expanding establishments (including entering establishments) add new jobs to the economy. The job destruction rate shows the rate at which contracting establishments (including exiting establishments) destroy jobs in the economy. The sum of the job creation and destruction rates, measures the total amount of job reallocation that is

⁸ The averages for the U.S. are: entrants have 24 employees and exiters have 30 employees. The averages for Appalachia are: entrants have 28 employees and exiters have 39 employees.

occurring in the economy.

The U.S. and Appalachia have positive net employment growth over all three time periods. The upper panel of Figure 8 shows the net employment growth rates for each of the three periods. While the U.S. experiences a slow-down in employment growth during the second period, Appalachia experiences increasing employment growth over the three periods. Apart from the second period, the net employment growth rates for Appalachia are slightly below those for the U.S.

Underlying this positive growth is a significant amount of employment churning. The job creation rate exceeds 45 percent and the job destruction rate is about 35 percent for the U.S. in all three time periods. The job creation and destruction rates for Appalachia are a bit lower: about 43 percent and 33 percent respectively. It is possible to break down the job creation rate into its two components and to determine the share of job creation due to employment growth at expanding continuing establishments and employment growth due to the entry of establishments. Likewise, it is possible to break down the job destruction rate into the share of destruction due to employment loss at contracting continuing establishments and employment loss due to the exit of establishments. The share of flows that can be attributed to births and deaths are about 60 percent for creation and destruction for each of the time periods for the U.S. The share of flows that can be attributed to births and deaths for Appalachia are very similar to the U.S. shares—they are about 60 percent for creation and destruction for each of the time periods.

The lower panel of Figure 8 shows the job creation and destruction rates for the U.S. and Appalachia. The decrease in net employment growth in the U.S. for 1987–1992 is the result of both a decrease in job creation rates and an increase in job destruction rates. In contrast, the job creation and destruction rates in Appalachia decline over the periods.

It is possible to measure the differences shown in Figure 8 across all of the years (see A2.8 for the specification used in these estimations). Table 4 presents the job flows comparisons. On average across all of the years in the study, the Appalachian Region has lower net employment growth (1.6 percentage points lower), lower job creation (4.5 percentage points lower), and job destruction (3 percentage points lower), thus, lower reallocation than the rest of the U.S. When controlling for industry, firm type, size, and years, the Appalachian Region has higher net employment growth than the U.S. (about 2.2 percentage points higher). The industry control (even at the sectoral level) is responsible for the change in rank of Appalachian and U.S. net growth. This is not surprising given that the employment in the Appalachian Region falls disproportionately in the Mining and Manufacturing sectors, which have negative and low net employment growth, respectively.

The differences in the job creation rates between Appalachia and the rest of the U.S. are significantly narrowed when controlling for differences in characteristics. The difference shrinks from 4.5 percentage points to 1.2 percentage points. By contrast, the difference in the job destruction rates widens (slightly) when controlling for differences in characteristics. The difference increases from about 3 percentage points to 3.4 percentage points.

Figure 8-A. U.S. & Appalachian Net Employment Growth

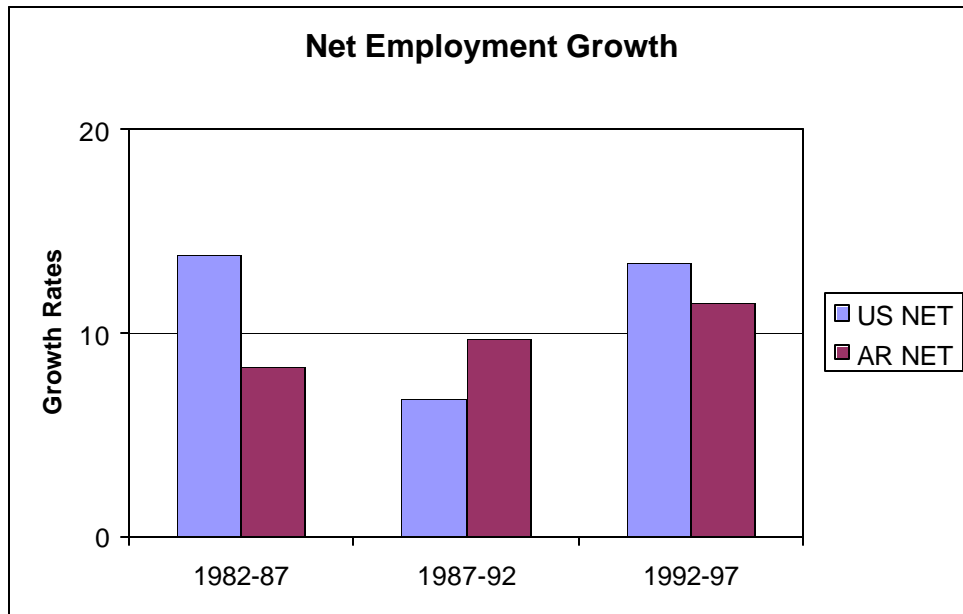


Figure 8-B. U.S. & Appalachian Job Creation & Destruction Rates

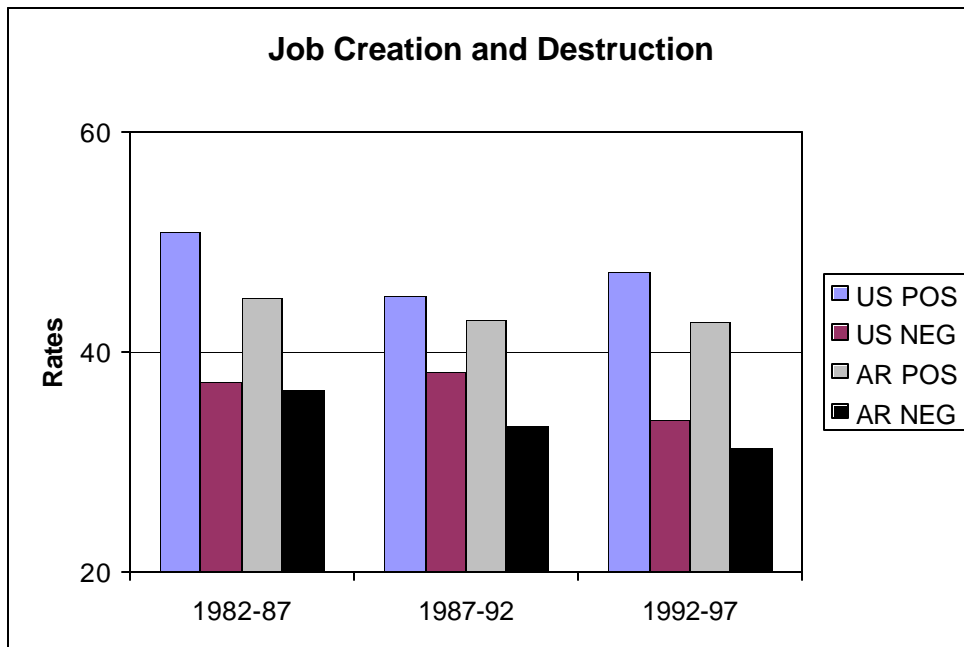


Table 4: Job Flows Comparison: Differences Between Appalachia and the Rest of the U.S.

Type of Comparison	Net Employment	Job Creation	Job Destruction	Reallocation
Aggregate	-1.55	-4.53	-2.98	-7.51
Controlling for other Factors*	2.24	-1.18	-3.43	-4.61

* Factors include industry, branch activity, year, and size.
All differences are statistically significant.

3.3.1. Job Creation and Destruction Rates by Industry

As has been shown, net employment growth rates are lower for Appalachia when no controls are used, but net employment growth rates are higher when industry controls are used. This subsection examines in more depth the importance of industry. Figure 9 shows the net employment growth rates by sector for the U.S. (top panel) and Appalachia (bottom panel). Some basic similarities exist in the sectoral net employment growth rates across Appalachia and the U.S. For both areas, the Service sector has the highest net employment rates, while the Manufacturing sector has the second lowest net employment rates (after mining). The net employment growth rates for the Retail and Wholesale trade and Construction sectors look similar across the U.S. and Appalachia. One of the noticeable differences across the two areas is that Manufacturing and Construction appear to have slow downs in net employment growth in the U.S. during 1987–1992, while they experience accelerating net employment growth in Appalachia during the same period.

The foregoing analysis has shown that job creation and destruction rates for Appalachia are smaller than they are for the rest of the U.S. This subsection examines whether this pattern holds over all sectors of the economy. Figure 10 shows the job creation and destruction rates for the U.S. and Appalachia over all of the sectors of the economy. The first, most striking, feature of the plots is how similar the magnitudes of the creation and destruction rates are in Appalachia and the U.S. For example, notice that the distinctive pattern in Construction is evident for both the U.S. and Appalachia. Similarly, in Manufacturing, job creation and destruction are relatively low compared to the other sectors for both Appalachia and the U.S. (see below for more details). The second most striking feature of the plots is that job creation and destruction rates are generally slightly lower for Appalachia than for the U.S. in almost every sector (except, as with the establishment birth and death rates, for Mining). The discrepancy between the rates in the U.S. and Appalachia is largest in the Wholesale Trade and FIRE sectors.

Figure 9-A. U.S. Net Employment Growth by Sector

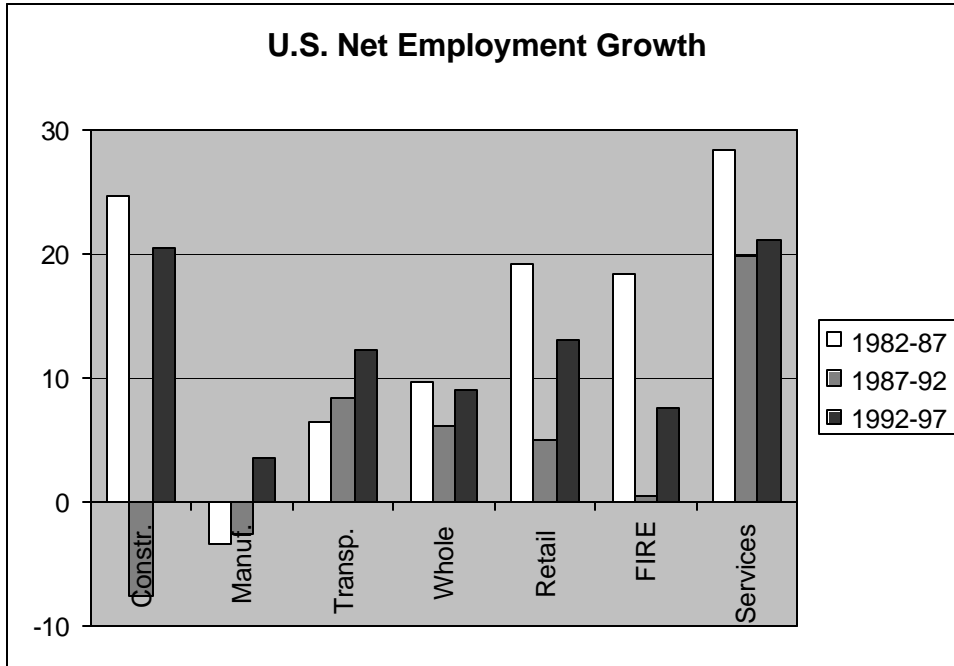


Figure 9-B. Appalachian Net Employment Growth by Sector

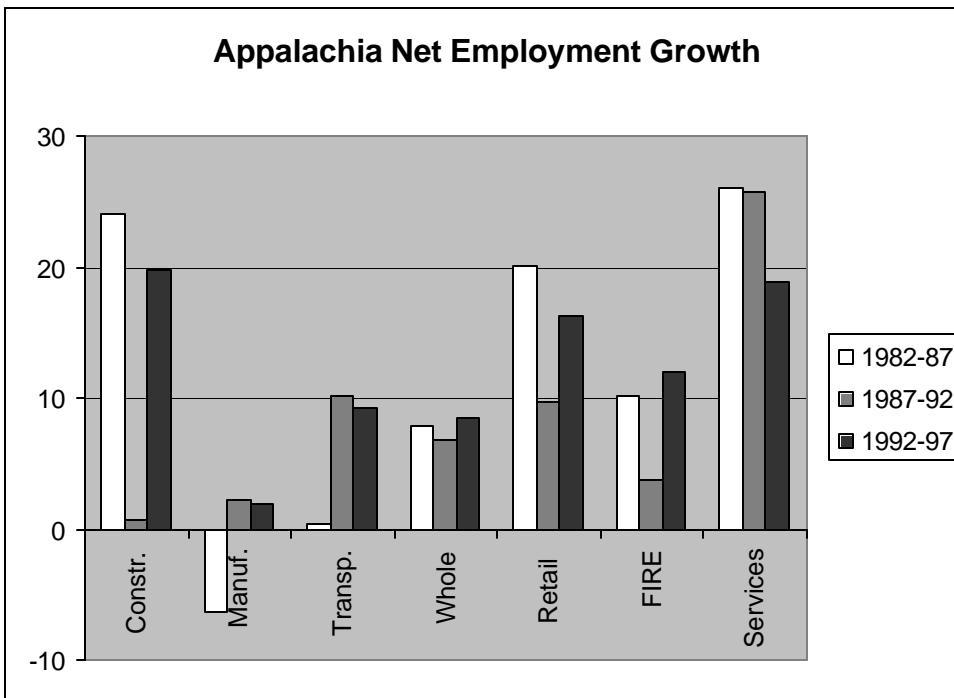


Figure 10-A. U.S. & Appalachia Mining Job Creation & Destruction Rates

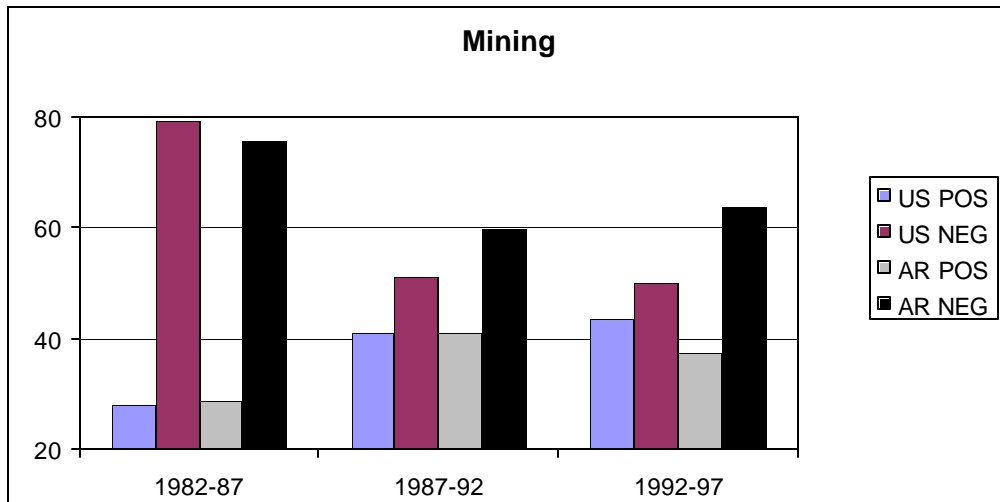


Figure 10-B. U.S. & Appalachia Manufacturing Job Creation & Destruction Rates

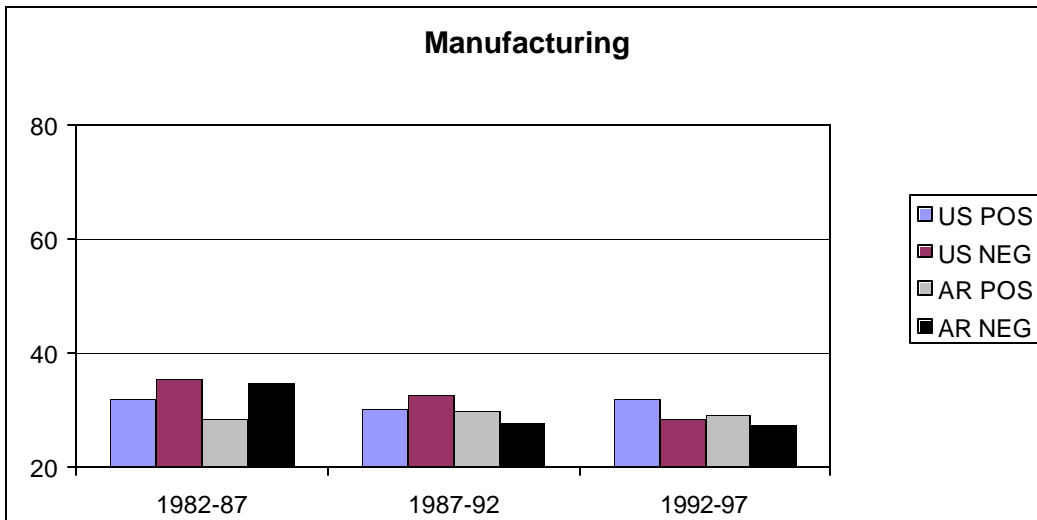


Figure 10-C. U.S. & Appalachia Construction Job Creation & Destruction Rates

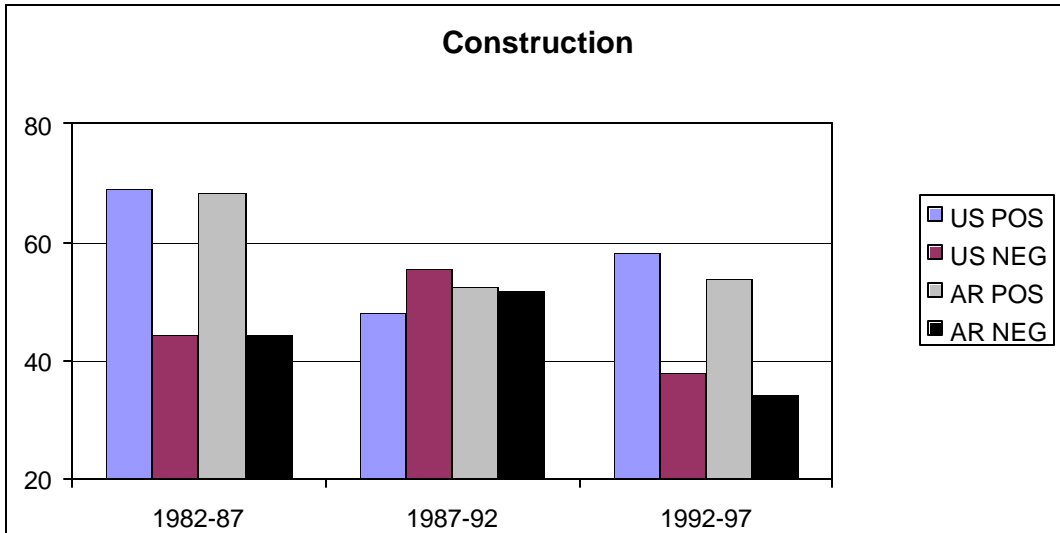


Figure 10-D. U.S. & Appalachia Transportation Job Creation & Destruction Rates

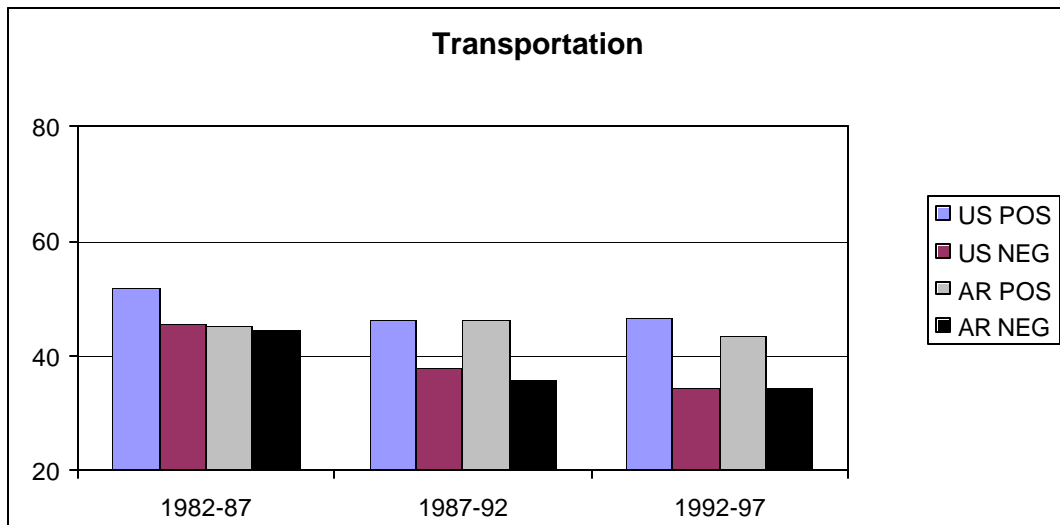


Figure 10-E. U.S. & Appalachia Wholesale Job Creation & Destruction Rates

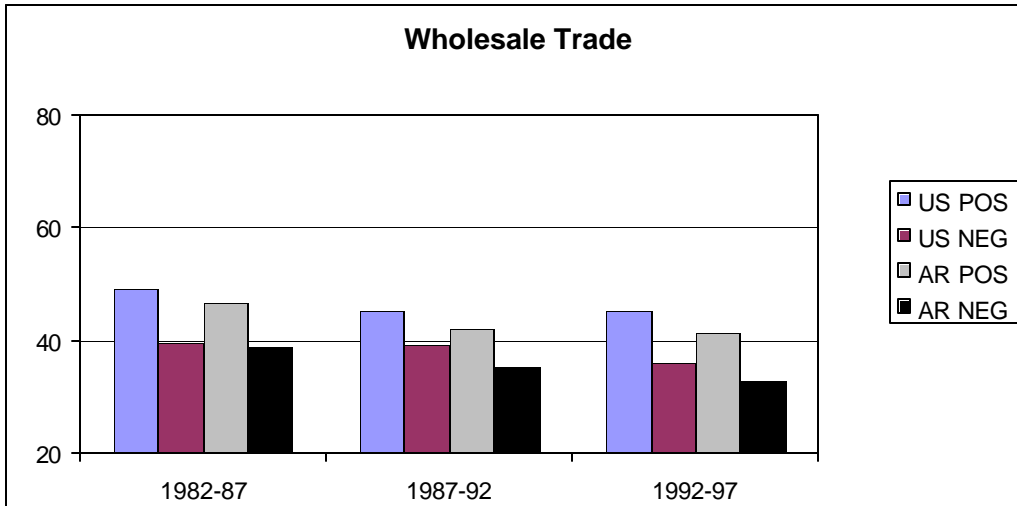


Figure 10-F. U.S. & Appalachia Retail Job Creation & Destruction Rates

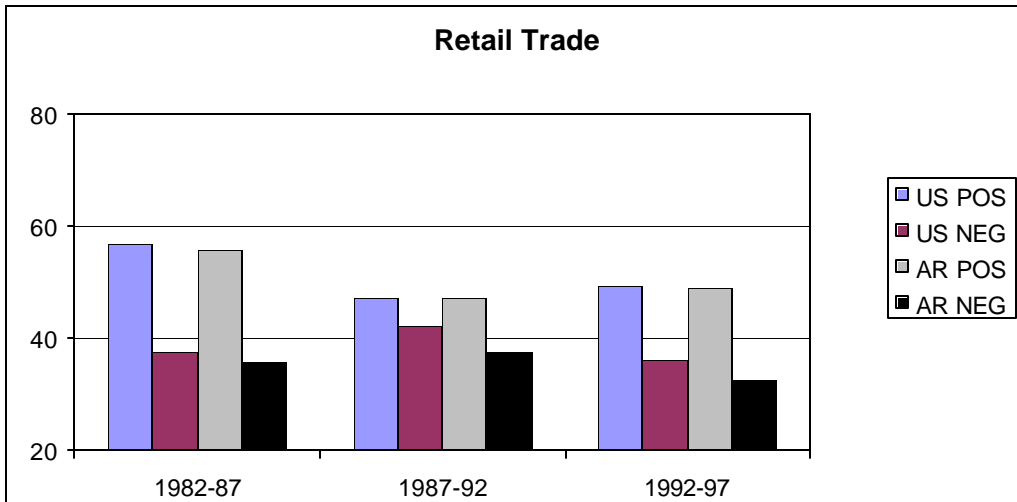


Figure 10-G. U.S. & Appalachia F.I.R.E. Job Creation & Destruction Rates

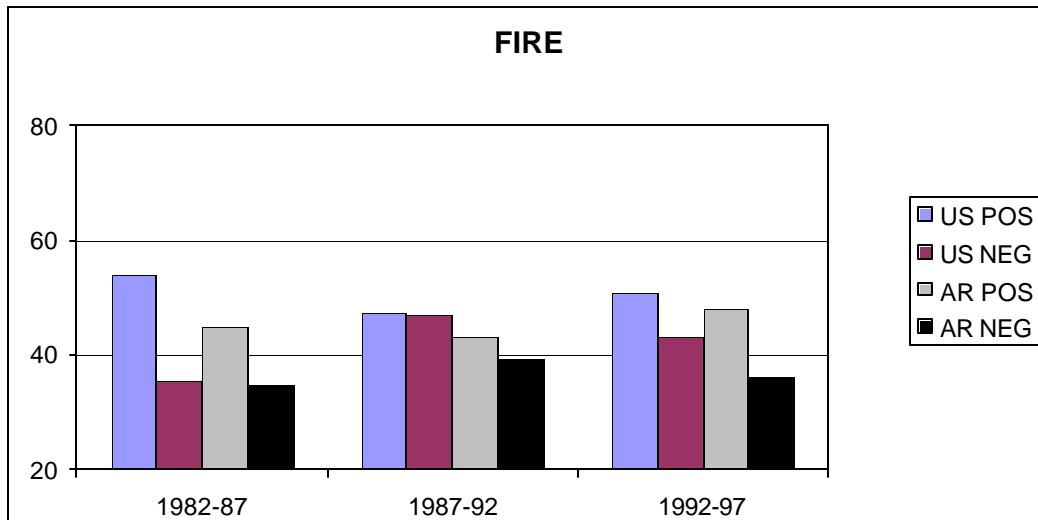
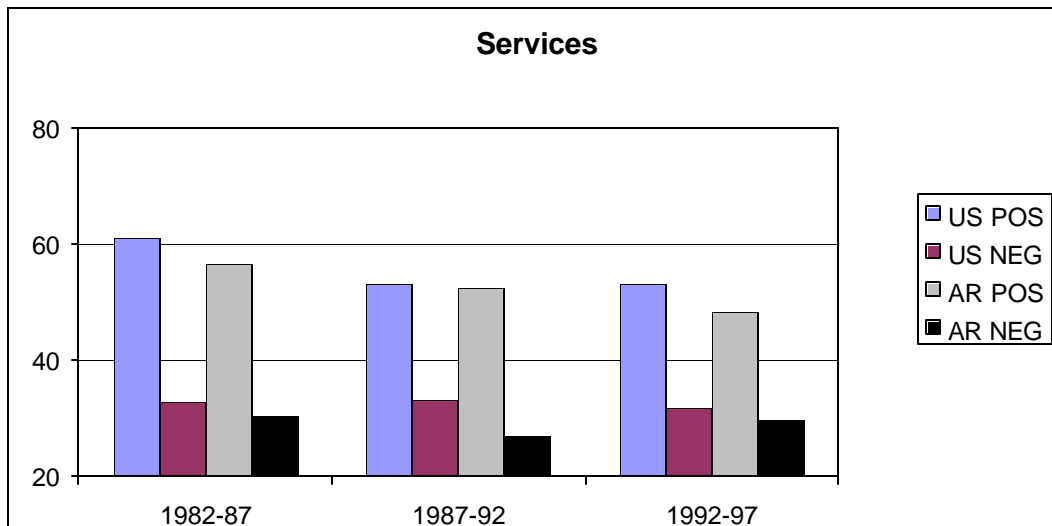


Figure 10-H. U.S. & Appalachia Services Job Creation & Destruction Rates



3.3.1.1 Job Creation and Destruction Rates in the Manufacturing Sector

As noted above, the job creation and destruction rates for Appalachia in manufacturing are very similar to those for the U.S. This section examines whether this similarity holds for the durable and nondurable subsectors of manufacturing. Figure 11-A shows the job creation and destruction rates for nondurable manufacturing. Generally, the job creation and destruction rates for Appalachia are below those for the U.S. but they follow the same time series patterns: job creation rates rise briefly and then fall, and job destruction rates fall briefly and then rise. The magnitudes of these changes, however, differ over the two areas—by the last period, the job destruction rate for Appalachia exceeds that for the U.S.

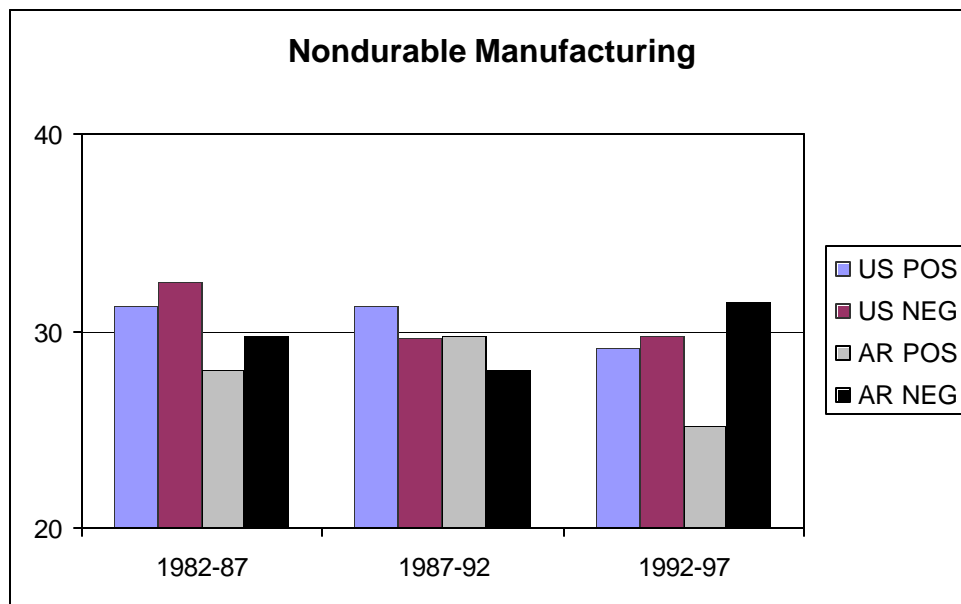
Figure 11-B shows the job flow rates for durables. Over the sample period, job creation rates rise (with a slowdown in the middle period for the U.S.) and job destruction rates fall for both areas. Again, job creation and destruction rates are generally lower in Appalachia than in the U.S.

In sum, the job creation and destruction rates at the subsector level are relatively similar for Appalachia and the U.S. The most interesting differences between the two areas occur between 1987 and 1992, where job creation rates rise for all groups except durables in the U.S. and the gap between the U.S. and Appalachian job destruction rates is especially large. There is a much more distinct drop in job destruction for durables than nondurables, and job creation rates seem to trend upward in durables but downward in nondurables.

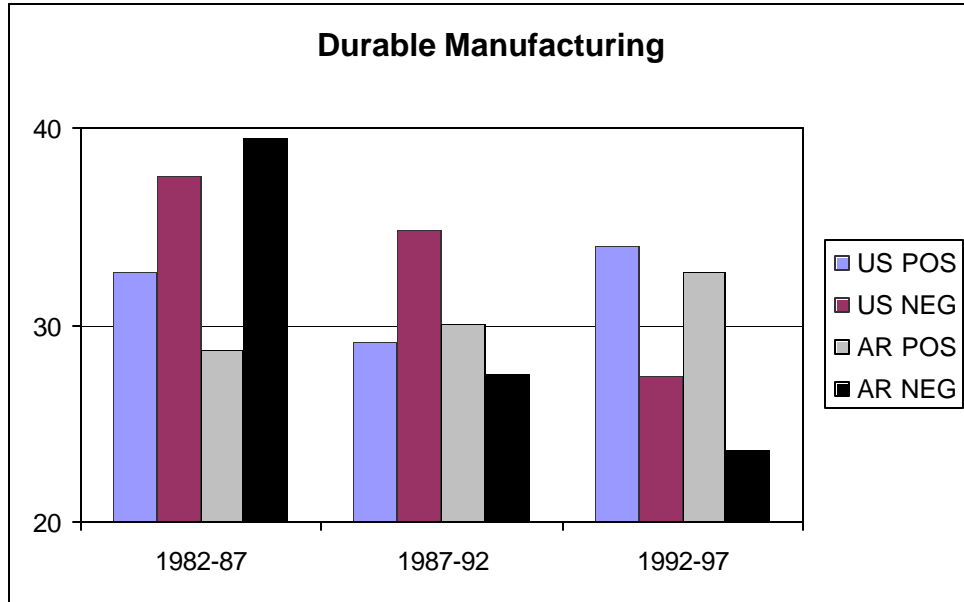
3.3.2 Job Creation and Destruction Rates in Metropolitan and Non-Metropolitan Areas of Appalachia

The net employment growth rates for metropolitan areas are slightly higher than those for non-metropolitan areas for all three time periods. The job creation and destruction rates are slightly higher for metropolitan areas relative to non-metropolitan areas. Thus, even with the higher net employment growth rates, the metropolitan areas still exhibit more job destruction than the non-metropolitan areas. Finally, the metropolitan and non-metropolitan job flows rates are converging over time.

Figure 11-A. U.S. & Appalachian Non-Durable Goods Job Creation and Destruction Rates



**Figure 11-B. U.S. & Appalachian Durable Goods
Job Creation and Destruction Rates**



4. Producer Services in Appalachia Compared with the United States

The producer services sector in Appalachia is compared to its counterpart in the U.S. in this section. First, an overall comparison of the sector using data from the LBD is presented. Second, the establishment birth and death dynamics across Appalachia and the U.S. are compared. And finally, the dynamics analysis is extended to the employment flows margin. In the dynamic analysis where the focus is on year pairs, the analysis is restricted to establishments that are classified in producer services in at least one of the years in the pair.

4.1 Characteristics of Producer Services

The definition of producer services used in this report is based on the consensus definition that emerges from the literature and includes the following industries: banking, nondepository institutions, security brokers, insurance carriers, insurance agents, real estate, business services, legal services, and engineering and management (see section A1.6 in the Data Appendix for a discussion).

There are approximately 800,000 establishments with 9.5 million payroll employees in the producer services sector in the U.S. in 1982. The number grows to 1.5 million establishments with 19.8 million employees by 1997. The percent of employment in the U.S. in this sector grows from 13 percent in 1982 to 20 percent in 1997. This growth also occurred in the Appalachian Region. There are approximately 47,000 establishments with half a million payroll employees in the producer services sector in the Appalachian Region in 1982. The number grows to 88,000 establishments with 1 million employees by 1997. The percent of employment in Appalachia in this sector grows from 8 percent in 1982 to 13 percent in 1997. The location quotient for producer services in Appalachia relative to the U.S. rises over time from 0.62 in 1982 to 0.68 in 1997.

4.1.1. Producer Services are Located Primarily in Metropolitan Areas

About two-thirds of all establishments in the producer services sector in Appalachia are in metropolitan areas. Thus there are disproportionately more producer services establishments in metropolitan areas than in non-metropolitan areas. (Recall about 60 percent of establishments in Appalachia are in metropolitan areas).

4.1.2. One-quarter of Producer Services Establishments are Part of a Multi-Unit Firm

The shares of establishments and employment in the U.S. in producer services that are part of a multi-unit firm are similar to the shares for the economy at large. That is, approximately 25 percent of all establishments in producer services in the U.S. are part of a multi-unit firm and these employ about 60 percent of all employees. The main difference between the shares for the economy and for producer services is that the increase in shares of employment for producer services is more significant than it is for the rest of the economy. As with the economy as a whole, the share of multi-unit establishments and employment is about the same for the Appalachian Region, especially in the later years. In the early years, the employment share is only about 50 percent.

4.1.3. Average Size of Producer Services Firms in Appalachia is 10 to 11 Employees

The average size of establishments in producer services in the U.S. between 1982 and 1997 is about 12 employees, while the average size for Appalachia is about 10 to 11 employees. Using the flows measure of size reveals that in contrast to the economy as a whole, producer services establishments in Appalachia are relatively smaller than for the rest of the U.S., by about 1 percent. When controlling for industry, branch activity, and years, this difference is more pronounced—about 4 percent. (See A2.1 for a description of the specification used to estimate these differences.)

4.1.4. Wages for Employees in the Producer Services Industry are about 20% lower in the Appalachian Region than in the Rest of the U.S.

Recall that the average employee’s wages are about 10 percent lower in Appalachia than in the rest of the U.S. This section applies to producer services the same type of wage analysis as was done for the total economy (see A2.2 for a description).

Table 5 shows the percent difference in wages for the average employee in Appalachia compared with the rest of the U.S. Wages for employees in the producer services industry are about 20 percent lower in the Appalachian Region than in the rest of the U.S.⁹ This is a larger difference than for the economy as whole. When controlling for industry, size, and firm type differences between the U.S. and Appalachia, the wages in the Appalachian Region are about 16 percent lower than the rest of the U.S.¹⁰ Compared to the economy as a whole, the wage differences are falling slightly over time (compare Tables 1 and 5).

Table 5: Producer Services Wages Comparison, Differences Between Appalachia and Rest of U.S.

Type of Comparison	1982	1987	1992	1997
Average Employee	-0.08	-0.22	-0.21	-0.20
Controlling for other Factors*	-0.08	-0.18	-0.16	-0.15

* The factors are industry, branch activity, and establishment size. All differences are statistically significant.

4.2 Establishment Births and Deaths for Producer Services

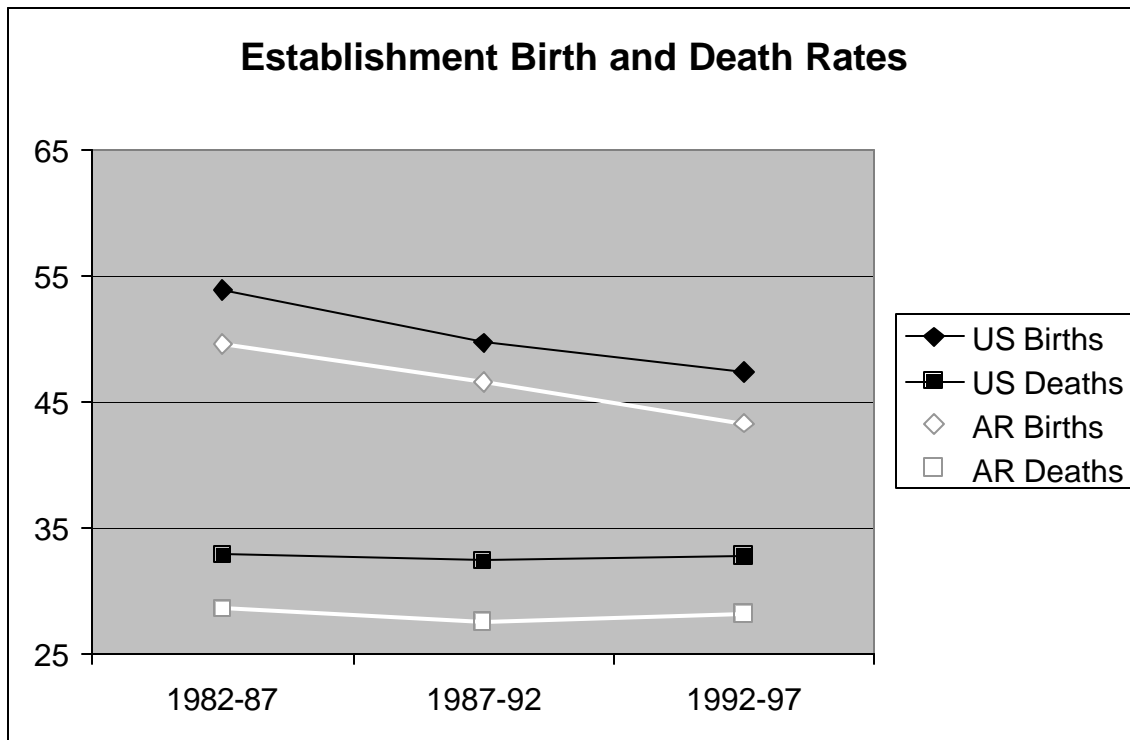
The establishment birth and death rates for producer services in the U.S. and Appalachia are shown in Figure 12. The birth rates are higher and the death rates lower for both the U.S. and Appalachia relative to their counterparts for the economy as whole (compare to Figure 5). As is true for the economy as a whole and for the two sectors in which producer services appear (Services and FIRE),

⁹ This is approximately the average difference for 1987–1997. For some reason the employment-weighted wage difference is much lower in 1982, but the unweighted wage difference in 1982 does not show such odd behavior.

¹⁰ Industry continues to be a control since the producer services sector is made up of many different industries.

the establishment birth and death rates for Appalachia are lower than they are for the U.S. As is the case for Services and FIRE, this difference seems rather stable over time, in contrast to the economy as a whole, in which the difference in death rates appeared to be widening (compare Figures 5 and 12). Notice that the death rates in producer services are generally flat (they fall from the first period to the second but then rise in the last period); this contrasts with the economy as a whole, in which the death rates have a general downward trend (they rise from the first period to the second and then fall in the last period).

Figure 12. Birth and Death Rates for Producer Services in the United States and Appalachia



The probability that a producer services establishment is an entrant or an exiter can be calculated for Appalachia and the rest of the U.S. to give further information on the relative importance of establishment churning in the two areas (see A2.4 for a description of the methodology). The probability of a producer services establishment being an entering establishment is 35 percent for the rest of the U.S. and is 34 percent for Appalachia. Similarly, the probability of an establishment being an exiting establishment is 23 percent for the rest of the U.S. and is 20 percent for Appalachia. When controlling for differences in characteristics across the two areas, the differences in probabilities increase slightly.

Comparing births and deaths in producer services to those in the total economy, the difference in probabilities for an establishment being an entrant is very similar for the economy as a whole and for producer services (the difference is about 1 percentage points in both cases). In contrast, the difference in probabilities for an establishment being an exiter is larger in producer services than for the economy

as a whole (the difference is about 3 percentage points for producer services versus 1 percentage point for the total economy).¹¹

4.2.1. Birth and Death Rates in Producer Services for Metropolitan and Non-Metropolitan Areas of Appalachia

The previous section has shown that birth rates are higher and death rates are lower in producer services as compared to the economy as a whole (for both the U.S. and for Appalachia, compare Figures 5 and 12). This pattern holds true for both metropolitan and non-metropolitan areas in Appalachia. Recall that birth rates in the total economy are very similar for metro and non-metropolitan areas. In contrast, in producer services the non-metro birth rates are markedly lower than the metro birth rates and this gap widens over time (in the last period, the birth rate for metro is 45 percent, while for non-metro it is 40 percent). Another difference between producer services and the total economy is that death rates for metro areas are higher than for non-metro areas in Appalachia (whereas in the total economy metropolitan death rates were slightly lower than non-metropolitan death rates).

4.2.2 Characteristics of Births and Deaths in Producer Services in Appalachia

The birth rates and especially the death rates are lower in Appalachia than in the U.S. for producer services. In this section, these births and deaths in Appalachia are examined to see if they are qualitatively different from their U.S. counterparts.

4.2.2.1 Wages for Producer Services

This section compares wages for producer services employees in Appalachia to their counterparts in the rest of the U.S. for all the years in the sample paying particular attention to the wages at entering and exiting establishments (see A2.5 for a description). Table 6 summarizes the results of these exercises. The average producer services employee in Appalachia earns about 20 percent less than does their rest of the U.S. counterpart over the years in the sample (this is the pooled year sample analog to the results shown in Table 5). When controlling for differences in characteristics over the two areas, this wage gap falls noticeably to 14 percent. This gap is larger than the 9 percent wage gap for the entire economy (compare to Table 2). When these establishments in producer services are divided up by their status, relative to their rest of the U.S. counterparts, establishments in Appalachia have wages that are 18 percent lower for entrants and 15 percent lower for exiters. The gap in wages for entrants is strikingly high in this sector of the economy (for the general economy the gap was 10 percent).

¹¹ This comparison is for the results that do not control for differences in other characteristics.

Table 6: Difference in Wages for Entrants and Exiters in Producer Services in Appalachia and the Rest of United States

Type of Comparison	Establishment Type			
	Total	Continuers	Exiters	Entrants
On Average Employee	-0.20	-0.21	-0.23	-0.24
Controlling for other Factors *	-0.14	-0.16	-0.15	-0.18

* The factors are industry, branch activity, size, and years.
All differences are statistically significant.

4.2.2.2 Size of Entrants and Exiters in Producer Services Establishments

This section compares the size of producer services establishments, particularly entrants and exiters, in Appalachia to their rest of the U.S. counterparts over all sample years using the flows measure of size (see A2.6 for a discussion of the specification). The results presented in Table 7 show that producer services entrants in Appalachia are about 4 percent smaller and producer services exiters are about 7 percent smaller than their rest of U.S. counterparts. Focusing on the all controls results, establishments are smaller in Appalachia than in the rest of the U.S. for continuing establishments (by 12 percent), entering establishments (by 7 percent), and dying establishments (by 8 percent). As compared to the size gap for the entire economy, the size differences here are larger especially for continuing establishments (compare to Table 3).

Table 7: Size of Entrants and Exiters in Producer Services: the Differences Between Appalachia and Rest of U.S.

Type of Comparison	Establishment Type			
	Total	Continuers	Exiters	Entrants
Average Establishment	-0.01	-0.09	-0.07	-0.04
Controlling for other Factors *	-0.07	-0.12	-0.08	-0.07

* The factors are industry, branch activity, and years.
All differences are statistically significant.

4.3 Employment Creation and Destruction in Producer Services

The employment flows for producer services in the U.S. and Appalachia are shown in Figure 13. Figure

13-A shows the net employment growth rates for the two areas. Relative to other sectors of the economy, producer services experience strong net employment growth in both Appalachia and the U.S. (compare to the upper panel in Figure 8). The net employment growth rates are very similar across the two areas except that the marked slowing in net employment growth in the 1987–1992 period in the U.S. is not as noticeable in Appalachia. Figure 13-B shows the underlying job creation and destruction rates for producer services for the U.S. and Appalachia. The job creation and destruction rates for Appalachia are lower than those for the U.S. The U.S. shows a sharp increase in job destruction and a decrease in job creation in 1987-92, but Appalachia does not show this.

It is possible to summarize these differences over all of the years in the study. The results of this comparison are presented in Table 8 (see A2.8 for a description of the specification). In contrast to the results for the total economy, the net employment growth rates for producer services in Appalachia are actually higher than those for the rest of the U.S. However, recall that the net employment growth rates for Appalachia are also higher than those of the rest of the U.S. once industry (and other characteristics) had been controlled for, and so this result is not surprising. The net employment rate is 3.7 percentage points higher in Appalachia than in the U.S. when controlling for differences in characteristics. Underlying this higher net employment rate are lower job creation and destruction rates. The job destruction rates are strikingly lower in Appalachia. The difference in the job creation rates between Appalachia and the rest of the U.S. narrows from 2.6 percentage points to 1.6 percentage points when controlling for differences in characteristics. By contrast, the difference in the job destruction rates widens from 4.1 percentage points to 5.3 percentage points when controlling for differences in characteristics. Combining the lower job creation and destruction rates, reveals that the employment reallocation rate for producer services in Appalachia is 6.9 percentage points lower than for the rest of the U.S.

Table 8: Job Flows of Producer Services: the Differences Between Appalachia and Rest of U.S.

Type of Comparison	Net Employment	Job Creation	Job Destruction	Reallocation
Aggregate	1.50	-2.59	-4.09	-6.68
Controlling for other Factors *	3.66	-1.62	-5.28	-6.91

* The factors are industry, branch activity, size, and years. All differences are statistically significant.

4.3.1. Employment Rates for Metropolitan and Non-Metropolitan Areas of Appalachia

The net employment growth rate for producer services, as for the economy as a whole, is higher for establishments in metropolitan areas in Appalachia than for non-metropolitan areas in Appalachia. As in general, the job creation rates are higher in the metropolitan area but these differences are more pronounced for producer services. The job destruction rates are relatively similar across metropolitan designation.

Figure 13-A. Net Employment Growth in Producer Services for the U.S. and Appalachia

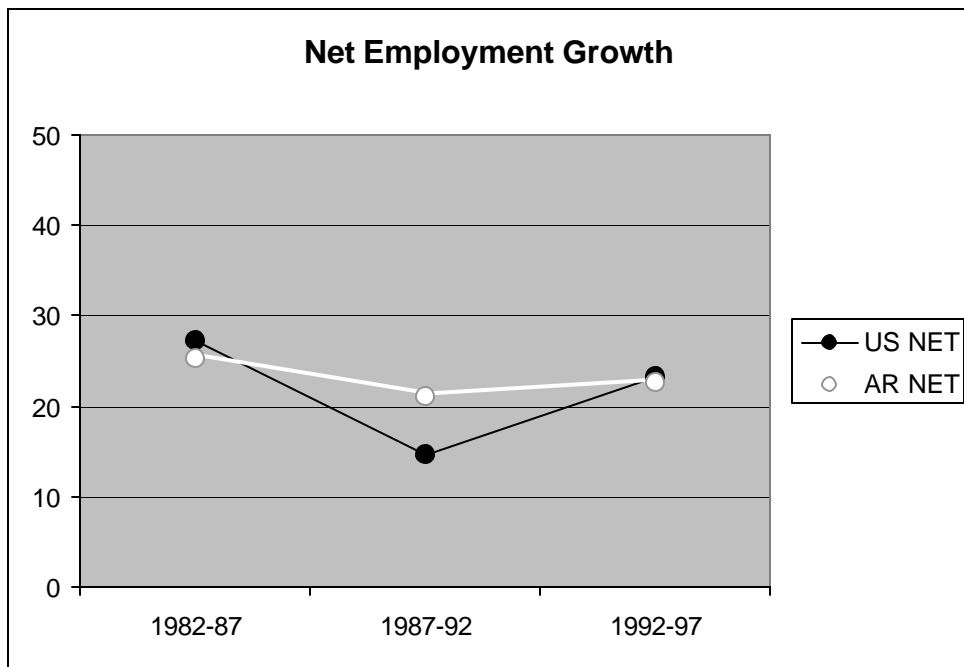
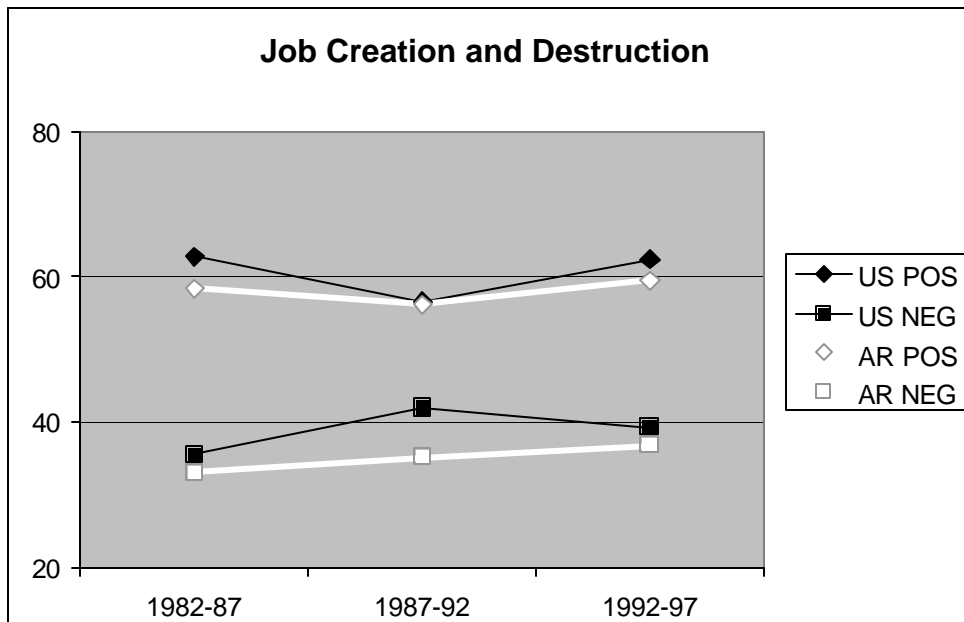


Figure 13-B. Job Creation and Destruction Rates in Producer Services for the U.S. and Appalachia



5. Comparison of Appalachian Subregions to the United States

The Appalachian Regional Commission divides the Appalachian Region into three subregions based on geographic location: Northern, Central, and Southern. The first part of this section describes these subregions in detail using data from the LBD concerning geography, industry, branch activity, establishment size, and wages. The second part of this section examines the establishment formation and attrition dynamics of these subregions. The third part of this section, analyzes the employment dynamics in these subregions. The base of comparison for all of these analyses is the U.S.

5.1 Characteristics of the Subregions

To place the subregions in context, the Northern and Southern subregions' economies are of roughly the same size (as measured by the number of establishments and employment) but the Central subregion's economy is much smaller. The Central subregion accounts for 22 percent of the counties in Appalachia but only 9 percent of the establishments, and slightly less of the employment. The Northern subregion accounts for 35 percent of the counties and 50 percent of establishments in 1982 and 45 percent of the establishments in 1997 (employment has about the same shares). The Southern subregion accounts for 43 percent of the counties and 41 percent of the establishments in 1982 and 46 percent in 1997 (employment has about the same shares).

5.1.1. Economic Activity Varies in Metropolitan and Non-metropolitan Areas Within Each Subregion

One of the most striking differences in the subregions is the variation in distributions of economic activity over metropolitan and non-metropolitan areas. The share of establishments in metropolitan areas for the Central subregion is a little less than 20 percent and the share of employment in metropolitan areas is slightly more than 20 percent. In contrast, the share of establishments in metro areas for the Northern and Southern subregions is about 65 percent; for employment, about 70 percent. These shares are roughly constant over the sample period. These differences in metropolitan-rural distributions among subregions are one of the reasons why the Central subregion is most similar to the general perception of Appalachia. The other reason is the differences in industry distribution.

5.1.2. Industry Varies Within Each Subregion, but There are Some Similarities

The three subregions have some similarities and differences in their sectoral composition. All three subregions in 1982 are dominated by Manufacturing, but by 1997 the Central and Northern subregions are dominated by Services. In all three subregions in 1982 and 1997, Retail Trade is the second most dominant sector, except for the Southern subregion in 1997, in which Retail Trade is the third most important sector behind Manufacturing and Services. Figure 14 shows the location quotients for each of the subregions relative to the U.S.

Figure 14 A. Central Appalachia's Relative Employment Shares by Sector

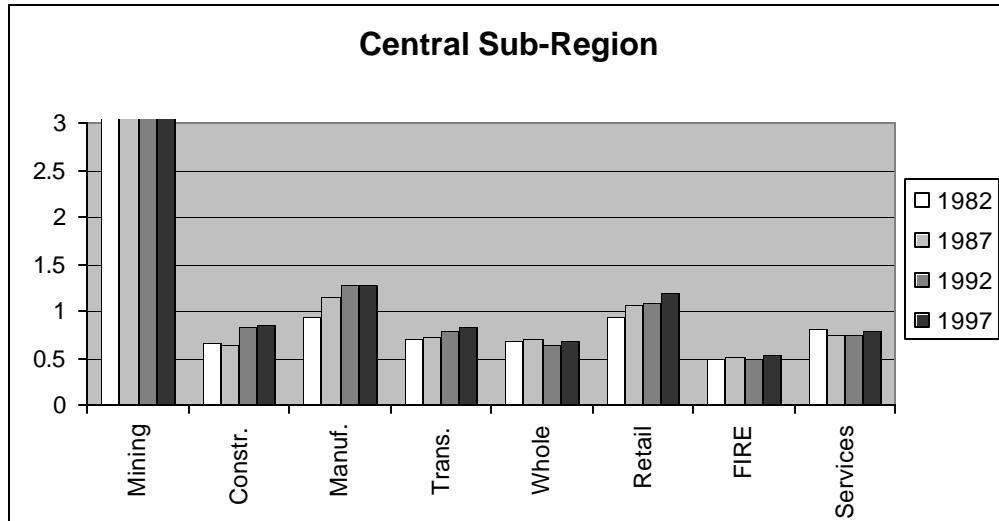


Figure 14-B. Northern Appalachia's Relative Employment Shares by Sector

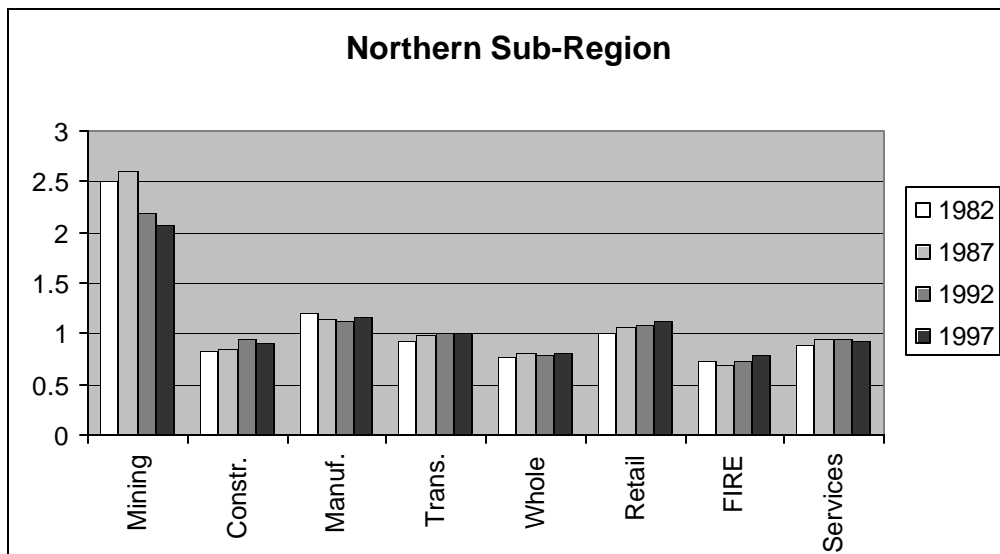
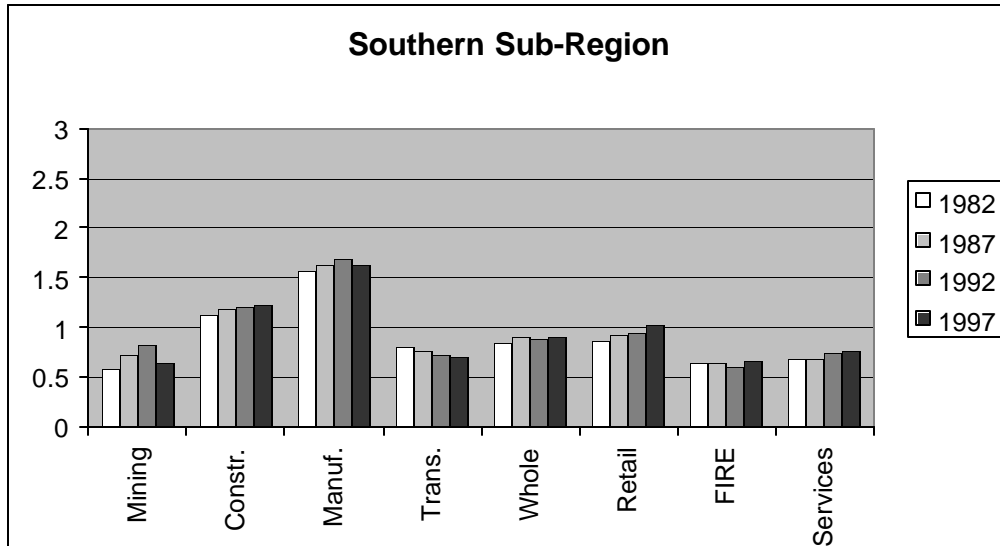


Figure 14-C. Southern Appalachia’s Relative Employment Shares by Sector



While mining is vastly over-represented in the Central subregion in all years, the Central subregion has seen increases in its share of Manufacturing and Retail Trade employment.¹³ The Northern subregion has a location quotient exceeding one in mining and manufacturing. The Southern subregion has especially high employment shares in Construction and Manufacturing relative to the U.S. Comparing the subregions to each other, the Central is over-represented in Mining and Retail Trade, the Northern is over-represented in FIRE and Services, and the Southern is over-represented in Construction and Manufacturing.

5.1.3. Establishment and Employment Shares at Branch Establishments

Establishment and employment shares at branch establishments are slightly lower in the Central subregion than in the Northern and Southern subregions. There has been a slight tendency for the share of economic activity (establishments and employment) to increasingly be at multi-unit firms over the time period. This increase is most noticeable in the Central subregion at about the middle of the sample period.

5.1.4. Establishment Size in the Subregions

The average establishment sizes for the subregions are relatively similar, but their differences are consistent over time. Over the four census years, the Central subregion has the smallest average establishment size (about 13 employees), the Northern has the middle (about 15 employees), and the Southern has the largest (about 16 employees). Using the flows measure of size over all of the years in the sample period, and comparing the subregions of Appalachia to the rest of the U.S. reveals that the

¹³ The scale has been truncated at three in order to show more detail, but would extend past ten in order to accommodate the location quotient for the Central Region in Mining.

Central establishments are 4 percent smaller and the Northern and Southern establishments are about 2 percent larger than establishments in the rest of the U.S. However, when controlling for other characteristics, the Central establishments are 12 percent smaller, the Northern establishments are 3 percent smaller, and the Southern establishments are about 4 percent smaller than establishments in the rest of the U.S.

5.1.5. Wages in the Subregions Compared with Wages in the United States

Recall that wages for the average employee are about 10 percent lower in Appalachia than in the rest of the U.S. In this section, the wages in the subregions are compared to the rest of the U.S. by year (see A2.2 for the estimation specification).

As shown in Table 9, wages for the Central subregion are about 20 percent below the rest of the U.S. and the Southern and Northern are about 10 percent below the rest of the U.S. Notice that the wage gap shrinks, then rises over time for the Central subregion, but actually increases slightly for the Northern and Southern subregions. With controls, the wage gap between the Central subregion and the rest of the U.S. declines over time, while the gap is essentially unchanged for the Northern and Southern subregions. (Although the wage gap for the subregions increases in the early years of the sample, this may reflect Appalachia's heavy reliance on manufacturing).

Table 9: Difference in Wages Between Appalachian Subregions and the Rest of U.S.

Subregions	1982	1987	1992	1997
Average Employment				
Central	-0.23	-0.15	-0.19	-0.21
North	-0.08	-0.08	-0.12	-0.13
South	-0.09	-0.09	-0.10	-0.12
Controlling for other Factors*				
Central	-0.30	-0.20	-0.19	-0.18
North	-0.11	-0.08	-0.10	-0.11
South	-0.11	-0.11	-0.11	-0.10

* The factors are industry, branch activity, and establishments size. All differences are statistically significant.

5.2 Establishment Births and Deaths in the Subregions

Establishment birth and death rates by subregions are shown in Figures 15-A and 15-B. The Southern subregion has the highest birth rate followed by the Central and Northern subregions. Ignoring the decline in the Southern subregion's birth rate from 1987 to 1992 (which mirrors that of the U.S.

economy), the difference in the birth rates is relatively stable over the three periods, even as all three subregions experience a decline in the rates. Ignoring the up tick in the Southern subregion's death rates from 1982 to 1992 (which mirrors that of the U.S. as a whole), the death rates for the Northern and Southern subregions are relatively similar and are lower than those for the Central subregion. The death rates for the three subregions converge over time. To differing degrees, the birth and death rates fall over the three time periods.

The prevalence of establishment entry and exit is measured by examining the probability that an establishment is an entrant or exiter (see A2.4 for how these probabilities are calculated). The probability that an establishment is an entrant is highest for the Southern subregion (33 percent) and the Northern subregion (31 percent), and lowest for the Central subregion (28 percent). The probability that an establishment is a death is highest for the Central subregion (26 percent), the Southern subregion (24 percent), and lowest for the Northern subregion (24 percent). When controlling for differences in characteristics across the areas, the difference between the probability of entry for the Central subregion is no longer significantly different than for the rest of the U.S.

Figure 15-A. Appalachian Subregion's Establishment Birth Rates

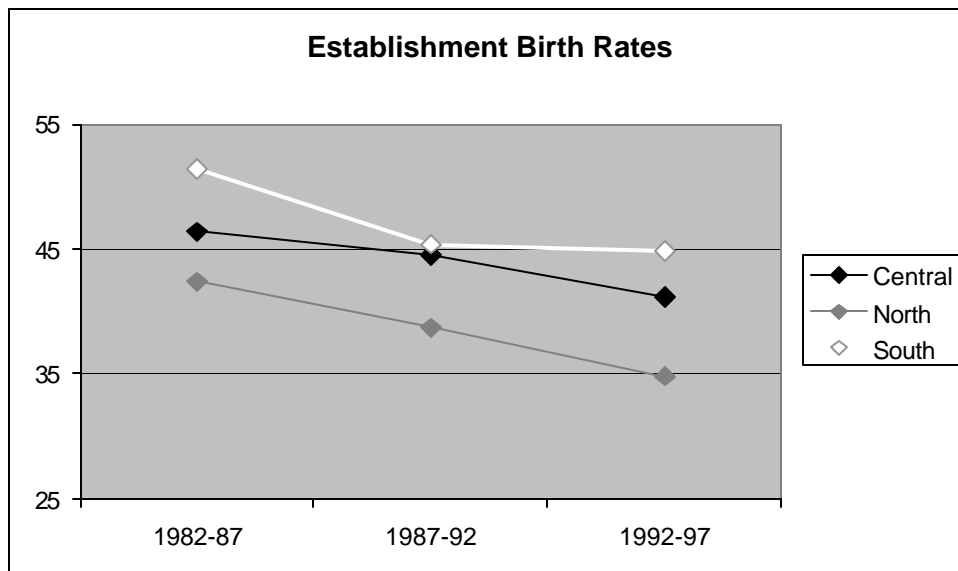
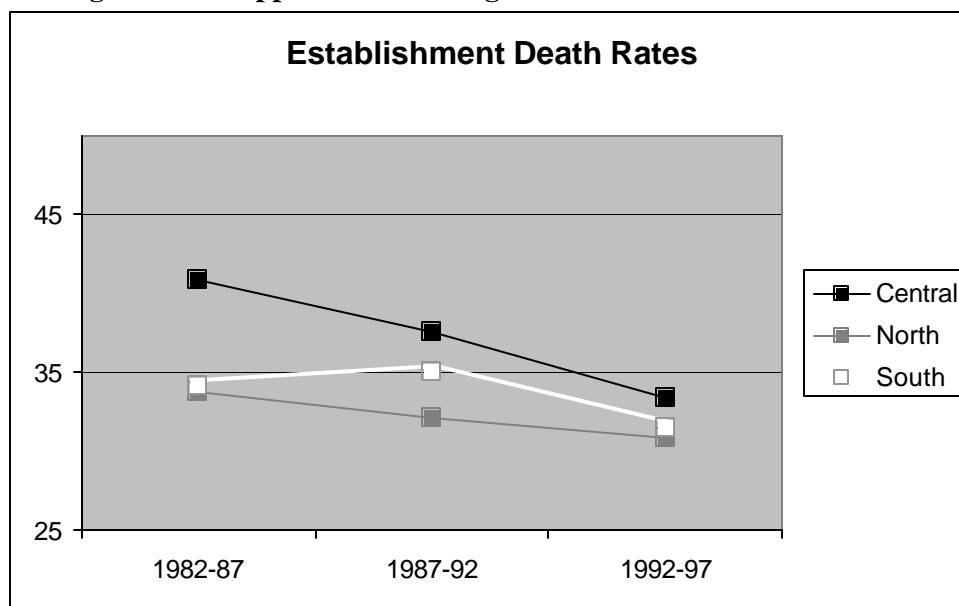


Figure 15-B. Appalachian Subregion's Establishment Death Rates



5.2.1 Characteristics of Births and Deaths in Appalachian Subregions

The differences in the establishment birth and death rates for the subregions highlight the heterogeneity of the Appalachian Region. The next subsection examines whether the births and deaths in these subregions are qualitatively different from their U.S. counterparts.

5.2.1.1 Wages of Entrants and Exiters in Appalachia Compared with the Rest of the U.S.

In this section, the wages of entrants (or exiters) in Appalachian subregions are compared to entrants (or exiters) in the rest of the U.S. for all years in the sample (see A2.5 for a description of the estimation specification). In addition, wages by subregion are compared to continuer establishments in the rest of the U.S. The results are shown in Table 10.

Focusing on the results that control for other characteristics, wages for the Central subregion's employees are 16 percent lower than the rest of the U.S. Wages for the Northern and Southern subregions' employees are 7 percent lower than the rest of the U.S.

The wages for employees in the Central subregion are 20 percent lower for establishment entrants, and 19 percent lower for establishment exiters than the rest of the U.S. counterparts.

The wages for employees in the Northern subregion are 10 percent lower for establishment entrants and 13 percent lower for establishment exiters, compared to their U.S. counterparts. The decomposed wage gaps are much larger than the total wage gap for the Northern subregion because the Northern subregion has very low birth and relatively more continuers than the rest of the U.S.

The wages for employees in the Southern subregion are 9 percent lower for establishment entrants and 10 percent lower for establishment exiters, compared to their U.S. counterparts. In all three subregions, the wage gaps are similar in size for employees at entrants and exiters. The wage gaps are smaller for Northern and Southern subregions when controlling for differences in other characteristics, but this is not the case for the Central subregion.

Table 10: Wages of Births and Deaths Comparison: Differences Between Appalachia and the Rest of the U.S.

Subregions	Establishment Type			
	Total	Continuers	Exiters	Entrants
Average Employment				
Central	-0.18	-0.20	-0.08	-0.16
North	-0.09	-0.13	-0.16	-0.14
South	-0.09	-0.12	-0.08	-0.08
Controlling for other Factors*				
Central	-0.16	-0.18	-0.19	-0.20
North	-0.07	-0.10	-0.13	-0.10
South	-0.07	-0.11	-0.10	-0.09

* Factors include industry, branch activity, year, and size.
All differences are statistically significant.

5.2.1.2 Size of Entrants and Exiters in Appalachian Subregions and in the U.S.

In this section the sizes of entrants (exiters) in the subregions of Appalachia are compared to the size of entrants (exiters) in the rest of the U.S. (see A2.6 for the estimation specification). Table 11 shows the results of this comparison. The average entering establishment in the Southern subregion is actually larger than its counterpart in the rest of the U.S. However, controlling for other differences, entrants in the Southern subregion are 2 percent smaller than entrants in the rest of the U.S. Southern subregion entrants, and Southern subregion exiters are 5 percent smaller than their U.S. counterparts. Focusing solely on the results that control for other factors, Northern subregion entrants are 7 percent smaller and Northern exiters are 8 percent smaller than their U.S. counterparts. Central subregion exiters are more than 10 percent smaller than their counterparts in the rest of the U.S., while Central subregion entrants

are only 7 percent smaller than their counterparts.

Table 11: Size of Births and Deaths Comparison by Appalachian Subregions: Differences Between Appalachia and the Rest of the U.S.

Appalachian Sub Regions	Establishment Type			
	Total	Continuers	Exiters	Entrants
Average Establishment				
Central	-0.04	-0.08	-0.04	** -0.00
Northern	0.02	-0.05	-0.04	-0.03
Southern	0.02	0.03	-0.02	0.02
Controlling for other Factors*				
Central	-0.12	-0.14	-0.13	-0.07
Northern	-0.03	-0.09	-0.08	-0.07
Southern	-0.04	-0.04	-0.05	-0.02
Factors include industry, branch activity, and years. All differences are statistically significant except when denoted by **.				

5.3 Employment Creation and Destruction

The employment growth rates by subregions are shown in Figure 16A and B. The net employment growth rates are shown in Figure 16-A. The net employment growth rates for Northern and Central subregions are very similar—almost zero net employment growth in the first period and weak employment growth in subsequent periods. In contrast, the Southern subregion has strong net employment growth in the first and third periods, with a slowdown in growth in the second period, which mirrors that for the U.S. as a whole.

Figure 16-B shows the job creation and destruction rates for the three subregions. With the exception of the increase in job destruction and decrease in job creation from 1987 to 1992, which is evident only in the Southern subregion, the Southern subregion has both higher job creation rates and lower job destruction rates than the other two subregions. The job destruction rates appear to converge over time for the three subregions.

Figure 16-A. Net Employment Growth by Appalachian Subregion



Figure 16-B. Job Creation and Destruction by Appalachian Subregion

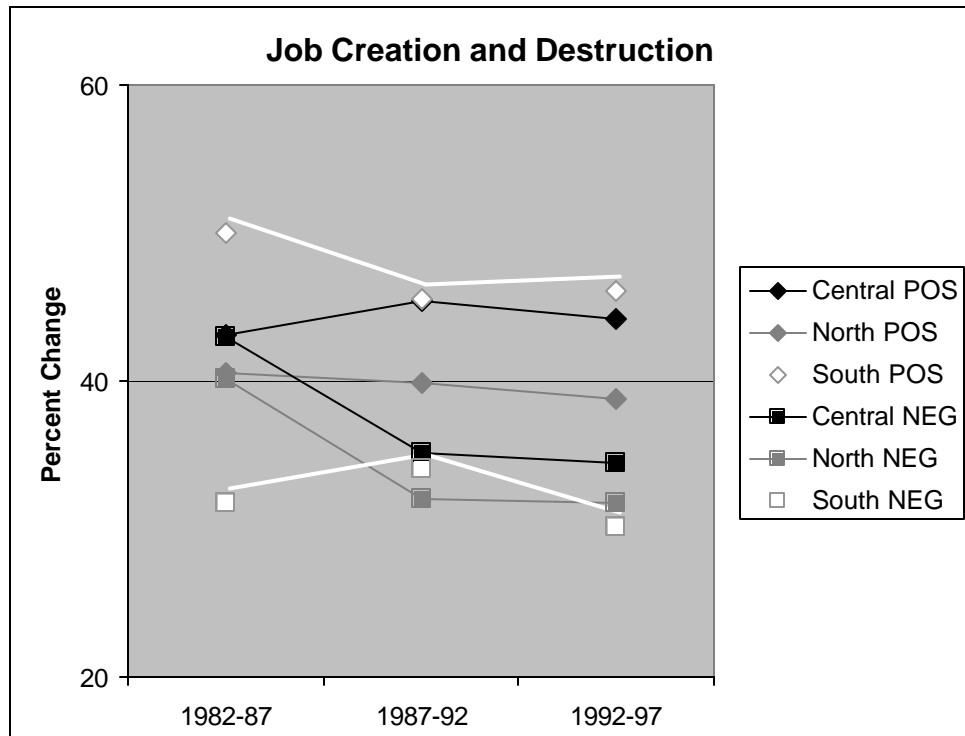


Table 12 summarizes the differences among subregions. The Central and Northern subregions have lower net employment growth rates than the rest of the U.S. However, when controlling for differences in industry, size, branch activity, and years, the net employment growth rate is *higher* in the Central subregion than it is for the U.S. Industry controls are responsible for this shift. This shift is not surprising when one recalls that the Central subregion is heavily dependent on the mining and manufacturing sectors. On the other hand, even with the controls, the Northern subregion still has net employment growth rates lower than the rest of the U.S., which suggests that the Northern subregion's problems are more diverse than the Central subregion's problems.

Table 12: Job Flows Comparison by Appalachian Subregion

Subregions	Net Employment	Job Creation	Job Destruction	Reallocation
Difference in Aggregate Rates				
Central	-4.79	-3.85	0.94	-2.91
Northern	-6.49	-8.35	-1.86	-10.21
Southern	3.85	-0.88	-4.73	-5.61
Controlling for other Factors*				
Central	3.55	-0.84	-4.39	-5.23
Northern	-3.42	-5.55	-2.12	-7.67
Southern	7.76	3.16	-4.59	-1.43

* Factors include industry, branch activity, size, and years. All differences are statistically significant.

The job creation rates in all three subregions are below that of the rest of the U.S. With the controls, the Southern subregion's job creation rates exceed those of the rest of the U.S. The job destruction rates for the Central subregion are higher than those for the U.S., but the job destruction rates are lower for the Northern and Southern subregions than the rest of the U.S. When controls are applied the job destruction rates for all three subregions are all lower than those for the rest of the U.S.

The Northern subregion's low net employment growth reflects too little job creation rather than too much job destruction (whether controlling for other factors or not). The Central subregion's low net employment growth rates appear to be related to industry composition. If one controls for this (as well as other characteristics), then the Central subregion actually has higher net employment growth rates, reflecting less job destruction (rather than more job creation). Finally, the Southern subregion has higher net employment growth rates than does the rest of the U.S. Without controlling for other factors, this reflects lower job destruction rates than for the U.S. However, controlling for other factors, this reflects both higher job creation rates and lower job destruction rates relative to the rest of the U.S.

6. Producer Services in Appalachian Subregions Compared to the U.S.

First we will present an overall comparison of the sector using data from the LBD. Next, establishment birth and death dynamics across the subregions are compared to the U.S. Finally, the analysis is extended to the employment flows for establishments that are classified in producer services.

6.1 Characteristics of Producer Services in the Appalachian Subregions

All three subregions of Appalachia experienced substantial growth in producer services sectors over the time period of this study. The number of establishments in the producer services sector grew from 1982 to 1997 as follows: 3,000 to 7,000 in the Central subregion; 24,000 to 38,000 in the Northern subregion; and 19,000 to 43,000 in the Southern subregion. The share of employment in producer services also grew in each region from 1982 to 1997: from 7 to 11 percent in the Central subregion; from 9 to 13 percent in the North subregion; and from 8 to 14 percent in the Southern subregion.

6.1.1. Economic Activity in Metropolitan and Non-metropolitan Areas of Appalachian Subregions

Economic activity in the producer sector is more concentrated in metro areas, compared with each subregion's overall economy. About 30 percent of employment in producer services in the Central subregion is in metro areas, compared to 20 percent for the Central subregion's economy as a whole. Likewise, about 80 percent of employment in producer services in the Northern and Southern subregions is in metro areas, compared to 70 percent for the Northern and Southern subregional economies as a whole. These shares are roughly constant over all of the years in the sample.

6.1.2. Shares of Multi-Unit Establishments for Producer Services in the Subregions

The shares of multi-unit establishments are about the same for the producer services sectors in each of the subregions as for their respective economies as a whole. However, employment in producer services sectors for each of the subregions is less concentrated in multi-unit firms than in their economies as a whole. The shares have shown an increase over time in economic activity occurring at multi-unit establishments. The increase is especially noticeable for the Central subregion at about the middle period of the sample.

6.1.3. Size of Producer Services Establishments in the Subregions

The average sizes for establishments in the producer services sector are relatively constant across the subregions. Again, the Central subregion tends to have smallest average establishment sizes, but the ranking of average establishment sizes for the Northern and Southern subregions varies over the years. Using the preferred flows measure of size, the average establishment in the Central subregion is 9 percent smaller, the Northern subregion is about 5 percent larger, and the Southern subregion is about 5 percent smaller than the average establishment in the rest of the U.S. However, when controlling for other characteristics, the average establishment in the Central subregion is 12 percent smaller, the Northern subregion is 3 percent smaller, and the South subregion is about 9 percent smaller than establishments in the rest of the U.S. In contrast to the rest of the economy, the size difference between the Northern and Southern subregion is strikingly larger in producer services.

6.1.4. Wages for Producer Services in the Subregions

Wages for employees at producer services establishments in the subregions of Appalachia are compared to their U.S. counterparts in Table 13 (see A2.2 for a description of the specification). The gap between the wages for the U.S. and the Appalachian Region in producer services was unusually low in 1982 (on a weighted-basis only). This anomaly appears in the subregions of Appalachia as well. Leaving aside 1982, the wage gap between the rest of the U.S. and the Central and Southern subregions narrows over the time period of the study. In contrast, the wage gap for the Northern subregion widens slightly over the time period. Nevertheless, by the end of the time period the gap for the Central subregion (24 percent) is still far larger than it is for the Southern (12 percent) and Northern (16 percent) subregions.

Table 13: Producer Services Wages Comparison by Subregions

Subregions	1982	1987	1992	1997
Average Employment				
Central	** 0.02	-0.23	-0.23	-0.19
North	-0.09	-0.14	-0.16	-0.14
South	-0.09	-0.29	-0.25	-0.24
Controlling for other Factors*				
Central	-0.12	-0.31	-0.29	-0.24
North	-0.05	-0.13	-0.15	-0.16
South	-0.12	-0.21	-0.16	-0.12

* Factors include industry, branch activity, and size.

All differences are statistically significant except when denoted by **.

6.2 Establishment Births and Deaths for Producer Services in the Subregions

The establishment birth and death rates for producer services establishments by region are shown in Figure 17. The establishment birth rates are especially high for the Southern subregion as compared to other subregions and as compared to the producer services sector for the U.S. The establishment death rates for producer services are more similar across the three subregions.

The relative importance of establishment entry and exit in the producer services industries in the subregions of Appalachia compared to the U.S. is analyzed by calculating the probabilities that an establishment is an entrant or exiter (see A2.4 for a description of the methodology). A Northern establishment has a lower probability of being an entrant or an exiter than does an establishment in the rest of the U.S. A Southern establishment has a lower probability of being an exiter but higher probability of being an entrant than does an establishment in the rest of the U.S. A Central establishment has lower probability of being an entrant than does an establishment in the rest of the U.S. These results

are similar to the results for the entire economy. The only difference is that in the most recent period, a Central establishment has a lower probability of being an exiter than does an establishment in the rest of the U.S. For the Central and Northern subregion, there is relatively less establishment dynamics in producer services than for the rest of the U.S. As has been seen in other comparisons to the rest of the U.S., the Southern subregion has strong entry dynamics and less exit dynamics.

Figure 17A. Establishment Birth Rates for Producer Services by Subregion

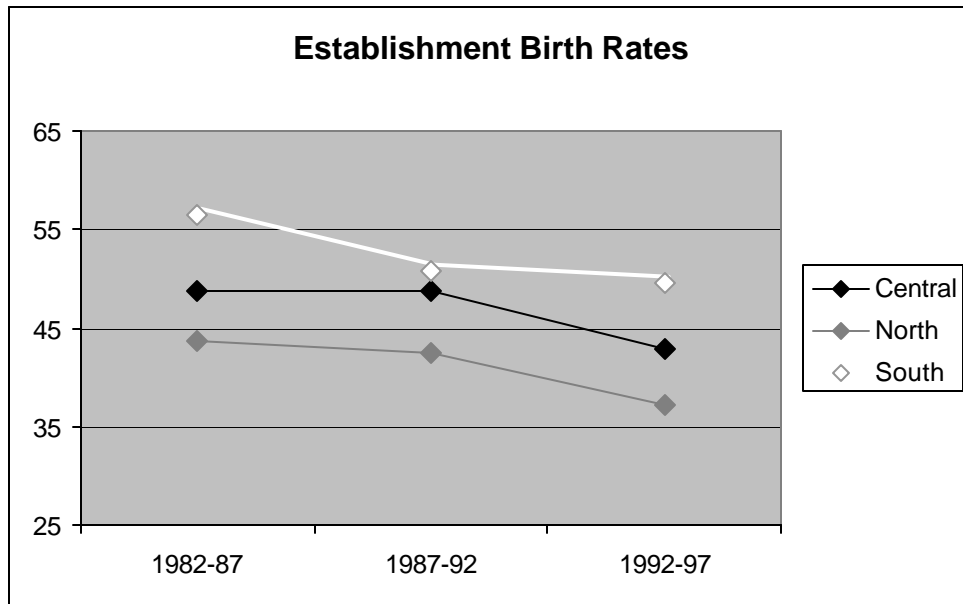
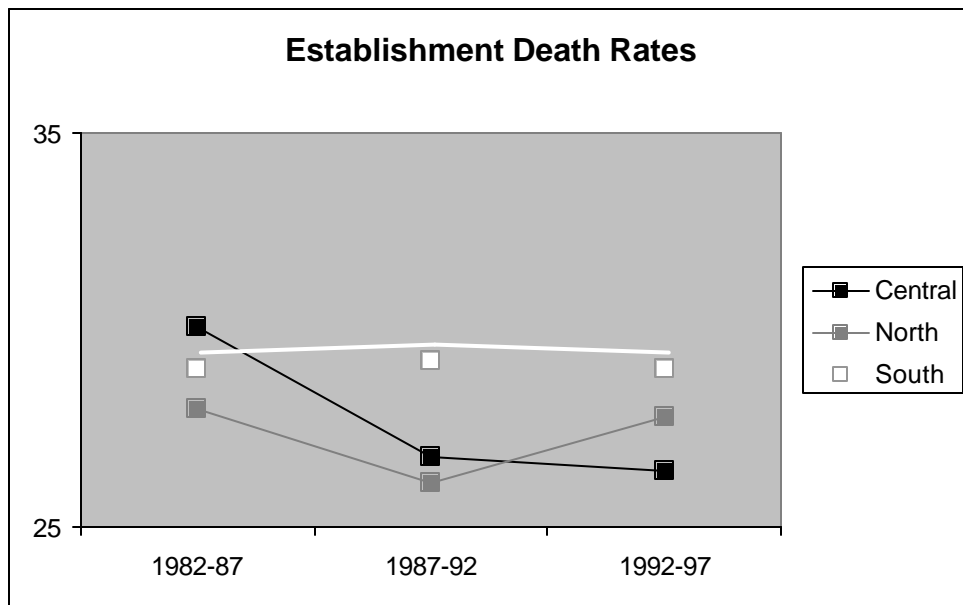


Figure 17B. Establishment Death Rates for Producer Services by Subregion



6.2.1 Characteristics of Births and Deaths in Appalachia

This section examines whether the births and deaths in the producer services sector of the three subregions of Appalachia are qualitatively different from their U.S. counterparts.

6.2.1.1 Wages of Entrants and Exiters in the Three Subregions Compared to Wages in the U.S.

In this section the wages of entrants (exiters) in the three subregions are compared to entrants (exiters) in the rest of the U.S. (see A2.5 for a description of the estimation specification). The results are shown in Table 14.

Focusing on the results controlling for other characteristics, the wage gaps for the average employee, relative to the rest of the U.S. are as follows: for the Central subregion, 23 percent difference from the rest of the U.S.; for the Northern subregion, 11 percent; and for the Southern subregion, 16 percent. These gaps are larger than for the economy as a whole (but especially for the Central and Southern subregions when compared to the results in Table 10).

In each subregion, the difference between the subregion and the U.S. in wages at *exiting* establishments is roughly of the same magnitude as the difference between the subregion and the U.S. in wages at *entering* establishments. In particular, the average employees at exiting and entering establishments in Central subregion have wages that are 30 percent smaller than their U.S. counterparts; in the Southern subregion the wage gaps are about 20 percent; and in the Northern subregion the wage gaps are about 10 percent. This is one of the few areas in which Northern subregion seems to be faring better than the Southern. However, when comparing the wage gaps for continuers, the Northern and Southern subregions have the same wage gap (15 percent).

Table 14: Wages of Births and Deaths in Producer Services by Subregions

Subregions	Establishment Type			
	Total	Continuers	Exiters	Entrants
Average Employment				
Central	-0.19	-0.20	-0.38	-0.33
North	-0.15	-0.21	-0.16	-0.13
South	-0.25	-0.22	-0.27	-0.31
Controlling for other Factors*				
Central	-0.23	-0.24	-0.33	-0.32
North	-0.11	-0.15	-0.07	-0.14
South	-0.16	-0.15	-0.21	-0.19

* Factors include industry, branch activity, year, and size.
All differences are statistically significant.

6.2.1.2 Size of Entering and Exiting Establishments in Producer Services in the Subregions of Appalachia Compared to their U.S. Counterparts

(See A2.6 for a description of the estimation specification.) Table 15 shows the relevant results. Focusing on the results controlling for differences in characteristics, the size gaps for entering and exiting establishments within a subregion are of the same magnitude. For example, the average exiting establishment in the Northern subregion is 6 percent smaller than its U.S. counterpart, and the average entering establishment in the Northern subregion is also 6 percent smaller than its U.S. counterpart. Moreover, the size gaps for entering establishments are about the same size for the Northern and Southern subregions. The Central subregion has slightly bigger size gaps than the other subregions. Note that the small size gap for all establishments in the Northern subregion (3 percent) masks larger size gaps once controlling for entering and exiting establishments. The size gaps are roughly the same as they were for the economy as a whole, except for the Southern subregion, where the size gaps in producer services are larger in all categories, and for the Central subregion, where the size gaps are larger for entrants (compare to Table 11).

Table 15: Size of Births and Deaths in Producer Services by Subregion

Region	Establishment Type			
	Total	Continuers	Exiters	Entrants
Average Establishment				
Central	-0.09	-0.18	-0.16	-0.09
North	0.03	-0.09	-0.05	-0.02
South	-0.05	-0.06	-0.08	-0.05
Controlling for other Factors*				
Central	-0.12	-0.15	-0.12	-0.11
North	-0.03	-0.12	-0.06	-0.06
South	-0.09	-0.11	-0.09	-0.07

* Factors include industry, branch activity, and year.
All differences are statistically significant.

6.3 Employment Creation and Destruction Rates for Producer Services

The net employment growth rates for producer services by subregion in Appalachia are shown in Figure 18-A. Figure 18-B shows the job creation and destruction rates are shown in the lower panel. The net employment growth rates for producer services establishments are noticeably higher for all three subregions as compared to establishments in the entire economy (compare to Figure 16). Comparing

these across the subregions, the Southern subregion has the highest net employment growth rates over all three time periods. The drop in net employment growth for the Southern subregion for the second period parallels that for the rest of the nation.

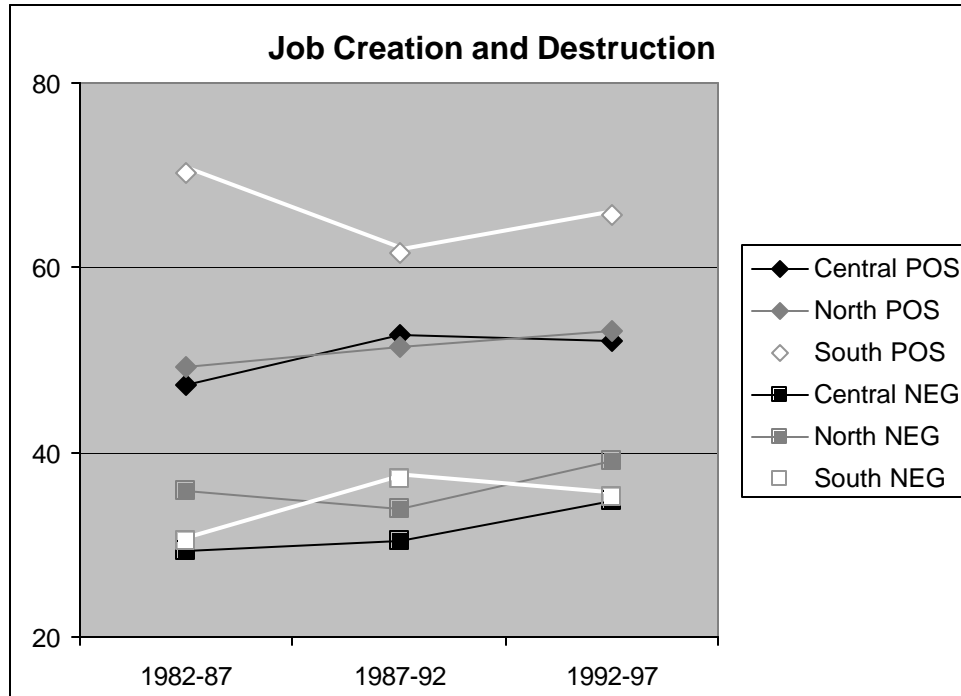
Underlying this strong net employment growth in the Southern subregion are very high job creation rates over all three periods. The Southern subregion's job creation rate in producer services is above 60 percent for all three time periods. Interestingly, the job destruction rates for producer services establishments in the Southern subregion are slightly higher than for establishments in general. The job creation rates for the Northern and Central subregions in producer services are also higher than the rates for establishments in general. In contrast to the pattern for the Southern subregion, the job destruction rates are much lower for the Central and Northern subregions in the earliest time period.

It is possible to summarize the differences in the job flows rates by year, as shown in Figure 18 (see A2.8 for a description of the estimation specification). The differences between the job flows rates in producer services in the subregions of Appalachia compared to the rest of the U.S are shown in Table 16. The upper panel shows the differences in these rates when aggregating the results up to the producer services industry over all of the years in the study.

Figure 18-A. Net Employment Growth in Producer Services by Subregion



Figure 18-B. Job Creation & Destruction Rates for Producer Services by Subregion



Confirming the results from Figure 18, the net employment rate for the Southern subregion is the highest relative to the other subregions: the rate is about 9 percentage points above the net employment growth rate for the rest of the U.S., whereas the other subregions have net employment growth rates below that for the rest of the U.S. The job creation rate for the Southern subregion is higher than the rates for the other subregions as well as the rest of the U.S. All three job destruction rates are below that for the rest of the U.S. The lowest job destruction rate is in the Northern subregion. Finally, the reallocation rates for the Central and Northern subregion are lower than for the rest of the U.S., but the Southern subregion's reallocation rate is indistinguishable from that of the rest of the U.S.

The lower panel of Table 16 shows the differences in the job flows rates in producer services in the subregions of Appalachia, compared to the rest of the U.S., when controlling for differences in composition of these areas in terms of industry, branch activity, establishment size, and time series patterns. These controls greatly affect the net employment growth rate of the Central and Northern subregions (raising both by about four percentage points). With the controls, the net employment growth rate of the Central subregion now exceeds that of the rest of the U.S. by nearly two percentage points. This improvement has come about almost exclusively through higher job creation rates. The differences in death rates are not much affected by the controls (they remain much lower than those for the rest of the U.S.).

Table 16: Job Flows of Producer Services by Subregion

Subregions	Net Employment	Job Creation	Job Destruction	Reallocation
Difference in Aggregate Rates				
Central	-2.11	-9.61	-7.50	-17.11
North	-6.12	-9.16	-3.04	-12.20
South	9.35	4.68	-4.67	** 0.00
Controlling for other Factors*				
Central	1.66	-5.73	-7.39	-13.13
North	-2.00	-6.29	-4.30	-10.59
South	9.39	3.42	-5.97	-2.55

*Other factors include industry, branch activity, size, and years.
All differences are statistically significant except when denoted by **.

7. Conclusions

One indicator of the general economic health of a region is the rate at which new jobs are created. The newly developed Longitudinal Business Database has been used in this report to develop a detailed portrait of establishment formation and attrition and job creation and destruction in the Appalachian Region. The foremost finding is that the pace of reallocation in Appalachia is lower than it is for the U.S. This is evident in Appalachia's relatively lower establishment birth and death rates and job creation and destruction rates. For example, on average over the study time period, the U.S. job creation rate exceeds 45 percent, while the Appalachian job creation rate is 43 percent. Similarly, the U.S. job destruction rate is about 35 percent, while the Appalachian job destruction rate is about 33 percent. Even when controlling for other differences, job creation rates are 1.2 percentage points lower and job destruction rates are 3.4 percentage points lower in Appalachia relative to the rest of the U.S.

Another indicator of the general economic health of a region is the quality of its jobs. The quality of jobs is measured in this report by the average wage paid at the establishment. Here too there is cause for concern about the economic health of Appalachia. The analysis shows that wages are about 10 percent lower in Appalachia than in the U.S. even when controlling for differences in other characteristics across the two areas. This wage discrepancy has not narrowed over the time of the study. Moreover, new establishments have a similar wage gap. Employees at new establishments earn wages 10 percent less than at new establishments in the rest of the U.S.

The producer services sector of the Appalachian economy has higher birth rates and job creation rates than the rest of the Appalachian economy, but the discrepancy between Appalachia and the U.S. exists even in this sector. For example, the gap between job creation rates for Appalachia and the U.S. is 1.2 percentage points for the total economy and 1.6 percentage points for producer services. More troubling is the fact that the gap between the wages for employees at establishments in Appalachia as compared to employees at establishments in the rest of the U.S. is much larger in this sector than for the total economy. Finally, this wage gap is even higher still for new establishments in producer services than for new establishments in the rest of the U.S.

The heterogeneity of the Appalachian Region is evident throughout the analysis in this report. Basic summary statistics concerning the number of establishments and employment in the subregions as classified by location and industry show enormous differences in the subregions. In terms of the indicators of economic health in the subregions, there are also large differences across the subregions. For example, even when controlling for other differences the Central subregions employees have wages about 20 percent below the rest of the U.S. but the Northern and Southern subregions' employees face a smaller wage gap of about 10 percent. The Central subregion's low job creation rates can partly be explained in terms of the industry composition of the region. This is less the case for the Northern subregion where the job creation rates are markedly low even when controlling for other characteristics (although controlling for these characteristics does raise the job creation rates a bit). On the other hand, the wage gap in the Northern subregion is not as severe as it is for the Central subregion. Finally, the Southern subregion appears to be faring the best of the three subregions in terms of the indicators of economic health analyzed. When controlling for other differences, it is apparent that this is in part due

almost equally to high job creation rates and low job destruction rates. Nevertheless, the wage gap for the Southern subregion is about 10 percent even when controlling for other differences and this gap is relatively steady over the study period. In sum, the Appalachian Region has areas that are comparable to the U.S. (for example, job creation in South) but has many other areas where it still lags behind the rest of the U.S.

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A1. Data Appendix

A1.1 Constraining Data to Inscope

Establishments in the following industries are excluded as out of scope to the Economic Census: Agricultural Production; Agricultural Services, Forestry, Fishing; Railroad Transportation; U.S. Postal Service; Elementary and Secondary Schools; Colleges, Universities, and Professional Schools; Labor Unions, Political Organizations, Religious Organizations; Private Households; Public Administration, Unclassified Establishments; and establishments with missing industry codes. (Although the SIC system changed over the sample period, the 2-digit and 3-digit industry codes that constitute the list of out of scope industries did not change.) The geography exclusions for the Economic Census are for establishments that are located in the following areas: foreign, Guam, Virgin Islands, Northern Marianas, and Puerto Rico. Finally, establishments that report 941 payroll taxes for benefit payments and various funds are excluded.

Out of scope establishments account for 100% of Agriculture and Public Administration establishments, less than 0.5% of Transportation establishments and about 9% of Services establishments for the U.S. Similarly, they account for 100% of Agriculture and Public Administration establishments, less than 0.5% of Transportation establishments and about 14% of Services establishments in Appalachia. In order to maintain the links in the establishments over time, an establishment is deleted if it is ever out of scope. Thus some in-scope observations are deleted in every year (cases where the establishment is sometimes in-scope and out of scope). For the U.S., out of scope establishments account for about 7% of establishments in 1982-87 and about 11% in 1992-1997 (the increase is due to the agricultural sector) and about 18% of employment in each of the census years. For Appalachia, out of scope establishments account for about 8% of the establishments in 1982-1987 and about 11% in 1992-1997 and about 18% of employment in each of the census years. Note that scope is determined only after filling in missing industry codes (see the section below).

A1.2 Filling in Missing Industry Codes

There are over 200,000 establishments in 1982, 1987, and 1992 and about 60,000 establishments in 1997 that are missing their industry codes for the U.S. For Appalachia, there are about 20,000 establishments in 1982, 1987, and 1992 and 7,000 establishments in 1997 that are missing their industry codes. The missing industry codes are filled using codes from other years. Since industry codes are most reliable in census years, the data editing algorithm first searches for an industry code in the next census year, then searches forward from $t+1$ to 1998, and then backwards from $t-1$ to 1977. A second edit to the data takes care of industry codes that do not appear in the official SIC system. Using data from other years fills in industry codes for over 100,000 establishments in each of the years 1982, 1987, and 1992, and about 40,000 establishments in 1997. For Appalachia, using data from other years fills in industry codes for over 10,000 establishments in 1982, 1987, and 1992, and about 2,000 establishments in 1997. The impact of editing the industry data did not materially change the industry distribution for the U.S.

A1.3 Removing Outliers

During the analysis of the employment data, impossibly large births were discovered in the data (establishments with more than 5,000 employees). All of these cases of large births in the in-scope data were deleted. Similarly, the wage data were found to include some establishments with impossibly large wages. For each year, all wage data that exceeded ten million dollars were deleted. In addition, any wage data that exceeded one million dollars in a year were deleted *unless* the establishment had five or less employees and was in one of the following industries: security broker, motion pictures, theatrical productions, doctor's offices, or legal services.

A1.4 Differences in Designation Rules

In order to consistently measure births and deaths at establishment and in terms of employment flows, births and deaths are designated based upon establishment employment rather than positive payroll (which is essentially the rule used by the LBD analysts). In addition, the constraint that an establishment is only kept if it has positive employment in at least one of the years in a year-pair is applied to the data in this paper. To the extent that entering and continuing establishments have zero or missing employment, this designation will produce birth/death designations that differ from those produced by Jarmin and Miranda. There are about 700,000 establishments that have zero or missing employment in the U.S. in any census year. Similarly, there are about 50,000 establishments that have zero or missing employment in Appalachia. The majority of these cases, for both the U.S. and AR, are births. The employment rule yields about the same number of births and deaths as the payroll rule but has significantly fewer continuers.

A1.5 Size Class Dummies

Establishments are classified based on their employment averaged over the two years in each year pair.

The size classes are:

Class 0 0-4 employees

Class 1 5-19 employees

Class 2 20-49 employees

Class 3 50-99 employees

Class 4 100-249 employees

Class 5 250-500 employees

Class 6 500-999 employees

Class 7 1000 or more employees

A1.6 Definition of Producer Services

The following four papers were used as guides in defining producer services (Goe 1996), Beyers and Lindahl (1996), Harrington and Garneau (1998), and Beyers (1989). Although the general concept of producer services is the same across these papers, services used by firms in their production processes; the actual definition varies in inclusiveness across the papers. The definition used in this paper is comprised of the most frequently cited two-digit industries. Thus the producer services group in this paper consists of the following industries: banking, nondepository institutions, security brokers, insurance carriers, insurance agents, real estate, business services, legal services, and engineering and

management. Note that the industry definition for 1982 is not strictly comparable to those for 1987, 1992, and 1997 since under SIC72 87 was part of 89, and SIC 89 is not included in the definition of producer services used in this paper.

A2. Methodology Appendix

A2.1 Measuring Differences in Size of Establishments

The difference in size of establishments between Appalachia and the rest of the U.S. is measured via a regression on log of average size with a dummy for whether or not the establishment is in the Appalachian Region (*ARC*). The log of average size is used since this allows the coefficients to be interpreted as showing approximately the percent difference in size between Appalachia and the rest of the U.S. A version of the regression controls for the differences between the Appalachian Region and the rest of the U.S. in branch activity, industry composition, and years. Controlling for differences in industry and branch activity removes the effects of differences in industry and branch activity composition of the Appalachia and the rest of the U.S. Thus, the controls are industry dummies (*Industry*), year dummies, and branch activity dummy (*MU*). Letting D_{et} refer to the log of average size for establishment e , the regression equation has the form:

$$(1) D_{et} = \mathbf{a} + \mathbf{b} * ARC_{et} + \mathbf{g} * MU_{et} + \mathbf{f} * \sum_{i=1}^{1514} Industry_{et} + \mathbf{h} * \sum_{i=1}^2 Year + \mathbf{e}_i$$

When the comparison group is the subregions of Appalachia, the regression format is the same as in Equation 1, except now the Appalachian Region dummy is replaced by three regional dummies.

A2.2 Measuring Differences in Wages at Establishments

The difference in the wages between Appalachia and the rest of the U.S. is measured using a regression on (log of) wages by year with a dummy for whether or not the establishment is in the Appalachian Region (*ARC*). The regressions are run by year to control for the fact that wages are in nominal dollars and are growing over time. The log of wages are used since this allows the coefficients to be interpreted as showing approximately the percent difference in wages between Appalachia and the rest of the U.S. A version of the regression includes controls for other differences in Appalachia and the rest of the U.S. The controls include industry dummies (*Industry*), size class dummies (*Size*), and a branch activity dummy (*MU*). Letting W_{et} refer to the log of the wage for establishment e , the regression equations have the form:

$$(2) W_{et} = \mathbf{a} + \mathbf{b} * ARC_{et} + \mathbf{g} * MU_{et} + \mathbf{d} * \sum_{i=1}^7 Size + \mathbf{f} * \sum_{i=1}^{1514} Industry_{et} + \mathbf{e}_i$$

These are run as employment-weighted establishment-level regressions and so the coefficient on the Appalachian dummy can be interpreted as the difference in wages for the average employee in Appalachia vis-à-vis the rest of the U.S. When the comparison group is the subregions of Appalachia, the regression format is the same as in Equation 2, except now the Appalachian Region dummy is replaced by three regional dummies.

A2.3 Calculating Establishment Birth and Death Rates

In measuring the birth and death rates, the first question is what is the correct choice of the base. There are three potential choices for denominators for $t-1$ to t birth and death rates: t , $t-1$, the average of t and $t-1$. The choice mainly concerns whether one uses t or $t-1$ as the denominator for births. Dunne, Roberts, and Samuelson (1988) use $t-1$ for births and deaths. They describe the motivation for their choices as follows “The denominator of the exit rate is all firms in operation at the beginning of the time

period and thus represents the pool of potential exiting firms. In the case of entry the pool of potential entrants cannot be observed. The denominator of the entry rate is the number of firms... in the previous period.” Jensen (1998) decomposes a particular year into its birth and death components and hence his measures are timed in a different manner than in the current paper. If one were to apply the timing conventions of this paper to Jensen’s measures, his measures would use t for births and $t-1$ for deaths.

Since the analysis in the current paper is in terms of pairs of years, it makes sense to use a measure that makes the birth and death rates for that pair of years comparable. Since gross flows concepts are also used in this paper, it makes sense to have the denominator used by both birth and death rates to be the average of the number of establishments in the two time periods. This yields a nice connection between the employment-weighted establishment birth and death rates and employment flow rates. Thus the measures are:

NE (t-1,t)	= new entrants between t-1 and t	(exist at time t)
NX (t-1,t)	= exiters that departed between t-1 and t	(exist at time t-1)
NT(t)	= number of establishments in t	
ANT(t-1,t)	= average number of establishments in t-1 and t:	
	$[NT (t-1) + NT (T)] / 2$	
Entry Rate:	$ENT (t-1,t) = NE(t-1,t) / ANT (t-1,t)$	
Exit Rate:	$EXT (t-1,t) = NX(t-1,t) / ANT (t-1,t)$	

When applied to the data, the highest birth rates are those that use t , the lowest are those that use $t-1$ (and of course, the measure that uses the average of t and $t-1$ employment falls between these). The measure of the death rates that uses the average of t and $t-1$ employment is lower than the measure that uses t .

Weighted Birth and Death Rates

The establishment birth and death rates weighted by employment are measured as:

EE (t,t-1)	= employment associated with new entrants between t-1 and t
EX (t,t-1)	= employment associated with exiters that departed between t-1 and t
ET(t)	= employment at all establishments in t
DENOM(t-1,t)	= average number of employment at establishments in t-1 and t:
	$[NT (t-1) + NT (T)] / 2$
Employment Formation Rate:	$EENT (t-1,t) = EE(t-1,t) / DENOM (t-1,t)$
Employment Attrition Rate:	$EEXT (t-1,t) = EX(t-1,t) / DENOM (t-1,t)$

A2.4 Measuring Probabilities that an Establishment is a Birth or Death

In order to test the significance of these differences, the establishment-level data are pooled and logistic regressions are used to examine differences in the probability that an establishment is a birth (death) in Appalachia and the rest of the U.S. A version of the regression includes controls for other differences in Appalachia and the rest of the U.S. The controls include industry dummies at the sectoral level

(*Industry*), year dummies, size class dummies (*Size*), and a branch activity dummy (*MU*). Note that the regressions compare the Appalachian Region to the rest of the U.S. (whereas the plots show the Appalachian Region and the entire U.S.) Letting E_{ct} refer to the event in question (for example when looking at births E is 1=birth, 0=otherwise), the regressions have the form:

$$(3) E_{ct} = a + b \cdot ARC_{ct} + g \cdot MU_{ct} + d \cdot \sum_1^7 Size_{ct} + f \cdot \sum_1^8 Industry_{ct} + h \cdot \sum_1^2 Year_{ct} + e_{ct}$$

The coefficients on the Appalachian dummy for this regression are presented in the tables below. Table A1 shows the results for the regressions comparing Appalachia to the rest of the U.S. The negative and significant coefficients on the Appalachian dummy mean that the probability that an establishment is a birth (death) is lower if the establishment is in Appalachia rather than in the rest of the U.S. Industry at the sectoral level continues to be a control for the producer services regression because the producer services industry includes establishments in two different sectors of the economy (FIRE and Services). When the comparison group is the subregions of Appalachia, the regression format is the same as in Equation 3, except now the Appalachian Region dummy is replaced by three regional dummies. Table A2 shows the results for the regressions comparing subregions of Appalachia to the rest of the U.S.

Table A1: Births and Deaths Comparison

Type of Comparison	Total Economy		Producer Services	
	Exit	Entry	Exit	Entry
Average Establishment	-0.07	-0.06	-0.16	-0.08
Controlling for other Factors *	-0.10	-0.06	-0.18	-0.10

* The factors are industry, branch activity, size, and years. All differences are statistically significant.

Table A2: Probability of Births and Deaths Comparison

Region	Total Economy		Producer Services	
	Exit	Entry	Exit	Entry
Average Establishment				
Central	0.05	-0.04	-0.19	-0.07
North	-0.09	-0.18	-0.17	-0.23
South	-0.09	0.06	-0.15	0.06
Controlling for other Factors*				
Central	** -0.02	-0.06	-0.23	-0.11
North	-0.11	-0.19	-0.18	-0.24
South	-0.11	0.06	-0.18	0.04

* The factors are industry, branch activity, size, and years.

All differences are significantly different except those denoted by **.

In order to quantify how much lower the probability is, the predicted probability that an establishment is a birth (death) for Appalachia and the rest of the U.S. is calculated. The probability is: Probability ($Y=1$) = $e^{-x^B}/(1+e^{-x^B})$. Where Y is birth (death). This is calculated for $ARC=1$ and $ARC=0$ for the simple regressions. Calculating the associated probabilities is more complicated when controlling for other characteristics since the calculation involves picking a value for each of the variables in the equation. Since all the variables are dummies, a simple rule such as using the mean value will not work.

For the total economy case comparing Appalachia to the rest of the U.S., two combinations of characteristics are chosen to see how the probabilities of an establishment being a birth or death changes. For each of these choices, the time period is 1982-87 and the industry is Services (which has the most establishments). The first combination reflects the characteristics of the majority of establishments in the U.S., branch activity is set for single units and the establishments are in the smallest size class. The second choice is for a slightly larger size class (20–49 employees) and multi units. For the small single units, the difference between Appalachia and the U.S in the probability that an establishment is a birth is about 1.5 percentage points and for a death the difference is about 2 percentage points (Appalachia is lower for both). For the medium multi units the percentage differences between Appalachia and the U.S. are less than 1 percentage point with the gap slightly larger for deaths (Appalachia is lower in all cases).

A2.5 Measuring the Differences in Wages at Entrants (Exiters)

The wages of entrants (exiters) in Appalachia are compared to entrants (exiters) in the rest of the U.S. by pooling the establishment data and running a regression on the log of wages. The regression is employment-weighted so that the coefficients reflect differences in wages for the average employee (rather than the average establishment). A version of the regression includes controls for other

differences in Appalachia and the rest of the U.S. The controls are industry, branch activity, size, and years. Letting A_{et} refer to the (log of the) average over the year-wage pairs wage for establishment e in one of the three groups (births, deaths, or continuers) the regression equation has the form:

$$(4) A_{et} = a + b \cdot ARC_{et} + g \cdot MU_{et} + d \cdot \sum_1^7 Size_e + f \cdot \sum_1^{1514} Industry_{y,t} + h \cdot \sum_1^2 Year + e_t$$

Note that the regressions without controls do not control for differences in years and thus are not directly comparable to the regressions without controls by year. When the comparison group is the subregions of Appalachia, the regression format is the same as in Equation 4, except now the Appalachian Region dummy is replaced by three regional dummies.

A2.6 Measuring the Differences in Sizes at Entrants (Exiters)

To test the significance of these size differences, regressions are run for each of these three groups of establishments (births, deaths, continuers) with the sample pooled over time on the (log of the) average size variable with an Appalachian dummy. A version of the regression includes controls for other differences in Appalachia and the rest of the U.S. The controls are branch activity, industry, and years. Letting D_{et0G} refer to the log of the average size of an establishment e that is in one of the three groups G of establishments (births, deaths, or continuers), the regression format is:

$$(5) D_{et0G} = a + b \cdot ARC_{et} + g \cdot MU_{et} + f \cdot \sum_1^{1514} Industry_{y,t} + h \cdot \sum_1^2 Year + e_t$$

Regression results reported are for *unweighted* regressions and so show the results for the average establishment. When the comparison group is the subregions of Appalachia, the regression format is the same as in Equation 5, except now the Appalachian Region dummy is replaced by three regional dummies.

A2.7 Calculating Job Creation and Destruction

Job creation and destruction rates are calculated using the methodology from Davis, Haltiwanger, and Schuh (1996). The job creation (destruction) rate is measured as the weighted average of the employment growth rates of expanding (contracting) plants including the contribution of entering (exiting) establishments. The employment growth rates are measured as the change in employment between $t-1$ and t , divided by the average of employment in $t-1$ and t . This measure of growth rates is the preferred measure since it is symmetric about zero and can incorporate establishment births and deaths.

Relationship Between Establishment Birth and Death Rates and Job Creation and Destruction Rates

A nice feature of the establishment formation rates used in this paper is that these are the same rates as the job creation at births (POSB) and job destruction at deaths (NEGD) found in Davis, Haltiwanger, and Schuh (1996). That is,

$$EENT(t-1,t) = POSB(t-1,t)$$

$$EEXT(t-1,t) = NEGD(t-1,t)$$

A2.8 Measuring Differences in Job Creation and Destruction Rates

In order to check the significance of these differences in employment dynamics, the establishment-level data are pooled and employment share-weighted regressions are run of the growth rates on a dummy variable for the Appalachian Region and relevant establishment-level controls. The growth rates are net employment, job creation, job destruction, and total reallocation. A version of the regression includes controls for other differences in Appalachia and the rest of the U.S. The controls include year dummies, industry dummies, a branch activity dummy, and a series of size class dummies. The regressions compare the Appalachian Region to the rest of the United States (whereas the plots show the Appalachian Region and the entire United States). Letting G_{et} refer to one of the four growth rates in question, the four regression equations have the form:

$$(6) G_{et} = \mathbf{a} + \mathbf{b} * ARC_{et} + \mathbf{g} * MU_{et} + \mathbf{d} * \sum_1^7 Size_{et} + \mathbf{f} * \sum_1^{1514} Industry_{et} + \mathbf{h} * \sum_1^2 Year_{et} + \mathbf{e}_{et}$$

These are establishment-level regressions weighted by establishment-level (average) employment shares using pooled data. Since the regressions are weighted by the (average) employment share, the coefficients correspond to the aggregate measure of the growth rate concept being estimated.¹⁴ For example, the coefficient on *ARC* for the net employment regression shows the percentage point difference in the net employment growth rate for Appalachia as compared to the rest of the U.S. When the comparison group is the subregions of Appalachia, the regression format is the same as in Equation 6, except now the Appalachian Region dummy is replaced by three regional dummies.

¹⁴ This form of regression is used by Davis and Haltiwanger (1999) for their plant-level regressions. An alternate form of the regressions that could have been used is weighted by employment and thus shows the difference between the growth rates for the average employee. The regressions weighted by employment look very similar to these regressions once we include the year dummies.