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**ESTABLISHMENT AND EMPLOYMENT DYNAMICS IN APPALACHIA:
EVIDENCE FROM THE LONGITUDINAL BUSINESS DATABASE**

by

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**Establishment and Employment Dynamics in Appalachia:
Evidence from the Longitudinal Business Database**

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1. Introduction

The general consensus concerning the Appalachian Region that emerges from studies of its socio-economic 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 most of the rest of the United States over a variety of dimensions. This paper focuses on the economic health of the region, specifically on the ability of the region to reallocate resources in response to changing economic conditions. 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 service, trade, and financial sectors. This shift has necessarily involved the large-scale reallocation of economic activity. More generally, a 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. Moreover, it is unclear whether the Appalachian Region experiences the same type of ongoing reallocation activity as does the U.S. economy. This question concerning reallocation is one of the primary concerns in this paper. Using the newly developed Longitudinal Business Database (LBD), this paper 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 paper also addresses this question.

A second concern of the paper reflects the school of thought in regional economics literature which emphasizes the importance of a strong 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 interregional trade. With the broad scope of data, this paper provides a detailed description of producer services in Appalachia vis-a-vis 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 paper 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 concern of the paper is to take into account 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, North, and South. Numerous studies have found that South has experienced more positive outcomes relative to the other two subregions over a variety of characteristics. These studies have also found that North appears to have declined over time

while Central has mostly unchanged. Isserman (1996) summarizes these differences as “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., North has lower entry rates and increasingly lower wages and productivity, Central has higher entry rates and lower (but relatively unchanged) wages and productivity, and South has higher entry rates and lower (but less so) wages and productivity. Accordingly, this paper examines the reallocation dynamics of these three subregions and compares them to the U.S..

Four major themes emerge from this paper. First, the Appalachian Region experiences far less reallocation of establishments and employment than does the U.S. This is evident in the lower establishment formation and attrition rates and in the lower job creation and destruction rates. At least part of this is 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 that is 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 paper strengthen this view of Appalachia as lacking in sufficient economic vitality.

The second theme that emerges from this paper is that 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 region. Compared to the rest of the U.S. on average over the study period, Central wages are about 20 percent lower even when controlling for differences in industry, size, and branch activity. However, Central’s wage gap has improved over the study period. In contrast, North and South wages are about 10 percent lower and this gap is relatively constant over the study period.

The third theme that emerges from this paper is that 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 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.

Finally, the fourth theme of this paper is the tremendous heterogeneity in the Appalachian Region. The three subregions of Appalachia have very different characters. Central is the region that most closely approximates the general view of Appalachia as it has the most activity in non-metropolitan areas and is most reliant on mining and manufacturing. In much of the analysis, the results for Central change dramatically for the better once industry controls are applied. Yet

industry composition is not the whole story. For example, Central suffers from low wages even when controlling for industry differences. North 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 North seems to lack economic vitality that encourages establishment births and job creation. On the other hand, the wage gap in North is not as severe as it is for Central. Finally, South is the region that is the most similar to the rest of the U.S.. South has net employment growth rates that exceed those of the rest of the U.S.. 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, South still lags the rest of the U.S. in terms of wages. The wage gap for South is about 10 percent even when controlling for other differences and this gap is relatively steady over the study period.

The paper is organized as follows. The data used in the study and measurement issues are discussed in Section 2. In Section 3, the Appalachian Region is compared to the U.S. over the entire economy. The section is divided into three subsections. In the first subsection, the focus is on describing 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. The second subsection examines establishment births and establishment deaths. The third subsection 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. In Section 4, the focus of the comparison is narrowed to the producer services sector of the economy. The total economy of the three subregions of Appalachia are compared to the U.S. in Section 5. The focus is narrowed again to the producer services sector in Section 6, where the three subregions are compared to the U.S. in terms of their producer services sectors. Concluding remarks are presented in Section 7.

2. Data and Measurement Issues

The data used in this study are from the Longitudinal Business Database (LBD) which is 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 in order to ensure the highest quality of 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 nonfarm payroll derived from the wages and salaries of employees at an establishment. From these data, we create an annual measure of wages which is 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 a careful analysis of all of the years in the LBD, it was decided that in order to maintain high data quality this study would use only data in years covered by an Economic Census (specifically, 1982, 1987, 1992, and 1997). Similarly, the study would only include data 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 6 million establishments and 87 million employees in each census year.

In order 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 upon the values of employment in those two years. The rules are: 1) births have zero employment in the start year and positive employment in the end year, 2) continuers have positive employment in both the start and end years, and 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 12th 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

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

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 subsequent recovery. The comparisons of general economic trends in this paper are for Appalachia (or its subregions) as compared to 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. In order to facilitate comparisons across the four main sections of the paper, the figures are produced with the same scales for like concepts where 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 two economies in terms of their geography, industry distribution, branch activity, establishment size, and wages. Section 3.2 examines the economic dynamics of the two areas in terms of their establishment births and deaths. Section 3.3 extends this analysis of dynamics by examining the employment flows in the two areas.

3.1 Characteristics of Appalachia

The Appalachian Region, as currently defined by the Appalachian Regional Commission (ARC), consists of 414 counties in thirteen states running from New York to Mississippi.² There are approximately 6 million establishments and 87 million employees in the U.S. and 0.4 million establishments and 6 million employees in the Appalachian Region on average in the dataset. Figure 1 shows the number of establishments and employment in the U.S. (left-scale) and the Appalachian Region (right-scale) for each census year.³ As is evident from the figure, the number of establishments and employment are growing over time for both areas. The number of establishments increases by 30 percent for both the U.S. and Appalachia, while employment has 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. Rural

The common perception of the Appalachian Region is of a relatively rural area. According to ARC, 42 percent of the population in Appalachia live in rural areas as compared to 20 percent for the U.S. as a whole. However, while metropolitan areas account for only 28 percent of the counties, they account for about 60 percent of establishments and 65 percent of employment in Appalachia. The LBD does not currently have a measure of metropolitan and non-metropolitan areas and 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.

3.1.2. Industry

The Appalachian Region has historically been reliant on the mining, agricultural,

² These counts are based on Census FIPS codes, using the Bureau of Economic Analysis FIPS codes yields 406 counties in Appalachia. Although Appalachia consisted of 404 counties over much of the sample period, the definition of Appalachia used in this paper is fixed at 414 counties over the entire sample period.

³ The counts in section 3.1 are based on the LBD designations of active establishments for the current year (i.e., establishments with positive payroll). In the sections concerning dynamics that follow (sections 3.2 and 3.3), the definition of active is necessarily based on the more restrictive definition of positive *employment*.

and manufacturing sectors for economic activity. Over the time period of this study, economic activity in the U.S. shifts away from these sectors. A similar shift in economic activity for Appalachia is apparent in Figure 2 which shows 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 in both the U.S. and Appalachia. An examination of the years in between 1982 and 1997 (not shown), reveals the manufacturing sector dominated in the U.S. through 1982, but in Appalachia through 1992. In terms of establishments (not shown), the service sector dominates the U.S. over 1982-1997 and Appalachia starting in the 1990s.

The industry distributions suggest that the changes in the industry composition are similar for Appalachia and the U.S.. However, there are still important differences between Appalachia and the U.S. as can be seen by looking at the location quotient. The location quotient is 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. Not surprisingly, the location quotient is significantly greater than one for mining in each 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

In recognition of the historical importance of the manufacturing sector in Appalachia, this section of the paper gives more detailed information about manufacturing. The number of establishments in manufacturing increases over the sample period in both the U.S. as a whole and in Appalachia (by about 20 percent for the U.S. and 30 percent for 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 then later in the U.S. as a whole (between 1992 and 1997). On net, employment in manufacturing fell for both the U.S. and Appalachia between 1982 and 1997 (by 3 percent for both areas). In terms of the durable and nondurable subsectors of manufacturing, there is more employment in durable manufacturing than in nondurable manufacturing for both areas (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.

There are twenty major groups in the manufacturing sector.⁴ Figure 4 shows 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 for the U.S. The figure shows that most Appalachian industries are similar to their U.S. counterparts in terms of their relative size and their time series patterns. There are, however, some industries that 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. (but 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.

3.1.3. Branch Activity

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 it is of interest to know whether the share of multi-unit activity in Appalachia is comparable to that of the U.S.. The shares are in fact very similar. For the 1982-1997 period, approximately 25 percent of all establishments in the U.S. are part of a multi-unit firm and these 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 from 14 employees in 1982 to 16 employees in 1997, the median U.S. establishment

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.

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.

has 4 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.

When looking at employment flows, the measure of size usually used is employment averaged over the start and end period for those 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 paper). 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 paper, controlling for differences in the composition of birth, death, and continuer establishments in Appalachia versus the U.S. also impacts the differences in size between the two areas.

3.1.5. Wages

A persistent concern about Appalachia is the gap between the wages paid in Appalachia and the wages paid 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 the estimation specification). 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 between Appalachia and the U.S. does not narrow over the time period. It is possible that this wage gap partly reflects differences in the industry, branch activity and size composition of establishments in Appalachia as compared to 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). Further examination shows that the industry control is the most influential here, suggesting that changes in industry composition are impacting wages. It could be that the controlling for industry widens the wage gap in the early part of the sample when employment in Appalachia was more concentrated in manufacturing relative to the rest of the U.S.. Manufacturing traditionally has higher wages relative to other sectors of the economy. As manufacturing

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.

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				
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 establishments 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 are calculated.) One must take care in interpreting the results from the comparison between the two areas 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 Appalachia. There is a decline in establishment birth rates, and to a lesser extent establishment death rates, for both the U.S. and Appalachia over the period. 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 generally about the same size over the time period. The establishment death rates are lower in Appalachia than in the U.S., but here the gap between the Appalachia and the U.S. rates widens after the first period.

Another way to compare the prevalence of establishment births and deaths is to compare the probabilities that an establishment is a birth (death) for Appalachia and the U.S.(see A2.4 for a description of how these probabilities are calculated). Note that the comparison here 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, establishments 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 still about 1 percentage point lower for Appalachia.

3.2.1 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. Figure 6 shows 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 birth rates for Appalachia are lower than for the U.S. (although by the end of the period, the birth rates are almost identical). For manufacturing, the birth rates for Appalachia are close to those for the U.S., but the death rates are lower in Appalachia as 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. The discrepancy also is large in the Service sector. These are the two sectors of the economy in which producer services are located.

Manufacturing Sector

As noted above, the birth rates for Appalachia are close to those for the U.S., but the death rates are lower in Appalachia for manufacturing. 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 By Appalachian Metropolitan and Non-Metropolitan Areas

The birth rates for metropolitan and non-metropolitan areas in Appalachia are nearly identical with the non-metro birth rates slightly lower than the metro birth rates. On the other hand, death rates for non-metro areas are higher than they are 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.

From the existing literature, it is known 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 establishments 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).

Wages

The empirical exercises in this section compare wages for employees in Appalachia to employees 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 2 summarizes the results of these exercises. The average employee at an establishment in Appalachia earns 10 percent less than does 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 over 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 relative to their rest of the 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 experience lower birth rates than does the rest of the U.S. but the births that it does experience tend to have lower wages than do 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	
Type of Comparison	Establishment Type

⁷ The continuing establishments used for comparison differ for births and deaths because they cover different years. It is important to keep in mind that 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 more stark by construction. (Since the births and deaths are being averaged with zero in one of the periods.)

	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.				

Size

As noted above, the average U.S. entering and exiting establishments have 11 employees. The average Appalachian entering and exiting establishments are slightly smaller. Recall that the total sample of establishments showed that establishments in Appalachia are *larger* than those in the U.S.. The results concerning entrants and exiters being smaller are 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. and thus as a whole establishments are larger in Appalachia.

Jensen (1998) found that the average sizes of entrants and exiters in manufacturing Appalachia 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 as 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 as 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.

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.

Table 3: Size of Births and Deaths Comparison				
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 concerns the number of jobs within 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. In order to get a more 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. Thus the net employment growth rate (NET) can be decomposed into job creation rate (POS) and job destruction rates (NEG). That is, $POS - NEG = NET$. The sum of the job creation and destruction rates, measures the total amount of job reallocation that is occurring in the economy (SUM).

The U.S. and the 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 decompose the job creation rate into its two components and to thus 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 decompose 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 these 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 these

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 slowdown in net employment growth in the U.S. for 1987-92 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 these 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) and lower job creation (4.5 percentage points lower) and job destruction (3 percentage points lower) and hence lower reallocation than does the rest of the U.S.. When controlling for industry, firm type, size, and years, the Appalachian Region has higher net employment growth than does the U.S. (about 2.2 percentage points higher). The industry control (even at the sectoral level) is responsible for this change in the ranking of Appalachian and U.S. net growth. This is not too 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.

Table 4: Job Flows Comparison				
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. By Industry

The above analysis has shown that 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. The analysis in this subsection examines the importance of industry in more depth. Figure 9 shows the net employment growth rates by sector for the U.S. (top panel) and Appalachia (bottom panel). There are some basic similarities 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 slowdowns in net employment growth in the U.S. during 1987-92, while they experience accelerating net employment growth in Appalachia during the same period.

The above analysis has shown that job creation and destruction rates for Appalachia are smaller than they are for the rest of the U.S.. The analysis in 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 Appalachia and the U.S. are in terms of the magnitudes of the creation and destruction rates. 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 is 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. over almost every sector (except, as with the establishment birth and death rates, for Mining). The discrepancy between the U.S. and Appalachia rates is largest in the Wholesale Trade and FIRE sectors.

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. The upper panel of Figure 11 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 briefly rise and then fall and job destruction rates briefly fall and then rise. The magnitudes of these changes, however, differ over the two areas so that by the last period, the job destruction rate for Appalachia exceeds that for the U.S.. The lower panel of Figure 11 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 in the 1987-92 period where job creation rates rise for all groups except for durables in the U.S. and the gap between the U.S. and Appalachian job destruction rates is especially large. Comparing the durables to nondurables, there is a much more distinct drop in job destruction for durables than nondurables and job creation rates seem to be trending upwards in durables but downwards in nondurables.

3.3.2 By Appalachian Metropolitan and Non-Metropolitan Areas

The net employment growth rates for the metropolitan areas are slightly higher than

those for non-metropolitan areas for all three time periods. The job creation and destruction rates are both 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.

4. Producer Services in Appalachia as Compared to the U.S.

The producer services sector in Appalachia is compared to its counterpart in the U.S. in this section. As in the previous section, an overall comparison of the sector using data from the LBD is first presented. Then the establishment birth and death dynamics across Appalachia and the U.S. are compared. 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 paper 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, this 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 0.5 million payroll employees in the producer services sector in the U.S. in 1982, this grows to 88,000 million 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. Rural

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

4.1.2. Branch Activity

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. Establishment Size

The average size of establishments in producer services in the U.S. over 1982-1997 is about 12 employees, while the average size for Appalachia is slightly smaller at

about 10-11 employees. As in Section 3.1.4, the preferred measure of size is the flows measure of size. Using this 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. (about 1 percent smaller). 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

Recall that the average employee's wages are about 10 percent lower in Appalachia as compared to 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 vis-a-vis the rest of the U.S.. Wages in the Appalachian Region for employees in the producer services industry are about 20 percent lower than for 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 for the rest of the U.S..¹⁰ In contrast to the economy as a whole, the wage differences are falling slightly over time (compare Tables 1 and 5).

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 establishments size. All differences are statistically significant.

4.2 Establishment Births and Deaths

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 are lower for both the U.S. and Appalachia relative to their counterparts for the economy as whole (compare to Figure 5). As

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.

is true for the economy as a whole and for the two sectors in which producer services appears (Services and FIRE), 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 the time periods. This is in contrast to the economy as a whole, where recall that 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 to the economy as a whole where the death rates have a general downward trend (they rise from the first period to the second and then fall in the last period).

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. By Appalachian Metropolitan and Non-Metropolitan Areas

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

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

examined to see if they are qualitatively different from their U.S. counterparts.

Wages

The empirical exercises in this section compare 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).

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.

Size

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 Births and Deaths in Producer Services Comparison				
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

The employment flows for producer services in the U.S. and Appalachia are shown in Figure 13. The upper panel of the figure shows the net employment growth rates for the two areas. Relative to other sectors of the economy, producer services experiences 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 1987-92 period in the U.S. is not as noticeable in Appalachia. The lower panel of Figure 13 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 an 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 differences in the job creation rates between Appalachia and the rest of the U.S. narrow 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 Comparison

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. *By Appalachian Metropolitan and Non-Metropolitan Areas*

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.

5. Comparison of Subregions of Appalachia to the U.S.

The Appalachian Regional Commission divides the Appalachian Region into three subregions based on geographic location: North, Central, and South.¹² 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, North and South are roughly similar in size in terms of establishments and employment and Central is very small in these terms. Specifically, Central accounts for 22 percent of the counties in Appalachia but only 9 percent of the establishments (and slightly less of the employment). North 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). South 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. *Rural*

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 Central 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 North and South is about 65 percent and for employment is about 70 percent. These shares are roughly constant over the sample period. These differences in metropolitan-rural distributions are one of the reasons why the Central Region is most similar to the general perception of “Appalachia.” The other reason is noted below, the differences in industry distribution.

5.1.2. *Industry*

The three subregions have some similarities and differences in their sectoral composition. All three subregions are dominated by Manufacturing in 1982, but by 1997 Central and North are dominated by Services. In all three subregions, Retail Trade is the second most dominant sector in both 1982 and 1997 (except for South in 1997 where it is the third most important sector behind Manufacturing and Services). Figure 14 shows the

¹² The ARC also classifies counties according to their distressed status. Distressed counties are those with low per capita market income rates, high poverty rates, and high unemployment rates as compared to U.S. averages. After consultation with ARC, it was decided that this designation is not suitable for the current project.

location quotients for each of the subregions relative to the U.S..¹³ Central is vastly over-represented in Mining in all years, but has also increased its share of employment relative to that of the U.S. in both Manufacturing and Retail Trade. North has a location quotient exceeding one in mining and manufacturing. South has especially high employment shares in both 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 North is over-represented in FIRE and Services, and the South is over-represented in Construction and Manufacturing.

5.1.3. *Branch Activity*

Economic activity at branch establishments is slightly lower in Central than in North and South in terms of both establishment and employment shares. 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 Central at about the middle of the sample period.

5.1.4. *Establishment Size*

The average establishment sizes for the subregions are relatively similar, but their differences are consistent over time. Over the four census years, Central has the smallest average establishment size (about 13 employees), North has the middle (about 15 employees) , and South 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 Central establishments are 4 percent smaller and North and South establishments are about 2 percent larger than establishments in the rest of the U.S. (see A2.1 for a description of the estimation specification). However, when controlling for other characteristics, Central establishments are 12 percent smaller, North establishments are 3 percent smaller, and South establishments are about 4 percent smaller than establishments in the rest of the U.S.

5.1.5. *Wages*

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 at 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 Central are about 20 percent below and the South and North are about 10 percent below the rest of the U.S.. Notice that the wage gap shrinks and then rises over time for Central, but actually slightly increases for North and South. With controls, the wage gap between Central and the rest of the U.S. declines over time, while it is essentially unchanged for the North and South. The introduction of controls increases the wage gap for the subregions in the early years of the sample. As was noted in the discussion of this pattern for the Appalachian Region, this may have something to do with Appalachia's heavy reliance on manufacturing.

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.

Table 9: Wage Comparison				
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

The establishment birth and death rates by subregions are shown in Figure 15. South has the highest birth rate followed by Central and then North. Ignoring the down tick in 1987-92 in the South's birth rate (which mirrors that of the U.S. economy), the discrepancy in the birth rates is relatively stable over the three periods even as all three subregions experience a decline in the rates. Ignoring the uptick in the South's death rates in 1982-92 (which mirrors that of the U.S. as a whole), the death rates for the North and South are relatively similar and are lower than those for the Central. The death rates converge over time for the three subregions. To differing degrees, the birth and death rates fall over the three time periods.

As in earlier sections of the paper, 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 of an establishment is an entrant is highest for South (33 percent), then North (31 percent), and is lowest for Central (28 percent). The probability that an establishment is a death is highest for Central (26 percent), then South (24 percent), and is lowest for North (24 percent). When controlling for differences in characteristics across the areas, the difference between the probability of entry for Central is no longer significantly different from the rest of the U.S. otherwise the results are generally the same.

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 this subregions are qualitatively different from their U.S.

counterparts.

Wages

The wages of entrants (exitors) in Appalachian subregions are compared to entrants (exitors) in the rest of the U.S. in this section over all of the years in the sample (see A2.5 for a description of the estimation specification). The results of this exercise are shown in Table 10. Focusing on the results that control for other characteristics, wages for Central employees are 16 percent lower relative to the rest of the U.S.. Wages for North and South employees are 7 percent lower than the rest of the U.S.. Central employees have wages that are 20 percent lower for establishment entrants and 19 percent lower for establishment exitors than their rest of the U.S. counterparts. North employees have wages that are 10 percent lower for establishment entrants and 13 percent lower for establishment exitors relative to their U.S. counterparts. The decomposed wage gaps are much larger than the total wage gap for North because North has very low birth rates and so when looking at total wages we are comparing relatively more births in the rest of the U.S. with relatively more continuers in the North. South employees have wages that are 9 percent lower for establishment entrants and 10 percent lower for establishment exitors relative to their U.S. counterparts.. In all three subregions, the wage gaps for employees at entrants and exitors are of similar size. The wage gaps are smaller for North and South when controlling for differences in other characteristics than when not using these controls, but this is not the case for Central.

Table 10: Wages of Births and Deaths Comparison				
Subregions	Establishment Type			
	Total	Continuers	Exitors	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.

Size

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

Table 11: Size of Births and Deaths Comparison				
Region	Establishment Type			
	Total	Continuers	Exitors	Entrants
Average Establishment				
Central	-0.04	-0.08	-0.04	** -0.00
North	0.02	-0.05	-0.04	-0.03
South	0.02	0.03	-0.02	0.02
Controlling for other Factors*				
Central	-0.12	-0.14	-0.13	-0.07
North	-0.03	-0.09	-0.08	-0.07
South	-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 16. The net employment growth rates are shown in the upper panel of the figure. The net employment growth rates for North and Central are very similar: both have almost zero net employment growth in the first period and then weak employment growth in the subsequent periods. In contrast, South has strong net employment growth in the first and third periods with a slowdown in the rate of growth in the second period (which mirrors that for the U.S. as a whole).

The lower panel of Figure 16 shows the job creation and destruction rates for the three

subregions. Ignoring the 1987-92 increase in job destruction and decrease in job creation which is evident only in South, South has both higher job creation rates and lower job destruction rates than the other two subregions. The job destruction rates appear to be converging over time for the three subregions.

Once again, it is possible to summarize these differences shown in Figure 16 across all the years (see A2.8 for the specification of the estimation). Table 12 shows the results of this exercise. Central and North have lower net employment growth rates than does 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 Central than it is for the U.S.. It is apparent that the industry controls are responsible for this shift. This switch is not surprising when one recalls that Central is heavily dependent on the mining and manufacturing sectors. On the other hand, wven with the controls, North still has net employment growth rates lower than that of the rest of the U.S. suggesting that the North's problems are more diverse than the Central's problem of over-reliance on slow growth industries.

The job creation rates in all three subregions are below those of the rest of the U.S.. With the controls, South's job creation rates exceed those of the rest of the U.S.. The job destruction rates for Central exceed those for the U.S., but for North and South they are lower than the rest of the U.S.. When controls are applied, the job destruction rates for the three subregions are all lower than those for the rest of the U.S.. In terms of magnitudes North's low net employment growth reflects too little job creation rather than too much job destruction (whether controlling for other factors or not). Central's low net employment growth rates appear to be related to industry composition. If one controls for this (as well as other characteristics), then Central actually has higher net employment growth rates, reflecting less job destruction (rather than more job creation). Finally, South 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..

Subregions	Net Employment	Job Creation	Job Destruction	Reallocation
Difference in Aggregate Rates				
Central	-4.79	-3.85	0.94	-2.91
North	-6.49	-8.35	-1.86	-10.21
South	3.85	-0.88	-4.73	-5.61
Controlling for other Factors*				
Central	3.55	-0.84	-4.39	-5.23

North	-3.42	-5.55	-2.12	-7.67
South	7.76	3.16	-4.59	-1.43

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

6. Producer Services in Subregions of Appalachia as Compared to the U.S.

The producer services sector in the subregions of Appalachia are compared to their counterpart in the U.S. in this section. As in the previous sections, an overall comparison of the sector using data from the LBD is first presented. The establishment birth and death dynamics across the subregions and the U.S. are then compared. 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.

6.1 Characteristics of Producer Services in the Appalachian Subregions

All three subregions of Appalachia experienced substantial growth in their producer services sectors over the time period of this study. In terms of establishment growth from 1982 to 1997, the producer services sectors grew from 3,000 to 7,000 for Central, from 24,000 to 38,000 for North, and from 19,000 to 43,000 for South. The share of employment in producer services also grew in each region over 1982 to 1997: from 7 to 11 percent in Central, from 9 to 13 percent in North, and from 8 to 14 percent in South.

6.1.1. Rural

As compared to the subregion's economies in general, economic activity in the producer sector is more concentrated in metro areas. About 30 percent of producer services employment in Central is in metro areas as compared to 20 percent for the Central economy as a whole. Likewise, about 80 percent of producer services employment in North and South is in metro areas as compared to 70 percent for the North and South economies as a whole. These shares are roughly constant over all of the years in the sample.

6.1.2. Branch Activity

The shares of establishments that are multi-units are about the same for the producer services sectors in the subregions as for their economies as a whole. However, employment in producer services sectors for the subregions is less concentrated in multi-unit firms than is the case for 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 Central at about the middle of the sample.

6.1.3. Establishment Size

As is the case for their economies as a whole, the average establishment sizes for establishments in the producer services sector are relatively constant across the subregions. Again, Central tends to have smallest average establishment sizes, but now the ranking of the average establishment size for North and South varies over the years. Using the preferred flows measure of size, the average establishment in Central is 9 percent smaller, North is about 5 percent larger, and South is about 5 percent smaller than the average establishment in the rest of the U.S.. However, when controlling for other characteristics, the average Central establishments is 12 percent smaller, North is 3

percent smaller, and South 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 North and South is striking in producer services.

6.1.4. Wages

In this section, wages for employees at producer services establishments in the subregions of Appalachia are compared to their rest of the U.S. counterparts (see A2.2 for a description of the specification). Table 13 shows the results of this exercise. Recall that when comparing the wages for the U.S. and Appalachian Region in producer services that the gap between the two was unusually low in 1982 (on a weighted-basis only), this problem appears in the subregions of Appalachia as well. Leaving aside 1982, the wage gap between the rest of the U.S. and Central and South is narrowing over the time period of the study. In contrast, the wage gap for North actually widens slightly over the time period. Nevertheless, by the end of the time period the gap for Central (24 percent) is still far larger than it is for South (12 percent) and North (16 percent).

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

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

The relative importance of establishment entry and exit in the producer services industries in the subregions of Appalachia vis-a-vis 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 North

establishment has a lower probability of being an entrant or an exiter than does an establishment in the rest of the U.S.. A South 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.. All of these results are similar to the results for the entire economy. The only difference is that now a Central establishment also has a lower probability of being an exiter than does an establishment in the rest of the U.S.. The results for when controlling for differences in characteristics are similar (and even stronger for Central). For Central and North there is clearly relatively less establishment dynamics in producer services than for the rest of the U.S.. As has been seen over a variety of dimensions, relative to the rest of the U.S., South has strong entry dynamics and less exit dynamics.

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.

Wages

The wages of entrants (exitors) in the three subregions are compared to entrants (exitors) in the rest of the U.S. in this section (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 Central 23 percent, for North 11 percent and for South 16 percent. All of these gaps are larger than for the economy as a whole (but especially so for Central and South, compare to 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 have wages that are 30 percent smaller than their U.S. employee counterparts, in the South the wage gaps are about 20 percent, and in the North the wage gaps are about 10 percent. This is one of the few areas in which North seems to be faring better than South. However, when comparing the wage gaps for continuers, North and South have the same wage gap (15 percent).

Table 14: Wages of Births and Deaths in Producer Services Comparison				
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.

Size

The sizes of entering (exiting) establishments in producer services in the subregions of Appalachia are compared to their rest of the U.S. counterparts in this section (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 North is 6 percent smaller than its U.S. counterpart and the average entering establishment in North is also 6 percent smaller than its U.S. counterpart. Moreover, the size gaps for entering establishments are about the same size for North and South. Central has slightly bigger size gaps than do the other subregions. Note that the small size gap for all establishments in North (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 South where the size gaps in producer services are larger over all categories and for Central where the size gaps are larger for entrants (compare to Table 11).

Table 15: Size of Births and Deaths in Producer Services Comparison				
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

The net employment growth rates for producer services by region in Appalachia are shown in the upper panel of Figure 18. The job creation and destruction rates are shown in the lower panel of the figure. 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, South has the highest net employment growth rates over all three time periods. The drop in net employment growth for the South for the second period which is evident in the total economy is also evident here.

Underlying this strong net employment growth in South are very high job creation rates over all three periods. The South'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 South are slightly higher than for establishments in general. The job creation rates for North and Central in producer services are also higher than they are for establishments in general. In contrast to the pattern for South, the job destruction rates are much lower for Central and North for the first period.

It is possible to summarize the differences in the job flows rates by year that are 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 as 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. Confirming the results from Figure 18, the net employment rate for the South is the highest relative to the other

subregions (it 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 that are below that for the rest of the U.S.). The job creation rate for the South 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 North. Finally, the reallocation rates for Central and North are lower than for the rest of the U.S., but the reallocation rate for South is indistinguishable from that for 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 as 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 impact the net employment growth rate of Central and North (raising both by about four percentage points). With the controls, the net employment growth rate of Central now exceeds that of the rest of the U.S. (by about two percentage points). This improvement has come about almost exclusively through higher job creation rates (but which are still much lower than those for the rest of the U.S.). The differences in death rates is 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 Comparison				
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 paper 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 paper 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 as compared to new establishments in the rest of the U.S.

The heterogeneity of the Appalachian Region is evident throughout the analysis in this paper. 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 Central employees have wages about 20 percent below the rest of the U.S. but North and South employees face a smaller wage gap of about 10 percent. Central's low job creation rates can partly be explained in terms of the industry composition of the region. This is less the case for North 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 North is not as severe as it is for Central. Finally, South 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 South 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 which are located in the following areas: foreign, Guam, Virgin Islands, Northern Marianas, and Puerto Rico. Finally, establishments which 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 1992-97 (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 1982-87 and about 11% in 1992-97 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:

$$(1)D_{et} = \mathbf{a} + \mathbf{b} * ARC_{et} + \mathbf{g} * MU_{et} + \mathbf{f}_j * \sum_1^{1514} Industry_{et} + \mathbf{h}_k * \sum_1^2 Year + \mathbf{e}_{et}$$

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:

$$(2)W_{et} = \mathbf{a} + \mathbf{b} * ARC_{et} + \mathbf{g} * MU_{et} + \mathbf{d}_i * \sum_1^7 Size + \mathbf{f}_j * \sum_1^{1514} Industry_{et} + \mathbf{e}_{et}$$

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-a-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_{et} refer to the event in question (for example when looking at births E is 1=birth, 0=otherwise), the regressions have the form:

$$(3) E_{et} = a + b * ARC_{et} + g * MU_{et} + d_i * \sum_1^7 Size_{et} + f_j * \sum_1^8 Industry_{et} + h_k * \sum_1^2 Year + e_{et}$$

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: $\text{Probability}(Y=1) = \frac{e^{x\beta}}{1+e^{x\beta}}$. 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:

$$(4) A_{et} = a + b * ARC_{et} + g * MU_{et} + d_i * \sum_1^7 Size + f_j * \sum_1^{1514} Industry_{et} + h_k * \sum_1^2 Year + e_{et}$$

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 $D_{et \in G}$ 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:

$$(5) D_{et \in G} = a + b * ARC_{et} + g * MU_{et} + f_j * \sum_1^{1514} Industry_{et} + h_k * \sum_1^2 Year + e_{et}$$

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:

$$(6) G_{et} = a + b * ARC_{et} + g * MU_{et} + d_i * \sum_1^7 Size + f_j * \sum_1^{1514} Industry_{et} + h_k * \sum_1^2 Year + e_{et}$$

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.