

Birth and Death of Manufacturing Plants and Restructuring in Appalachia's Industrial Economy, 1963 – 1992

Evidence from the Longitudinal Research Database

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Executive Summary

The objective of this paper is to paint a statistical portrait of Appalachia's manufacturing sector, focusing on the rate of entry and exit of new and old establishments, the pay and productivity characteristics of plants in Appalachia, the role of branch plants in the Region, and whether there is significant variation in these measures within Appalachia. The picture is mixed:

Manufacturing in Appalachia, relative to the rest of the country, looks much the same in 1992 as it did in 1967 – lower wage, lower productivity, and still highly reliant on branch plants.

Plants in Appalachia over the period of the study are concentrated in low wage, low productivity industries and, even when accounting for the region's unique industry mix, pay lower wages and have lower productivity than plants elsewhere in the US.

This is not due to a lack of new entrants: Manufacturing plant entry rates in the Region overall are only slightly lower than the US as a whole.

Further, job formation rates associated with entrants are only slightly lower than the US. Job destruction rates at plants exiting the region are also lower than the US.

New entrants into Appalachian manufacturing have tended to reinforce the Region's existing low wage, low productivity manufacturing base.

Establishments and employment associated with entrants are concentrated in low wage, low productivity industries in Appalachia. Even when accounting for the region's unique industry mix, manufacturing entrants in the Region pay lower wages and have lower productivity than entrants in the same industry elsewhere in the United States.

Branch plants continue to be large contributors of better than average employment opportunities in Appalachia.

Branch plants continue to pay higher wages and have higher productivity than single-unit plants in the region. In fact, there is evidence the differential has increased. While the share of employment at branch plants is decreasing in Appalachia and the US, branch plants still account for 75 percent of manufacturing employment in Appalachia.

While these trends hold for the Region in aggregate, 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.

Entry rates in the North consistently lag the nation and the rest of Appalachia. Entry rates in South and Central Appalachia exceed entry rates nationally. While all three regions have lower wages and lower productivity than the US, the difference between the South and the US decreased over the period. In contrast, in the North it increased and in the Central it was unchanged.

Introduction

The manufacturing sector has undergone tremendous change. Globalization and technological change are driving restructuring and downsizing in American manufacturing. The US economy has experienced tremendous restructuring over the past fifteen years at all levels; manufacturing plants have re-engineered their operations, companies have restructured, and as a result, regions and the country as a whole have experienced dramatic economic change. Factories, and the jobs associated with them, have relocated to other regions of the country or have left the US altogether. Increasing foreign trade and changes in technology have affected the competitive position of the industrial plants that remain, and thus the employment opportunities and future prospects of industrially dependent regions. These trends have generated interest and concern among the general public about the availability of “good jobs at good wages” and the prospects for long-term economic growth.

The concern is as great or greater in Appalachia. Characterized in the 1960’s as an economically deprived area, the manufacturing sector generally, and manufacturing branch plants specifically, have been a cornerstone of the Region’s economic development efforts. The Region has looked to the manufacturing sector as a source of relatively well-paid, stable employment opportunities. Historically, manufacturing firms have looked to rural areas for relatively low-wage workers and favorable business climates in which to operate. These factors have historically made Appalachia attractive to certain types of manufacturing industries.

Indeed, the Region has made progress. Isserman (1996) suggests that the gap between Appalachia and the rest of the country is shrinking. Glasmeier (1997) suggests that federal policy has contributed significantly to the transformation of the nation’s rural areas. Yet the success is not unqualified. Isserman suggests that while parts of the region are catching up, some still considerably lag the nation. Glasmeier, Kays, and Thompson (1995) suggest that a major cornerstone of rural economic development, manufacturing

and more specifically, manufacturing branch plants, are increasingly affected by the trends of globalization and technological change. It seems that the manufacturing operations that rural areas have historically attracted (relatively low wage, low productivity) are most exposed to these trends. The Region's historical reliance on the manufacturing sector and the restructuring that trade and technology are fostering, suggest that a taking stock exercise is warranted. This study examines how the manufacturing sector in Appalachia has evolved over the past thirty years. It focuses specifically on three main questions:

1) Is the Region attracting new manufacturing plants at the same rate as the rest of the country?

One key indicator of the economic opportunities in a region is the rate at which new job opportunities are created. New plants offer new employment opportunities for workers. New plant formation rates can also be seen as a measure of the economic vitality of a region. To see how Appalachia fared during this period of restructuring, this study examines whether new plant formation in Appalachia matches new plant formation in the rest of the country. We examine the entry of new manufacturing establishments and the exit of existing establishments across 5-year intervals relative to the US entry and exit rates.

Beyond providing new employment opportunities, new plants and firms can have a transforming effect on regions. If new plant formation is concentrated in particular sectors, this can significantly affect the industrial base in a region. We characterize the nature of entrants and examine their impact on the Region's manufacturing base.

2) Is the manufacturing base in the Region still low wage, low productivity?

Historically, the industrial base of Appalachia has been concentrated in low growth, low wage, low productivity industries. We examine the evolution of the

manufacturing base in Appalachia, focusing not only on industrial composition, but also the pay and productivity of the plants. While industrial mix is important, industry is just one characteristic of a plant or a job. Jobs at plants that are more productive and pay high wages are typically considered to be “better” jobs than less productive, lower paying jobs, all else being equal. While industries are characterized as high or low wage and high or low productivity, there is considerable variation even within detailed industry groups. Even in low wage industries, some plants pay high wages. The unique data used in this study allow us to compare pay and productivity characteristics of individual plants across regions. We describe the characteristics of new entrants and examine what role, if any, new entrants had on industrial restructuring. We present evidence on the industry, pay, and productivity of plants in the Region at various points in time, and also compare characteristics of entrants in Appalachia to entrants in the rest of the country.

Another important characteristic of a manufacturing plant is its ownership structure. Branch plants differ in many ways from single-unit plants. Branch plants tend to pay higher wages and to be more productive than single-unit plants. We examine the role of branch plants in Appalachia, how prevalent they are, and what type of job opportunities they provide.

3) Is the Region still heavily reliant on branch plants?

Branch plants have long dominated employment opportunities in rural America (Glasmeyer, Kays, and Thompson (1995)), and contributed steady, high wage, high benefit employment opportunities for rural workers. Branch plants have traditionally located in rural areas because of low labor costs and favorable business climates. Yet, with changes in trade and technology, businesses can now consider locations anywhere in the world. Rural America is no longer as favorable in terms of low wages and favorable business climate. This study examines whether branch plants continue to contribute significantly to the Appalachian manufacturing sector, both in terms of share of employment and the wage and productivity characteristics of the jobs.

About the Data used in the Study

To develop this statistical portrait, we use the Longitudinal Research Database (LRD), a unique, detailed, plant level database, which covers the entire US manufacturing sector from 1963 to 1992 in 5-year intervals. The LRD has linked plant level observations from the 7 Censuses of Manufactures across time.¹ The Census of Manufactures provides detailed data on plant characteristics, such as location, size, industry, wages, output, and branch plant status. Thus, the LRD allows us to examine birth and death rates in manufacturing and the plant characteristics of the births and deaths. We use the geographical identifiers on the LRD to classify plants as in the Region or outside and examine births and deaths and the wage and productivity characteristics of plants in the Region and the US.

Summary of Results

Manufacturing in Appalachia, relative to the rest of the country, looks much the same in 1992 as it did in 1967 – lower wage, lower productivity, and more reliant on branch plants.

While the Region may be catching up to the rest of the nation on a number of socioeconomic measures (Isserman (1996)), this does not seem to be true for the Region's manufacturing base. In 1967, the Region's manufacturing plants and employment were concentrated in low productivity, low wage industries. Even when comparing plants in the same industry in the Region to the rest of the country, plants in Appalachia were lower wage and lower productivity. This remains true in 1992.

¹ The LRD contains plant, or establishment, level data in contrast to firm, or enterprise, level data. An establishment is a physical location engaged in manufacturing activity. It is not a corporate entity.

This is not due to a lack of new entrants: Manufacturing plant entry rates in the Region overall are only slightly lower than the US as a whole.

Further, exit rates are also slightly lower than the US. The job formation rate associated with new plants is only slightly lower than the US, and again, job losses associated with plant closure is also lower than the US. Together, these suggest that plant and job formation in the Region is not that different than the rest of the country. While these trends hold over most of the period considered, they do not hold for all sub-regions within Appalachia.

New entrants into Appalachian manufacturing have tended to reinforce the Region's existing low wage, low productivity manufacturing base.

The characteristics of these new plants and jobs do not compare favorably to the rest of the country in terms of pay and productivity. Comparing the average manufacturing plant in the Region to the average manufacturing plant in the US, the Region's plants are larger, pay lower wages, and are less productive. Part of this is due to the composition of plants and jobs in Appalachia. Establishments and employment are concentrated in lower wage and lower productivity industries in the Region.

When we control for these industry composition differences, the differences decrease, but even controlling for industry differences, plants in the Region pay lower wages and are less productive than plants in the same industry elsewhere in the US. The same is true for entrants in the Region. Entrants in the Region are concentrated in lower wage and lower productivity industries (for instance, textiles and apparel). Further, new

manufacturing plants in Appalachia, even controlling for industry composition, pay lower wages and are less productive than new entrants elsewhere in the US.

Branch plants continue to be large contributors of better than average employment opportunities in Appalachia.

The Region continues to have a greater concentration of plants and employment at branch plants than the rest of the country. This holds, in general, across industries, particularly in industries that are important in the Region's economy. Entry continues to reinforce this, as entrants in the Region are more likely to be branch plants than elsewhere in the country. In terms of characteristics of jobs, branch plants continue to contribute "good" jobs to the Region. Branch plants have higher wages and higher productivity than non-branch plants in the Region, and there is some evidence the difference is increasing. The same holds true for new entrants that are branch plants – they have higher wages and higher productivity than other new entrants.

While these trends hold for the Region in aggregate, 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.

The North has had the lowest plant entry rates, consistently lower than the national entry rate, while the South and Central sub-regions have had higher entry rates than the rest of the nation. While all three sub-regions had consistently lower average wage and productivity than the rest of the country, the relative wage and productivity characteristics in the different sub-regions had different trends. The average wage in the North relative to the rest of the country decreased over the period. In contrast, the average wage in the South relative to the US increased.

Appalachian Manufacturing in 1967: Low Wage, Low Productivity

We begin with a portrait of Appalachian manufacturing in 1967. In 1964, the President’s Commission on Appalachia characterized Appalachia as a region apart. It offered fewer employment opportunities and lower wages than other regions of the country. This same characterization held for the manufacturing sector in Appalachia. On average, manufacturing plants in Appalachia had lower wages and lower productivity than other regions of the country. Average plant wages and productivity for manufacturing plants in Appalachia relative to the rest of the country are shown in Table 1.²

Table 1		
Comparison of Plants in Appalachia to Plants in the Rest of the Country		
1967		
(Percent Difference from Plants in Rest of Nation)		
	Wages	Productivity
Appalachian Plants (on Average)	-0.154**	-0.153**
Appalachian Plants (controlling for Industry and Urban/Rural Differences)	-0.064**	-0.068**

** denotes statistical significance at the 1 percent level

The average manufacturing plant in Appalachia paid 15.4 percent less and was 15.3 percent less productive than plants elsewhere in the country. Part of this is due to the fact that plants in Appalachia were concentrated in low wage, low productivity industries. In order to examine the differences in the region’s industry mix relative to the rest of the nation, we have computed industrial location quotients which show the concentration of establishments or employment in Appalachia relative to the rest of the country. If a particular industry accounts for a larger share of the Appalachian manufacturing than that

² Appendix II describes the specification used to estimate these differences. The results will be presented as the percent difference between the mean plant in the ARC and the mean US plant outside the ARC.

industry accounts for nationally, the location quotient will be greater than 1. If the industry accounts for less of Appalachian manufacturing than it does nationally, it will be less than 1. Industry location quotients are displayed in Figure 1 (see Appendix IV for a list of the Standard Industrial Classification (SIC) for all major industry groups in the manufacturing economy).

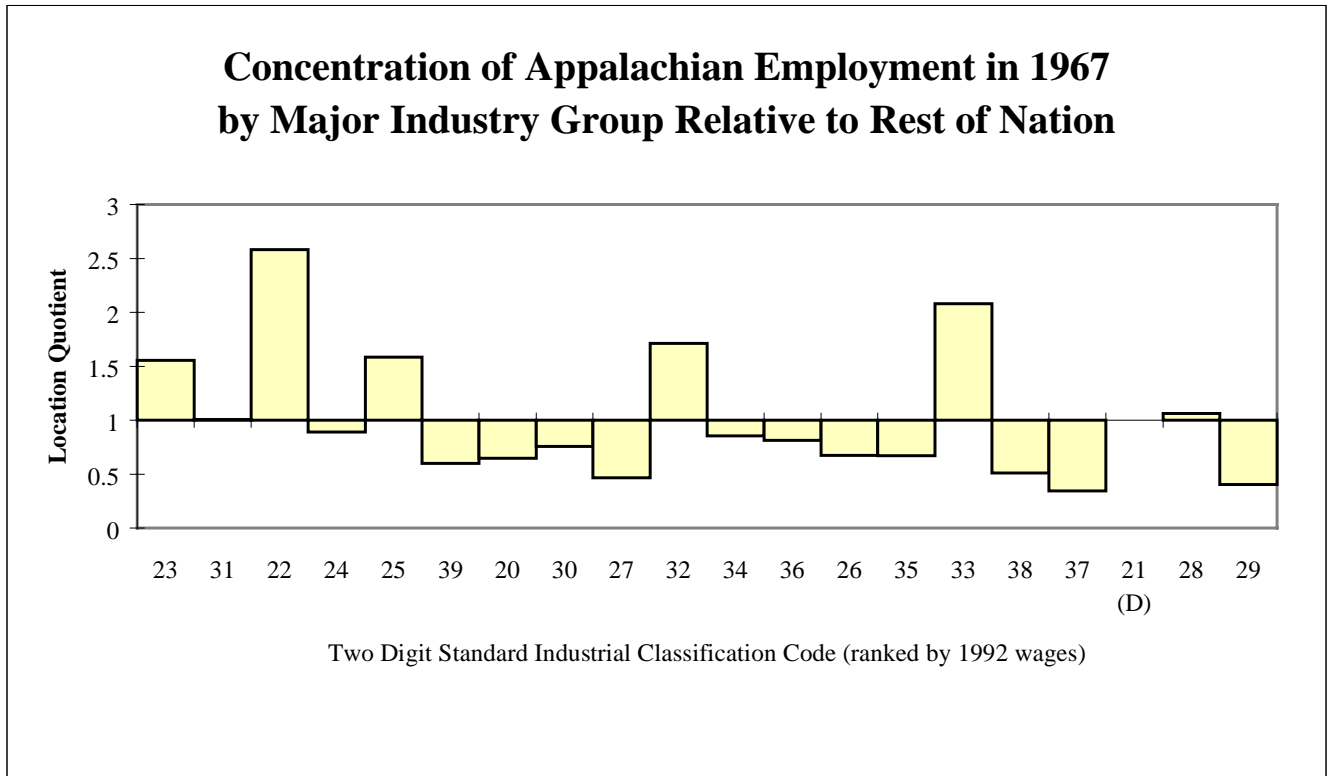


Figure 1

Figure 1 ranks the industries by their average wage in 1992, with industries with low average wages on the left and industries with high average wages on the right. In 1967, Appalachia had both establishments and employment concentrated in low wage industries. With the exception of the higher paying sectors of Primary Metals (SIC 33) and Chemicals (SIC 28), employment is concentrated in relatively low wage industries such as Textiles (SIC 22), Stone and Clay Products (SIC 32), Apparel (SIC 23), and

Furniture (SIC 25).³ In addition to paying low average wages, many of these same industries have low average labor productivity. Thus, much of Appalachian manufacturing is concentrated in low wage, low productivity industries.

The second set of results summarized in the lower panel of Table 1 take into account the differences in industry mix and urban and rural differences to compare plants in the same industry in the Region and outside the Region.⁴ Accordingly, controlling for the differences in industry composition and urban and rural locations, yields a smaller wage and productivity differences between plants in Appalachia and plants elsewhere, but a difference persists. These results show that in 1967, on average, plants in Appalachia paid 6.4 percent less than plants in the same industry and same urban or rural setting elsewhere in the country. In addition, plants in Appalachia were 6.8 percent less productive than plants elsewhere in the country, once one controls for industry types and urban/rural locations. In the next section we examine 1992 data to analyze the changes that have occurred in the Appalachian manufacturing economy.

The Region in 1992

In 1992, as in 1967, much of the manufacturing sector employment in the Region is concentrated in low wage, low productivity industries. The concentration of Appalachian employment by major industry groups is depicted in Figure 2, which uses the location quotients of employment in 1992, again ranked by industry average wages, to compare the Appalachia's industry mix with the rest of the nation. While remarkably similar to the overall industry mix in 1967, the industry composition has changed, with the relative share of employment by industry increasing in Textile Mill Products (SIC 22), Lumber and Wood Products (SIC 24), Furniture and Fixtures (SIC 25) and Rubber and

³ The Region also has a high concentration of employment in the Tobacco industry (SIC 21) which pays relatively high wages in 1992. The data for this industry is suppressed to prevent disclosure.

⁴ See Appendix II for a description of the specification. Controlling for industry and urban/rural removes the effects of differences in the industry and urban/rural composition of the different regions.

Concentration of Appalachian Employment in 1992 by Major Industry Group Relative to Rest of the Nation

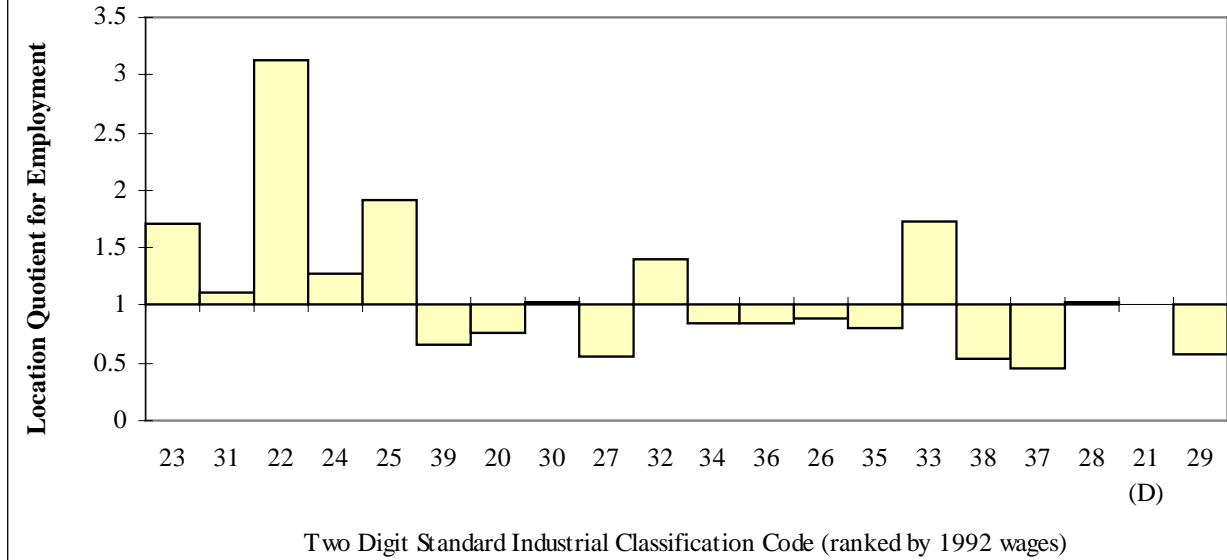


Figure 2

Miscellaneous Products (SIC 30), and decreasing substantially in Stone, Clay, Glass and Concrete Products (SIC 32) and Primary Metal Products (SIC 33).

Further, in Table 2 we see a comparison of the wages of plants in Appalachia to the rest of the country. Over time, the pattern shows a persistent wage gap, although the wage differentials narrowed in the 1970s, and then widened in the 1980s, with only a modest reduction registered in 1992 differentials. Over time, the average plant in Appalachia pays between 10 and 15 percent lower wages than plants elsewhere in the

country. If industry composition and differences in urban and rural location are controlled for, the differential decreases. Nonetheless, a substantial wage differential still persists over the time period, with plants in Appalachia paying between 4 and 8 percent lower wages compared to similar plants elsewhere in the country. As we shall see below, some of these persistent differences are attributable to the pattern of entry and exit of new and existing plants that has tended to reinforce the existing low wage industrial mix.

Table 2						
Comparison of Wages at Plants in Appalachia to US (Percent Difference Compared to Plants in Rest of Nation)						
Year	1967	1972	1977	1982	1987	1992
Appalachian Plants (on Average)	-0.154**	-0.110**	-0.103**	-0.127**	-0.142**	-0.135**
Appalachian Plants (controlling for Industry and Urban/Rural Differences)	-0.064**	-0.053**	-0.044**	-0.064**	-0.078**	-0.073**

** denotes statistical significance at the 1 percent level

Table 3 shows a similar story for productivity. Without controlling for industry composition, the average plant in Appalachia is about 15 percent less productive than the average manufacturing plant elsewhere in the country. If industry composition and urban and rural differences are taken into account, plants in the Region are still about 7 percent less productive than plants elsewhere.

In some sense, the Region is ending up in the same place that it started. This is not to say there hasn't been wage or productivity growth. Nationally, overall manufacturing sector productivity growth has been strong. The Region, as a whole, has been keeping up, but not gaining ground. Part of the reason that the Region has not gained ground is that while there has been considerable entry and exit in Appalachian manufacturing, it has tended to reinforce the Region's existing low wage, low productivity manufacturing base. In the next section, the paper examines how the Region compared to the rest of the country in terms of attracting and creating new manufacturing plants.

Table 3						
Comparison of Productivity at Plants in Appalachia to US (Percent Difference Compared to Plants in Rest of Nation)						
Year	1967	1972	1977	1982	1987	1992
Appalachian Plants (on Average)	-0.153**	-0.137**	-0.129**	-0.154**	-0.151**	-0.150**
Appalachian Plants (controlling for Industry and Urban/Rural Differences)	-0.068**	-0.057**	-0.05**	-0.073**	-0.080**	-0.069**

** denotes statistical significance at the 1 percent level

Entry and Exit Rates

One measure of the economic vitality of a region is the rate at which new establishments are being opened in the region. New plants provide new job opportunities for workers in the area and augment the existing tax base. We examine the rates of new manufacturing plant formation in the US over the past thirty years and compare new plant

formation in the Region to the US. The LRD allows us to calculate plant entry and exit rates at 5-year intervals for the period beginning 1963 and ending in 1992. The entry rate is simply a measure of the portion of the existing plants in a region that opened in the previous five years. Similarly, the exit rate is the portion of plants in operation in a region that went out of business over the next five years.⁵ We use the entry and exit rates in the US as a benchmark against which to compare entry and exit rates in Appalachia.

Plant entry rates for US manufacturing establishments for each of the 5-year periods between 1963 and 1992 are reported in Table 4. We see that the US manufacturing sector is very dynamic. Over the sample period, new entrants in each 5-year period account for between 32 percent and 42 percent of all manufacturing establishments. In addition to a significant share of plants entering in each period, a significant portion of plants exit each period. Between 35 percent and 39 percent of all establishments exit in each 5-year period. This is evidence of significant turnover in the manufacturing sector.⁶

Table 4 Establishment Entry Rates for the US Manufacturing Sector (Percent Change during Five-Year Period)						
Period	1963-67	1967-72	1972-77	1977-82	1982-87	1987-92
Plant Entry Rate	.318	.391	.423	.381	.369	.387

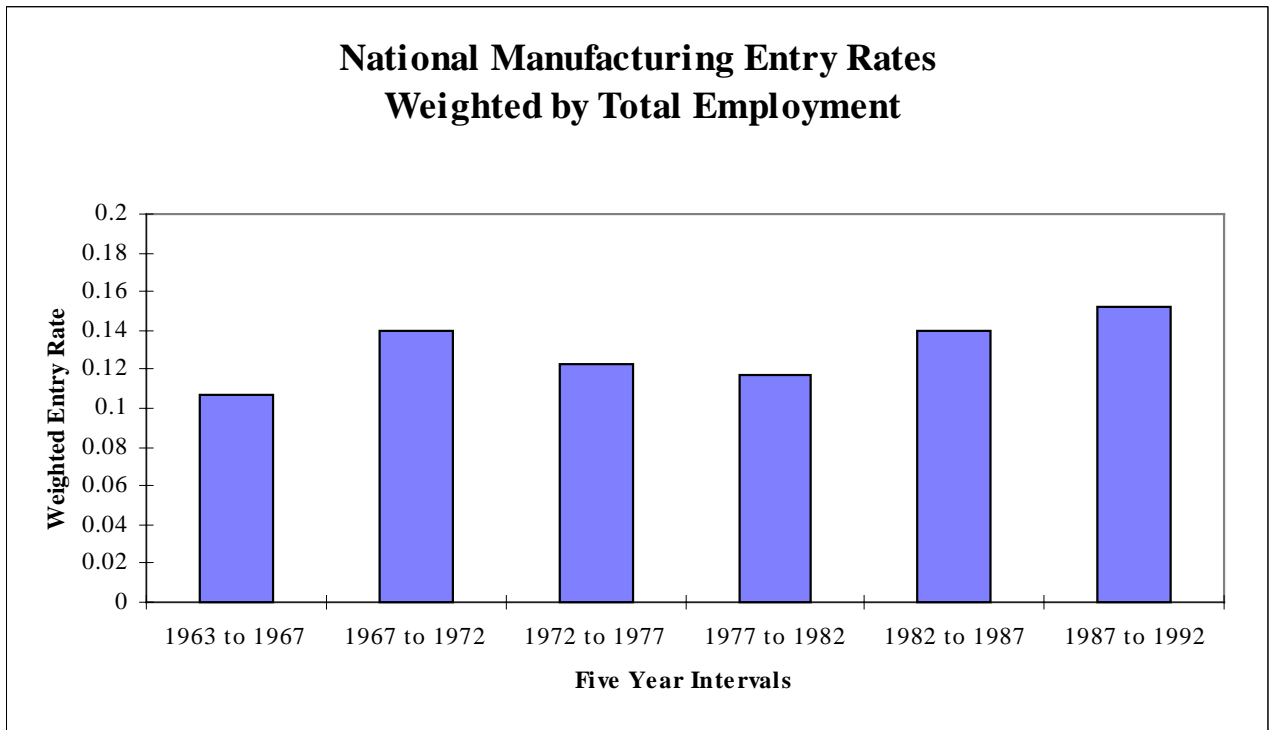
Figure 2 shows the employment associated with entrants for each 5-year period. These graphs show a very dynamic picture as well. Between 11 percent and 15 percent of all employment is accounted for by new entrants in each 5-year period. The employment graph also shows cyclical dynamics, with higher employment creation due to entrants

⁵ The appendices describe the data in more detail and describe how we calculate entry and exit rates for establishments and measure the employment associated with entrants and exits.

⁶ The reported entry and exit rates are similar to those reported in Dunne, Roberts, and Samuelson (1988).

during expansions.⁷ While the five-year periods do not correspond exactly to peaks and troughs in the business cycle, the entry rates do vary over the periods. Entry rates tend to be higher during booms and lower during contractions. For example, the 1977-1982 period, which contained two recessions as reported by the Bureau of Economic Analysis, the employment entry rate is lower than other periods. To gain a sense of how entry varies over the business cycle, we compare the entry rate over the 1977-82 period to the 1982-87 period. The employment weighted entry rate over the 1977-1982 period, which contained two recessions, is .117. The entry rate for the 1982-1987 period, which contained no recessions, is .140. The employment weighted entry rate is about 20 percent lower for the 77-82 period than the 82-87 period. This gives us some sense for evaluating the differences over the business cycle.

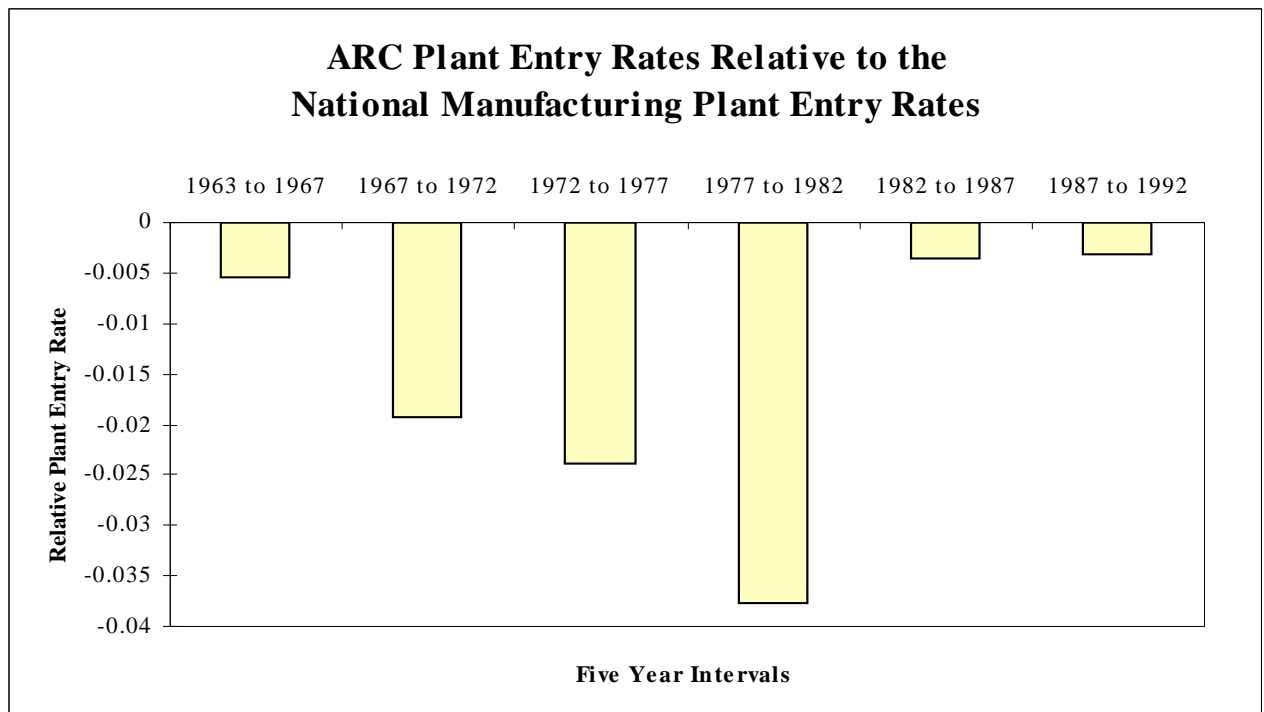
Figure 3



⁷ There are also higher employment losses to exits during recessions. Davis, Haltiwanger, and Shuh (1996) report similar patterns in gross job creation and destruction numbers. While the patterns are similar, we are restricting our analysis to the employment associated with entrants and exits. Davis, Haltiwanger, and Shuh look at gross job creation and destruction rates at both entrants and exits and employment associated with reallocations across continuing plants.

To compare entry and exit rates in Appalachia to the US, we classify each plant as being in the Region or not, based on the county in which the plant is located. Figure 4 shows the entry rates for the Region relative to the US for the period.⁸ As Figure 4 shows, for most years the entry rates for the Region are only slightly less than the US. For 63-67, 82-87, and 87-92, the entry rates are only about 0.005 lower than the US rate. For the periods 72-77 and 77-82, the entry rate in the Region is appreciably lower, approximately 0.023 lower in 72-77 and about 0.038 in 77-82. It is difficult to gauge the economic significance of these differences. One way to characterize the difference is as a percentage of the US total. For the 77-82 period (which contained two recessions), the

Figure 4



⁸ The LRD contains some records (less than 5%) which have spurious geographical code changes. To mitigate the effect these spurious geography code changes have on calculated entry and exit rates for particular regions, we report entry and exit rates relative to the US. We compared relative entry and exit rates excluding the plants that changed geography codes, and the results were qualitatively and quantitatively similar.

Region entry rate is about 10 percent lower than the national rate (which was relatively low over this period). This suggests the Region was even harder hit than the rest of the country in the 79 and 81-82 recessions. In contrast, for the 87-92 period, the Region's entry rate is only about 0.8 percent lower than the US rate.

The exit rates are also lower for all years, and lowest in the most recent period. For the 87-92 period, the Region exit rate was 0.033 lower than the US, a difference of about 9 percent. These results suggest that the rate of new plants opening in the Region, particularly recently, does not differ dramatically from the US entry rate. Further, the exit rate is lower as well, probably compensating for lower entry rates. Overall, the Region experienced slightly lower entry rates and slightly lower exit rates than the rest of the country. We will see later that the regional trends, however, mask considerable variation among the different sub-regions of Appalachia.

Entrants: Industry, Pay, and Productivity

We now turn to the question of the nature of the entrants into the Region. We have shown that entry and exit rates in the Region are only slightly lower than the rest of the US (with the exception of the 1977-82 period). We have also shown that in 1967 and 1992 plants in the Region paid lower wages and were less productive than other plants in the US. Now we consider the differences between entrants in the Region and entrants elsewhere in the country, to see how entrants affect the industry mix, wage, and productivity composition of plants and to see if there is evidence of restructuring within the Region.

We focus on three key aspects of new entrants: 1) is the industrial mix of new entrants in the Region similar to the rest of the country, 2) do new entrants in the Region compare favorably to new entrants elsewhere in terms of pay, and 3) do new entrants into the Region compare favorably in terms of productivity. To investigate the industrial

composition of new entrants in the Region, we analyze the cumulative number of entrants in each industry in the Region compared to the rest of the country.

Once again we measure concentration of industries relative to the rest of the nation (using a location quotient) to demonstrate the industries in which the Region had higher entry rates than the rest of the nation and industries which had lower entry rates than the rest of the nation. Where the location quotient is greater than one, the Region had a higher share of entry in this industry than the rest of the country. Where the location quotient is lower than one, the Region had a lower share of entry in this industry than the rest of the country.

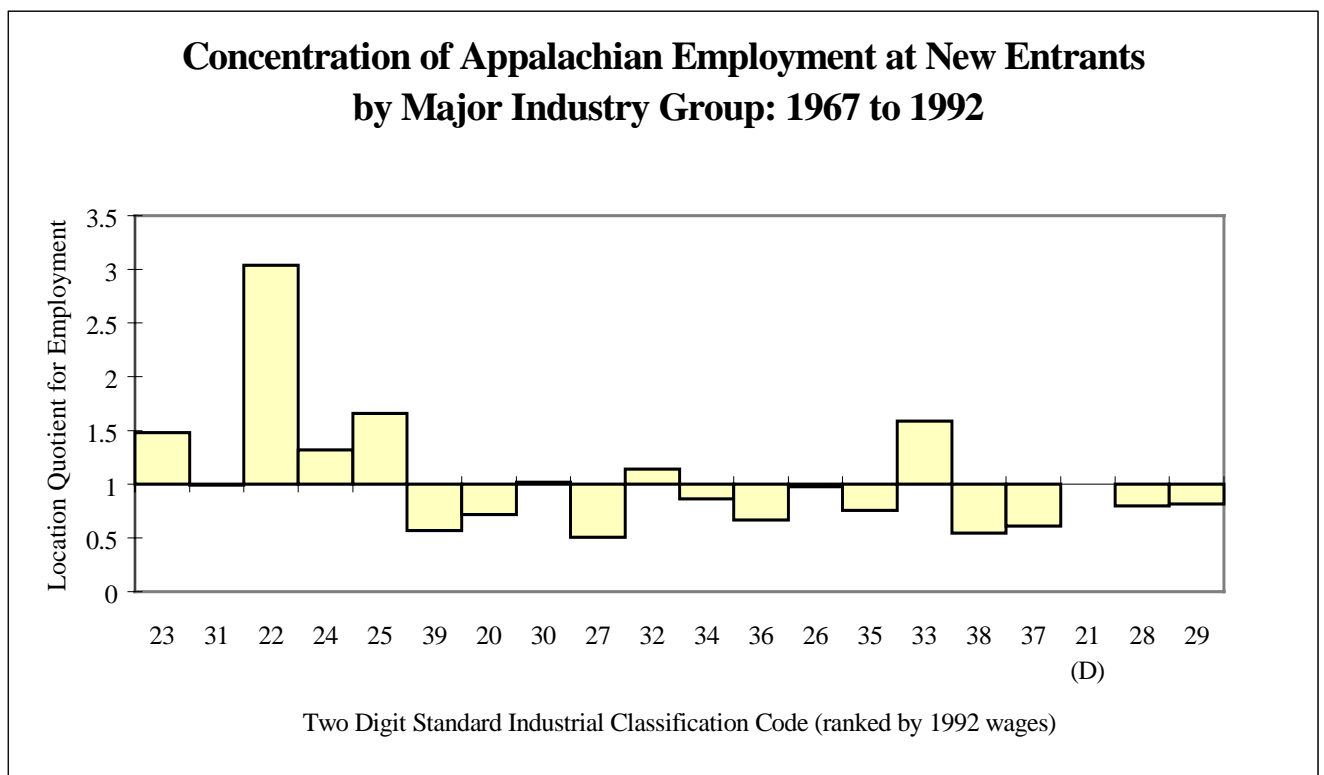


Figure 5

Figure 5 shows the relative concentration of employment by industry associated with all entrants in Appalachia over the 1967-1992 period. The industries are ranked according to average pay in 1992, with low wage industries grouped on the left hand side

of the graph and high wage industries grouped on the right hand side of the graph. The cumulative measure resembles the location quotient for employment in 1967 (see Figure 1). Figure 5 indicates that the employment at new entrants over the 67-92 period were concentrated largely in the same industries as the distribution of employment as in 1967, thereby reinforcing the patterns found in the 1967 manufacturing base.

Further, with the exception of the high wage Primary Metals sector (SIC 33), employment at new entrants was concentrated in relatively low wage manufacturing industries. The data indicate that the Region was creating more than its share of jobs in Textiles (SIC 22), Apparel (SIC 23), Wood Products (SIC 24), and Furniture (SIC 25). All of these industries pay below the average manufacturing wage.

The distribution of exits is also similar to the overall distribution of employment. It is mostly concentrated in Textiles and Apparel. One exception is Primary Metals production (SIC 33), which had higher levels of employment at exits and lower levels of employment at entrants, evidence that this industry was decreasing in importance in the Region. With the exception of Primary Metals, entrants and exits mirror the existing manufacturing sector. Overall, this evidence indicates that on balance, most of the region-wide industrial restructuring seems to be a result of plant exits, rather than plant entries. While entrants and exits have not significantly changed the industrial mix in the Region, we are also concerned with whether new entry has affected the pay and productivity characteristics of the Regions—a topic that we now turn to examine.

Characteristics of Entrants

A key issue for assessing the prospects of a region's economic development is whether the pay and productivity of plants entering in the Region show evidence that these new plants are contributing to better employment opportunities in the Region. We attempt to address this question by comparing the pay and productivity characteristics of new entrants in the Region to new entrants elsewhere in the country. In this section, we

use a sub-sample of all plants and consider only new entrants. New entrants are, on average, smaller, pay lower wages, and are less productive than continuing plants in the same industry. Because of these differences, we compare the pool of new entrants in the Region to new entrants in other parts of the country (and exclude continuing plants from this portion of the analysis).

Table 5						
Comparison of Wages at New Entrants in Appalachia to US						
(Percent difference from National Average)						
Entry Period	1963-67	1967-72	1972-77	1977-82	1982-87	1987-92
Appalachian Plants (on Average)	-0.157**	-0.102**	-0.079**	-0.113**	-0.133**	-0.11**
Appalachian Plants (controlling for Industry and Urban/Rural Differences)	-0.058**	-0.046**	-0.035**	-0.051**	-0.082**	-0.058**

** denotes statistical significance at the 1 percent level

Tables 5 and 6 (upper panels) report how new entrants in the Region compare to new entrants elsewhere in the country (without controlling for industry or location).⁹ New

⁹ These regressions are run only on the sub-sample of plants that are new entrants in each period. See Appendix II for more discussion of the specification.

entrants in the Region tend to pay less than non-Region new entrants. The difference in pay ranges roughly between 8 percent and 16 percent less than plants elsewhere in the country. Further, productivity in new plants in the Region also lags the rest of the nation. With the exception of 1977, new entrants in the Region are approximately 15 percent less productive than non-Region entrants. Though not reported here, new entrants in the Region tend to be larger than new entrants elsewhere in the country. Entrants in the Region tend to be about 10 to 15 percent larger than new entrants elsewhere (probably reflecting that more of the entrants in Appalachia are branch plants – more on this later).

Table 6						
Comparison of Productivity at New Entrants in Appalachia to US						
(Percent difference from National Average)						
Entry Period	1963-67	1967-72	1972-77	1977-82	1982-87	1987-92
Appalachian Plants (on Average)	-0.155**	-0.134**	-0.100**	-0.146**	-0.145**	-0.144**
Appalachian Plants (controlling for Industry and Urban/Rural Differences)	-0.062**	-0.056**	-0.035**	-0.064**	-0.082**	-0.059**

** denotes statistical significance at the 1 percent level

The results in the previous section demonstrated that entrants are concentrated in the same industries as existing plants. We have also seen that this industrial composition affects the average wage and productivity characteristics in the Region. We want to control for these industry composition differences, and compare the wage and

productivity characteristics of new plants in the Region to new plants in the same industry in the rest of the country. The lower panels of Tables 3 and 4 report the differences between plants in the Region and plants elsewhere after controlling for industry and urban/rural mix. Again, like the results for all plants, we see that industry composition and urban/rural are important. When we control for these differences in composition, the differences between the Region and the rest of the country diminish, but are still statistically significant. Entrants in the Region pay lower wages and have lower productivity than plants in the same industry in other parts of the country. The differences in average pay are cut in half, but still range between 3 percent and 8 percent lower over time. The same holds true for productivity. Once industry and urban/rural mix are controlled for the differences are reduced, but over time plants in the Region still are between 3 percent and 8 percent less productive than plants in other parts of the country.

These results, in combination with the results of the previous section, suggest that new entrants are not contributing significantly to a restructuring of the Region's manufacturing sector, either through changing the industry composition or by providing relatively higher wage or productivity jobs than elsewhere in the country. To the extent that there is industrial restructuring occurring in Appalachian manufacturing, it is not affecting the average wage and productivity differentials.

Branch Plant Economy

Branch plants, plants owned by enterprises that have multiple plants (as opposed to single-plant enterprises), have traditionally played a large role in rural economies and rural economic development strategies (Glasmeier, Kays, and Thompson (1995)). They have provided good stable jobs with relatively high wages and full benefits. Large, multi-plant corporations had looked to rural areas for low wage workers and favorable business climates. Now, with increased import competition from low wage countries, more

opportunities to invest in low wage countries, and increasing technological change, these multi-plant companies are under increased pressure to lower costs and have a wider range of options than choosing to locate in Appalachia. The wage rates in Appalachia, while low relative to the rest of the country, do not look low relative to wages elsewhere in the world. While branch plants have played an historical role in the Region, there is a sense that these plants are more susceptible to the changes in foreign trade and foreign direct investment and technological change.

In this section we examine the role that branch plants play in the Appalachian manufacturing sector and how it has evolved over time. We start by examining the wage and productivity characteristics of branch plants in the Region relative to single-unit plants.

<p style="text-align: center;">Table 7 Wage and Productivity Premia at Branch Plants Compared to Single Unit Plants in Appalachia (Including Industry and Urban/Rural Controls)</p>						
Year	1967	1972	1977	1982	1987	1992
Wages	.076**	.095**	.068**	.150**	.120**	.094**
Productivity	.182**	.204**	.202**	.288**	.277**	.286**

** denotes statistical significance at the 1 percent level

Table 7 shows the wage and productivity premia at branch plants compared to single-unit establishments.¹⁰ On average, branch plants in Appalachia pay higher wages and are more productive than single-unit plants. This relationship holds nationally as well. Branch plants tend to be bigger and belong to larger corporations. These

¹⁰ Due to processing changes made at the Census Bureau in 1982, in tables 6, 12, and 13, we exclude administrative records. Administrative records are very small plants, typically less than 20 employees, that are not mailed a survey form. Instead, their data is culled from administrative data from other government agencies. The change in processing significantly affects the relative wage and productivity differentials. Rather than introduce a bias due to processing changes, we exclude the administrative records.

characteristics are correlated with higher wages and higher productivity. Thus, it is not surprising that branch plants in Appalachia have higher wages and higher productivity than other plants in the region. What is interesting is there is evidence that the productivity advantage of branch plants is increasing. The productivity difference between branch plants and single-unit plants increased by 57 percent between 1967 and 1992. The trend in wages is somewhat different. There is a large increase in the wage premium at branch plants in 1982, but it then declines over the 1982 to 1992 period. Moreover, by controlling for industry and location type, we are able to surmise that branch plants are concentrated in more productive, higher pay industries, and tend to be located in urbanized areas of the region. Both of these trends, increases in the wage and productivity premia are going on nationally as well.

These results confirm those in Glasmeier, Kays, and Thompson (1995) that suggest that branch plants offer, on average, higher wage and higher productivity employment opportunities than single-unit plants. Glasmeier, Kays, and Thompson also suggest that branch plants have been an important piece of the rural economy.

We now turn to the prevalence of branch plants in Appalachia. Table 8 shows the percentage of establishments in the United States that are multi-units (branch plants) and the percentage of plants in Appalachia that are branch plants. The lower panel of the table shows the percentage of manufacturing sector employment that is in branch plants for the United States and the Region.

While branch plants account for a small share of manufacturing establishments nationally, ranging between 10 and 20 percent of establishments, they account for the bulk of employment in manufacturing. Branch plants account for around 70 percent of employment in manufacturing for the United States.

Table 8
Share of Manufacturing Plants and Employment at Branch Plants
in Appalachia and the US
(percent of total plants and employment)

Year	1967	1972	1977	1982	1987	1992
US - Plants	.169	.206	.205	.207	.198	.189
ARC - Plants	.221	.260	.261	.275	.253	.242
US - Employment	.720	.746	.750	.731	.712	.697
ARC - Employment	.776	.800	.809	.782	.759	.754

Branch plants account for a larger share of plants in Appalachia than the rest of the country. This is true in almost all industries (the sole exception across years is the Food Industry (SIC 20)).¹¹ Further, in industries where employment is concentrated in the Region, like Textiles (SIC 22) and Apparel (SIC 23), the differences are large. In Textiles, between 15 percent and 20 percent more plants are multi-units in the Region than elsewhere in the country. The same holds for Apparel. A higher percentage of the manufacturing plants in the Region are branch plants than elsewhere in the country.

Branch plants also account for a larger share of employment in Appalachia than the rest of the country. While the share of employment at branch plants nationally varies between 70 percent and 75 percent, the share of employment in Appalachia at branch plant ranges between 75 percent and 80 percent – typically about 5 percent higher in Appalachia than in the US. In both the US and Appalachia, we can see that the share of employment at branch plants peaked in 1977 and have decreased since then.

¹¹ In 1967 in both Petroleum (SIC 29) and Primary Metals (SIC 33) the percentage of multi-units in the ARC was less than the US. By 1977 this had changed.

A key concern for state and regional economic development specialists is the share of new entrants plants and employment at branch plants in a given state or region and how this relationship has changed over time. To answer these questions, Table 9 presents the data on the share of new entrant plants and employment at branch plants for the United States and Appalachia. We see that new entrants in Appalachia are more likely to be branch plants than new entrants elsewhere in the country. In addition, more employment at entrants in Appalachia is concentrated at branch plants than elsewhere in the country. This again seems to be a story of new entrants reinforcing the existing industrial base.

While branch plants continue to account for a larger share of both plants and employment in Appalachia relative to the rest of the country, the share is declining steadily, leading to a smaller difference with the rest of the nation. Nevertheless, branch plants continue to contribute significantly better employment opportunities largely because branch plants pay higher wages and have higher productivity than single-unit establishments. A cautionary note, however, is raised by these trends, as the steady erosion of the employment share of branch plants within the region underscores how vulnerable the region may be to the effects of the internationalization of trade and the acceleration of technological innovation. In this context, Appalachia's reliance on these types of plants for high wage, high productivity jobs poses new policy challenges, particularly in formulating appropriate strategies that permit the region to retain and attract these types of plants and jobs.

Table 9
Share of New Plants and New Employment at Branch Plants
in Appalachia and the US

Year	1967	1972	1977	1982	1987	1992
US - Plants	.149	.166	.131	.111	.123	.110
ARC - Plants	.181	.195	.154	.151	.140	.136
US - Employment	.570	.570	.516	.455	.518	.490
ARC - Employment	.659	.636	.569	.514	.516	.572

Sub-Regions within Appalachia

The preceding sections paint a picture of manufacturing in the Region as only slightly less dynamic than the rest of the country, but offering lower wage and lower productivity employment. The Region is large, and it would not be surprising if there is variation in experience within the Region. In fact, the data for the Region as a whole hide considerable variation within Appalachia. The different regions within Appalachia have experienced very divergent outcomes over the past thirty years. In this section, we break the Region into three sub-regions, North, Central, and South, and examine entry rates of manufacturing plants, the industrial composition in each region, and the pay and productivity characteristics of manufacturing plants in the Region.¹²

¹² In Appendix III we show how the entry and exit rates differ across the ARC portion of states within the ARC. In general, these rates are consistent with the results for the three sub-regions.

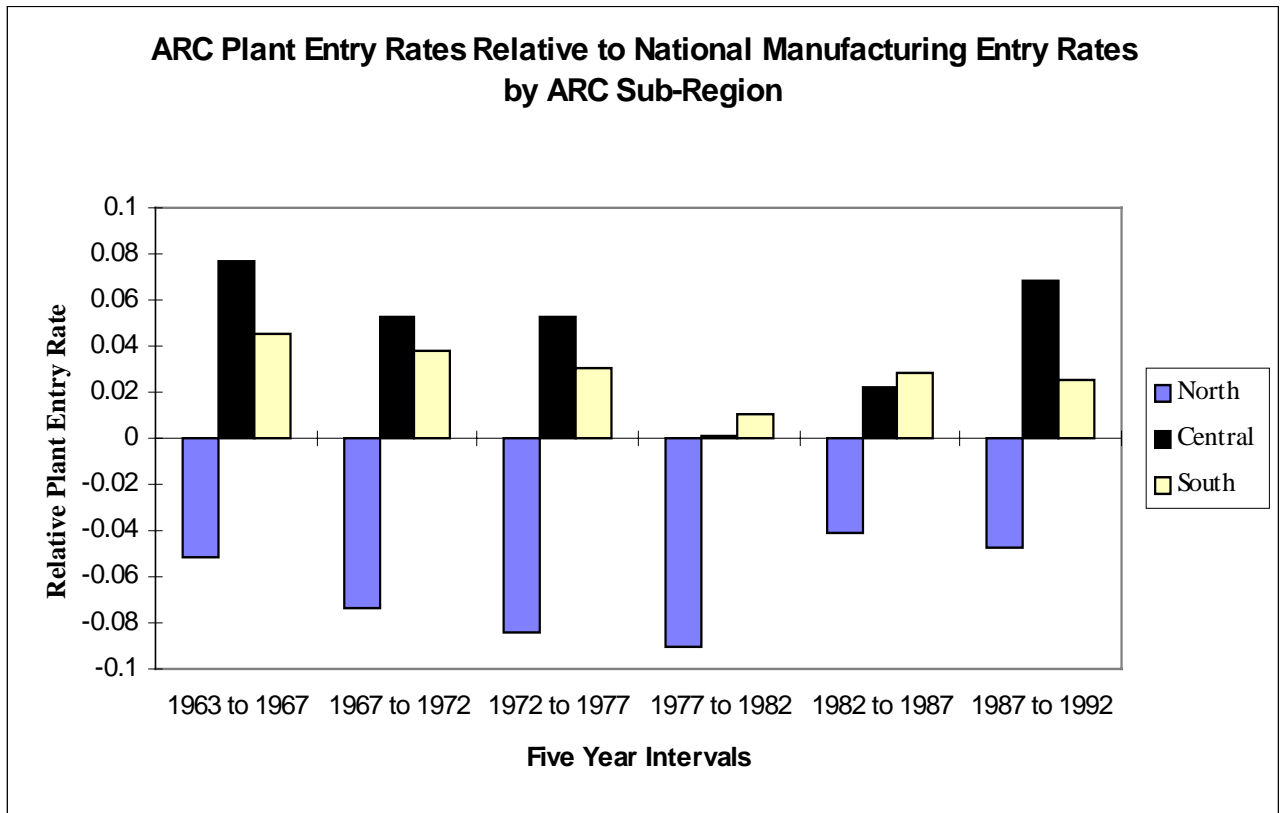


Figure 6

Entry and Exit Rates by Sub-Region

It is striking how disparate the experiences of the different regions have been over the past 30 years. Figure 6 shows how plant entry rates within the sub-regions of the Region compare to the US. The North region has had consistently lower entry rates than the other regions in Appalachia and than the US as a whole. For the 1987-92 period, the entry rate in the North was about 12 percent lower than the US as a whole. During the 70's and early 80's, the entry rate was even lower relative to the US and the rest of the Region. While it is difficult to interpret the magnitude of these differences, the gap in

North's relative entry rate is similar in magnitude to the effect of a recession on the national entry rate.

The experience in the Central and South is dramatically different. Entry rates in the Central and South exceed entry rates in the nation. With the exception of the 1977-82 recession period, the Central region has experienced relatively high entry rates compared to other parts of the Region and to the US. The South has also experienced high entry rates relative to the US, but the entry rates have been more consistent than the Central. In terms of exit rates, again, the sub-regions experienced different outcomes. The North has had consistently lower exit rates than the rest of the Region and the US. One notable exception is the North region for the 1982-87 period. For this period, the North's exit-related job loss rate was very similar to the US as a whole. The Central region has had slightly higher exit rates than the Region and the US. The South had slightly higher exit rates in the early part of the period, but recently has had a lower exit rates than the US. The higher entry rates, and only slightly higher or lower exit rates, in the Central and South have contributed to employment growth in these regions.¹³

Industry, Pay, and Productivity by Sub-Region

We also see there is variation in the industrial mix of entrants to the three regions. Figure 7 shows that entrants in the North are concentrated in Primary Metals (SIC 33), Stone and Clay Products (SIC 32), Electrical Machinery (SIC 36), Wood Products (SIC 24), Leather Products (SIC 31), and Apparel (SIC 23). With the exception of Primary Metals and Electrical Machinery, the entrants are concentrated in relatively low wage industries. Entrants in the Central are concentrated in low-wage industries of Apparel, Leather Products, and Wood Products. With the exception of the high wage industries in Primary Metals, entrants in the South are concentrated in low wage sectors of Textiles (SIC 22), Furniture (SIC 25), Primary Metals, and Wood Products. Thus, the pattern of

¹³ Again, it is important to emphasize that this analysis is only part of the picture. We are excluding employment reallocations across continuing plants from the analysis. These reallocations across continuing plants are also an important component of employment growth.

entry rates within the sub-regions have tended to reinforce the existing industrial base in relatively low wage industries.

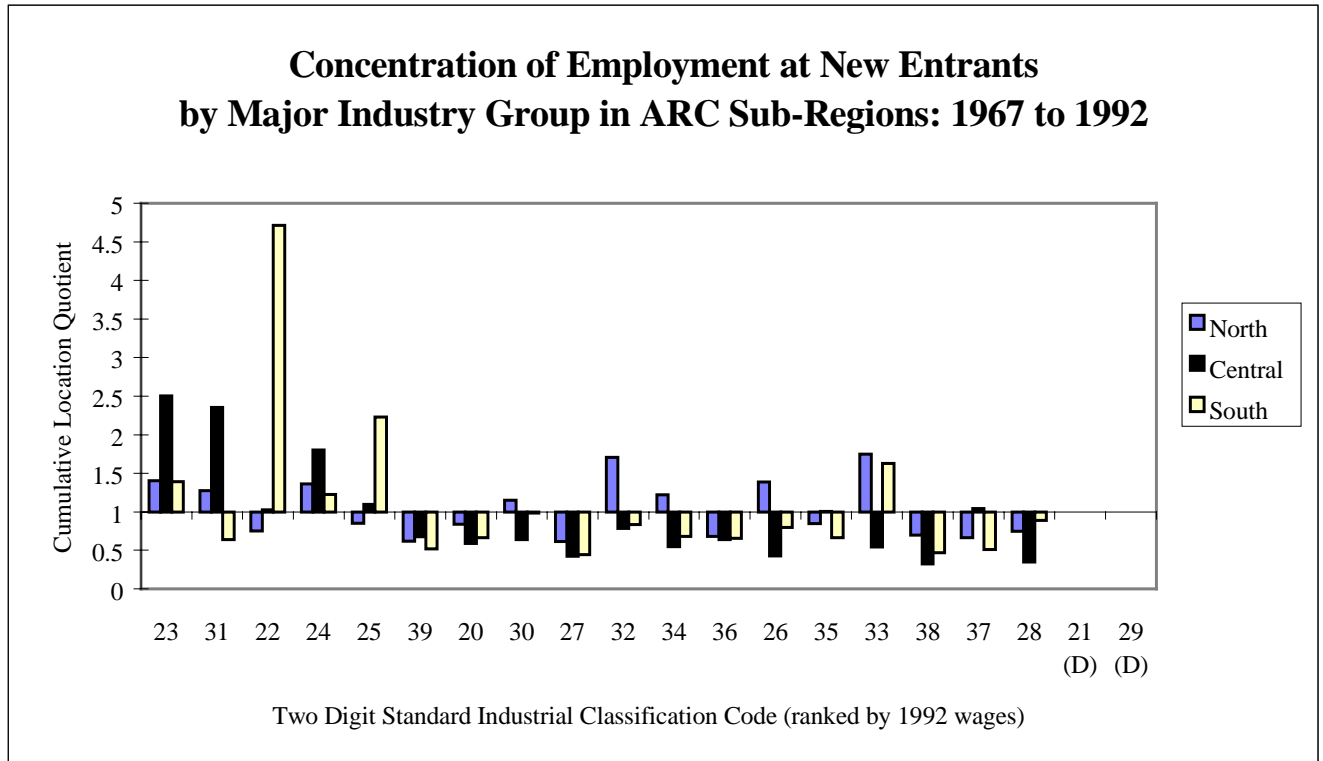


Figure 7

Next, we examine whether there is similar variation in the pay and productivity differences between plants within the Region. Because we know that some of this variation is accounted for by the differences in the industry composition across regions and differences in the urban/rural mix, we control for these differences in the analysis.

We see in Table 10 that, again, the sub-regions have had different experiences over the 1967 to 1992 period. While all three regions have consistently lower wages than the rest of the country, trends within each sub-region vary. The difference in average wages in the North seems to increase over the period. In 1967, the average plant in the North has about 4.4 percent lower wages than the average plant elsewhere in the

country(controlling for industry and location). In 1992, the average plant in the North has over 9 percent lower wages than the rest of the country. Average wages in the Central region showed larger decreases relative to the rest of the country. The South, in contrast, appears to be closing the gap with the differences in average wages between the South and the rest of the country decreasing over the period from almost 9 percent in 1967 to 5.2 percent in 1992 .

Table 10 Wages in Appalachia Compared to the US by Sub-Region (Controlling for Industry Composition and Urban/Rural Differences) Percent Difference compared to US						
Year	1967	1972	1977	1982	1987	1992
North	-0.044**	-0.045**	-0.024**	-0.021**	-0.058**	-0.092**
Central	-0.089**	-0.070**	-0.073**	-0.125**	-0.122**	-0.101**
South	-0.088**	-0.061**	-0.064**	-0.100**	-0.092**	-0.052**

** denotes statistical significance at the 1 percent level

Average productivity in the three sub-regions, as illustrated in Table 11, show trends similar to average wages. Average plant level productivity is consistently lower in all three sub-regions relative compared to similar industries and locations in the rest of the country, but the three regions had varied experiences. The differences between the average plant in the North and Central and the rest of the country increased, while the average productivity difference between plants in the South and the rest of the country decreased.

Table 11 Productivity in Appalachia Compared to the US by Sub-Region (Controlling for Industry Composition and Urban/Rural Differences) Percent Difference compared to US						
Year	1967	1972	1977	1982	1987	1992
North	-0.059**	-0.052**	-0.041**	-0.060**	-0.068**	-0.075**
Central	-0.071**	-0.048**	-0.063**	-0.116**	-0.126**	-0.094**
South	-0.082**	-0.065**	-0.058**	-0.082**	-0.085**	-0.061**

** denotes statistical significance at the 1 percent level

The evidence on entrants is similar. The entrants in all three sub-regions tend to be larger than the rest of the United States. Entrants tend to pay lower wages than the rest of the country. Again, similar to the above results, the entrants in the South had the smallest wage difference for the 1987-92 period, suggesting that plants in the South are narrowing the difference with the rest of the country. Entrants and exits in all three sub-regions also have lower labor productivity than entrants and exits in the rest of the country.

Branch Plants by Sub-Region

Appalachia has a higher proportion of plants that are branch plants and a higher share of employment at branch plants than the rest of the country. Table 12 shows the same holds for all three sub-regions of Appalachia. While all three have higher shares of employment at branch plants, the South has the highest share of employment at branch plants and the North the lowest. Further, all three sub-regions reflect the national trend of decreasing employment at branch plants, but the magnitude of the change has differed across the sub-regions. The change between 1977 (the peak in all regions) and 1992 was a

decrease of about 8 percent in the North, 5 percent in the Central, and 4 percent in the South.

Table 12						
Share of Employment at Branch Plants in Appalachia						
by Sub-Region						
Year	1967	1972	1977	1982	1987	1992
US	.72	.75	.75	.73	.71	.69
ARC - North	.78	.79	.80	.77	.73	.72
ARC - Central	.75	.80	.80	.77	.74	.75
ARC - South	.78	.81	.82	.79	.78	.78

Table 13 exhibits the relative wage differences between branch plants and single unit plants by sub-region. Again, the variation is striking. In the Central region there is little difference between the average wage of branch plants and single-unit plants. This contrasts with the difference in the North, where branch plants have roughly 10 percent higher wages than single-unit plants. In the South, branch plants in 1967 paid roughly 3 percent higher wages than single-unit plants but by 1992, they paid almost 10 percent higher wages than single-unit plants, a three-fold increase.

Table 13 Wage Premia at Branch Plants in Appalachia by Sub-Region (Controlling for Industry Composition and Urban/Rural Differences) Percent Difference compared to US						
Year	1967	1972	1977	1982	1987	1992
North	.115**	.123**	.110**	.212**	.147**	.097**
Central	.022	.046*	.008	.082*	.054*	.041*
South	.031**	.067**	.033**	.097**	.104**	.098**

** denotes statistical significance at the 1 percent level, * at the 5 percent level

Table 14 shows the relative productivity differences between branch plants and single-unit plants. In the Central region, branch plants have a productivity differential 28 percent higher productivity than single-unit plants. In the North, the productivity differential between branch plants and single-units is about 29 percent. In the South, the productivity differential between branch plants and single-unit plants nearly quadrupled, from roughly 18 percent to 29 percent. Overall, these results suggest that branch plants in Appalachia are concentrated in relatively higher productivity and higher wage industries, and in more urbanized areas. One noteworthy observation is that the composition of branch plants in the South has shifted from a concentration in low productivity industries in 1967 to having a higher concentration in high productivity industries in 1992, based on our analysis of industry mix.

<p align="center">Table 14 Productivity Premia at Branch Plants in Appalachia by Sub-Region (Controlling for Industry Composition and Urban/Rural Differences) Percent Difference compared to US</p>						
Year	1967	1972	1977	1982	1987	1992
North	.186**	.231**	.214**	.307**	.277**	.288**
Central	.173**	.145**	.150**	.268**	.229**	.281**
South	.177**	.179**	.197**	.272**	.283**	.286**

** denotes statistical significance at the 1 percent level, * at the 5 percent level

The fact that branch plants continue to account for nearly 80 percent of employment in the South, combined with the increasing productivity and especially pay differentials between branch plants and single-units, suggests that branch plants are a significant factor in the South's improving conditions. In the North and Central, branch plants also constitute a significant fraction of employment, but do not show increasing pay differentials.

Conclusion

We have covered a lot of ground. Before discussing the conclusions, we should mention a few caveats that accompany this analysis. First, this analysis focuses only on the manufacturing sector, so entry, exit, pay, and productivity developments in the service sector and other sectors are not considered here. Second, the analysis only considers entry and exit. It does not examine the reallocation of employment across continuing plants. To

the extent that these reallocations are important, this analysis misses this portion of job creation and destruction. Third, the results presented here do not explicitly consider plant-level changes over time, such as changes in a plant's equipment through replacing older vintage equipment, or increases in the scale of production, or increases in capital intensity. The results document average changes across industrial sectors and various regions. Thus, these results reflect average changes that could be driven by changes in the region's or sub-region's industrial composition or by plant-level changes. Last, the analysis does not examine the causes of these trends, it merely documents the trends. Changes in demographic characteristics, educational attainment, infrastructure, technological innovation, business climate, international trade, and other factors could contribute to the observed trends.

What conclusions can we draw about the manufacturing sector in Appalachia? First, manufacturing in Appalachia, relative to the rest of the country, looks much the same in 1992 as it did in 1967 – lower wage, lower productivity, and more reliant on branch plants, even after accounting for regional differences in industry mix and urban and rural location. Second, this is not due to a lack of new entrants. Manufacturing plant entry rates in the Region overall are only slightly lower than the United States as a whole. Third, job formation rates associated with entrants are only slightly lower than the rest of the United States. Job destruction rates at exits are also lower than the United States.

While this is true for the Region taken together, there is considerable variation within the Region. The North region has lower entry rates and lower exit rates. The Central region has higher entry rates and higher, but decreasing, exit rates. The South has higher entry rates, and recently, has had lower exit rates.

The sub-regions also differ in their entry-related and exit related job creation and loss rates. These differences in the regions contribute to the differences in aggregate employment outcomes between 1967 and 1992:¹⁴

¹⁴ Again, it is important to emphasize this ignores employment growth and decline at continuing plants.

- the Central region experienced more than a 66 percent net employment increase;
- the South region experienced a 19 percent increase;
- the North experienced a 37 percent decrease in manufacturing employment.

The evidence on the “quality” of the jobs associated with these plants is less heartening. New entrants into Appalachian manufacturing have tended to reinforce the Region’s existing low wage, low productivity manufacturing base. Establishments and employment associated with entrants are concentrated in low wage, low productivity industries in Appalachia. Even controlling for industry composition, manufacturing entrants in the Region pay lower wages and have lower productivity than entrants in other regions in the United States. Entrants in Appalachia are also more likely to be branch plants than elsewhere in the United States.

Again, there are differences across the sub-regions within Appalachia. The wage differential between the South and the US decreased over the period. In contrast, in the North it increased and in the Central it was unchanged.

Another significant finding is that branch plants are still an important part of Appalachia’s economy. In particular, branch plants continue to be large contributors of better than average employment opportunities within Appalachia. Branch plants pay higher wages and have higher productivity than single-unit plants. In fact, there is evidence the differential has increased. While branch plants only accounts for about one-quarter of the total number of plants in the region, and the share of employment at branch plants is decreasing in Appalachia and the United States, branch plants still account for 75 percent of employment in Appalachia. Further, increased average wages at branch plants in the South are likely contributing to the South closing the gap with the US.

The policy implications of these findings are difficult to tease out from this analysis because this study did not attempt to analyze what has determined regional productivity changes and changes in the industrial mix of the region. Nor has it attempted

to analyze the effects of different public policies, such as industrial recruitment policies, tax preferences or regional factors that may explain some of these patterns. Moreover, it is important to note that the findings of this analysis should not be construed as settling the claims and counterclaims about whether large or small businesses account for the greatest share of job creation in the region. Indeed, because this analysis does not include an examination of the service sector, where most of the region's job growth has occurred over the last decade, essential baseline data analysis is lacking to address such issues.

Despite these limitations, a central policy implication that does emerge from the pattern of entry and exit, and rapid job creation and destruction, is the need for continuous public and private investment in job training, reemployment and employment services. While it is beyond the scope of this study to make any specific recommendations about the size or scope of such investments, this study's findings underscore how the region's manufacturing economy has exhibited a continuous churning of jobs, which engenders a considerable amount of job displacement. Given the rapid job flow among industries, and the well documented pace of technological change, it may also make sense to consider investing in updating of industrial skills standards for assessment and education and training programs. A region's capacity to efficiently adjust its labor market, and improve its labor productivity, depends in large measure on making sound investments in human resource development.

One issue, albeit only indirectly related to these findings, is whether the region's reliance on the branch plants makes it more vulnerable to import penetration and/or certain types of plant relocation, particularly in more labor-intensive industries and operations. While the findings in this report do not identify which sectors may be most vulnerable to such trends, they certainly do raise questions about the comparative advantage of those sectors that depend on the low-wage labor market. Answers to these complex questions would require a more detailed analysis of import-sensitivities by industry.

Another set of issues relates to whether the branch plant economy has influenced the region's manufacturing base either by stimulating or retarding the formation of clusters, subcontracting chains and networks among specific industries. Many anecdotal industry accounts indicate some stimulus of clusters, particularly between the automobile branch plants and auto parts sectors, and the textile and precision machine tool sectors. However, the findings in this study indicate that in aggregate, the single-unit plants have had low productivity growth compared to branch plants, even after controlling for industry composition. Thus, if clustering has taken place, it must be rather limited and/or recent.

The results suggest continuing challenges for policy makers seeking to improve the relative condition of Appalachian manufacturing. The Region continues to generate plants and jobs in low wage, low productivity industries. Further, these plants pay lower wages and have lower productivity than plants in the same industry elsewhere in the country. The Region continues to be heavily reliant on branch plants for relatively high wage and high productivity jobs. To the extent that branch plants and low wage, low productivity jobs are more susceptible to changes in trade and technology, the Region may face mounting challenges in the future.

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Appendix I: Data Description

The data used in this paper are from the Longitudinal Research Database (LRD). The LRD is composed of the Census of Manufactures from each year it was collected starting in 1963 (63, 67, 72, 77, 82, 87, and 92). The data items available on the LRD include employment, wages, output, capital, material inputs, etc. The plants on the LRD are assigned unique identifiers that allow the plants to be tracked over time, creating a panel data set. For more information on the LRD, see McGuckin and Pascoe (1988).

Appendix II: Definitions/Methodologies

In this section, we describe the definitions of entrants, exits, and describe the specifications used for the regressions.

Definition of entrants and exiters

Entrants are defined as plants that are not present in a Census in a previous period (period $t-1$) and are present in the current Census (period t). We track entrants between 1963 (the first Census of Manufactures available) and 1967. Plants that are there in 1967 but not present in 1963 are called entrants. Plants that are in the Census in 1963 and not in 1967 are defined as exits. Below we define how we calculate entry and exit rates.

$NE(t)$ = New Entrants between $t-1$ and t

$NX(t)$ = Exiters between t and $t+1$

$NT(t)$ = All Manufacturing Plants in period t

$EE(t)$ = Total Employment associated with entrants between $t-1$ and t

$EX(t)$ = Total employment associated with exits between t and $t+1$

$ET(t)$ = Total Employment at all plants in period t

Entry Rate = $NE(t)/NT(t)$

$$\text{Exit Rate} = \text{NX}(t)/\text{NT}(t)$$

$$\text{Employment Formation Rate} = \text{EE}(t)/\text{ET}(t)$$

$$\text{Employment Attrition Rate} = \text{EX}(t)/\text{ET}(t)$$

Regression Specifications:

To describe the differences between plants in the ARC and plants outside the ARC, we run a series of regressions. The coefficients of interest are the coefficients from the dummy variables for the ARC (or for sub-regions within the ARC). The dependent variables, plant size, wages and labor productivity, are all expressed in logs. Thus, the coefficients on the ARC or Sub-Region dummies can be interpreted as the percentage difference between the mean ARC plant and the mean non-ARC plant.

Specifications with No Controls:

$$\log(\text{Plant Size}_i) = \alpha + \beta \text{ARC}_i$$

Specifications with Industry and Urban/Rural Controls:

$$\log(\text{Wages}_i) = \alpha + \beta \text{ARC}_i + \delta \text{Industry}_i + \gamma \text{Rural}_i$$

By Sub-Region With Industry and Urban/Rural Controls:

$$\log(\text{Productivity}_i) = \alpha + \beta_1 \text{Central}_i + \beta_2 \text{North}_i + \beta_3 \text{South}_i + \delta \text{Industry}_i + \gamma \text{Rural}_i$$

Where:

Plant Size_i = Total Employment at the Plant

Wages_i = Average Wages at the Plant (Total Salaries and Wages/Total Employment)

Productivity_i = Labor Productivity at the Plant (Value Added/Total Employment)

ARC_i = 1 if the plant is in the ARC, 0 otherwise

$Central_i = 1$ if the plant is in the Central region of the ARC, 0 otherwise

$North_i = 1$ if the plant is in the North region of the ARC, 0 otherwise

$South_i = 1$ if the plant is in the South region of the ARC, 0 otherwise

$Rural_i = 1$ if the plant is not in an SMSA, 0 otherwise

$Industry_i =$ Set of approximately 450 Dummies representing each 4-digit SIC code

For the specification where we are comparing the average job in the ARC to the average job outside the ARC, the same set of specifications are used, but each observation is weighted by plant size (total employment). The coefficients from this regression can be interpreted as the difference between the average job in the ARC compared to the average job outside the ARC.

Appendix III: Entry and Exit Rates by State within the ARC

Entry Rates by ARC Portion of States						
	1963-67	1967-72	1972-77	1977-82	1982-87	1987-92
ARC - AL	0.392	0.457	0.473	0.383	0.406	0.429
ARC - GA	0.374	0.484	0.487	0.431	0.456	0.446
ARC - KY	0.399	0.432	0.447	0.380	0.363	0.463
ARC - MD	0.219	0.312	0.296	0.313	0.377	0.396
ARC - MS	0.407	0.410	0.500	0.384	0.407	0.459
ARC - NC	0.332	0.395	0.425	0.392	0.365	0.375
ARC - NY	0.262	0.297	0.334	0.299	0.315	0.321
ARC - OH	0.274	0.316	0.368	0.313	0.330	0.335
ARC - PA	0.259	0.316	0.334	0.285	0.326	0.332
ARC - SC	0.344	0.405	0.412	0.368	0.376	0.363
ARC - TN	0.340	0.408	0.439	0.386	0.381	0.407
ARC - VA	0.417	0.433	0.481	0.385	0.376	0.400
ARC - WV	0.319	0.358	0.376	0.303	0.348	0.404
Exit Rates by ARC Portion of States						
	1967-72	1972-77	1977-82	1982-87	1987-92	
ARC - AL	0.415	0.366	0.398	0.353	0.356	
ARC - GA	0.397	0.382	0.417	0.369	0.388	
ARC - KY	0.436	0.359	0.413	0.333	0.361	
ARC - MD	0.279	0.307	0.345	0.313	0.345	
ARC - MS	0.394	0.359	0.412	0.306	0.360	
ARC - NC	0.392	0.327	0.379	0.313	0.333	
ARC - NY	0.349	0.272	0.340	0.301	0.314	
ARC - OH	0.321	0.322	0.359	0.288	0.294	
ARC - PA	0.336	0.309	0.334	0.312	0.307	
ARC - SC	0.281	0.327	0.338	0.303	0.322	
ARC - TN	0.366	0.359	0.394	0.339	0.337	
ARC - VA	0.468	0.375	0.392	0.349	0.346	
ARC - WV	0.397	0.335	0.385	0.356	0.342	

Appendix IV. Standard Industrial Classification by 2 digit Major Industry Group

Manufacturing sectors based on 1987 manual

SIC 20	Food and kindred products
SIC 21	Tobacco products
SIC 22	Textile mill products
SIC 23	Apparel and other finished fabric products
SIC 24	Lumber and wood products
SIC 25	Furniture and fixtures
SIC 26	Paper and allied products
SIC 27	Printing, publishing and allied industries
SIC 28	Chemicals and allied products
SIC 29	Petroleum refining and related industries
SIC 30	Rubber and miscellaneous plastic products
SIC 31	Leather and leather products
SIC 32	Stone, clay, glass and concrete products
SIC 33	Primary metal industries
SIC 34	Fabricated metal products, except machinery and transportation equipment
SIC 35	Industrial and commercial machinery and computer equipment
SIC 36	Electronic and other electrical equipment & components
SIC 37	Transportation equipment
SIC 38	Measuring, analyzing and controlling instruments; photographic, medical and optical goods; watches and clocks
SIC 39	Miscellaneous manufacturing industries