

## FACT SHEET

### **Title of Study:**

Logging Cost and Productivity Survey

### **What is the purpose of this research project?**

- The purpose of this project is to monitor the production and cost patterns of independent logging businesses.
- One of the advantages of this study is that “real data” are collected concerning the actual volumes produced and expenditures made over time compiled with assessments of current market, regulatory, and economic conditions across the Eastern region.

### **How was I selected for involvement?**

- Participating businesses are nominated by state logging associations, members of national trade associations, or other wood consuming firms.

### **How will the research be conducted?**

- Businesses agreeing to participate are asked to provide weekly or quarterly production data (i.e., green tons of wood delivered to a wood receiving facility per week or quarter) and quarterly cost information relating to the logging business.
- Basic descriptions of the business are collected during field visits and observation. Participants are free to answer (or provide) as much or as little data as they are comfortable with.
- Correspondence or interaction with the research team is expected to be about two times per year for data collection and the participant’s time commitment to compile the data is minimal (generally less than one hour).

### **Study Site:**

Data will be collected at the locations of the logging businesses and data analysis will be conducted on the MSU campus.

### **Will this information be kept confidential?**

- Confidentiality procedures will be explained to study candidates and include:
  - Enlisting multiple contractors in a particular geographic area to protect against business identification.
  - The data provided will be aggregated and coded to ensure that confidentiality is maintained.
  - Randomly assigned Logger ID numbers will change every two years. Only study investigators and respective business owner(s) will know their unique code.
  - Only members of the research team who have completed Mississippi State University’s Institutional Review Board (IRB) training will have access to the data.

### **Who do I contact with research questions?**

If you should have any questions about this research project, please feel free to contact Dr. William Stuart (662-325-0913), Dr. Laura Grace (662-325-8919), or Mr. Clayton Altizer (662-325-8027). For additional information regarding human participation in research, please feel free to contact the MSU Regulatory Compliance Office at 662-325-0994.

### **What if I do not want to participate?**

Please understand that your participation is voluntary and you may discontinue your participation at any time.

*Mississippi State University does not discriminate on the basis of race, color, national origin, sex, age, disability, or veteran status.*

## **Acknowledgements**

We would like to thank those groups currently supporting this project. Current funding has been provided by the following organizations:

**Mississippi Forest and Wildlife Research Center**  
**USDA Wood Utilization Research Grant**  
**Wood Supply Research Institute**

Special thanks go to the contractors who have so willingly shared their knowledge, records, hospitality and friendship with the students and faculty working on this project. Their assistance warrants personal and public recognition, however the need for confidentiality precludes their recognition by name.

## INTRODUCTION

The contractor cost and productivity study began at Virginia Tech in 1988, with the objective of establishing a baseline for measuring improvements in production and economic efficiency over time. Original study participants were located in the piedmont and coastal plain regions of the Southeastern US. In 1995 the Virginia Tech study was expanded to include the Appalachian region; and Mississippi State University began analyzing Lake States' contractors and also increased the overall number of central time zone contractors. In 1999 the study was transferred exclusively to MSU, and currently, encompasses loggers from all of these physiographic regions (see map).

The main goals of the study include tracking year-to-year impacts of weather, markets and regulations on business performance; analyzing operating expenses to gauge economic viability; and reporting the overall health and status of the logging profession to the wood-consuming industry. Several publications and reports are generated periodically using data collected from study participants. The confidentiality of study participants is paramount. No contractor can be identified through the information contained in the reports since cost and production figures are coded and aggregated.

Contractors invited to participate in the study are usually recommended by Forest Resources Association (FRA) member companies or various loggers' associations or councils. The criteria for inclusion are that the contractor be considered in the top 25 % of the logging force, that the operation be respected for its environmental performance and community relations, and that the logger maintains good records. Participation remains strictly voluntary and the number of inactive participants varies from year-to-

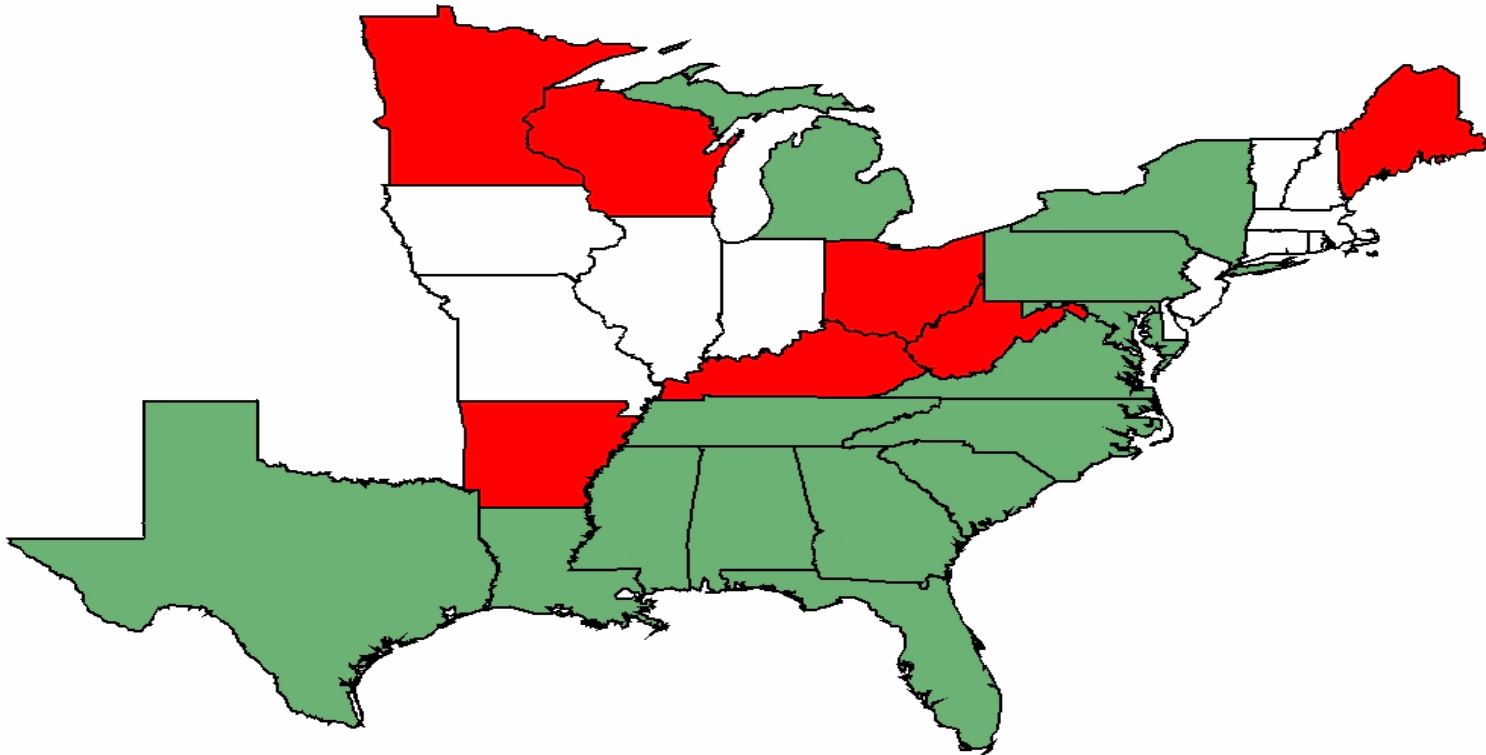
year primarily due to extenuating circumstances beyond the control of individual contractors or study administrators.

The cost information can be obtained in several different formats. No revenue or profit data is collected. Tax returns, balance sheets, statements of revenue, and profit and loss reports are common methods of financial reporting. We can work directly with the contractor to acquire this information or can correspond with an accountant if the participant prefers this avenue of approach. The convenience of each respective participant is the hallmark of the cost and production study. Again, any information is kept strictly confidential. Once we receive the financial information it is divided into six cost categories for further analysis: equipment, labor, consumables, insurance, administrative overhead, and contracted services (see enclosed “Components of Logging Costs”).

Production information can be provided by load; or on a daily, weekly, monthly, or quarterly basis. It is preferred that this information be as detailed as possible since the nature of tracking variations in production requires specific data. Yearly estimates can be used but are considered a last resort option. All production information is reported in tons for the sake of comparison, and any other unit of measure is converted using a local conversion factor.

### Logger Cost and Productivity Study Participants

- States Not Participating
- States Currently Participating
- States Selected for Expansion



## ***COMPONENTS OF LOGGING COSTS***

### **1. Equipment**

- A. Note payments (this shows actual cash flow to principal)
- B. Depreciation (this will give us a good indication of equity)
- C. Taxes (Highway use, property tax)

### **2. Labor**

- A. Payroll (wages and salaries)
- B. Payroll taxes (FUTA, FICA, and Medicare)
- C. Workers Compensation Insurance (please provide rate and experience modification factor if available)
- D. Employee Benefits

### **3. Consumables**

- A. Tires
- B. Fuel
- C. Oil and Lubricants
- D. Parts and Maintenance
- E. Truck and Equipment washing
- F. Non-depreciable tools (chains saws)
- G. Gravel
- H. Mats
- I. Wrecker Service

### **4. Administrative Overhead**

- A. Secretary Wages
- B. Bookkeeping or Accounting fees
- C. Office expenses
- D. Licenses
- E. Fines
- F. Legal and Professional Dues
- G. Travel Expenses
- H. Phone and CB Radio Expenses
- I. Medical Expenses
- J. Educational Costs

### **5. Insurance**

- A. General Liability
- B. Equipment (Fire/Theft/Vandalism)
- C. Umbrella Policy

### **6. Contract Services**

- A. Contract Hauling
- B. Cut & Skid, Moving Expenses, other
- C. Road Building/BMP

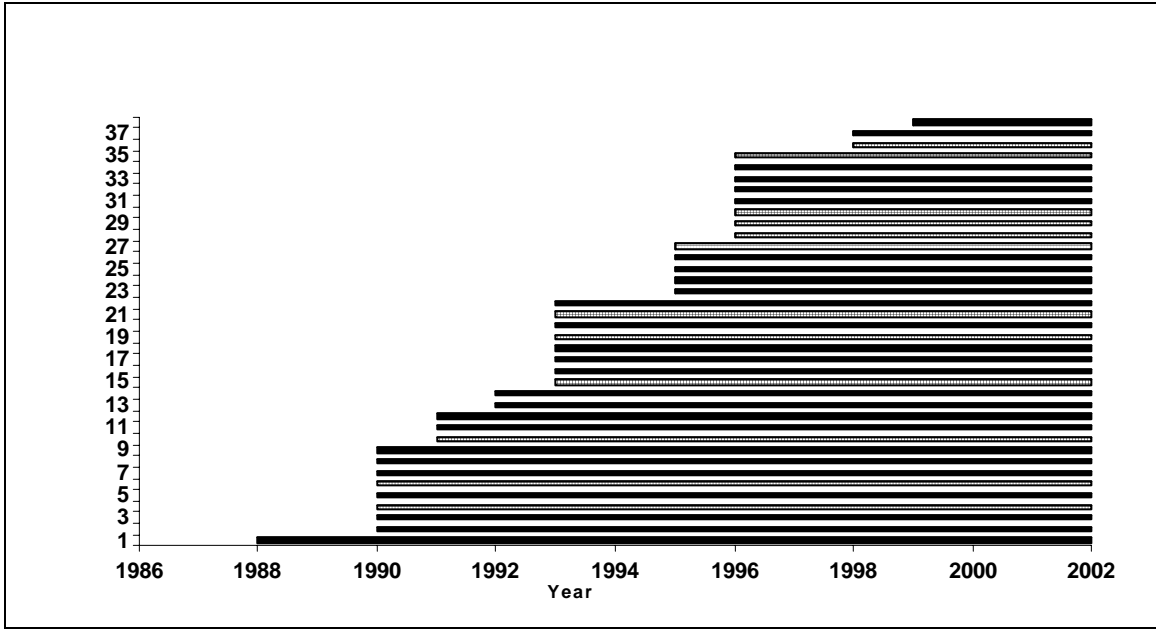
## **SAMPLE OUTPUTS**

This section is intended to provide study candidates the opportunity to view typical output generated from data obtained from active participants. Several examples include aggregate data for the entire study population. Other examples include a more detailed analysis of groups of contractors from regional or physiographic subsets of the study participants. Some illustrations contain information for a single year while other examples include a span of several years. It should be noted that all of these approaches are necessary and equally important to achieve the overall goals of the study.

These examples should not be viewed as an exhaustive list but rather a “snapshot” of current research produced by MSU for study participants. More complex output can be expected and will be available at no cost to study participants when completed. Our mission is to give an accurate portrayal of the wood supply system. The continued cooperation of independent logging contractors, accountants, wood dealers, and industry personnel are critical to accomplishing this goal.

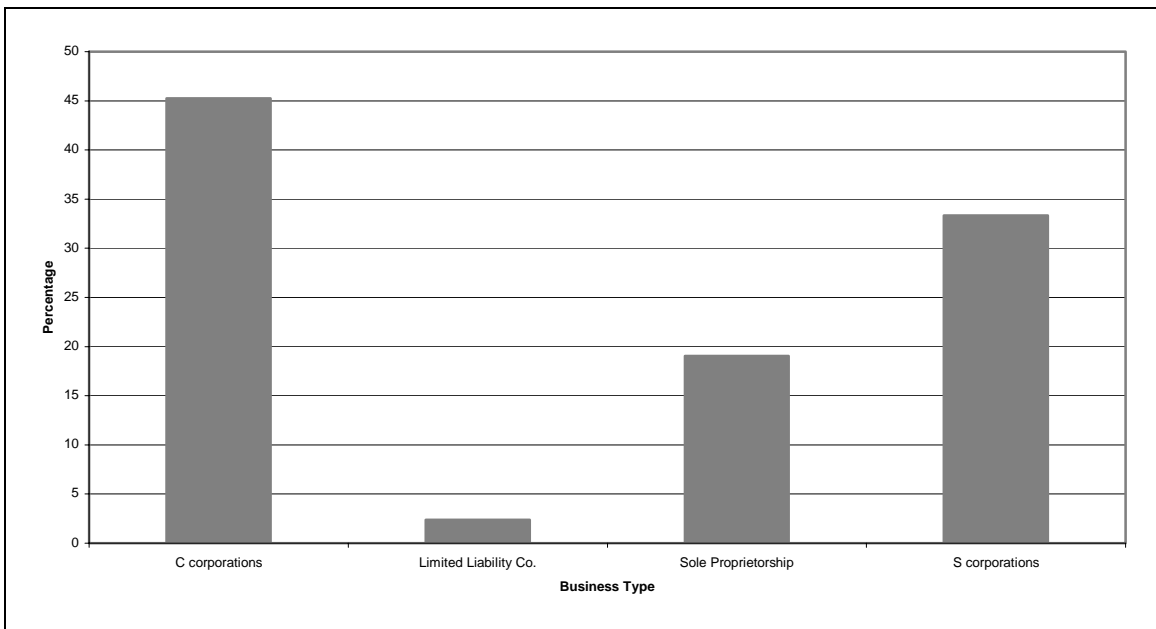
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# **BUSINESS CHARACTERISTICS**

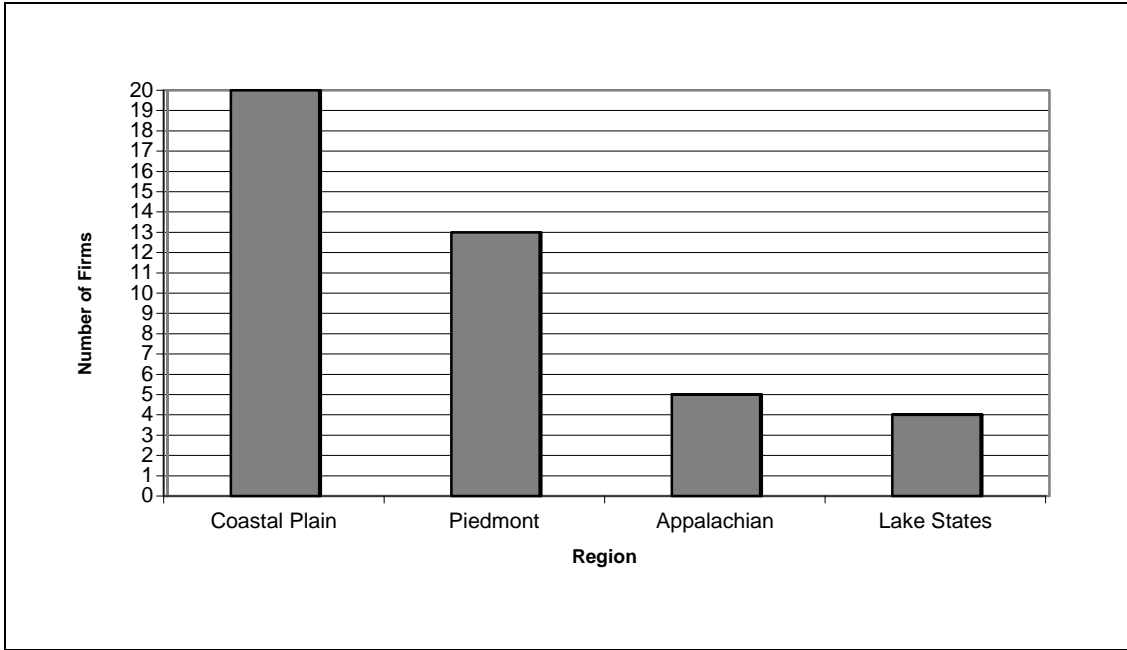


**Length of individual firm participation: active participants. \***

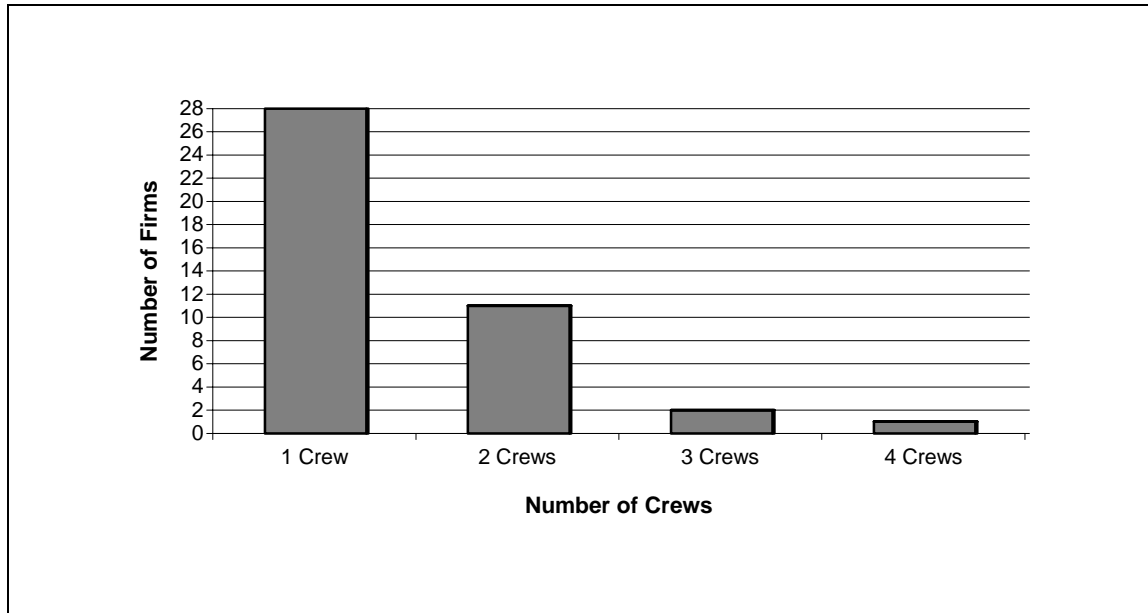
\*The firms in white represent “new” firms that have provided data for the first time or that have re-entered the study after being inactive for several years.



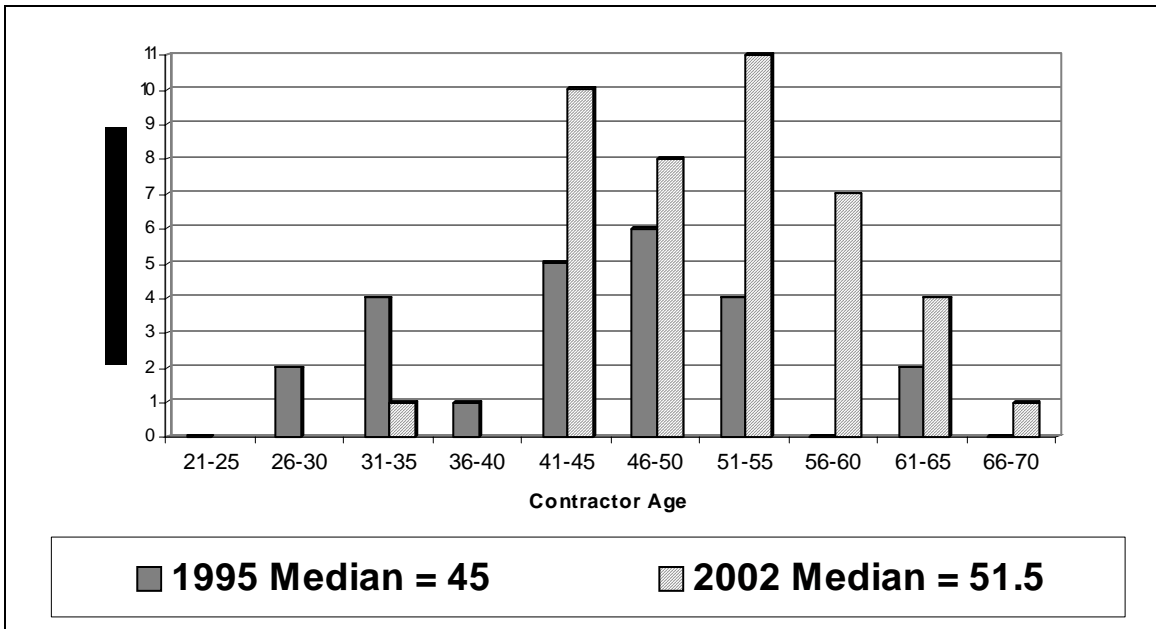
**Type of business structure for active study participants.**



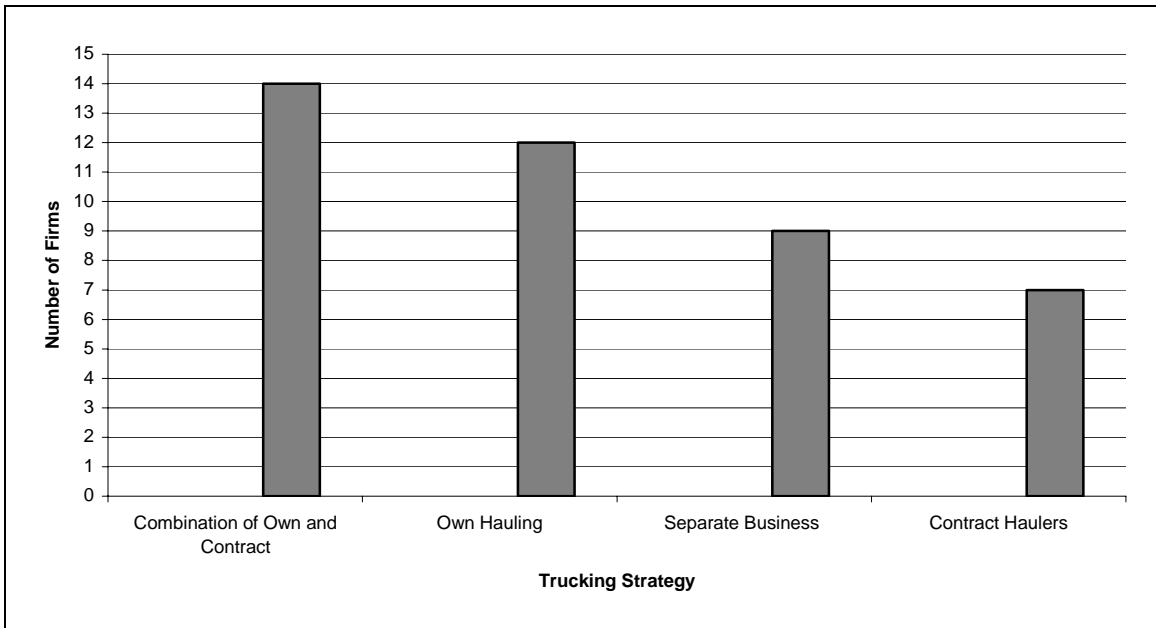
Location of study firms by region.



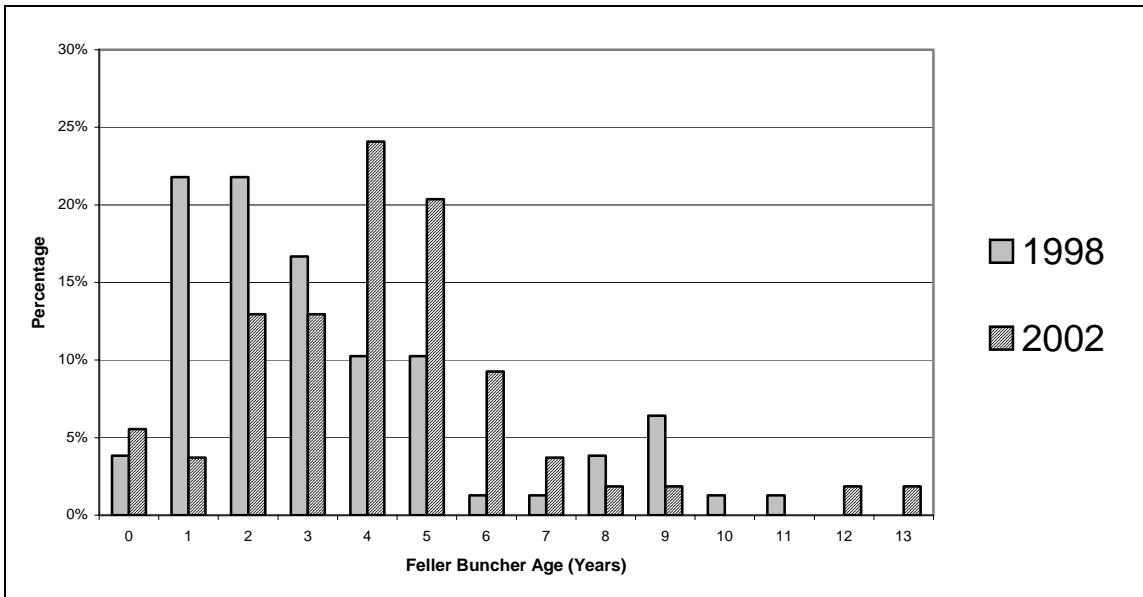
Number of crews operated by the firms in the study.



Age distribution of study participants in 1995 compared to 2002.

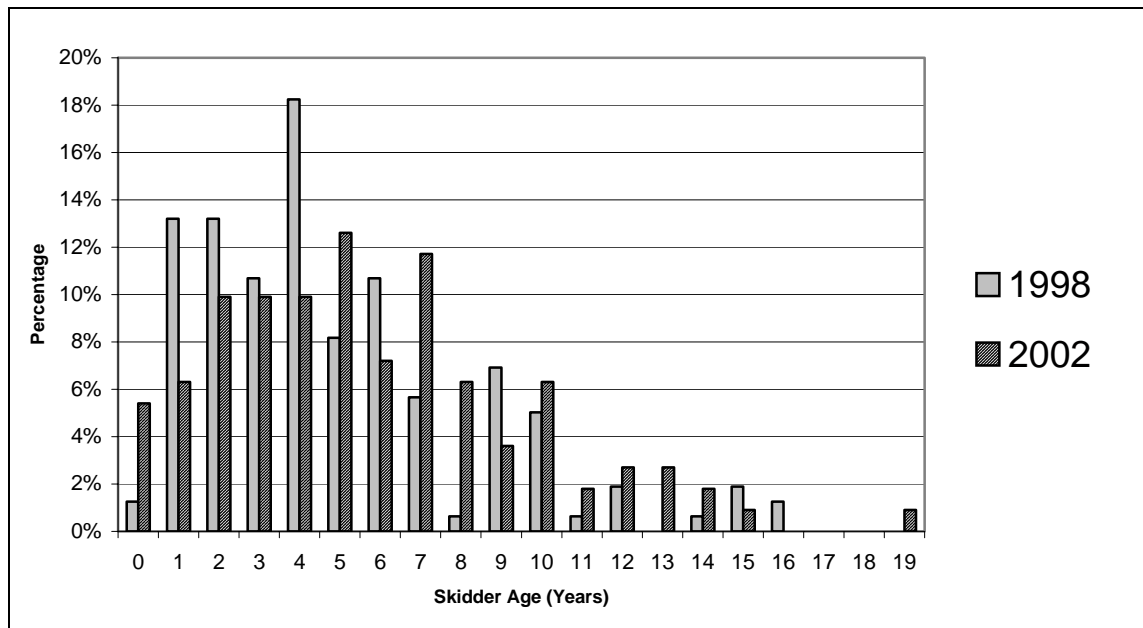


Trucking strategies used by the firms in the study.



Age distribution of feller-bunchers in this study and a 1998 study. \*

\*Notice 65% of the feller-bunchers in 2002 were at least 4 years old. Approximately the same percentage was less than 4 years old in the 1998 study.



Age distribution of skidders in this study and a 1998 study. \*

\*Notice that 60% of the skidders in 2002 were at least 5 years old. In the 1998 study, 65% were five years old or less.

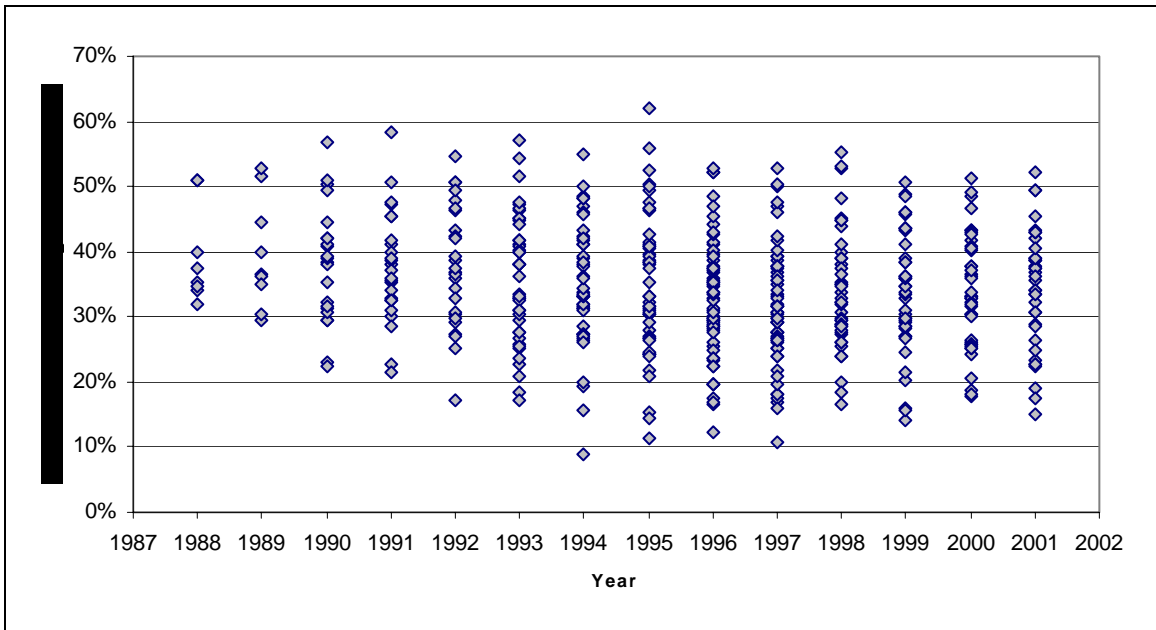
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# **EXPENSES**

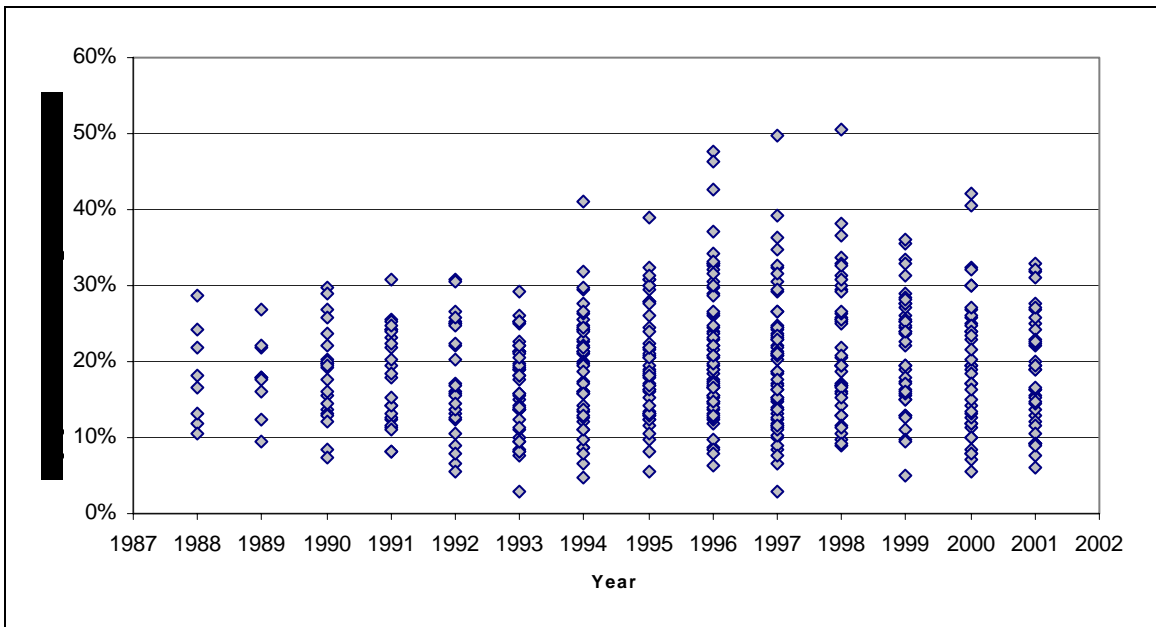
**Total expenditure quartile statistics for the same 37 firms from 1999 to 2001. \***

	Total Cost Quartiles			Change		
	1999	2000	2001	1999-2000	2000-2001	Overall
<b>Minimum</b>	\$167,508	\$151,671	\$179,866	-9%	19%	7%
<b>First Quartile</b>	\$663,480	\$654,844	\$600,524	-1%	-8%	-9%
<b>Median</b>	\$962,934	\$1,023,085	\$872,291	6%	-15%	-9%
<b>Third Quartile</b>	\$1,582,477	\$1,376,244	\$1,751,776	-13%	27%	11%
<b>Maximum</b>	\$3,685,103	\$4,306,915	\$5,360,044	17%	24%	45%
<b>Range</b>	\$3,517,595	\$4,155,243	\$5,180,179	18%	25%	47%
<b>IQR</b>	\$918,997	\$721,400	\$1,151,252	-22%	60%	25%

\*Several of the smaller firms discovered different markets for their services to compensate for decline in demand and contract rates in traditional markets. Those in the middle and upper end of the population were able to cut expenditures in rough proportion to the shifts in production. Those in the first quartile were unable to cut their costs as fast as their production fell. Many changed business strategy, moving from commodity to grade products, buying and merchandising their own timber and doing “specialized” jobs. Total expenditures for the smallest firm rose by 7% over the period even though total tonnage was 27% of that in 1999. Expenditures for the firm forming the bound between the first and second quartile were at 91% of the 1999 level even though output had dropped 47% over the period. The upper bound of the third expenditure quartile fell back as production increased in 2000 and then advanced significantly as production declined in 2001, ending with an 11% gain, a four percentage point gain over production. The expenditures for the largest firm increased at a modest rate in 2000 and more rapidly in 2001, ending with a 45% increase in outlays to cover a 40% increase in production.

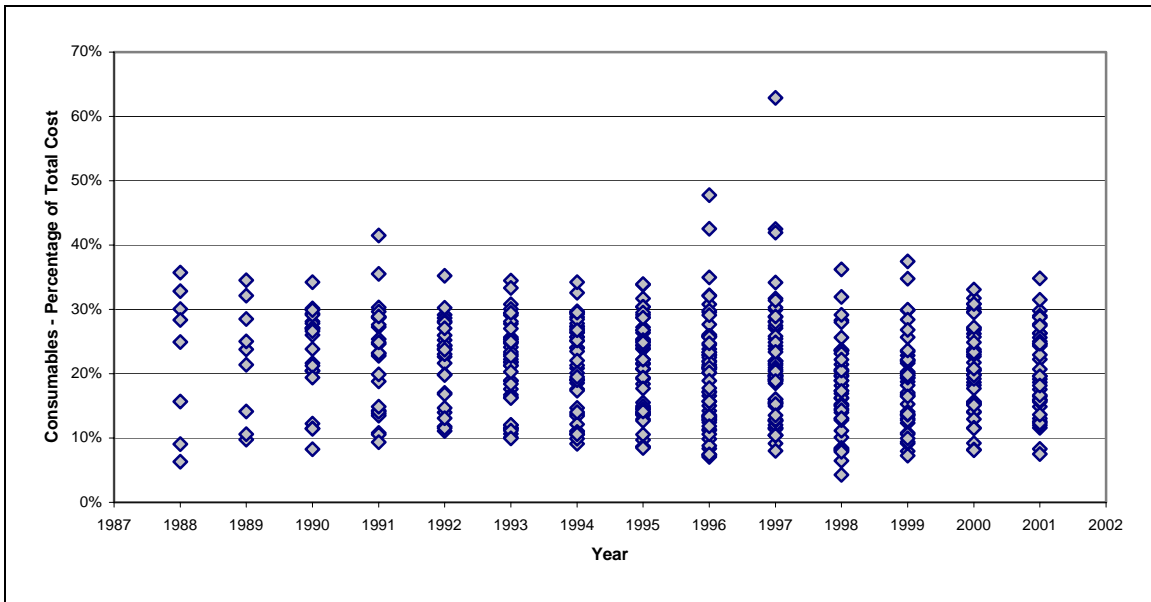


**Labor as a percentage of total cost for all study participants from 1988 to 2001.**



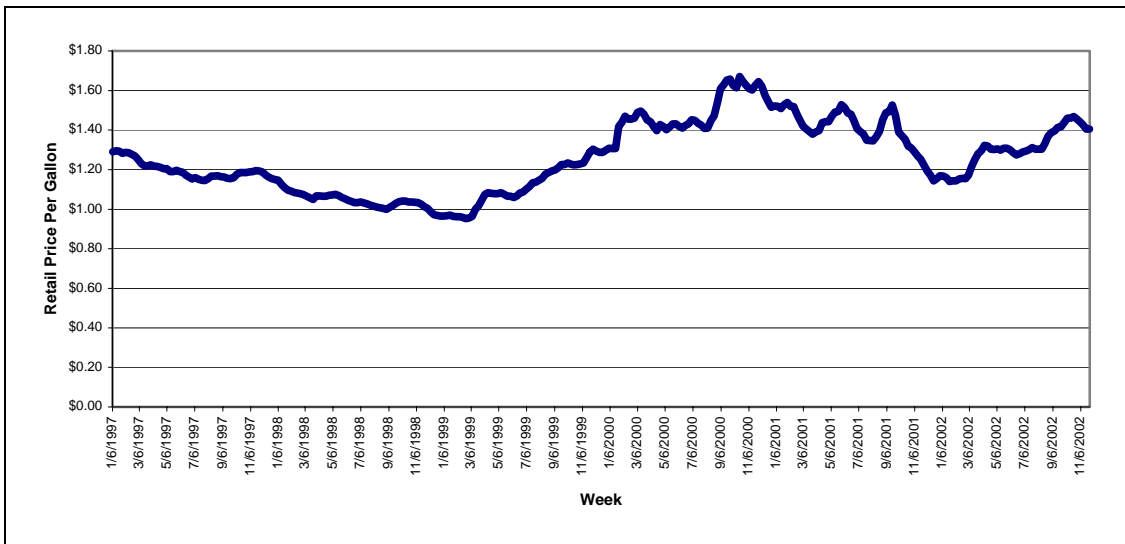
**Equipment as a percentage of total cost for all study participants from 1998 to 2001. \***

\*Note the last major period of equipment reinvestment was 1993-1998.

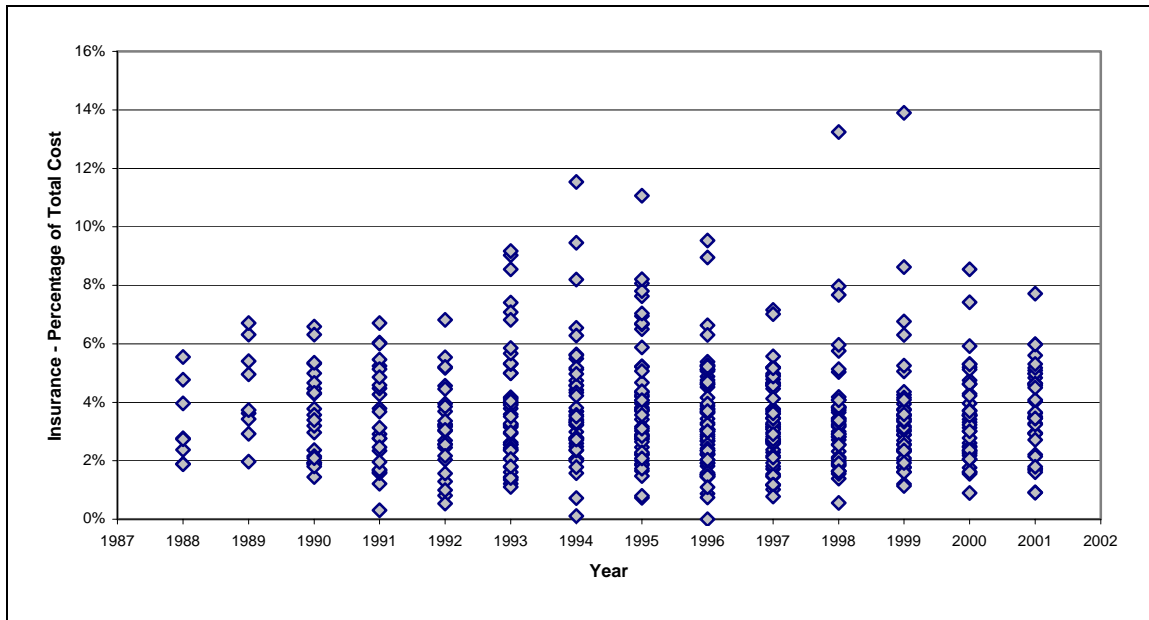


**Consumables supplies as a percentage of total cost for all study participants from 1988 to 2001. \***

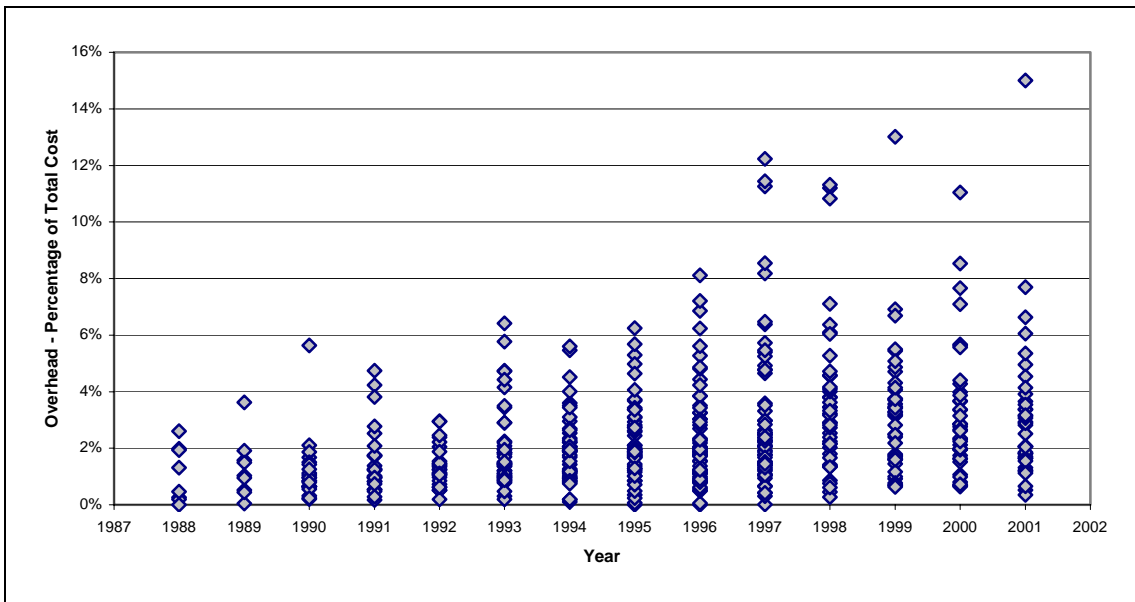
\*Note the recent peaks reflect large fuel increases and the increased repair costs associated with operating older equipment.



**Diesel fuel price trend from 1997 through 2002. (Source-US Department of Energy: 2002)**



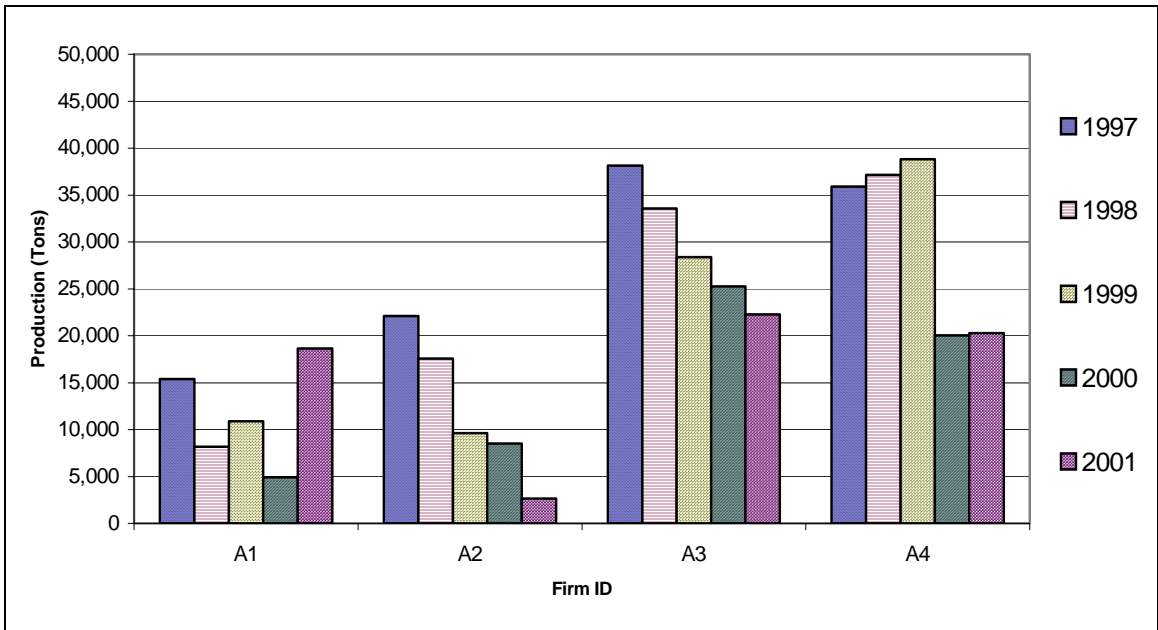
**Insurance as a percentage of total cost for all study participants from 1988 to 2001.**



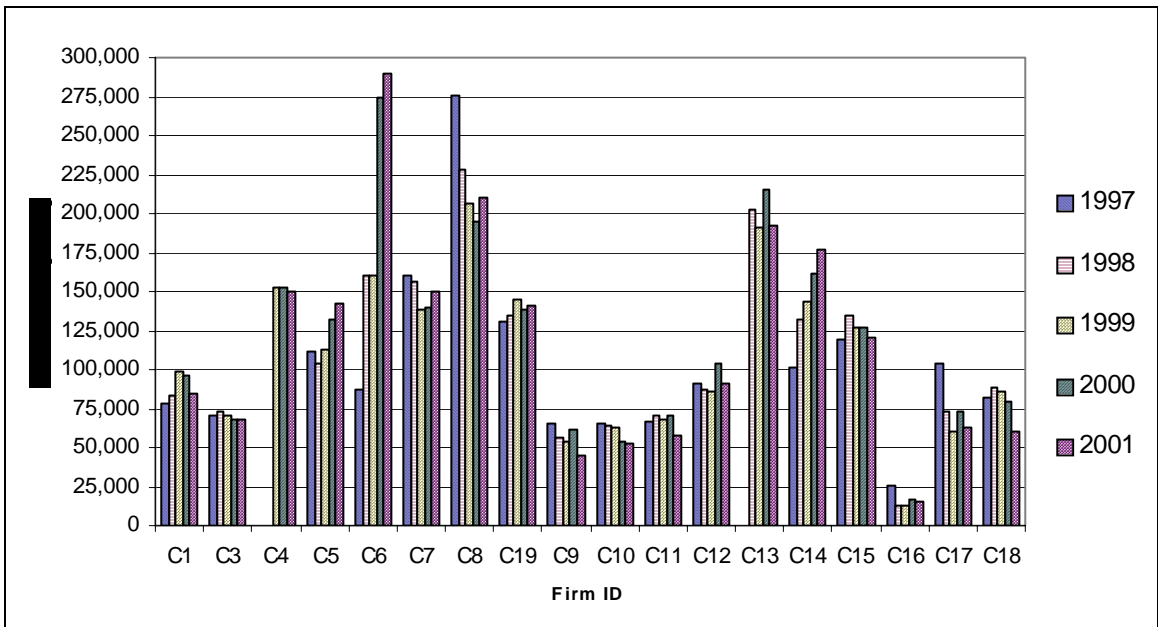
**Administrative overhead as a percentage of total cost for all study participants from 1988 to 2001.**

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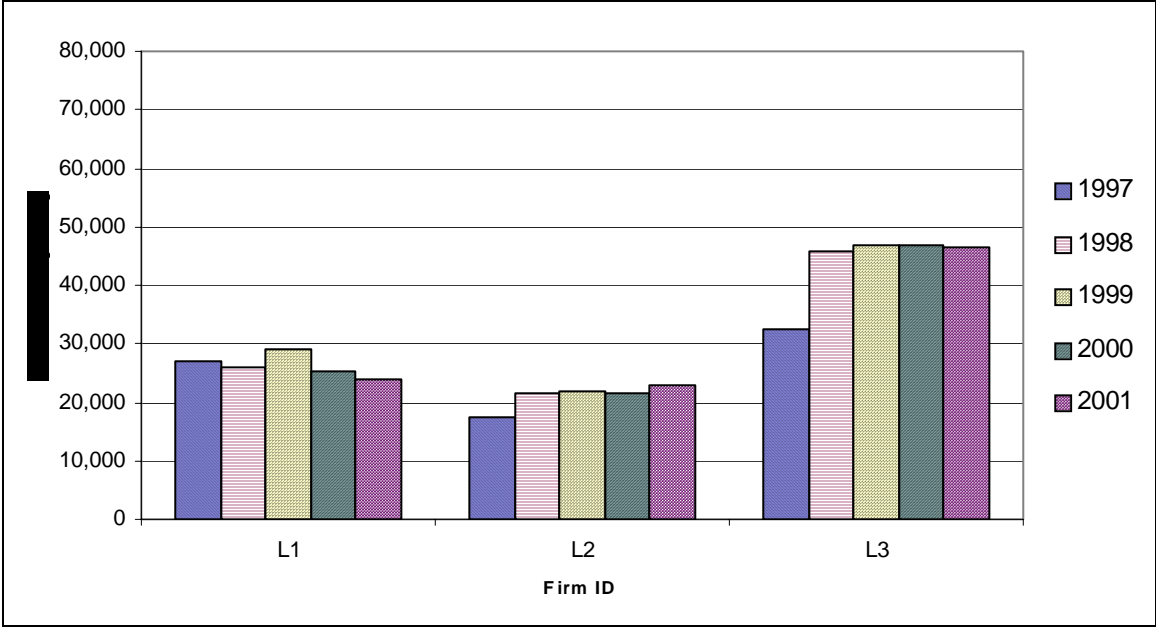
# **PRODUCTION**



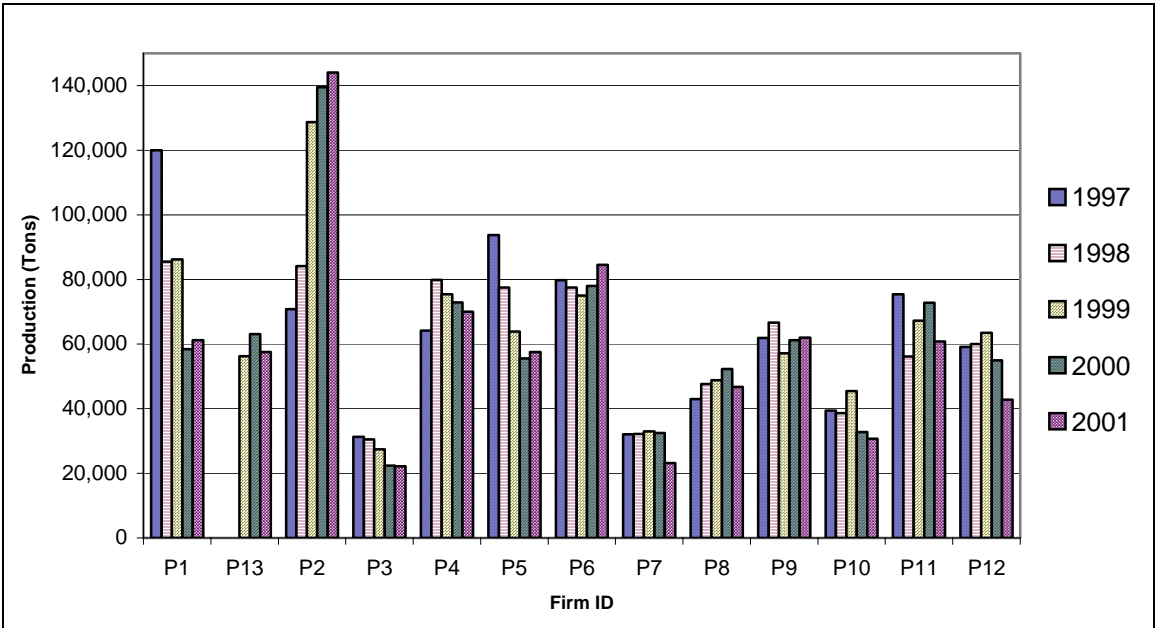
Shifts in production for firms located within the Appalachian region.



Shifts in production for firms located within the coastal plain region of the study.



Shifts for firms located within the Lake States region.



Shifts in production for firms located within the piedmont region of the study.

Production ranks for a group of 37 firms from 1999 to 2001. \*

Firm	Production Rank			Rank Change		
	1999	2000	2001	99-00	00-01	99-01
A2	1 (Low)	2	1	1	-1	0
A1	2	1	3	-1	2	1
C16	3	3	2	0	-1	-1
L2	4	5	7	1	2	3
P3	5	6	5	1	-1	0
A3	6	7	6	1	-1	0
L1	7	8	9	1	1	2
P7	8	9	8	1	-1	0
A4	9	4	4	-5	0	-5
P10	10	10	10	0	0	0
L3	11	11	13	0	2	2
P8	12	12	14	0	2	2
C9	13	17	12	4	-5	-1
P13	14	19	16	5	-3	2
P9	15	18	22	3	4	7
C17	16	23	23	7	0	7
C10	17	13	15	-4	2	-2
P12	18	14	11	-4	-3	-7
P5	19	15	17	-4	2	-2
P11	20	22	20	2	-2	0
C11	21	21	18	0	-3	-3
C3	22	20	24	-2	4	2
P6	23	24	25	1	1	2
C18	24	25	19	1	-6	-5
C12	25	27	27	2	0	2
P1	26	16	21	-10	5	-5
C1	27	26	26	-1	0	-1
C5	28	29	30	1	1	2
C15	29	28	28	-1	0	-1
P2	30	31	31	1	0	1
C7	31	32	32	1	0	1
C14	32	34	34	2	0	2
C19	33	30	29	-3	-1	-4
C4	34	33	33	-1	0	-1
C6	35	37	37	2	0	2
C13	36	36	35	0	-1	-1
C8	37 (High)	35	36	-2	1	-1

\*Some firms shifted several places over the period. Firm P1, for example, slipped from 26<sup>th</sup> place to 16<sup>th</sup> in 2000 and then partially recovered to 21<sup>st</sup> in 2001, an overall decline of 5 places. The 1999-2000 drop was the result of a decline of over 27,700 tons of

output, the 2000-2001 gain resulted from a production increase of 2,700 tons. The most dramatic shifts were two moves of seven places upward by firms P9 and C17 and a downward shift of seven places by firm P12. The shift for P9 came from producing an additional 4,800 tons, that for C17 from an additional 2,400 tons. The downward shift of P12 came from a decline of 27,750 tons. The 1999 individual firm production ranged from 9,644 tons per year for the smallest to 206,592 tons for the largest. The range increased from 2,649 to 290,000 in 2001.

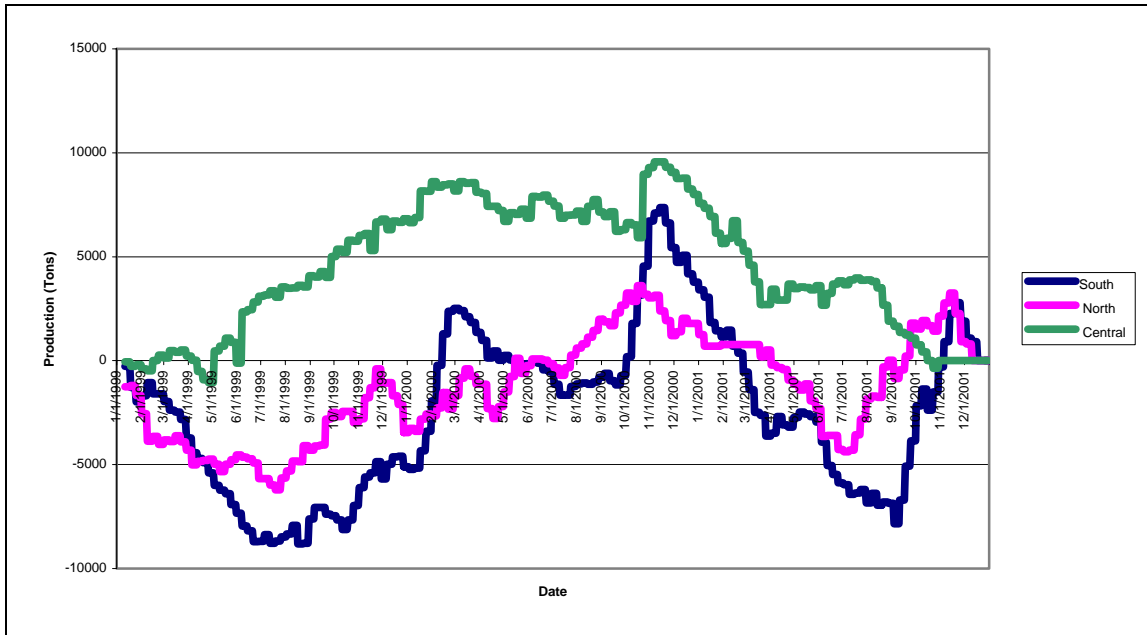
**Production quartile statistics for 37 firms from 1999 to 2001. \***

	Production Quartiles (Tons)			Change		
	1999	2000	2001	1999-2000	2000-2001	Overall
<b>Minimum</b>	9,644	4,916	2,649	-49%	-46%	-73%
<b>First Quartile</b>	45,500	32,831	24,043	-28%	-27%	-47%
<b>Median</b>	63,891	63,088	57,604	-1%	-9%	-10%
<b>Third Quartile</b>	112,309	126,500	120,000	13%	-5%	7%
<b>Maximum</b>	206,592	275,000	290,000	33%	5%	40%
<b>Range</b>	196,948	270,084	287,351	37%	6%	46%
<b>IQR</b>	66,809	93,669	95,957	40%	2%	44%

\*Note:

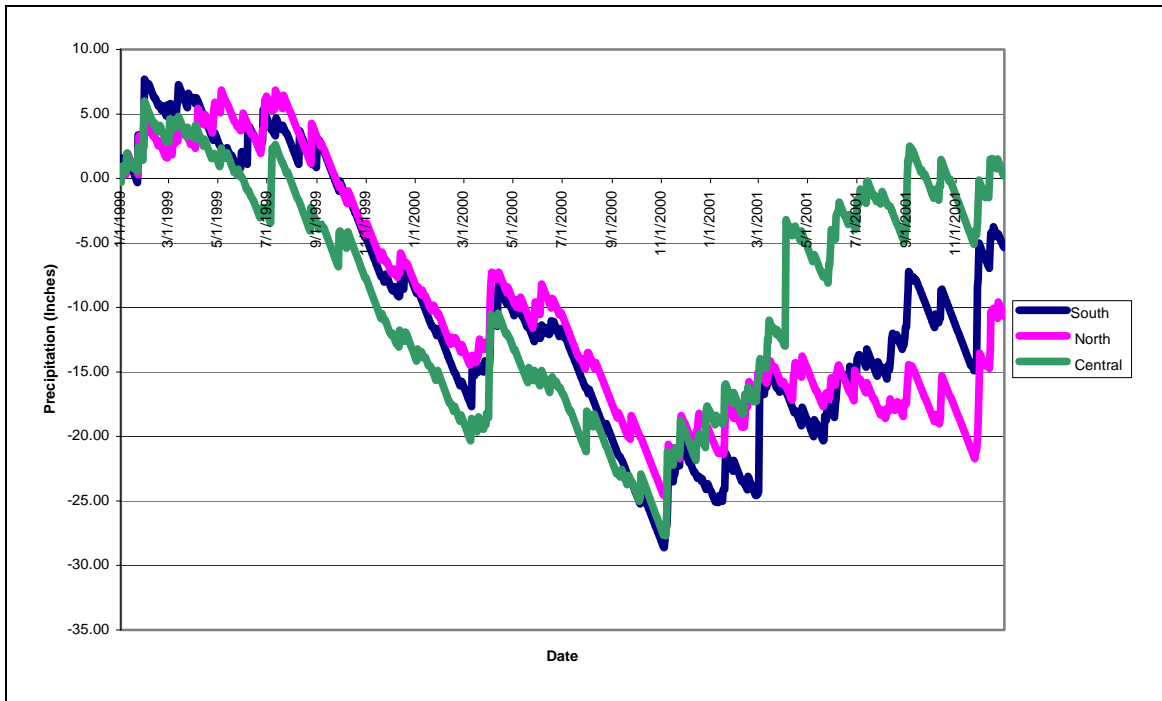
1. The range increased.
2. Firms in the first 2 quartiles lost the ability to produce.
3. The median firm declined by 6000 tons over the period.
4. Third quartile firms increased production slightly.
5. Most of the gains were from the largest firms.

## Production Variability



**Cumulative production patterns for three Mississippi firms from 1999-2001. (One contractor is located in South MS, one in North MS, and one in Central MS.) \***

\*Points above the cusum line indicate that the firm is operating above its cumulative production average for that particular point in time. The southern firm experienced the greatest variability for the three-year period, with the central firm exceeding its cumulative average for most of the three-year period. The northern firm did experience frequent fluctuations in production; however, they were not as erratic as the southern firms' over the same span.

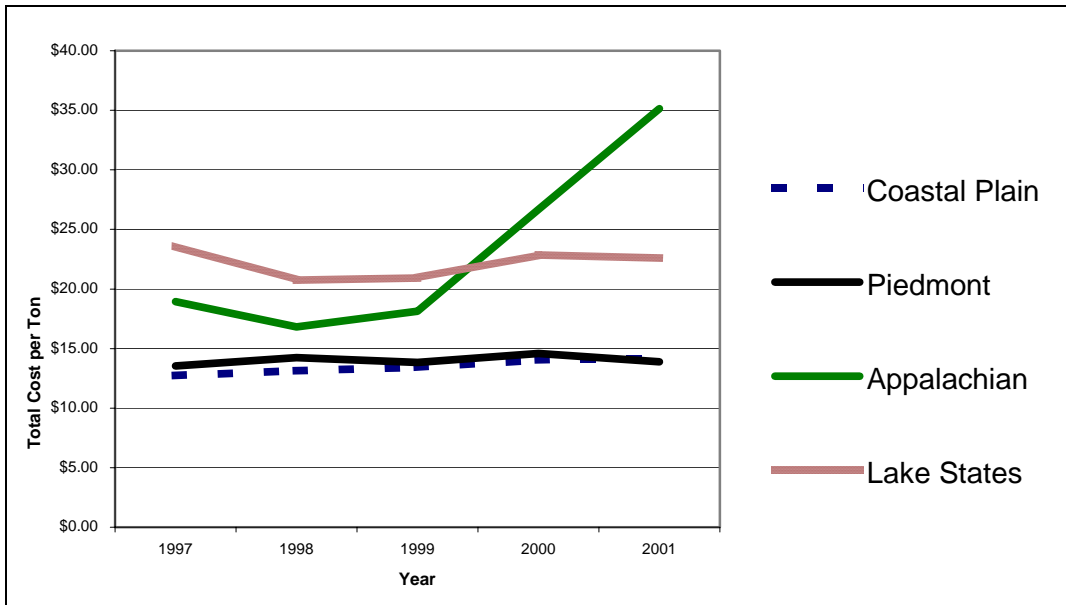


**Cumulative rainfall patterns for three Mississippi locations from 1999 to 2001. \***

\*The base line used was the average daily rainfall for the three-year period. This graph is similar to the common statistic of inches ahead or behind normal rainfall. Points above the cusum line indicate that the rainfall to that point is above the five-year rainfall average and points falling below the line indicate the rainfall is lagging behind. The years of 1999 and especially 2000 were two of the driest in recent memory. The pattern reversed in 2001, when the state received higher rain totals than in previous years.

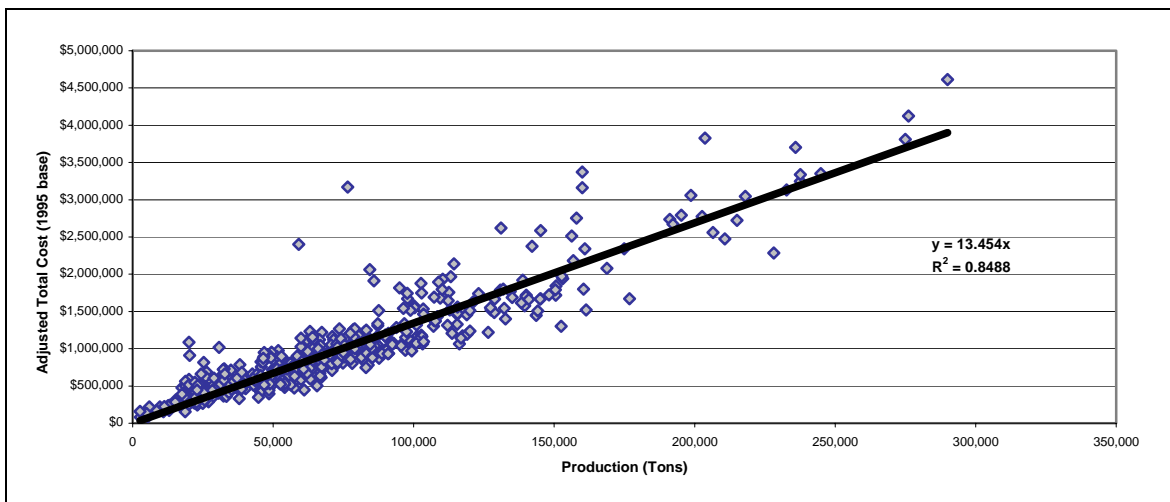
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**COST PER TON  
& OTHER ANALYSIS**



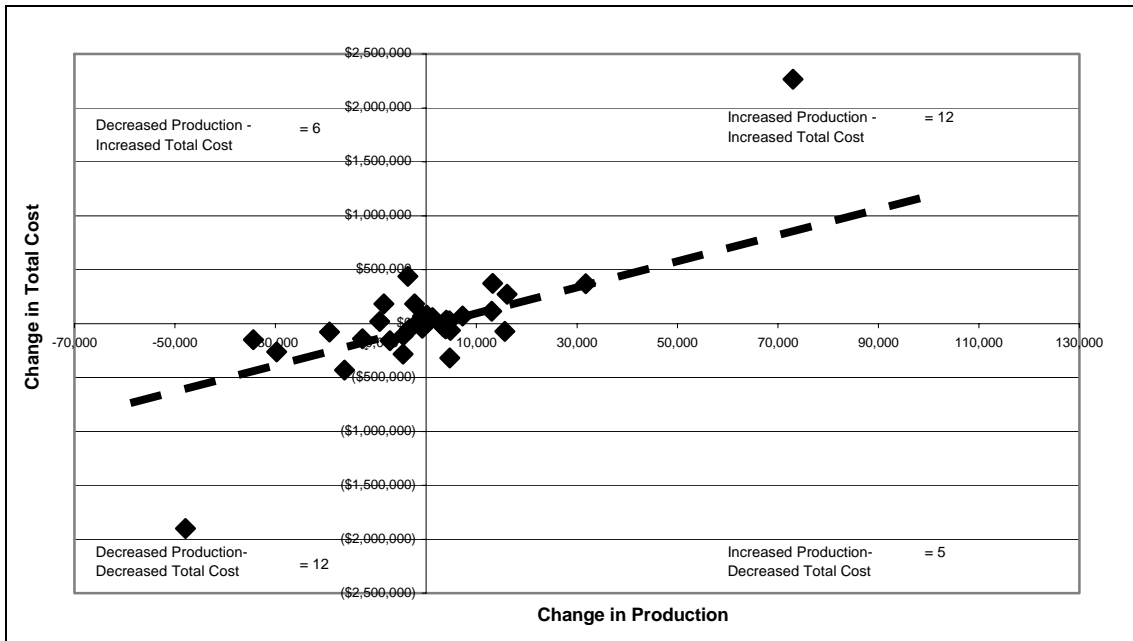
Median total cost per ton by region for 35 firms from 1997 to 2001. \*

\*The Appalachian firms experienced the largest increases in cost per ton, rising over 90% from 1999 to 2001. The total costs per ton for the Lake States firms as a group rose between 1999 and 2000, and then stabilized. Coastal plain and piedmont firms' expenditures increased slightly.



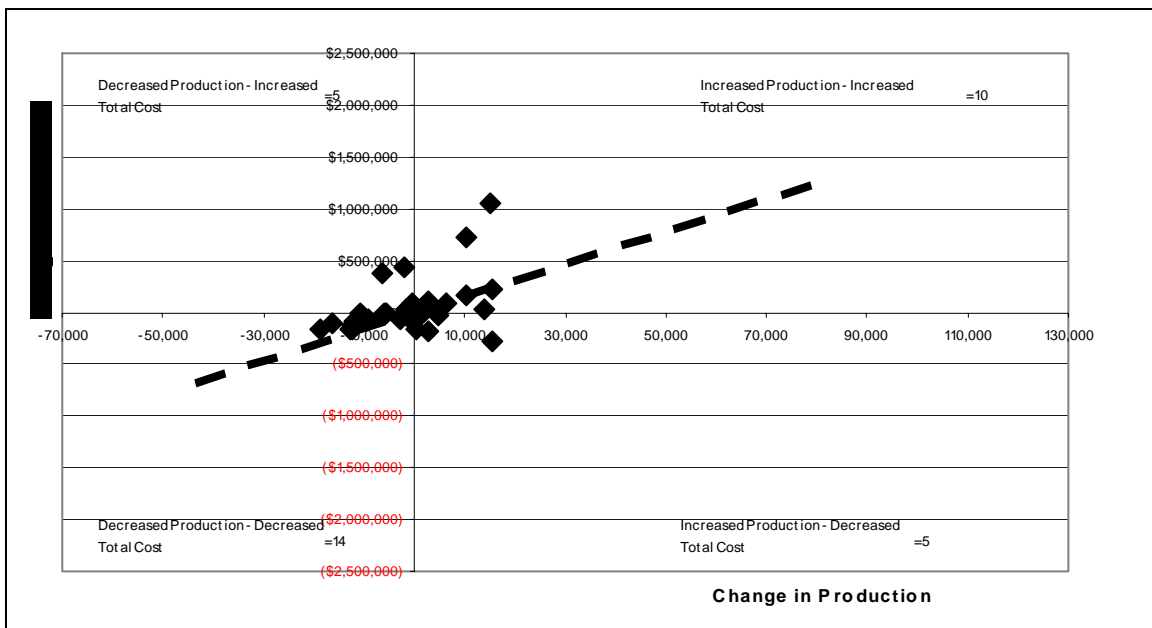
Adjusted total annual cost versus annual production for all firms from 1988 to 2001. \*

\*This regression analysis shows the relationship between both total annual expense and yearly production from 1988 to 2001. The costs were adjusted for inflation using 1995 as the base year. The  $R^2$ -value indicates the amount of variation in total cost that can be explained by annual production. The total cost per ton for the period, represented by the slope of the line, is \$13.45 (1995 basis).



Total production and expense shifts for 35 firms from 1997 to 1998. \*

\*The dashed line through the graph reflects the average cost structure for the entire sample. Those operations below the line “beat the average”, made the change and ended up with lower costs per ton. Twelve firms increased both production and expenses while twelve more experienced decreases in both categories. Five firms were able to decrease costs while increasing production but the decreases were small. Six firms lost production yet still experienced a rise in total cost. The extreme outliers in the upper right and lower left quadrants represent firms that made major changes.



Total cost and production shifts for 34 firms from 2000 to 2001.\*

\*The majority of the firms fell in the “typical” first and third quadrants during the 2000 to 2001 shifts. Shifts are again in general alignment with the trend line, with some spaced far off the line indicating a more orderly or planned adaptation to market and operational forces. It should be noted that one firm was unable to provide data for the 2000 – 2001 analysis.

There were fourteen firms in the third quadrant which were able to decrease expenditures as production declined. Several of the firms in the first quadrant went to a new business strategy of specialized harvesting, which explains the outlying data points. Five firms in quadrant two used more traditional economy measures and increased their production and decreased their total outlays.

**Quartile statistics for 35 firms’ total cost per ton from 1997 to 2001.\***

	<b>Cost per Ton Quartiles</b>				
	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
<b>Minimum</b>	\$8.07	\$9.76	\$10.28	\$8.26	\$9.04
<b>First Quartile</b>	\$12.19	\$11.98	\$12.49	\$12.73	\$13.01
<b>Median</b>	\$13.85	\$14.05	\$14.76	\$15.4	\$14.59
<b>Third Quartile</b>	\$16.09	\$17.02	\$18.14	\$18.26	\$21.19
<b>Maximum</b>	\$23.6	\$25.52	\$25.04	\$61.3	\$69.31
<b>Range</b>	\$15.53	\$15.76	\$14.76	\$53.04	\$60.27
<b>IQR</b>	\$3.89	\$5.04	\$5.65	\$5.53	\$8.19
	<b>Change</b>				
	<b>1997-1998</b>	<b>1998-1999</b>	<b>1999-2000</b>	<b>2000-2001</b>	<b>Overall</b>
<b>Minimum</b>	21%	5%	-20%	9%	12%
<b>First Quartile</b>	-2%	4%	2%	2%	7%
<b>Median</b>	1%	5%	4%	-5%	5%
<b>Third Quartile</b>	6%	7%	1%	16%	32%
<b>Maximum</b>	8%	-2%	145%	13%	194%
<b>Range</b>	1%	-6%	259%	14%	288%
<b>IQR</b>	30%	12%	-2%	48%	111%

\*Costs increased for all groups, with the increase growing larger moving out from the median. The median costs per ton increased five percent from 1997 to 2001. The first quartile bound increased steadily from 1997 to 2001 by approximately seven percent. The third quartile bound increased dramatically for the period (32%) and peaked in 2001 at \$21.19 per ton. The minimum cost increased nearly one dollar per ton over the five years, a 12% increase. The maximum cost per ton increased dramatically, due to a local market change.

Production and cost per ton rankings for 37 firms from 1999 to 2001. \*

	Prod Rank	\$/Ton Rank	Prod Rank	\$/Ton Rank	Prod Rank	\$/Ton Rank
ID	1999	1999	2000	2000	2001	2001
A2	1	37	2	31	1	37
A1	2	24	1	35	3	2
C16	3	30	3	24	2	29
L2	4	31	5	36	7	32
P3	5	27	6	27	5	31
A3	6	28	7	29	6	26
L1	7	35	8	34	9	34
P7	8	34	9	30	8	33
A4	9	29	4	3	4	36
P10	10	23	10	9	10	35
L3	11	33	11	37	13	30
P8	12	7	12	5	14	9
C9	13	2	17	1	12	1
P13	14	19	19	13	16	15
P9	15	20	18	28	22	7
C17	16	32	23	16	23	25
C10	17	1	13	4	15	4
P12	18	18	14	33	11	24
P5	19	9	15	11	17	8
P11	20	8	22	20	20	16
C11	21	17	21	19	18	21
C3	22	21	20	21	24	19
P6	23	15	24	18	25	18
C18	24	5	25	32	19	22
C12	25	6	27	6	27	5
P1	26	12	16	26	21	10
C1	27	3	26	8	26	13
C5	28	26	29	22	30	28
C15	29	13	28	7	28	20
P2	30	11	31	10	31	6
C7	31	22	32	14	32	14
C14	32	4	34	2	34	3
C19	33	10	30	12	29	12
C4	34	16	33	17	33	17
C6	35	36	37	23	37	27
C13	36	25	36	15	35	23
C8	37	14	35	25	36	11

\*It should be mentioned that the relationship between production and cost per ton is not necessarily consistent. Smaller firms do tend to have higher costs, but larger firms do not necessarily have lower costs. Costs per ton rankings change dramatically from year to year as a result of management decisions.

Small changes in production ranking, such as the increase from the 20<sup>th</sup> to 22<sup>nd</sup> position between 1999 and 2000 for firm P11, can affect unit costs dramatically. The cost per ton ranking changed 12 positions, from 8<sup>th</sup> to 20<sup>th</sup>, for this firm. A similar shift of two positions, from 25<sup>th</sup> to 27<sup>th</sup> for firm C12, left the unit cost ranking undisturbed. Some firms like C3, exhibited stability. Others, like P12, stayed in the middle but moved downward in the production ranking and upward in costs, while P9 moved upward in production and downward in the cost rankings. The annual production for firm A1 increased over 3-fold from 2000 to 2001, while operating costs remained relatively stable. This phenomenon can explain his cost per ton ranking plummet of 33 positions, from 35<sup>th</sup> in 2000 to 2<sup>nd</sup> in 2001.

Exogenous factors, such as the production niche (final harvest versus thinning, hardwood versus pine, product separation, etc), weather, general market conditions, and business strategy can have a major effect on both job productivity and unit costs.