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STRUCTURE, CONDUCT, PERFORMANCE

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TRACY C. MILLER

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Harland P. Wood
Major professor

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THE MARKET FOR FIREWOOD IN THE LANSING AREA: STRUCTURE, CONDUCT, PERFORMANCE

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Tracy Courtney Miller

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ABSTRACT

THE MARKET FOR FIREWOOD IN

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In light of the energy crisis, firewood has been considered by some policymakers as a low cost, dependable alternative home heating fuel. This study examines the firewood market in the Lansing area to determine it's effectiveness in getting a dependable supply of firewood from the forest to the consumer at a low cost.

Surveys of consumers and suppliers of firewood were conducted to discover the current and expected demand for firewood and factors influencing supply. Current prices for firewood are such that it isn't competitive with natural gas and may not provide significant savings for most fuel oil users unless they can cut it themselves. A lowering of production costs through the use of technology, vertical integration and joint production may help reduce prices. Better communication and information are needed so that novices can do a better job of choosing firewood that burns safely and efficiently.

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CHAPTER I

INTRODUCTION

Background

The 1973 Arab Oil Embargo and events that followed, along with the Iranian oil cutoff in 1979 have prompted elected officials and government agencies to give more and more attention to the problems of growing dependence on Arab oil, rising prices of fossil fuels and the possibility of future energy shortages. In recent years, the U.S. government has sought to develop an energy policy that would reduce dependence on imported fossil fuels while still maintaining a high standard of living for American consumers.

The Department of Energy and various other federal agencies in response to mandates from Congress and the President, have considered and enacted various measures to encourage the development of alternative energy sources. Possible alternatives include solar energy, nuclear energy, wind energy and biomass energy.

Biomass energy, especially wood, is a practical and time-tested alternative. Wood was the major source of energy for heating and industrial processes up until the late 19th century.[1] Wood is a renewable resource and is in abundant supply in many parts of the U.S. including Michigan.

As the price of fossil fuels rises, firewood is becoming an increasingly popular heat source in many parts of the U.S. This trend is noticeable in Michigan and many other states. In New England, for example, a survey conducted by the Economics, Statistics and Cooperative

Service (ESCS) showed that 33 percent of households burned a combined total of 2,851,000 cords of firewood in Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island in the 1978-1979 heating season. This was a 9 percent increase over the previous winter.[2]

Woodstove sales data also show a rapid increase in recent years, reflecting the trend toward increased heating with wood. Riteway Manufacturing Company reports a 16-fold increase in woodstove sales between 1974 and 1977.[3] Nearly a million woodstoves are sold each year in the U.S.

Although wood heating is most prevalent in rural areas, it is also important in metropolitan areas where adequate firewood supplies are available within a reasonable distance of users.

As fuelwood demand increases in heavily populated areas, markets are growing in significance as the means of getting fuelwood from the forest to the consumer. There have always been markets for firewood around major cities where fireplaces are popular, but generally on a small scale.[4] Such markets are changing rapidly as firewood gains popularity as an energy source rather than just a luxury item for decoration and entertainment.

Most markets in America are established institutions with an array of rules, regulations, standard operating procedures, tax laws, etc. to organize the exchange of goods and services. These rules and customs provide advantages for some market participants and activities and disadvantages for others. For example, various institutional and environmental factors have favored the automobile industry and discouraged the development of mass transportation alternatives.

Since policymakers want to encourage development and exploitation of domestic energy resources such as wood as a home heating fuel, it follows that the institutions and policies influencing firewood markets must be designed or changed as necessary to encourage greater reliance on wood.

One method of encouraging wood utilization is to use educational campaigns to try to influence consumer preferences. Such activities are beyond the scope of this study. We assume the traditional notion of consumer sovereignty. The question then becomes what policy measures, if any, should be used to influence the market so as to encourage more consumers to heat with wood given a population of consumers with various combinations of incomes, tastes and preferences. The objective is to provide these consumers with the alternative of being able to acquire firewood as a convenient, dependable heating fuel at a reasonable price.

If firewood is to be a cheap and dependable alternative energy source for a large number of people, it is important that efficient institutions for marketing and distribution exist. The purpose of this study is to describe the market for firewood in a small metropolitan area, Lansing, and consider alternative policy measures to improve it's performance.

Literature

A number of other firewood market studies have been conducted with different objectives in mind. Nagle and Manthy conducted a study of the market for fireplace wood in New Haven, Connecticut in 1966.[5] The study was a descriptive study of the market with emphasis on sources of supply and marketing practices.

Most other studies look at firewood production and marketing from the producer or firewood dealer's perspective. Studies conducted in Tennessee and Massachusetts give information on activities and operating costs of typical firewood firms.[6] Another study combines consumption data from the Baltimore-Washington and Minneapolis-St. Paul areas with cost data for three firms using La Font Processors to mass produce firewood.[7] The Cooperative Extension Service of Baraga County, Michigan has developed a report giving information about various firewood producing firms throughout New England and the Lakes States.[8]

The foregoing studies will be cited as necessary for cost data and to suggest alternatives to practices and market conditions which are common in the Lansing area.

Approach of This Study

This study uses a structure-conduct-performance paradigm, where market structure and conduct are considered in terms of demand, supply and market environment. Where possible, alternative structural arrangement will be compared, based on production, marketing and policy alternatives which have been used elsewhere either within the fuelwood industry itself or in other related industries, to discover policy measures that yield a better performance. Market performance will be analyzed from the perspective of the consumer who is trying to locate a cheap, dependable and convenient heating fuel.

The structure-conduct-performance paradigm utilized in this study and the variables chosen as relevant were similar to those found in a number of articles. The basic approach can be found in a paper by Bruce Marion, Application of the Structure, Conduct, Performance Paradigm

to Subsector Analysis.[9] Marion lists several conceptual schools or approaches to the structure, conduct, performance paradigm. These include technological determinism, behavioral, and institutional approaches. The approach of this study most closely resembles the institutional approach with some technical determinism included. Several of the dimensions of structure, conduct and performance which will be considered in this study were chosen from among a list of dimensions Marion mentioned as critical in his paper.[10]

Since we assume consumer sovereignty, consumer preferences will be treated as exogenous except where market and product information may persuade consumers to purchase or acquire a different quality or quantity of product to better meet their demand for a cheap, dependable and convenient heating fuel. Various scenarios of supply and market environment will be considered in order to consider structural alternatives that will more effectively meet the demands of the various classes of firewood consumers, especially those who heat with wood.

The analysis will focus on alternative ways of structuring the supply side of the market in terms of number and characteristics of suppliers, product standards, vertical coordination and technology of production. Alternative advertising methods, facilities for exchange, and rules and policy measures, especially as they influence supply and exchange, will also be compared.

Relevant market performance criteria are discussed in an article by Jesse.[11] He also discusses the difficulty of empirically measuring performance according to the various criteria. Sosnick lists undesirable market characteristics which shouldn't be present if a market is to be

considered "effectively competitive."[12] Bain in his book on industrial organization gives additional suggestions for appropriate performance measures in studies such as this one.[13]

Market performance criteria in this study include price and quality of product, dependability of supply, effectiveness of the market in communicating consumer preferences, and transactions costs. Profitability and excess supply problems will only be considered insofar as they may have a long term impact on quantity and quality of the product supplied.

Before alternatives can be considered, we must know the current structure of the market and the characteristics of the various participants involved. Specifically, we need to find out something about consumer preferences and attitudes, current and projected demand for fuelwood and factors which may influence demand. On the supply side, we want to know number and characteristics of suppliers, trends in supply, factors which influence supply, and technology of production. Advertising methods, rules and standard operating procedures for exchange and product and market characteristics can be considered as part of the market environment.

Structure of the market and it's influence on conduct of the participants will be discussed under the three headings mentioned above: demand, supply and market environment. These topics make up Chapters II, III and IV respectively. The effect of these structural characteristics and conduct, on performance are discussed in a separate section on market performance, Chapter V. The last chapter considers critical performance areas and discusses alternative policy measures which may improve performance.

METHOD

Information necessary to complete this study includes data from the Lansing area on the various demand, supply and market characteristics mentioned above. Most of this information is not available from secondary sources in the Lansing area. As a result primary data must be collected. Data on market structure can be used to make inferences about conduct of participants and data and inferences about market structure and conduct can then be used to predict performance based on economic and behavioral principles and assumptions. Empirical information about conduct of participants and performance of the market can be used in some cases to test the validity of our predictions and inferences. Since performance is difficult to measure empirically in many dimensions, assumed relationships between performance criteria and measurable outcomes will be used as necessary.

Demand and supply information were obtained from three telephone surveys. (Copies of each survey instrument are included in the appendix.) One survey consisted of a simple random sample of 279 households. Another was a sample of 37 households who have recently purchased woodburning equipment. The third survey was a sample of fuelwood dealers who sell at least part of their firewood in the Lansing area. Supporting information was also obtained from an energy-use survey of 207 residents of Oakland and Livingston Counties.

The study area was the Lansing metropolitan area. Since most of the data was collected by telephone, it was limited to the local calling area. The local calling area includes Lansing, East Lansing, and suburbs such as Williamston, Grand Ledge, Mason and surrounding rural areas but

excludes outlying communities such as Charlotte and Perry. Okemos was also excluded from the first consumer survey.

Consumer Surveys

The original sample of 279 households was about 70% homeowners. Multiple-unit dwellings made up about 25% of the sample. Most of the respondents lived in urban or suburban areas (43.5% city, 26.6% suburban and 12.5% small town). The remaining 17.5% lived in rural areas.

Only 246 cases were usable because of 33 who refused to respond. This shouldn't be a major source of bias since it is likely that few of the nonrespondents used any firewood at all.

Those who use firewood are likely to be interested in a firewood survey of this nature since the information may be helpful to them; others may not care about firewood, especially if it isn't a viable heating fuel for them to consider. This is confirmed by the fact that the reason most often cited by nonrespondents for not responding to a wood energy survey is that they don't use firewood.

To adjust for the problem of nonresponse, wood utilization percentages are based on the complete sample with all nonrespondents treated as if they don't use wood for heat. Nonresponse to individual questions in the survey will usually be handled by calculating percentages of respondents only.

Questions in this survey included a series of questions on household characteristics, wood utilization and attitudes. The sample was divided into two subsamples: the first 205 respondents were asked a number of attitude questions to determine trends, plans and expectations with respect to wood utilization in the future. Most of these attitude

questions applied only to those who don't use wood for heat. Later, when 74 additional respondents were contacted to increase the size of the sample, these attitude questions weren't included to speed the completion of the survey.

Because such a small number in this sample considered wood as a major heat source (see demand section for numbers and percentages), another sample of wood users was obtained from the files of three local woodstove dealers. The second sample was intended to be exclusively wood users. All the respondents had purchased some type of woodburning equipment in the year preceding the survey. Such a sample may not reflect the overall population as well as a random sample of wood users. Since most of these respondents had just recently begun heating with wood, they may not accurately reflect the attitudes and practices of those who have been using wood heat for a longer period of time. However, this sample may help support some of the findings from the original sample.

The second sample consisted of 62% rural residents and included only 2 respondents from Lansing itself. The same questions were used (with some minor additions and changes) in the first and second samples.

The sampling frame for the first survey was all possible seven digit telephone numbers from the local exchange dialed from campus. Numbers were generated from a random numbers table so that any number had an equal chance of being selected. Such a survey necessarily excludes those who don't have telephones or who weren't home during the calling period. Numbers where no one could be reached were dialed on several different evenings and Saturdays to try to reduce the percentage

of nonresponse. Many numbers where no connection was ever made were businesses so could not be legitimately counted as nonrespondents. The interviewer estimates that the percentage of households included in this group of nonrespondents was less than 10% of the number actually contacted. For further discussion of the advantages and disadvantages of the telephone survey method see Professional Telephone Surveys by A. B. Blankenship.[14]

Firewood Dealer Survey

This survey is of a different nature than the consumer survey. The purpose of this survey was to contact a broad cross-section of suppliers, and not to make statistical inferences about the entire population. Such a cross-section must include a substantial percentage of the population so that all classes of dealers are included. Nonresponse percentages and characteristics are not a major concern unless a class of dealers is largely excluded from the sample.

A list of local suppliers was obtained from the Lansing State Journal and the Towne Courier. Several tree removal companies were discovered in the yellow pages of the phone book. A number of other dealers were discovered by word of mouth from their competitors, customers, wholesalers and woodstove dealers. Those who didn't sell any firewood locally were excluded from consideration except for comparison purposes.

The survey was administered informally with a series of short answer questions and probing by the interviewer to discover motivation, plans, and unusual practices of various dealers. The questions focused on price, service and quality, plans and objectives, source of wood, size

and volume of business, inventory management, period of operation, equipment used, costs, customer characteristics and advertising. A copy of the survey form and questions are included in the appendix.

Seventy-five of the surveys were coded with respect to discrete or quantifiable characteristics, for statistical purposes. The SPSS package was used on this data to generate frequencies and cross tabulations to compare characteristics of various classes of suppliers.[15] Other useful information was gleaned by hand from the individual survey forms.

The survey was conducted in February, March and April of 1980. Several more dealers were contacted in October and November for purposes of comparison. A total of 105 firewood dealers were contacted in this way of whom 100 actually sold or exchanged fuelwood in the 1979-80 winter season.

An attempt was made to contact every dealer that could be contacted within the limited time available. A number of dealers were excluded because they refused to respond or couldn't be reached at the time of the survey. Several others which were unknown at the time of the survey were discovered through various sources after the survey was finished. A number of others were probably missed because the writer was unaware of their existence. Those most likely to be excluded are the small localized part-time dealers who advertise with a sign in their yard, by word of mouth, or by selling door-to-door. Small dealers are common along rural roads and in suburban neighborhoods selling door-to-door.

Several large dealers who advertise frequently were among the non-respondents. A number of others probably did not report true information

for fear of internal revenue audits. In general, there is an incentive to under-report wood sales because few firewood dealers obey state and federal tax laws and do not wish to be conspicuous. Others were reluctant to give information on wood sources for fear of revealing trade secrets to the competition.

Along with survey data, newspaper ads were used to cross-check information on prices, quality and period of operation and fill in gaps caused by nonresponse. Newspaper ads were also useful in showing advertising practices.

The survey data, once it has been collected, can be used to make inferences about firewood market characteristics of interest. First, we can estimate demand from consumer survey data on firewood consumption, fireplace and stove ownership and attitudes. Chapter II discusses demand and the factors which influence the demand for firewood under different conditions.

ENDNOTES

[1]David A. Tillman, "Uncounted Energy: The Present Contribution of Renewable Resources" in David A. Tillman, K. F. Sarkanen and L. C. Anderson (eds.). Fuels and Energy from Renewable Resources (New York: Academic Press, 1977).

[2]"New England Firewood Use," based on the results of a survey of 6,000 households in New England conducted by the U.S. Department of Agricultural Economics, Statistics and Cooperative Service cited in The Northern Logger, 28, No. 10 (April 1980). A cord is defined as the amount of wood that fills 128 cubic feet of space when the wood is tightly stacked, usually a stack of wood 4 feet wide by 8 feet long by 4 feet high.

[3]James S. Trefil, "Woodstoves glow warmly again in millions of homes," Smithsonian. 9 (October 1978), 54-57.

[4]For an example see George S. Nagle and Robert S. Manthy The Market for Fireplace Wood in an Urban Area of Connecticut, U.S. Forest Service Research Paper NE-51, (Upper Darby, Pa: Northeastern Forest Experiment Station, 1966). 16 pp.

[5]This study discusses the market in the 1963-64 fireplace season.

[6]Richard L. Mosena, "Economic aspects of firewood production in east Tennessee" ([Knoxville?]: Tennessee Valley Authority, 1976). 40 pp; George P. Frick, The Firewood Producer's Manual, ed. Jane A. Difley ([Sunderland]: Mass. Tree Farm Committee, 1978). 46 pp.

[7]U.S. Forest Service, Prospectus: Firewood Marketing and Manufacturing by Ralph T. Monahan and Jeffrey L. Wartluft, 1980. 25 pp.

[8]Baraga County Cooperative Extension Service, A Look at the Business of Fuelwood Marketing and Manufacturing ... 1980 (L'Anse, Michigan: 1980).

[9]Bruce Marion, Application of the Structure, Conduct, Performance Paradigm to Subsector Analysis ([Columbus]: Mimeo, 1976). 9 pp.

[10]Marion, p. 3.

[11]Edward V. Jesse, Measuring Market Performance: Quantifying the Non-Quantifiable. N.C. Project 117 Working Paper 15 (1978). 22 pp.

[12]Stephen H. Sosnick, "Toward a concrete concept of effective competition" Am. J. of Agr. Econ. 50:4 (1968) 827-853.

[13]Joe Bain, Industrial Organization, 2nd ed. (New York: John Wiley and Sons, 1968).

[14]A. B. Blankenship, Professional telephone surveys (New York: McGraw-Hill, 1977). 244 pp.

[15]For more information on SPSS see Norman H. Nie et al., Statistical Package for the Social Sciences, 2nd ed. (New York: McGraw-Hill, 1970). 675 pp.

CHAPTER II

DEMAND

Description

Demand can be considered as either a static or a dynamic concept. This study considers fuelwood demand primarily as a static phenomenon. Most of the survey data was in terms of current (1979-80) market conditions with some questions about response to various alternative scenarios involving changing price of fuelwood and substitutes.[1] The study is dynamic in that current trends will be considered. Our focus is on primary demand (for consumption by homeowners).

The demand side of the firewood market is like most other consumer goods markets in that it involves many independent buyers with a variety of tastes and preferences with respect to comfort, convenience, use of time, safety and willingness to pay.

Aggregate demand for firewood in terms of quantity and quality demanded is a function of tastes and preferences, income, price of the various types of wood, price and availability of substitute goods, population, weather, and price and ownership of complementary goods such as woodstoves, fireplaces and wood furnaces.

This study abstracts from possible changes in tastes and wood utilization technology except as they are reflected in current utilization trends. It is difficult to ascertain the slope of the demand curve empirically to determine how demand might change with changing price. In predicting changes in demand we will consider trends, attitudes and comparative costs of wood as a fuel versus alternative fuels.

One of the main determinants of firewood demand is ownership of complementary goods--woodstoves, fireplaces, wood furnaces and related accessories. Before a person can burn firewood in his home and gain any benefit he must own some type of woodburning equipment. As previously stated, there has been a strong upward trend in the demand for woodburning equipment in recent years, reflecting many of the same factors which caused an increase in the demand for firewood. There have also been a number of technological changes improving the efficiency and ease of operation of woodburning equipment.[2] Changing technology, particularly as it affects the cost, ease of operation, convenience and safety of woodburning may have a significant impact on demand in the future.

Firewood consumers demand wood for a number of reasons. Some (primarily fireplace users) use it solely for pleasure and aesthetics. Others use wood as their primary heating fuel. There is a wide range between these extremes where people use firewood for varying amounts of supplemental heat, sometimes combined with occasional use for aesthetic purposes, or both.

A number of studies classify firewood consumers into four categories: fireplace owners who use wood exclusively for aesthetic purposes, fireplace owners who use wood for both heat and aesthetic purposes, woodstove and wood furnace owners who use wood as a supplementary heating fuel and those who use wood as a primary heating fuel.[3]

Because of limitations in the data, this study considers two basic classes of users, those who own fireplaces and those who own woodstoves with some consideration of those who heat exclusively with wood.[4]

Quantity Demanded by Fireplace and Woodstove Owners

In general, we would expect woodstove owners to use more wood than fireplace owners since they are more likely to consider their woodstove as an energy source. One factor which reduces this is the fact that fireplaces are so inefficient in utilizing wood. If a person wants a reasonable amount of heat from his fireplace he will have to use quite a bit more wood for an equivalent amount of heat.[5]

In the Lansing area most of those who use fuelwood are fireplace owners. About 30% of the sample and 45% of homeowners use woodburning equipment in their homes. Of those who use woodburning equipment, 75% own fireplaces, 15% own woodstoves and 10% own wood furnaces.

This survey reveals that most fireplace owners use their fireplaces infrequently. As a result they don't have a significant input in heating the home. A survey in nearby Oakland and Livingston Counties found that most fireplace owners do not consider their fireplaces as a source of supplemental heat.

Fireplace owners in the Lansing area use comparatively small quantities of firewood. Firewood in Michigan is generally sold by the face cord which is a stack of wood 4 feet high by 8 feet long by 12 to 24 inches wide (usually 16 inches wide). Most fireplace owners (71.1%) in this survey said they used one face cord or less during the winter of 1979-80 with 60.8% acknowledging they used their fireplace less than 5 hours per week on the average. (See Tables 2-1 and 2-2.)

Many fireplace owners have purchased devices such as heatalators, glass doors, blowers and various other devices to increase the efficiency of their fireplaces. About one-third of our sample of fireplace owners indicate having done so. Some have even purchased fireplace inserts

TABLE 2-1

NUMBER OF FIREPLACE AND WOODSTOVE
OWNERS BY AMOUNT OF FIREWOOD USED

User Class	Quantity of Firewood Used in the 1979-1980 Heating Season (face cords)				
	Less Than 1	1-2	3-10	11 or more	Don't Know
Fireplace Owners	20	16	7	2	29
Woodstove Owners	0	3	8	2	3
All Wood Users	20	19	15	4	32

TABLE 2-2

NUMBER OF FIREPLACE OR WOODSTOVE OWNERS
BY HOURS PER WEEK THAT WOOD IS BURNED

User Class	Number of Hours that Wood is Burned - Winter Average (per week)				
	Less Than 1	1-5	6-10	11-50	Over 50
Fireplace Owners	10	21	4	21	4
Woodstove Owners	0	0	2	2	12
All Wood Users	10	21	6	23	16

which are basically woodstoves. As a result, there is no longer as clear a distinction as there used to be between a fireplace and a woodstove. Some of both groups can heat a home efficiently with wood.

Only 17% pf those who burn wood ever use wood as their only heat source for any length of time on a regular basis, and only about 8% of woodburners listed wood as their primary heat source. This compares with estimates that about 5.5% of woodburners heat with wood in Baltimore-Washington and Minneapolis-St. Paul areas.[6] About 25% of wood users indicate they operated their stove or fireplace more than 25 hours per week during the 1979-80 heating season.

The average quantity of wood used was about 3.1 face cords with an average operating period of 25 hours per week during the heating season last year. This was based on the 90 who used woodburning equipment out of the sample of 279.

Fireplace owners in the survey used an average of 2.0 face cords last winter and operated their fireplaces an average of 13.5 hours per week. Since there are probably around 140,000 households in the metropolitan area, we could extrapolate that demand for fireplace wood was about 70,000 face cords.[7] It may well be higher since outlying areas weren't surveyed. Rural residents are more likely to be homeowners and have easier access to wood than others, therefore their demand per household is probably greater.

Woodstove owners in the survey used an average of 6.0 face cords and operated their stoves an average of 80 hours per week last winter.[8] Extrapolating over the metropolitan area, approximate annual wood consumption for woodstove use was about 42,000 face cords. A sample of 25

who consider wood as their primary heat source used an average of about 9.5 face cords each in the winter of 1979-80.

The total fuelwood demand in the Lansing metropolitan area was about 110,000 face cords last winter calculating from survey averages. Allowing for the likelihood that our averages were low, actual demand may have been as high as 200,000 face cords.[9]

Preference of Fireplace Owners vs. Woodstove Owners

Because of differences in objectives between the two categories of wood consumers, there are differences in the type of products and services demanded. Fireplace owners burn wood largely for pleasure and aesthetics. They also use small quantities of wood. Since there is also a tendency for fireplace owners to have higher incomes, their demand for firewood is largely determined by the opportunity cost of cutting their own wood, price of synthetic wood and price of alternative forms of entertainment.[10] The "income effect" whereby consumption declines with higher prices because of budget constraints isn't likely to have much effect on fireplace owners, who usually use no more than 50 to 100 dollars worth of firewood per year.

Most woodstove and wood furnace owners are in an entirely different position. They burn wood primarily to save money on heating fuel.[11] Budget constraints are a major factor for many of them, since they use an average of about 200 dollars worth of firewood.

As a result, we would expect fireplace owners to pay a higher price for a better quality product and service mix. Woodstove and wood furnace owners, with cost savings as a major objective, will be much more likely to seek the least expensive method of acquiring firewood.

The most obvious cost-saving alternative would be for a person to cut his own firewood. Doing so he foregoes the benefits of having someone else cut and split the wood. He may have less choice as to species and must season the wood himself.

Both surveys support this hypothesis. (See Table 2-3.) In the survey of wood users, 50% of fireplace owners purchase at least some of their own firewood while only about 25% of those who use wood as their primary heat source purchase any wood. Of those who reported using three or more face cords last year, all but 5% cut at least some of their own wood while 37% who used two face cords or less purchased all of their wood.

Part of this difference may be related to locational factors. Fireplace owners are widely distributed throughout the metropolitan area, their percentages almost matching sample percentages in the survey (Table 2-4). Fireplace owners are slightly more concentrated in suburban and rural areas, especially in newer subdivisions with larger houses.[12]

Woodstove owners, on the other hand, are heavily concentrated in rural areas; 21.9% of rural respondents have woodstoves while only 5.2% of the urban and suburban respondents have them. Rural residents in general are more likely to have woodlots nearby where they can cut their own wood.

Most people who heat with wood are not particular about the species of wood they burn provided that it is some type of hardwood. Fifty-three percent of survey respondents fall into this category. Many will use softwood if it is the only wood available or can be had for a lower price (38% of survey respondents). Most acknowledged a willingness to pay more for seasoned wood (73%).

TABLE 2-3

RELATIONSHIP BETWEEN TYPE OF WOODBURNING DEVICE AND WHETHER FIREWOOD IS PURCHASED OR ACQUIRED FREE OF CHARGE

Type of Woodburning Device	Source of Wood		
	Purchase all Firewood	Purchase some Firewood	Acquire All Wood Free of Charge
Number of Fireplace Owners	16	18	26
Number of Woodstove Owners	1	2	8
Number of Wood Furnace Owners	0	1	8

TABLE 2-4

RELATIONSHIP BETWEEN WOODBURNING AND LOCATION

Type of Woodburning Device	Location			
	Urban	Suburban	Rural	Small Town
Number Who Don't Use Wood	49	22	11	13
Number Who Own Fireplaces	28	23	14	8
Number Who Own Woodstoves	3	4	7	1

Those who had particular species or quality preferences were often small scale users (mainly fireplace owners). As a result certain wood such as white birch, cherry, apple and hickory are in greater demand than others.

Trends

Demand for firewood is a function of the price and availability of alternative fuels. With current price levels, firewood is competitive with fuel oil and electricity but is more expensive than natural gas.[13] Survey data indicates that natural gas users have been less likely to switch to wood heat, especially when high investment and/or wood acquisition costs are involved. From the survey of 37 woodstove and fireplace owners 23 (62%) use fuel oil, 9 (25%) use natural gas and 5 (13%) use electricity for heat. This compares with data from the overall consumer survey which showed that 75% of homeowners heat with natural gas, 15% use fuel oil and 5% use electricity.

A number of people acknowledged that it would be more expensive for them to heat with wood than continue using natural gas when asked about their propensity to switch to wood heat. Several even said that a doubling or tripling of natural gas price would still not overcome the cost difference enough to make up for the inconvenience of wood heat.

Many people expect relative prices of fossil fuels (including natural gas) to increase rapidly in the future so that of 10 who plan on switching to wood, 8 currently heat with natural gas.

The trend toward wood heat is fairly strong with nearly five percent of the sample indicating some plans to switch to wood heat. If fossil fuel prices should rise rapidly we could expect even more to switch.

Eighteen percent said they would switch to wood if the price of their current heating fuel doubled, and 44 percent said they would switch if price tripled (assuming wood prices remained constant). The actual number who would switch under various scenarios is probably lower because of likely increases in fuelwood prices and the high initial investment required.

Demand for firewood is comparatively volatile because of fluctuations in weather from year to year. The winter of 1979-80 is a good example of how an unusually warm winter without snow can hurt firewood sales significantly.[14] Besides the smaller heating needs in such a winter, lack of snow allows many homeowners easy access to wooded areas where they can cut their own wood.

In most winters, heavy snows and lack of woods access catch consumers and some wood retailers unprepared. Their only alternative to maintain adequate wood supplies is to purchase from suppliers and wholesalers who are better prepared (having stockpiled wood during the summer and fall).

The preceding chapter has shown that woodstove owners and fireplace owners used in excess of 100,000 face cords of firewood last year. The fact that only those who use small quantities of wood purchase most of their firewood would lead us to believe that only about 25 percent of the wood that is used is purchased in the market. This is comparable to figures from New England which show that between 25 and 50 percent of the firewood used is purchased in the different states.[15]

From the figure of 25 percent we can estimate that somewhere around 27,000 face cords of wood were purchased last year. This estimate

probably has a wide margin of error and could be as low as 15,000 or as high as 50,000 face cords. It can be expected to increase this year, rising by at least 10 or 15 percent unless this winter is milder than last.

For consumers to purchase that much firewood, suppliers had to sell as much in the Lansing area. Now that we have an idea of the demand, we can look at the supply and see how the two compare. Also we can consider how suppliers attempt to meet demand for seasoned wood and demand of the different consumers with various species preferences.

ENDNOTES

[1]When we speak of price, we also include costs of acquisition for those who cut their own wood.

[2]For more information on current woodburning technology see The Woodburner's Encyclopedia by Jay W. Shelton and Andrew B. Shapiro (Vermont: Crossroads Press, 1976).

[3]This is the classification scheme used in two studies conducted by the Maryland Forest Service and the Minnesota Department of Natural Resources cited in the U.S. Forest Service study, Firewood Marketing and Manufacturing, p. 9.

[4]Woodstove owners are grouped with wood furnace owners because of the small sample used and similarities in use of both. Wood furnaces can heat a larger area than woodstoves and are more likely to be used as the primary heat source in a home. "Woodstove" when contrasted with fireplace in this study is often used to mean any indoor wood-heating device other than a wood fireplace.

[5]Fireplaces usually retain less than 10 percent of the heat produced from the wood that is burned as heat for the house. The rest goes up the chimney. Non-airtight box stoves can reach efficiencies of 40 to 50 percent, though often less. Airtight stoves and furnaces are generally 55 to 65 percent efficient. For a more detailed discussion of this see Heating with Wood by S. A. Weeks, J. P. Lassoie and L. D. Baker (Northeast Regional Agricultural Engineering Service, Ithaca, New York, 1977).

[6]U.S. Forest Service, Firewood Marketing and Manufacturing, Table 5, p. 17.

[7]Extrapolations from census data, 1977 estimates. The population of the four counties included in the metropolitan area, Eaton, Ingham, Clinton and Ionia was 455,100 in 1977 (Michigan Statistical Abstract, 1978, Table I-5). Using 3.25 as the approximate population per household gives an estimate of 140,000 households. Number of persons per household for each county in 1970 is given in Michigan Statistical Abstract, 1978, Table I-22.

[8]Wood usage may be low since many who cut their own wood don't know how much wood they used. Others may not know the difference between a cord and a face cord.

[9]The fact that our sample excluded primarily rural homeowners, as well as the likelihood that those who didn't know how much wood they used were larger users would cause our estimates to be low.

[10]Fireplaces are expensive to build and are usually found in larger more expensive homes owned by higher income people.

[11]This is confirmed by the survey of those who have recently purchased woodstoves where 20 out of 37 cite cost savings as their primary reason for switching to wood heat.

[12]Subdivisions in East Lansing such as White Hills have a high proportion of homes with fireplaces.

[13]Natural gas price as of May 1980 was .2165 cents per cubic foot in Lansing according to Consumer's Power Company. Adding in fixed charges the cost to homeowners may be close to .25 cents per cubic foot. This is the equivalent of $3.57 per million BTU's at 70 percent efficiency. Dry red oak firewood at $90 per standard cord costs about $7.50 per million BTU's assuming 50 percent efficiency. A more detailed comparison is given in a University of Minnesota Agricultural Extension Publication, Heating the Home with Wood (St. Paul, University of Minnesota, 1979), pp. 14-16.

[14]As reported by fuelwood dealers, demand was well below expectations and prices fell as a result. In previous winters, observance of newspaper ads often shows a tightening of supplies in midwinter (fewer ads and higher prices).

[15]"New England Firewood Use," The Northern Logger, 28, no. 10 (April 1980), 1.

CHAPTER III

SUPPLY

Description

In the Lansing area, the firewood market involves over 100 commercial suppliers who sold a combined total of well over 12,000 face cords locally in the winter of 1979-80.[1]

Most firewood firms consist of one person or a few individuals (often related) working together who have access to extra wood from their own property or from a nearby farmer's property and have taken advantage of recent increases in demand for firewood to earn some extra income. Most sell only small quantities of wood. Of 104 firms sampled, 64 reported selling less than 50 face cords last winter.

Most suppliers in this survey cut the wood themselves either clearing out live trees, dead or down wood or logging tops. About 80 percent of suppliers reported cutting or gathering the wood themselves. Often this wood was available free of charge (40 percent of the time), at a small charge (15 percent payed less than $10 per face cord) or on shares (almost 10 percent). (Table 3-1)

Most fuelwood dealers contacted in the Lansing area are producer-retailers, manufacturing and marketing all the fuelwood they sell. Others, especially larger firms, purchase part or all of their wood from wholesalers and concentrate their efforts on marketing. Most of these merchant-retailers are also involved in some manufacturing, usually converting the wood to usable pieces by cutting and splitting as necessary. A

TABLE 3-1

RELATIONSHIP BETWEEN VOLUMES OF FIREWOOD SALES AND METHOD AND COST OF WOOD ACQUISITION

Supplier Class By Sales Volume	Method and Cost of Wood Acquisition (Cost Per Face Cord)					
	Free	Shares	Under $10	$10-$20	Over $20	Variable or Uncertain
Dealers Who Sell Less Than 10 Face Cords	5	2	1	2	1	1
Dealers Who Sell 10-50 Face Cords	17	3	3	2	1	3
Dealers Who Sell More Than 50 Face Cords	5	3	7	4	1	1
All Dealers*	30	8	16	11	3	8

* This includes some who didn't report sales.

number of others were contacted, some of whom were largely wholesalers selling a substantial part of their wood for resale. Many of these wholesale firms harvest the wood themselves but perform little additional processing. Several can be considered only as distributors purchasing the wood from pulpwood cutters, transporting it to market areas, and selling to retailers.

There is considerable overlap between producers, wholesalers, retailers and distributors. A given firm may be involved at different levels of the market at different times or may be in all levels of the market at the same time.

From the consumer's point of view, what is important is the product and service mix available at the retail level and the price. Wholesale markets are only important insofar as their prices and practices influence retail price and quality. Since all wholesalers in this study also sold fuelwood directly to consumers, all firms are considered as part of the retail market.

Firewood is not a homogeneous commodity for which a simple demand and supply model can be used to relate price and quantity supplied. When a person makes a decision to purchase or acquire firewood, he must choose between a large number of alternative product and service mixes as supplied by the different suppliers at various prices. His purchase involves a choice of product quality and quantity as expressed by seasoning, wood species, size of the load, amount of bugs in the wood, size and number of pieces and others. It also involves some choice between services such as delivery, promptness of service, method of payment required, stacking and responsiveness to complaints.

These product and service choices provided by the various suppliers and the market performance which results are determined by a number of decisions, objectives and constraints facing each individual supplier.

This chapter seeks to examine the influence of various firm objectives, characteristics and decisions on product and service mix and price offered over time.

The chapter is divided into four sections. The first considers objectives and characteristics of different firms as they influence price, quality and services provided. The second section serves to summarize and expand on parts of the first by looking at key services and considering which types of firms are likely to provide them. The third section considers alternatives that a firm has with respect to source of supply, technology and method of operation as they influence quality, services and price. Finally, the fourth section considers how we might expect the fuelwood supply situation to change over time under various scenarios.

OBJECTIVES

The market can be divided into several major classes of sellers as follows:

(1) Those who consider firewood as a full time business;

(2) Those who produce and sell firewood full time in season but operate some other business the remainder of the year;

(3) Those who produce, transport or sell firewood as a byproduct--loggers, pulpwood cutters, wood products firms, and even trucking companies;

(4) diversified retail outlets such as hardware stores, garden stores, grocery stores, etc. that offer firewood as a small part of their product line;

(5) part-time operators who have access to wood and cut and sell firewood to earn extra money, as a hobby or for exercise.

Part-time

Most firewood sellers fall into the last category as part-time operators. This group includes firms that sold anywhere from a few bundles of wood to some that sold over 500 face cords last winter. Most work primarily during their spare time spending evenings, weekends and days off cutting, splitting and delivering wood. Some are students or teachers who stockpile wood during free time in the summer so that they can sell during the busy winter season.

Most part-time firms operate for a period of between two and six months with peak sales and production between October and December. Sometimes another sales peak occurs in January and February when there is heavy snow cover and few firms have wood available. Many part-time sellers just sell until they run out of wood, once or twice advertising in the fall to get business moving. Some will continue to serve established customers after their main selling period is over with extra wood left over, or by cutting to order.

As a group, part-time sellers offer a wide variety of prices and product-service mixes depending on objectives and acquisition costs. Those who sell primarily to earn extra income are likely to sell wood at comparatively high prices and seek to minimize acquisition and processing costs. Some will try to pass off poor quality wood (poor

species or unseasoned) as good quality wood, particularly if they don't plan to sell for very long. Others will seek to minimize the actual wood per face cord by dumping a pile or stacking loosely. We would expect those who plan on selling for a longer period of time to be more likely to offer good quality wood.

Some firms may produce and sell wood primarily for reasons other than income. Other reasons for selling wood include recreation, benevolence or desire for recognition. If income isn't particularly important, a firm may offer a lower price but restrict quantity. Many part-time sellers offer a limited quantity and cannot be counted on to respond quickly to customer requests, especially in periods of unusually high demand.

To get a better handle on the specific practices we would expect from individual suppliers we need to consider more closely the possible objectives of a part-time firewood seller. For simplicity, we will consider a number of classes of dealer objectives and characteristics. Part-time firewood sellers can be divided into four subgroups:

(1) Those who decide they want to earn some extra income and have chosen the fuelwood business as the way to earn that extra income;

(2) Those who acquire wood or have the opportunity to acquire wood because of circumstances in such a way that firewood sales becomes a profitable alternative;

(3) Those who cut and sell firewood because they enjoy it as a hobby;

(4) Those who are unemployed and sell firewood to occupy their time and supplement their income.

The first group has characteristics which are common to all the groups and largely fits the general description already given. We just consider the last three as separate classes of fuelwood sellers.

Circumstances

First we can consider the individual or firm who has come upon some wood largely as the result of circumstances. Included in this group would be farmers with small woodlots or fencerows, orchard owners and workers, those who are handy with a chainsaw and know someone with woods to clear, and construction workers who are involved in land clearing.

These types of firms can generally acquire firewood at little or no cost. At least the variable costs of acquiring firewood are low since they already own the standing timber or have cut the wood for another purpose.

This type of dealer is often selling wood as a one-time opportunity. He wants to get rid of the wood as soon as possible for quick income. Such an individual or firm will provide services such as delivery, stacking and splitting as necessary to generate demand. He doesn't need to charge a high price to cover his costs and may benefit by undercutting the market if he wants to move a lot of wood quickly.

This type of firm is also more likely to be careless about quality factors that are difficult to discern such as seasoning, species mix and size of the units that he sells. If a firm doesn't plan to continue selling in the future, reputation, which may be affected by these factors will not be important.

Included in this group are a number of dealers who advertise various you cut-it-yourself arrangements. These are mainly farmers and other

property owners, usually with a limited supply. Those with large quantities can usually sell their wood wholesale without even advertising.

There are 31 firms of this type in our sample who reported circumstances or extra wood left over from other activities as the reason for entering the fuelwood business. According to our survey results these types of firms sold small quantities of wood (six sold less than ten face cords and none sold more than 250 face cords) and offered some of the lowest prices (four offered firewood for less than $30 per face cord). Many also sold at comparatively high prices.

Several in this group reported not seasoning their wood very much. All but 3 in this group reported acquisition price of less than ten dollars per face cord with 18 reporting that their wood was acquired free of charge. Only 3 worked more than 25 hours per week on firewood production and marketing. Only 3 firms in this group indicated intentions to increase production and sales this year with 7 indicating plans to decrease production or discontinue entirely. Several had already left the wood business by the time they were contacted. Other factors such as species mix and amount of wood actually delivered per face cord or number of complaints could not be discovered from the survey. Thus, we cannot say conclusively whether our behavioral hypotheses are correct. We had hypothesized that firms in this class would be less likely to provide seasoned wood, tightly stacked face cords or good quality hardwood species than others.

Unemployed Factory Workers

The next major group of part-time fuelwood dealers are those who have been laid off of work and need something to occupy their time and

give them some income. Firewood production and sales offers an ideal solution in that they can earn income on their own while retaining unemployment benefits.[2] Layoffs at Oldsmobile and Fisher Body in the last year have resulted in many new entrants into the fuelwood business. Five of those contacted listed being laid off as the reason for selling firewood. Several others who sell fuelwood full-time also began because of layoffs.

Many dealers in this group are temporary, selling only until they are called back to work. Two of five reported plans to discontinue operations in the near future.

Others have operated for a number of years with the level of fuelwood production and sales depending on whether they are working or laid off of their primary job.

Because most layoffs occurred last fall and winter, dealers in this group had less control over wood quality, especially seasoning and species. They had to find their wood supply in a short period of time wherever they could. Few had much success because they tried to break into a market that had a substantial excess supply problem.

We expect those who are temporary, as many in this group are, to provide wood of questionable quality, depending on the scruples and circumstances of the individual dealer. Others who have more long-range objectives are probably more concerned with quality and customer satisfaction.

Four of the five part-time dealers who reported layoffs as the reason they sell fuelwood offer wood that has been seasoned for over a year. This doesn't necessarily disprove our hypothesis that temporary

sellers offer lower quality wood. It merely indicates that most dealers in this group had access to wood which had been dead or down for over a year. The incentive for giving small loads with too much air space still exists for these firms.

Those sampled also charged comparatively high prices, perhaps an indication that profitability was important for dealers in this class. In Michigan these types of suppliers are likely to be common for a long time to come in conjunction with cycles in the automobile industry.

Firewood as a Hobby

Those who sell firewood as a hobby or for exercise have certain things in common with each of the other groups. Those contacted in our survey are few in number but sell substantial quantities of firewood--all seven reported sales in excess of 25 face cords last winter. We would expect many in this group to have been in business for a long period of time and have many established customers.

Many of these dealers take pride in the quality of product that they offer. Profit is not so important in general and they are more willing to devote time to preparing the wood. Most of them seem to be more knowledgeable than others about wood-utilization technology so that they can more effectively meet the needs of their customers.

Firms in this category are rarely concerned about sales volume. At least one supplier reports that he keeps his prices high just to keep volume at a manageable level. Nevertheless 2 of the 7 report that their firewood business occupies more than 40 hours per week in season. Those who have considered firewood production and sales as a hobby are among the most likely to expand their operations in the future. Two reported intentions of selling much more firewood next year.

Seasonal Firewood Dealers

Those who sell firewood as a seasonal business make up a substantial portion of the market. These are mainly people in construction, landscaping or some other occupation that does not occupy them year around. Though few in number, they are among the largest quantity suppliers in the Lansing area. Several reported selling more than 500 face cords last year.

We would expect dealers from this class to be more interested in building and maintaining an established clientele of customers since they may be in business for a while. As a result, quality of product should be particularly important. These sellers ought to be more careful as to size of the load, species and dryness and more responsive to complaints than others. Since they often are restricted to the coldest months by other job responsibilities, they are forced to sell when the market is most competitive.

They need to maintain a high level of sales with reasonable profit to support themselves by firewood sales. Since acquisition costs tend to be higher for firms that supply quality wood, high sales and reasonable profits are difficult to maintain when market prices are low.

Firms that are having trouble finding enough customers to buy their wood at an acceptable price have several alternatives:

(1) They can try to gain customers through advertising techniques (beyond the typical classified ad) and by offering features such as fast, efficient service in response to customers calls--using an answering service if necessary.

(2) Cut prices and operate on a low profit margin or at a loss until a sufficient-sized clientele has been attracted.

(3) Stockpile wood and/or invest in equipment to enable the firm to capitalize on periods of unusually high demand such as when adverse weather conditions make the woods inaccessible to others. Cash flow may be a problem in this situation.

As a group, seasonal dealers are more likely to provide a quality product at a reasonable price. In some cases they may contribute to price wars in periods of excess supply, while alleviating shortages in periods of excess demand.

Our data isn't conclusive enough to prove our hypotheses about dealers in this group, except to tell us that several have attempted unusual advertising techniques in order to increase sales. Several make it a practice to contact old customers by telephone when wood is available in order to build and maintain an established clientele. Also, these and other large scale dealers are more likely to offer a choice of species and quality. Prices charged varied considerably between firms in this group ranging from $30 to $45 per face cord. As a rule these types of firms did not vary their price last year except by a small reduction at the end of the season to clear out inventories as necessary.

Full Time Dealers

Closely related to seasonal dealers are a number of others who spend at least part of the year working full time selling firewood (more than 40 hours per week). Most have another full or part-time job besides firewood production and sales. Only two firms report firewood production

and sales as their primary occupation. Even these two have other sources of income in the off-season. Full time firewood dealers should be similar to seasonal producers in offering a quality product with the idea of attracting and maintaining an established clientele. Because it is difficult to earn a living selling firewood, we might expect a high attrition rate among those who try to make fuelwood sales their primary occupation. We don't have enough evidence on the local level to test this claim.

The main difference between seasonal and full time dealers is that the latter have more flexibility as to the timing of wood acquisition and sales. Most have a continuous income from other sources so are not as dependent on income from fuelwood sales during a particular season. Those who earn a large part of their living from fuelwood sales are not restricted to a particular season and can adjust their operations accordingly.

Those dealers who aren't too restricted by other occupations can use their time in the spring and summer to stockpile wood for better seasoning. They can also offer special deals in the off-season or attempt to corner the market early in the season before there is much competition. Both of these practices have been used by Lansing area dealers with success.

Two examples demonstrate how some of these full time and seasonal dealers are more responsive to consumers in terms of providing quality products and dependable service. One dealer reports that he will buy wood from another retailer in order to get wood for a customer if he is short. Another dealer has an answering service so that customers can

reach him at all times. A number of dealers, particularly in this group, offer discounts for senior citizens.

Firewood as a Byproduct

There are a number of fuelwood dealers advertising in the Lansing area who sell, produce or distribute firewood because it fits in well with their other activities. Pulpwood cutters have been selling firewood in ever increasing numbers because of the recent economic slowdown. Pulpwood cutters are not located in the immediate area. Most acquire their wood from forested areas more than 100 miles north of Lansing. Another fellow in this category was a trucker who made use of his empty truck to haul firewood from forested areas in northern Michigan to metropolitan areas in the south and southeastern part of the state.

Most producers and dealers in this group are wholesalers. They usually sell the wood by the pulp cord (4 feet by 8 feet by 100 inch stacks) in quantities ranging from 16-22 cord loads. The larger loads may be the result of exaggerated estimates by the dealers. Prices are fairly standardized for pulp cords ranging from $50 to $75 per cord for a truckload, with most charging $55-$60 in Lansing.

Most of those contacted report that a substantial part of their volume is sold on the retail level. Figures are misleading, however, since the seller often cannot tell whether the wood will be consumed or resold. Markets for each firm may include several metropolitan areas, especially Detroit, Grand Rapids, and Lansing, with some going as far as Toledo and Chicago. Prices vary according to distance.

Some of these firms also sell smaller quantities, especially to local customers at local prices. For example, prices at Houghton Lake

are $20-$25 per face cord for the vacationer who happens to have room to bring wood back to Lansing.

This portion of the market has increased substantially in the fall of 1980 because of pulpwood plant closings and probably accounts for most of the wholesale firewood sold in the Lansing area.

Tree Removal Companies

A related group of suppliers in the Lansing area are the various tree removal companies. Several are listed in the telephone directory. Since these firms have been in business longer than most others they understand the fuelwood business better than most.[3] Their products are likely to be of good quality since their reputation is at stake. However, since fuelwood is a byproduct of other operations, they may not always provide prompt service to consumers. Prices are higher than most but only reflect the more dependable quality provided.[4]

Retail Outlets

The last group of fuelwood dealers are the various retail outlets such as farm and garden stores, hardware stores, grocery stores and others who offer firewood as one of a variety of products available to the consumer. Most such firms do not offer delivery but usually provide a fairly standardized product at a reasonable price. The consumer can see what he is getting and the reputation of the firm is at stake. Since such retail outlets thrive on repeat business we can expect them to be responsive to complaints.

These retail outlets are about the only place where small quantities of wood, such as trunkloads, are available as well as kindling. These

smaller units sell at relatively higher prices. For example, an armload of wood at $1.70 can be equivalent to almost $200 per cord.[5] At such prices wood can be highly profitable. Most local retail outlets sell small quantities of wood and account for only a small percentage of the market.

SERVICES PROVIDED

When considering services provided a number of patterns emerge regarding the various types of fuelwood suppliers.

Delivery

Delivery is a service that is almost a must for a successful fuelwood retailer. Most consumers don't own a pickup truck or any other means of transporting their own wood.

Most fuelwood suppliers will provide delivery to their customers, often at no extra charge. Some offer a discount to pick the wood up, but many cut the wood to order and do not have any pick up arrangements. Dealers who sell large quantities of wood on a part-time basis often do not have adequate space to store all the wood themselves. Some fuelwood dealers, particularly small part-time dealers, limit the distance they will deliver and some have charges related to distance. Several of those who deliver free of charge would find they lose money going beyond a certain distance.

Some farmers who sell only moderate quantities as well as most retail outlets will not deliver wood. Tree removal companies are sometimes reluctant to deliver, especially during busy periods. Small localized dealers who don't advertise by newspaper are less likely to deliver than others.

Stacking

Stacking is a service which is considered fairly important, especially in urban and suburban communities. Some consumers even like to have the wood brought into their basement or garage, or stacked some distance from the road or driveway where the delivery truck is parked. Most dealers will charge extra for this type of service and some will not provide it at all. Stacking is normally five and sometimes ten dollars more if available at all. Some dealers, particularly those who want to attract and maintain a large clientele will stack the wood as a matter of courtesy. Many will stack at no charge for elderly or handicapped customers. Sometimes dealers will stack wood just to show how much the buyer is getting; often as loosely as possible to maximize profits.

Processing

The size, shape and dryness (seasoning) of firewood pieces are important for a number of reasons. Consumers like wood that fits their stove or fireplace. Logs can be too small and burn too quickly or too large and difficult to handle. Split wood is easier to burn (and often dryer) than unsplit wood and requires no additional preparation by the consumer. Green wood absorbs almost as much heat energy as a fire can produce in evaporating moisture and should be seasoned before use by the consumer. Dry wood can be used immediately and rids the consumer of storage problems.

Most local fuelwood dealers offer wood in logs 16-18 inches long and split at least once. There are a few dealers who offer a choice of log lengths ranging from 12 inches up to 24 inches for different sized

stoves and furnaces. Larger dealers, especially those who operate all year sometimes offer standard cords with 4 foot or 8 foot logs unsplit for a discount. Wholesalers and pulpwood producers sell primarily 8 foot or 100 inch logs by the pulpwood cord.

Those who have been in business for a while and those who are serious about establishing a clientele are more likely to offer seasoned wood. Part-time producers and those who have recently entered the fuelwood business are more likely to cut the wood as they go. Sometimes wood advertised as seasoned is a mixture of green and dry wood. Sometimes, it was dead or down in the forest for six months to a year, but hasn't been stored after it was cut.

Sometimes the wood they call seasoned hasn't been seasoned at all--or has only been seasoned for a few months. Most consumers cannot tell the difference between dry and green wood and can be easily deceived in this respect. Those who finally realize they've been taken can contact the dealer and complain or stop payment if they have written a check. Many dealers will replace defective wood or increase the size of the load in response to complaints. Those who sell small quantities for a short time have much less incentive to respond to complaints than others.

TECHNOLOGY AND COSTS OF PRODUCTION

The conduct of a given firm in the fuelwood industry is influenced considerably by technology and the method of production and distribution used by that firm.

Location is a key factor influencing the price, quality and service mix provided by a given fuelwood retailer. The location of the dealer as well as the location of the supply source are important determinants

of such things as stumpage price, harvesting costs, transportation costs and processing costs or wholesale price where applicable. Location also influences the dependability of the supply.

Most suppliers contacted in this study were located in Lansing or surrounding areas. A number of firewood producers, especially wholesalers were located in an area upwards of 100 miles north of Lansing.

Firewood producers in the Lansing area have widely varying acquisition costs depending on who they know and where their property is situated. Producers in rural parts of the metropolitan area can usually find a neighbor who has a woodlot to be thinned or cleared or fencerows to be cut. Prices are generally no more than five dollars per face cord for such wood and often there is no charge at all.

City dwellers and more ambitious types can check around and fin logging tops or wood cleared along highway and utility rights-of-way. Prices are generally five dollars per face cord or less, but may go as high as fifteen. Those in construction and related occupations often have a distinct advantage in that they may be involved in land-clearing operations and have little trouble making a deal for the wood cut as a byproduct.

Another option for firewood producers is to purchase land or timber. Several producers in the Lansing area have bought the woods on a piece of land for firewood production. One dealer reports prices as low as eight dollars an acre for a ten-acre tract. Prices depend on objectives of the landowner, stocking and quality of the timber. In central Michigan, stocking can be as high as 50-75 cords per acre but averages less than 10.[6] Purchasing standing timber on a woodlot is a quick way to obtain large quantities of wood at a low stumpage cost. However, such opportunities are comparatively rare.

Other sources of wood include gravel pits, landfills and city parks and recreation areas. City dwellers may have to make do with wood from landfills or from city cleanup operations. Landfill wood is usually of very poor quality and becoming harder to find, although it's free and requires little work to acquire what is available. Wood from city cleanup operations is available at irregular intervals and there is increasing competition to get it as soon as it's available by those who want it.

Those who are located further north near state lands have an advantage in being able to acquire wood from the Department of Natural Resources. Wood marked for timber stand improvements (TSI's) on state land can be obtained for an average of two dollars per cord.[7] Since individual TSI's usually involve only small quantities of wood (5-10 cords at the most) and occur in widely scattered areas at irregular intervals, they are not a dependable source of wood supply for fuelwood producers.

Many large-scale firewood wholesalers and producers obtain their wood from timber sales on state lands. Most such producers are located in areas such as Gladwin, Houghton Lake, Cadillac, or Grayling. Prices of stumpage from timber sales range from 10 to 25 dollars per cord depending on the quality of the timber stand and demand for wood at the time.[8] This method of acquisition is only feasible for those who have the equipment to harvest and transport large quantities of timber.

Lansing area dealers can rent a semi-trailer to haul wood down from state lands. Harvesting can be done by contract or by hiring men temporarily to cut the wood. The costs of renting equipment and the trouble of finding dependable temporary labor makes this an inefficient method at best from the producer's point of view. Pulpwood cutters and producers

and forest products firms who own their own semi-trailers and equipment can harvest and transport the wood at considerably less cost.

Most retailers who decide to cut their own wood must search diligently and make as many contacts as possible to find a cheap source of quality fuelwood. Better quality wood such as oak, beech or hard maple is harder to find and more expensive. The further north a person goes, the easier it is to find a good quality northern hardwood stand available at a reasonable price.

Many times fuelwood is acquired on shares. The landowner offers free firewood for anyone who will cut on a cord for a cord, two for one or three for one exchange basis. The dealer then cuts two or three or four cords and gives one to the landowner. At first, this seems like free firewood but reflection reminds us that cutting wood for someone else is just as much a cost as paying to cut for oneself. The actual cost of an exchange can be measured in terms of opportunity cost of time spent cutting additional wood. This opportunity cost consists of either foregone profits on the exchanged wood, value of leisure time or earnings possible from alternative activities. If the exchanged wood could have been sold (no excess supply problems), the producer may actually be paying half of the sales value of the wood on a cord for a cord exchange. If the wood can be sold for 35 dollars picked up at the place it was cut, then half or $17.50 worth of wood cannot be sold for each face cord that's cut and that $17.50 is a cost to the producer. The cost is less on two for one or three for one exchanges.

Alternatively, landowners who sell firewood can allow others to cut wood for them on shares. This would be a rational decision if there was more than enough wood in the woodlot to meet demand, the stumpage price

is less than the cost of the landowner's cutting the wood himself and the net return from a cord that's cut is greater than twice the stumpage price (on a cord for a cord exchange). If a shortage were likely, then every share removed by the parties harvesting shares would involve foregone profits unless the net return per cord was less than twice the cost of the landowner cutting the wood himself and more than twice the stumpage price.

Whether a landowner or a woodlot owner can profit by having wood cut on shares depends largely on the stumpage price as compared to his harvesting costs. Those who value their time and don't care much for cutting fuelwood as well as those who sell a large quantity of wood will benefit from a shares arrangement.

Wholesale Wood Prices

A number of local fuelwood dealers, especially those who sell large quantities of wood, purchase wood wholesale. Most wholesale fuelwood sold in the Lansing area is sold in 8 foot or 100 inch logs in 16 to 22 cord loads. Prices are generally between $55 and $65 a pulpwood cord, with some as high as $75-$80 per cord.

Since each pulpwood cord makes between 2.5 and 3 face cords, wholesale wood purchased in this fashion costs between $18 and $25 per face cord. Such wood must be cut into 12, 16, 18 or 24 inch lengths before it can command a good price on the retail market.

Another option is to purchase the wood in quantity but already cut into face cords and split. Such wood is generally available for no more than five or ten dollars less than the market price. Prices reported by

retailers (purchasers) and wholesalers (sellers) range from $15 to $32 per face cord delivered, with most in the $25 to $30 range. The lower prices are common for green wood sold in the off-season. Purchasing green wood may involve greater risk for the retailer and may create cash-flow and storage problems.

Purchasing the wood at roadside from pulpwood cutters (in quantity) is another alternative. Such a purchase requires large trucks - semi-trailers or tandem dump trucks at least. As a result, it is feasible only for those who own or can afford to invest in such vehicles or rent them (a few large scale dealers and pulpwood cutters). Prices of wood at the roadside are reported to be $25-$40 per pulpwood cord in quantity in the northern lower peninsula.

Comparison of Costs and Benefits of Various Wood Sources

In comparing the relative advantages and disadvantages of various sources of firewood, a number of factors need to be considered. Distance from the source to the storage yard and to the market is often the most important consideration as it influences transportation costs.

Transportation costs depend on a number of factors besides distance. These include size of the load, cost of depreciation and maintenance on the vehicles, and frequency of use. The trucking industry uses 45¢ per mile as an estimate of the average cost of trucking.[9] This is based on a certain average annual mileage, probably in excess of 20,000 miles. In the fuelwood industry, costs are usually quite a bit higher. Frick estimates transportation costs for a hypothetical firewood firm that travels a total of 7000 miles annually hauling wood to be about 71¢ per mile.[10]

Cost does not change very much with the size of the truck or the size of the load. Thus, there is an advantage to hauling as much wood as possible on a large truck. Using the trucking industry estimates of 45¢ per mile, the least we could expect for costs of a 20-cord load hauled 100 miles (200 miles round trip) would be about five dollars per cord. Using a more conservative figure of one dollar per mile gives a cost of ten dollars per cord for a 200 mile trip.

Several local retailers and wholesalers have estimated that it costs between $300 and $500 to bring a 20-cord load to Lansing from state lands ranging from 100 to 200 miles away.[11] One wholesaler from Gladwin estimated costs of three dollars per mile to haul wood from Gladwin south. Presumably, he measured round-trip costs and calculated mileage costs based on one-way mileage so that it was actually $1.50 per mile.

Using these figures given by Michigan dealers, the cost of transporting a 16- to 22-cord load of wood from the pulpwood region of the northern lower peninsula is somewhere between $15 and $30 per cord.

Smaller loads are usually hauled in pickup trucks, intermediate-sized trucks such as stake-rack trucks or dump trucks or trailers of various sizes. Cost per cord with a small truck will be greater with the same mileage than with a semi-trailer. A pickup truck can operate for between 25¢ and 50¢ per mile.[12] This amounts to a transport cost of about five to ten dollars per face cord within a twenty-mile radius (assuming a capacity of two face cords) with transport costs being the dominant factor as distances increase beyond 50 miles.

The distance a dealer can afford to haul wood is largely dependent on the type of vehicle he already owns. It takes a substantial volume

of wood to justify investment in anything larger than a pickup truck if it's primary use will be to haul firewood. Dealers who own only a pickup truck or a small dump truck will usually benefit by purchasing wood wholesale if they can't find an adequate supply within 50 miles.

Harvesting and processing costs also must be considered in deciding whether to purchase or acquire fuelwood on the stump, by the pulpwood stick or processed and ready for use. Harvesting and processing fuelwood are time-consuming and require certain types of equipment. Necessary equipment includes chainsaw and splitting mauls at the least and for more sophisticated operations a skidder or tractor and power splitting equipment are desirable. Harvesting, even with sophisticated equipment, consumes about 3 man-hours per cord or 1 man-hour per face cord.[13] Processing takes a little longer than harvesting - about 3.5 hours per cord in Frick's illustration. As a result labor time will usually be over 2 man-hours per face cord and often close to 3 man-hours when transportation is included.

Purchasing wood wholesale will at least save harvesting costs and some transportation costs and may even save processing costs. The most cost-efficient method of acquiring fuelwood depends largely on equipment owned or available, scale of operations and wage rate or labor opportunity costs.

Besides costs of acquisition, fuelwood retailers need to consider the dependability of their supply source. This is particularly important in the winter when there's heavy snow cover. At such times, it's virtually impossible to cut wood anywhere but areas near roads except with special equipment. Stockpiling is the best solution to this problem but is not

always feasible because of storage costs, cash-flow problems or the risk involved.

One disadvantage of relying on wholesale sources of wood is the waiting period required. Wholesale firewood often requires several weeks notice while a firm doing it's own cutting can get several face cords in a day or two. An additional cause for concern is that wholesale wood is of less certain quality, and usually green. Also there are times when wholesalers are just plain hard to locate.

Processing

Besides source of supply, a firewood firm has a number of options regarding processing the wood. By processing is meant cutting the wood into stove-size lengths and splitting it to a diameter acceptable to the consumer, as well as seasoning the wood.

Seasoning is something not all firms are concerned about. How much the wood is seasoned is related to objectives of the firm, amount of property available for storage including indoor storage space, security of the property, source of the wood and preferences of the customers of the particular firm.

Seasoning can be quite costly to a fuelwood dealer. There is time involved in properly stacking the wood to season. Letting the wood season for six months to a year involves an opportunity cost in terms of present profits foregone. Some firms report that they can reduce seasoning time considerably by storing wood indoors. A firm could purchase a drying shed for this purpose, but such a shed is only worthwhile if it can be used for several years.[14] Firms who own idle buildings have an advantage here.

Seasoning is less important if the firm cuts mainly dead and down wood. In any case, seasoning can only be justified if the increase in wood value more than offsets the cost of storing the wood (a function of the interest that could have been earned on revenues from green wood in the same time period).

Splitting

There are several different ways to cut and split wood. The most advanced method is to use mechanical equipment such as a La Font processor.[15] This is a device which cuts and splits wood into fuelwood-size pieces automatically. It can process 10 to 20 cords per 8-hour shift or well over 4000 cords per year. A USDA study reports that under certain ideal conditions a fully mechanized firewood plant could make a profit only by processing and selling more than 3500 cords per year.[16] This is far more than any retail firm in the Lansing area reported selling and would account for a substantial portion of the local market (over 25% based on market demand estimates). It is questionable whether anyone would risk such a venture in a market as competitive as this one. There are potential benefits to the consumer from such an arrangement which will be discussed later in Chapter VI.

More realistic alternatives appropriate to the scale of firms which exist in the Lansing area involve using chainsaws, or buzz saws on occasion, to cut the wood and splitting the wood either by hand (with splitting mauls) or automatically with various power splitting devices.

About one third of the firms contacted have power splitting equipment including many of those who sell relatively small quantities (less than

50 face cords annually). Power splitting equipment can cut processing time by 25%.[17] Power splitting equipment is of two basic types - hydraulic ram splitters and screw-type splitters. Screw-type splitters cost between $200 and $500 on the average. Hydraulic ram splitters average between $500 and $1,000.[18] Power splitters for commercial use are more expensive with prices of $2,000 or more common.[19] Several producers in the survey made their own power splitting equipment.

Using power splitting equipment may save about one man-hour per cord (between five and ten dollars depending on the cost and value of labor). A firm that sells 20 cords per year (about 50 face cords) saves somewhere between $100 and $200 per year and can benefit only if the splitter is used regularly for between five and ten years (at 6% interest). Depending on labor cost, firms that process 50-100 cords of fuelwood or more (150-300 face cords) can pay the cost of a power splitter in a year or less from cost savings.

Processing Costs

Variable costs of processing fuelwood are mainly a function of labor time required. The time required to process a face cord of wood varies considerably between firms. The activities of acquiring, transporting, processing and delivering fuelwood can rarely be accomplished in less than 2 man-hours per face cord for a typical retail firm. One firm reports that each piece of wood must be handled an average of seven times by the retailer from acquisition through delivery to the consumer. When comparing hours of work reported each week with face cords sold, very few firms work less than an average of two hours per face cord sold.

Processing by itself takes anywhere from 1/2 man-hour to 2 man-hours per face cord depending on skill, experience, equipment and organization of the laborers as well as the amount of processing accomplished. One large firm reports that a three-man crew can process 18 cords (40-60 face cords) in an eight hour day or about 5-7 face cords per hour. Another firm estimates that processing a cord of wood takes between 3 and 5 man-hours or about 2 to 3 cords (5-10 face cords) per man day.

Frick gives a detailed explanation of the activities involved in processing a cord of wood and of time-saving methods for a firm under certain conditions.[20] One idea for reducing labor time and also reducing equipment costs is to split full-length logs first and then cut into stove or fireplace lengths. Organizing deliveries so that two or three customers in the same area can be served on the same trip decreases delivery costs. Also some firms could reduce their costs by limiting the area within which they will deliver firewood.

A key factor influencing operating costs of a firewood firm is the way that laborers are used in the processing and delivery of firewood. Too many hands are inefficient and can be dangerous, but too few hands are equally inefficient and sometimes dangerous. Coordinating activities between several laborers to minimize idle time and take advantage of scale economies can be beneficial.

It is preferable to have at least two men for cutting, splitting and delivering wood. That way the wood can be thrown off the truck quickly and where necessary, the second man can stack the wood. For a large-scale harvesting, processing and retailing firm Frick suggests a

two-man crew.[21] Highly mechanized operations often require a crew of three or more.

TRENDS

The firewood market is a very volatile market. It is very easy to enter and easier to exit. To get started, all a person needs is a chainsaw, splitting maul, pickup truck and access to wood. If he owns property he may not even need a pickup truck. Thus, we see considerable variation of prices, products and services offered over time.

In the summer, there are very few wood dealers in operation. Those who sell in the off-season either have plenty of spare time or derive a significant part of their income from fuelwood. Discounts are common, especially for green wood in quantity.

The fall is a time when dealers or potential dealers vie for position in the market. Some begin selling in September, especially if they've been around and can contact old customers. More and more firms enter the market until December when a peak is reached. The state of the local economy has considerable impact on the number of firms in the market at this time. Price and quality competition becomes increasingly important as more firms enter the market. Specialty dealers are common in November and December with woods such as white birch, apple and hickory for the fireplace market (which peaks in December).

Sometime in December, January or early February, the number of suppliers sharply declines in most years as snow makes the woods inaccessible. The few remaining firms are those who have better equipment or have stockpiled wood during the summer and fall. These are primarily large firms

who produce and sell wood as a major source of income. Seasoned wood usually is scarce during this period and the general price level rises somewhat and remains high as long as demand holds up.

It's difficult to discern any long term trends in firewood supply. In recent years, economic cycles and weather appear to be the major factors which have influenced the supply of firewood. Opportunity costs of labor which are influenced considerably by the level of employment and wage rates are of primary importance in determining the supply of firewood at various prices.

The quantity of fuelwood supplied isn't merely a function of the price and operating costs. Uncertainty is a factor which causes firms to produce at levels consistent with expected demand and price rather than actual demand. A number of firms, especially large firms, must make production decisions at least three to six months ahead of the selling period so that their decisions are very subject to error if demand isn't as expected. This helps to explain why there was a problem of excess supply in the winter of 1979-80 for example.

We would expect that in the future supply will continue to fluctuate about the trend line of increasing demand for wood as a home heating fuel. As the industry matures, supply will probably become more closely related to price and costs. Firms can be expected to get a better understanding of their costs and of how to predict future demand.

Technology, the economy and demand for other forest products should be the key factors which determine the future supply of firewood. Improvements in technology may decrease costs and increase the supply of

firewood. Economic growth and increased demand for other forest products will tend to increase costs and reduce the supply ceteris paribus.

As this chapter has shown, firm objectives, technology and organization can have a significant impact on the price, quality of product and service mix provided by a firewood dealer. These factors and others combine to determine the supply schedule for various product and service mixes over time.

Now that we have described firewood demand and firewood supply, we need to consider one more factor, the market environment, before arriving at any conclusions about performance. Buyers and sellers do not operate in a vacuum to exchange goods and services, but come together with the aid of various third parties and operate within the physical and social environment of the market. Chapter IV considers the market environment as it influences the conduct of buyers and sellers.

ENDNOTES

[1]This figure was obtained by summing the sales reported by each dealer. It is probably low because of several large dealers who refused to respond, and others who may have been missed.

[2]This is true largely because few firewood dealers report their income from wood sales so that it has no influence on their legal employment status.

[3]Based on personal interviews with two proprietors of local tree removal companies.

[4]Those local tree removal companies that were contacted reported prices of $40 per face cord or higher.

[5]Mosena (p. 5) discussed the profitability of selling wood in bundles containing five or six pieces of firewood plus kindling for $1.70 each at a retail outlet in Knoxville, Tennessee.

[6]Average stocking can be calculated by dividing stocking by acreage. In the Lansing area stocking averages about 700 cubic feet per acre, which is less than ten cords per acre assuming 85 cubic feet per cord. This value was estimated using data for Clinton, Eaton and Ingham Counties from U.S. Forest Service, the Growing Timber Resource of Michigan, 1966 (St. Paul, Minnesota, 1970) Table 16 and Table 31.

[7]From telephone conversation with Nemah G. Hussain, Michigan Department of Natural Resources Forest Management Division, November 1980.

[8]Timber bids in the past year have been in this range according to Hussain.

[9]Frick, p. 24.

[10]Less use of vehicles means a higher cost per mile because of fixed costs.

[11]By 20-cord load is meant a semi-trailer load of wood which contains between 16 and 22 cords of wood according to estimates from various producers.

[12]Paul A. Herbert, "Firewood Farms for Energy Savers," Michigan Out-of-Doors, (March 1978), pp. 84-87.

[13]Frick, p. 34. Mosena (p. 7 and p. 8) shows labor time to be considerably higher for harvesting. Comparison is difficult because Mosena's study divides activities differently.

[14]Frick, p. 23.

[15]U.S. Forest Service, Firewood Marketing and Manufacturing.

[16]U.S. Forest Service, Firewood Marketing and Manufacturing, Table 12, p. 24.

[17]Based on information obtained from the proprietor of a local tree removal company, T.D. Tree Removal Co.

[18]University of Minnesota Agricultural Extension Service, p. 11.

[19]Mosena (p. 36) gives a cost of $3025 for a 1976 Lickety Log Splitter Model 93999. Commercial models like this are larger and more durable than the low-cost models mentioned. Appropriate size and durability depends on the volume of business and objectives of the firm.

[20]Frick, pp. 22-23 and 34.

[21]Frick, p. 32.

CHAPTER IV

MARKET ENVIRONMENT

Any market requires a number of conditions for exchange to take place. There must be communication, an accepted set of rules and customs governing the interaction of buyers and sellers and the actual physical act of exchange itself. This chapter considers market environment in terms of communication, rules of exchange and other physical factors which influence the exchange process.

COMMUNICATION

Communication is the first necessary part of the exchange process. Sellers must communicate to potential buyers that they have a product to sell before exchange can occur. Buyers in turn seek to communicate their preferences to sellers by the choices they make and by suggesting other alternatives or complaining about choices that sellers offer. Through this communication process the terms of exchange are set and exchange occurs. Buyers and sellers adjust to one another's signals by an iterative process.

Sellers generally initiate communication by advertising. Through advertising they seek to attract customers who perceive their products and services to be desirable. Advertising can be accomplished through a number of different communications media. Firewood firms accomplish most of their advertising through the classified advertising section of local newspapers. Others advertise by word of mouth or through signs or wood displays on their property. Some contact potential customers

or former customers directly by telephone or door-to-door. A few use the yellow pages of the telephone directory as a more permanent advertising medium.

Newspaper Advertising

Newspaper advertising is most common because it is an inexpensive way to reach a large number of potential customers on a temporary basis. In the 1979-80 winter season classified ads in the Lansing State Journal were four dollars for ten days for a four-line ad. In the Towne Courier prices were two dollars per issue for the first ten words and 25¢ for each additional word. Since the firewood business involves low sales volume and low profit margins, most dealers can't afford much advertising beyond classified ads, especially if they only devote a small part of their time to fuelwood production and sales. Newspaper advertising is a very suitable means of advertising in a market which is very fluid - with frequent entrance and exit by producers.

Most fuelwood producers who sold a substantial volume of wood advertised at least once in the newspaper last year. The choice of which newspaper or newspapers to use depends on the size of the market region which a dealer wishes to cover.

The Lansing State Journal covers a large region of central Michigan extending from Lansing to areas at least 30 miles away in all directions. If a dealer in Perry sold wood to someone in the Portland area, delivery would involve a round trip of almost 100 miles, an expensive sale at 25¢ per mile. In such cases, many dealers refuse to serve callers beyond a

certain radius. Receiving calls takes valuable time so that if a dealer wishes to serve only local customers, he may be better off advertising in a local newspaper such as the Towne Courier, which serves the East Lansing, Haslett and Williamston areas or the Reminder, which serves the Grand Ledge area. This problem doesn't concern many dealers probably because, as some have indicated, consumers tend to call numbers from local areas first when seeking firewood.

Most dealers acknowledge that the State Journal generates more business because of its wider circulation. However, several acknowledge that they attract a substantial number of customers through the Towne Courier.

Wholesalers and dealers from rural areas away from major cities usually advertise in several newspapers such as the Detroit Free Press and the Grand Rapids Press along with the State Journal. One regional wholesaler advertises in cities as far away as Toledo and covers eight cities throughout lower Michigan.

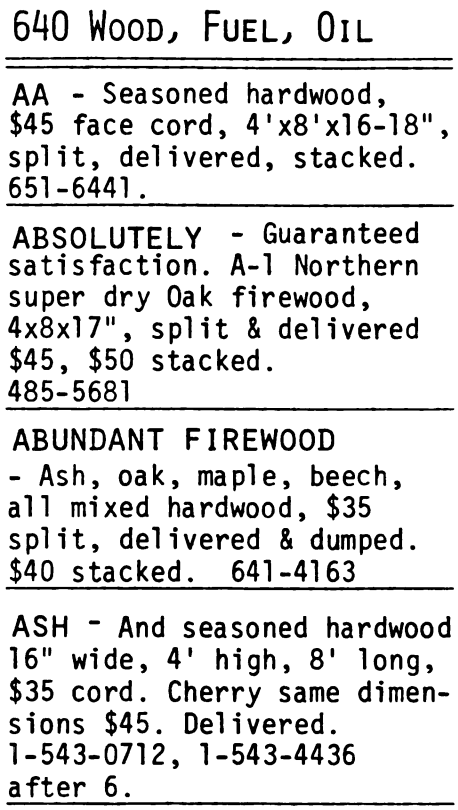
Timing and frequency of advertising are important considerations. Most large firms advertise frequently, if not continually, throughout their sales period. Many smaller firms and some large firms do most of their business over a short period of time. Such firms advertise once or twice in the fall and have it over with. Other firms, especially established firms, advertise at strategic times such as early fall, Christmas, mid-winter or early spring.

Early fall is a time when business picks up and many new customers are seeking wood for the first time. Those who get a head start in September often have a distinct advantage in attracting new customers.

Christmas is the peak sales period for fireplace wood. Midwinter, when supplies are tight, offers opportunities for firms that had the foresight to stockpile wood and wish to capitalize on higher prices during a period of excess demand. Early spring is the time for clearance sales. The number of ads is reduced considerably by late March and several firms are usually offering leftover wood at reduced prices. Others seek to encourage buyers to purchase green wood in quantity at a lower price and season it themselves.

Firms advertising in the newspaper are limited by space to a simple statement of their products and services offered. Most, but not all, list the type of wood, price per unit and services offered. An example, taken from the State Journal shows several typical ads for firewood (Figure 4-1). In a November 1979 issue of the State Journal with 22 ads, all but four stated whether they offered hardwood or softwood, all gave a price and all but two stated whether they delivered or not. Most firms sell by the face cord, but a few advertise by the pickup load. One or two local firms offer full cords and several wholesalers advertise large quantities for a discount at certain times of the year.

Communicating quality is difficult with a product such as firewood, yet quality is a major selling point. The three main quality characteristics of interest to consumers are seasoning, species and how the wood is cut and split. It is advantageous for a firm to offer seasoned wood and state this in its ad. It is unusual for firms to advertise "green" wood although some may offer "fresh-cut" wood. Some firms list specific species offered, but very few advertise choices. Several of those who offer species choices just give a price range. Splitting is sometimes



640 WOOD, FUEL, OIL

AA - Seasoned hardwood, $45 face cord, 4'x8'x16-18", split, delivered, stacked. 651-6441.

ABSOLUTELY - Guaranteed satisfaction. A-1 Northern super dry Oak firewood, 4x8x17", split & delivered $45, $50 stacked. 485-5681

ABUNDANT FIREWOOD - Ash, oak, maple, beech, all mixed hardwood, $35 split, delivered & dumped. $40 stacked. 641-4163

ASH - And seasoned hardwood, 16" wide, 4' high, 8' long, $35 cord. Cherry same dimensions $45. Delivered. 1-543-0712, 1-543-4436 after 6.

Figure 4-1. Typical Classified Ads for Firewood

SOURCE: Lansing State Journal, November 30, 1980.

listed, although the buyer can expect that most dealers will have the wood cut and split to fireplace size, if they sell by the face cord. Several firms seek to accentuate the quality of their wood by offering "AAA hardwood" or "Premium firewood."

Most firewood firms can only be identified with a telephone number. Two large local firms used trade names they had developed in their State Journal ads last year. Several others identify themselves by the name of the proprietor.

There are a number of selling points by which firms sought an advantage in the firewood market last year. Several firms emphasized that their wood was stored indoors. Others offered free kindling wood. One firm consistently stood out for its lengthy ads offering wood that was "guaranteed," with various quantity discounts and a year-end clearance sale. Another firm accepted credit cards and stated so in its ad.

It is virtually impossible to measure how these advertising practices affected sales, but as a rule, we would expect that firms advertising extra features would attract more customers than others. Since many customers complain about seasoning, finding wood that has been dried indoors should be a major selling point. A firm that accepts credit cards also has a decided advantage, particularly with people who aren't accustomed to carrying cash in large amounts.

As a rule, price appears to be the consideration that attracts customers to a firm more than any other single factor. Successful firms last winter were generally those with low prices, especially if they sold a high volume of wood during the winter. Firms with a head start in the

fall or unusual advertising techniques sometimes prospered in spite of high prices.

Firms that had excess supply problems last winter were those who advertised too little, entered the market too late or wouldn't lower their prices enough during the glut that occurred last winter.

Other Methods of Advertising

Several large, successful firewood firms in the Lansing area didn't advertise by newspaper last winter. These were primarily firms that had been around for years and had an established clientele or firms that contacted potential customers directly by telephone or door-to-door.

Word of mouth is the most common way that customers find out where to acquire firewood. Information from friends and neighbors and work associates acquired by word of mouth accounted for most of the firewood purchase decisions in both consumer surveys. Word of mouth, however, is not very useful for a brand new firm. This explains the prevalence of newspaper advertising among new firewood firms. Even old firms find that newspaper advertising in addition to recommendations helps their sales.

Since most consumers choose the place they will purchase firewood based on the recommendations of others, perhaps woodstove dealers should be a good place to pass the word along. This does not appear to be the case as only two people in the survey listed woodstove dealers as their primary information source for purchasing firewood and only one of those who have recently purchased woodstoves found his source via a woodstove dealer. Only one or two in the supplier survey said they advertised through a woodstove dealer. Perhaps this is because, as our survey seems to indicate, people tend to consider potential fuelwood sources before

they purchase a woodstove. Also, it should be remembered that the vast majority of wood purchased is by fireplace users.

The foregoing considerations aside, those who purchase woodstoves are good targets for advertising by firewood dealers. Promotional arrangements with woodstove dealers may be an idea for advertising that has been overlooked by many. One local woodstove dealer advertised a free face cord of wood to go along with any woodstove purchase last winter.

Dealers who sell wood door-to-door are nearly as common as newspaper listings as the primary information source listed in the consumer survey by which people find out where they can purchase wood. A number of younger dealers attract their customers by this means. Door-to-door wood sales is most successful if done early in the fall in upper middle-class housing developments. Several Lansing area dealers report considerable success peddling wood in the Detroit suburbs also.

For those who sell wood at irregular times there are advantages to direct sales. It saves newspaper advertising costs and the worry of having someone around to answer the telephone. If a person feels like he wants to sell some wood he can, if not he doesn't have to turn people down over the phone as he would if he had an ad listed.

Direct sales can be an expensive way to do business, particularly if sales are few and far between. Direct sales can be cheaper than other methods of advertising if a dealer can sell a large volume of wood in one area. This is an important consideration when a dealer has a truck that can hold two or more face cords and sells mostly one face cord at a time or less. If he can get rid of an extra face cord or cords in the same

neighborhood from which he receives a call for one face cord he has cut his transportation costs per face cord almost in half.

One efficient method of selling wood directly, as told by an area resident, is to make it a family affair with children fanning out over the neighborhood seeking customers while mom and dad manage the truck.

There are a number of other advertising techniques that are used by firewood entrepreneurs. Calling old customers at the beginning of the fall or when wood is available has proven to be very profitable. Business cards are commonly used, especially among larger scale dealers and experienced sellers. Yard signs cost very little and can attract quite a few customers if placed along heavily traveled thoroughfares. Most dealers are not so suitably located, but those that are can take advantage of their situation. Gas station owners with extra space can generate a lot of firewood business if they stack wood in their lots.

More elaborate advertising methods such as display ads have been tried by at least one firm. Another firm has rented a billboard near Flint.

Another method of advertising, restricted to large well-established firms is to use the yellow pages of the local telephone directory. Up until 1980, tree removal companies have been the only ones to use the telephone book. Recently, however, a firm which is trying to become established has added its name to the list offering wood in the yellow pages. Ads in the telephone book are especially popular among firewood sellers in the Detroit area.

Communication From the Buyer to the Seller

Not all advertising in the fuelwood industry is from the seller to the buyer. There are several examples in the Towne Courier and State Journal

where buyers offer to cut wood on shares or to clear farmers' land off as needed in order to get the wood from the land. These are probably people intending to sell some of the wood they cut.

The usual way a buyer communicates his preferences is by what economists call exit. He chooses a firm with whom to do business and indicates his dissatisfaction with that firm by taking his business elsewhere. Alternatively, he can use his voice to complain to the dealer about the quality of the wood.

Firms who wish to gain a better understanding of consumers' wishes can do so via a market survey of customers or potential customers or even by informally asking customers about complaints, preferences and suggestions for improving service.

RULES OF EXCHANGE

For a market to exist, there has to be a system of rules and property rights defined between the parties involved in the exchange. Some of these rules and property rights are defined explicitly by the legal code of the county, state or nation and others are culturally or socially accepted norms of behavior. Relevant laws include tax laws, laws influencing weights and measures, zoning laws and various consumer protection laws as well as government monetary policies. Cultural norms in combination with some of these laws influence such things as the medium of exchange, units used in exchange, bargaining, product standards and rights and obligations of buyers and sellers in the exchange process. Tax laws and zoning laws also influence the cost of the product.

Firewood exchange is a process which usually begins with a phone call by the customer requesting a certain quantity of firewood be delivered to

his home. The buyer and seller set a time that is mutually convenient, often several days after the call is made. Usually, the seller delivers the wood at the appointed time and the buyer examines the wood and pays for it on the spot.

Most exchange is on a cash basis. This is true of both wholesale and retail markets. Personal checks are usually accepted and post-dated checks are sometimes acceptable, particularly from direct sales customers. Credit is rarely available except with individuals or firms who are sufficiently diversified to afford the cost of major credit cards such as Master Charge.

Delivery agreements are usually by word of mouth. No contractual arrangements were acknowledged by any of the dealers for delivery either to wholesale or retail customers. One or two of the forest products firms had contractual arrangements with loggers. Several firms had contractual arrangements with the state or private landowners to cut timber.

Price is usually set by the seller and is not subject to bargaining. The price is communicated in person or is set by the seller over the telephone so that the buyer knows ahead of time the price per unit at which the product or products and associated services are offered.

Understanding the units that are offered can be difficult. Most fuelwood is sold by the face cord, which is a non-standardized unit not defined by Michigan law. Most producers list dimensions of the units they sell. Others offer amounts such as pickup loads and bundles which are entirely at the discretion of the seller.

Because of the uncertainty involved, units and quality are more subject to bargaining than price. A consumer has a number of options by

which he can bargain for the price of a quantity not offered by the dealer, or a quality mix or service mix not offered. He can ask for a small quantity and suggest a price reduction proportional to the quantity reduction. He can ask for a large quantity and seek a discount (buy two face cords if they can be had for less than twice the price of one for example). Similar bargains may be possible with respect to quality and services - if mixed hardwood and softwood is offered he can ask for all softwood for a discount or offer a premium for all hardwood. A consumer also has the option of bartering, offering other goods or services in exchange for wood. Most firewood firms will barter if they receive a good offer from a customer.

Legal Rights and Obligations of Market Participants

Fuelwood buyers and sellers have a number of obligations and legal rights in their dealings one with another. Sellers must provide a product and service mix that fits the specifications of the agreement made with the buyer. If they say the wood was seasoned for six months and it turns out green, they can be charged with misrepresentation. If the quantity provided was less than stated, the same is true.

For these charges to be effective the burden of proof is upon the buyer. He must first prove that the firm made a certain offer, which is difficult since there is rarely a written agreement. Even if he can prove the terms of the agreement, it is even more difficult to show that they were violated.

Wood species is comparatively easy to test but seasoning is not as clearcut. There can be a significant difference between wood that has

been split and dried in the open for a period of time, wood that was lying on the forest floor and wood that was standing in the forest, though dead for a period of time.

Quantity is the most difficult to prove, especially if a face cord or a pickup load was the unit offered. There is no one standard of how much wood is in a face cord or pickup load. Presumably, a face cord ought to be 8 feet long and 4 feet high if the logs are tightly stacked. This is a convention which is almost universally accepted by fuelwood dealers. Since logs can be stacked a number of different ways, it would still be difficult to prove that the firm cheated, except in extreme cases, even if the courts would accept the conventional definition of a face cord.

If wood is sold in standard cords the law gives the buyer a more well-defined standard upon which to base complaints.[1] A complaint can be made to the Director of Weights and Measures who can then weigh, measure or inspect the units offered. The Director of Weights and Measures has the authority to ask the courts to have an injunction ruled against the offending firm under certain circumstances.[2]

The buyer is not only protected from fraudulent sellers, but he also has certain obligations in the market place. That which is of primary importance in firewood exchange is the buyer's obligation to pay the price agreed upon. Occasionally buyers do not meet this obligation by writing bad checks. In such a case the seller can prosecute though he may have similar difficulties proving his case as the buyer did.

In any grievance between a buyer and seller, there is a decided advantage in the two resolving the conflict themselves. Court costs, time

and trouble rarely make it worthwhile for either party when a transaction of less than $50 is involved. Sellers may have more to lose from such exposure of their operations than any possible revenue they could recover because of tax laws which most firewood dealers violate (see below for explanation of tax violations).

The only situation where a court case may be worthwhile is if a group of consumers wants to bring a class action against a dealer or where a large transaction of several hundred dollars is involved. A successful class action suit would be very unlikely because of the problem of demonstrating that everyone in the class was cheated in the same way in such an informal marketing situation. Class action works much better with mass-marketed, packaged goods.

Tax and Zoning Laws

The firewood seller is also obligated by tax laws. He is required to pay sales tax on all his retail sales and income tax on his net income. For sales tax he must acquire a license from the state and for income tax he must file the appropriate return. If he hires employees he also must pay into Social Security and Workmen's Compensation in some cases.

Very few firewood dealers in the Lansing area pay income or sales tax. Many dealers are reluctant to discuss certain features of their business for fear of being found in violation of tax laws. Only one dealer in the entire survey acknowledged having a sales tax license and even then he did not start charging tax until the fall of 1980.

Firewood production and sales is very much a part of the underground economy. It is very easy for dealers to avoid paying taxes because of

the informal nature of their operations. One local dealer astutely pointed out that there is generally no way to prove a person sold firewood to anyone. Even if it can be shown that wood was transferred from the seller to the buyer, the seller can say he gave the wood away. If it can be shown that he received cash or check as payment, he can claim that the cash was a gift and not payment for the firewood. How well such argument would hold up in court is hard to determine. Nevertheless, it is difficult to enforce sales tax or income tax laws without written records of transactions or receipts, which are rarely used by firewood sellers. An additional factor which makes it difficult to discover tax law violations is that the method of advertising used by most dealers preserves their anonymity. It is very difficult to locate a person to prosecute for violating tax laws when all that is known about him is his phone number.

An additional legal factor which is of some importance in firewood markets is zoning. Firewood producers and sellers tend to be located in residential areas. Zoning laws, however, prohibit advertising or commercial activities in residential areas within incorporated towns and cities. As a result, firewood dealers in such areas cannot advertise or sell wood from their property. This probably increases the proportion of wood that is delivered since customer pickup is virtually prohibited in such cases.

OTHER FACTORS INFLUENCING EXCHANGE

Communication and rules are necessary antecedents for exchange. The physical environment and product characteristics are also important

factors influencing exchange. Distance from dealer to consumer and relative locations of dealers and consumers are important. Product characteristics as they influence the frequency and size of transactions are also important. The distance from a fuelwood dealer to his customers, though partly related to advertising is also a function of the number and location of dealers in the metropolitan area offering various product and service mixes as compared to the distribution of customers demanding various combinations of product quality and services.

The greater the number of dealers in the area, particularly if they are widely dispersed, the less the distance need be between consumer and producer.

Dealers in the Lansing area are well distributed throughout the metropolitan area. As a result, distance between buyer and seller can be kept to a minimum. Our survey showed dealers scattered throughout the metropolitan area with sales nearly proportional to population in each of six areas (Table 4-1). About half of the dealers in the survey said they sold most or all of their wood locally, within their own or surrounding communities, an area of no more than ten or fifteen miles radius from the dealer. Less than 10 percent sold any wood outside the Lansing area. Many of the larger dealers sold most of their wood locally.

The most likely reason for a consumer to seek a more distant supplier is quality. Specific species such as white birch and applewood are comparatively rare and may be harder to find locally than mixed hardwood. Quality hardwoods such as oak, cherry and hickory are harder

TABLE 4-1

NUMBER OF WOOD DEALERS AND
VOLUME OF SALES BY LOCATION

Market Size	LOCATION					
	Williamston	Bath	Grand Ledge	Eaton Rapids	Mason	Lansing
Number of Dealers	22	9	6	7	8	18
Estimated Sales Volume (face cords)	1,600	1,300	700	800	350	2,200

Sales volume was calculated by adding reported sales from each dealer in each area. Fewer dealers were contacted from Grand Ledge and Eaton Rapids areas probably because they were less likely to advertise in the State Journal or Towne Courier due to their location.

to locate nearby, especially unmixed with other less desirable species. Price and cost variations between areas also create some incentives to purchase from distant dealers. Part of the price variation appears to be caused by the fact that several dealers tend to charge less than enough to cover their actual delivery costs, especially where delivery charges do not vary with distance.

Frequency and size of purchases is related to the nature of demand, advertising and technology. Most consumers purchase one or two face cords at a time. Since most only use one or two face cords in a season such a purchase size makes sense. Larger purchasers are inclined to acquire firewood several times in a season. Almost half of those who purchase wood purchased more than once last year. There are very few who made more than two purchases because very few of the large-quantity users in this area purchase firewood.

Very few purchased in quantities less than a face cord. Even those who use smaller quantities often at least purchase one face cord because of relative price differences and the scarcity of suppliers who offer small quantities of firewood.

In summary, the market environment in the Lansing area is characterized by high information costs, informal exchange unaffected by direct government regulation and many buyers and sellers distributed throughout the area. Suppliers provide subsidized information through advertising, but consumers are more likely to listen to their friends, acquaintances and relatives who presumably provide better information. This can be a high cost for someone who knows very few people who use firewood.

Information cost, rules of exchange and the number, size and distribution of buyers and sellers interact with consumer preferences and supplier goals and practices to determine market performance. Chapter V considers how effectively the firewood market meets various performance objectives.

ENDNOTES

[1]Legally, a standard cord is "the amount of wood in 128 cubic feet when the wood is ranked and well stowed" according to Michigan Laws Public Act 1964, No. 283 Sec. 2 (Michigan Laws Compiled, Vol. 15, p. 226).

[2]Michigan Laws Public Act 1964, No. 283 Secs. 11-14.

CHAPTER V

PERFORMANCE

Now that the stage has been set, we can consider how the various features of demand, supply and market environment interact to produce various performance outcomes. As stated in the introduction, our concern is that firewood be a cheap, dependable and convenient heating fuel for the consumer. There is no absolute measure we can use to determine how well this objective is met. In fact, there is no way to say whether one outcome is better than another and have everyone agree. What is cheap for one consumer may not be for another and may be inconvenient for someone else. Any outcome involves tradeoff between cost, dependability and convenience and does not affect all consumers in the same way.

In the Lansing area, firewood as a heating fuel is in competition with electricity, natural gas and oil, all of which require little work by the final user. The fuel or power is fed into the furnace or heating system automatically. All the homeowner needs to worry about is occasionally cleaning and maintaining furnaces, wiring, pipes, radiators, ducts and similar equipment.

With firewood, no such automated system is available to the average consumer. To heat with wood a homeowner needs to store the wood, bring it into the house and load the wood furnace or wood stove once or twice a day, besides regular maintenance and cleaning of the equipment. He may also have to prepare the wood by cutting or splitting it to fit his stove or furnace and seasoning to improve its burning properties.

In considering convenience then, the firewood consumer is looking for a way that he can minimize storage costs and the time and trouble involved in preparing wood and stoking the woodstove. He needs to weigh these factors against the costs of repeated purchases or trips to cut wood and consider price differences between different levels of convenience.

Dependability is related to the economic question of excess demand. If there is excess demand or a shortage some consumers won't be able to purchase firewood of a desired quality when they want to. Dependability is not only related to availability but it can also be considered to be related to price variation. A dependable supply is one where the price remains relatively stable (or in an inflationary economy increases at a steady rate) and where the desired product and service mix is available whenever consumers perceive a need.

This chapter is divided into three sections. The first considers factors which influence price or cost of acquisition for various qualities of products and services. The second considers excess demand and supply over time for various product and service mixes. The third section considers how effectively price and quality are communicated between buyers and sellers; how well the market enables consumers to articulate their preferences and have those preferences satisfied.

PRICE

Firewood can be acquired for a wide range of prices depending on what mix of convenience and wood quality the consumer is seeking. If he has the time and equipment, he can usually find a place to cut the wood himself free of charge.

Many homeowners don't have the time nor the desire to cut and prepare their own firewood. For them wood is only viable if it can be purchased in a convenient form at a reasonable price as described above. If price of alternative fuels were to increase substantially, convenience might become less important.

Retail fuelwood prices in the Lansing area averaged between $35 and $40 per face cord delivered in the winter of 1979-80. Several dealers offered wood for $30 per face cord and a number of others charged $45 per face cord. A few specialty dealers charged $50 to $60 for quality hardwoods such as birch, cherry and oak. On the other hand, green wood was available in the spring for as low as $20 per face cord and softwoods were generally available for $20 to $25 per face cord.

Fuelwood prices were increasing steadily up until 1979 along with increasing fuelwood demand in the same period. Prices have leveled out somewhat since last fall, although a cold winter this year may mean a substantial price increase.

Price is determined by a number of interacting factors. These include objectives of the firm, operating costs, degree of competition between firms, quality and reputation of a particular firm, method of advertising, season of the year and various other factors. Each of these factors can be considered separately, though several are interrelated.

Objectives

Firms in the fuelwood business can be divided into three categories in terms of their attitude towards profits and price. Their reasons for having these attitudes were discussed in Chapter III. Some aren't too concerned with profits but seek to offer a quality product and service mix

at a reasonable price. Others have limited time available and seek to earn a high level of profits subject to a time or quantity constraint. The third group is largely concerned with profits and seeks to produce a quantity at a price level consistent with high profits - ideally at the profit-maximizing level where marginal revenue equals marginal cost.

Dealers in the first group may charge comparatively low prices. Those in the second group will often charge more than the third. If the market isn't perfectly competitive they may be able to charge a higher price if they sell less quantity than those in the third group.

It is difficult to say whether firms actually seek to maximize profits or merely earn some satisfactory level of profits. Behavioral economists often claim that satisficing behavior explains why prices are sticky and firms are reluctant to raise or lower prices or change product quality even if they expect that such a price or quality change would increase their profits. Uncertainty is a major reason for satisficing.

Since the fuelwood market has been subject to considerable uncertainty in recent years we would expect to see a lot of satisficing behavior rather than maximizing behavior. This may explain some of the low prices charged by dealers who could have sold all the wood they wanted at a higher price. Several firms may offer lower prices in the short-run with the objective of gaining an established clientele or a certain share of the market in the long-run.

Operating Costs

Operating costs are highly variable between firewood dealers in the Lansing area. Some give costs as low as $7 per face cord and others figure costs to be over $30 per face cord. Many do not consider the value

of their own labor or capital in this calculation. Studies of the operations necessary for a firm to produce firewood have shown costs consistently on the high side of the above figures, even with economies of scale.

In two separate studies of hypothetical firewood firms in Tennessee and Massachusetts in 1976 and 1977, the authors arrived at production costs of $45 to $55 for a large firm in Massachusetts and costs of between $60 and $70 for a firm in Tennessee.[1] Allowing for inflation, these figures would be the equivalent of costs between $70 and $100 per cord or $25 to $35 per face cord today.

Operating costs can be divided into variable costs and fixed costs. We can then consider short-term and long-term decision-making. Economists define the short-term as a period within which fixed costs are invariant. The long-term is a period wherein a firm can invest or disinvest in any and all fixed assets so that all costs are variable.[2]

In the firewood business, variable costs include most labor costs, fuel and related expenditures. Fixed costs include vehicles, equipment such as chainsaws, splitting mauls and storage bins and other capital assets involved in firewood production and marketing.

Wood can be fixed or variable depending on inventory levels of the firm. If a landowner or firewood firm owns a certain amount of stumpage, the stumpage value can be considered a fixed cost. The same is true for a large pile of wood which a firm has acculumated in the past. On the other hand, if a firm must be continually purchasing stumpage or cutting and processing new wood to replenish the supply as he sells, the wood is more of a variable cost.

Variable costs are easy for a firewood firm to account for. Usually, they will be passed on directly to the consumer in the cost per face cord. Delivery costs are sometimes an exception to this in that they are often included in the price which doesn't allow for cost variation by distance.

Most firewood producers probably value their labor at ten dollars or more per face cord (about five dollars per hour).[3] Many who have higher alternative wage rates or spend more time harvesting and preparing firewood would place a higher value on their labor. Probably very few firms would value their labor at more than $25 or $30 per face cord, except some of those who have since given up because the firewood business is unprofitable. Labor time involved in delivery adds additional costs of about five to ten dollars per face cord, depending on distance, stacking and speed of the truck and workers. There are probably several who place little or no cost on their time spent in the firewood business because they enjoy working with firewood or have few alternative ways to spend their time.

Remaining variable costs for a firewood firm are usually less than $15 per face cord. Stumpage price is usually five dollars or less but can be as high as $15 per face cord. Chainsaw operation is probably no more than a few dollars per face cord. Delivery costs (not including labor time) probably average about five dollars and rarely go over ten dollars per customer for Lansing area dealers.

Adding just variable costs together it becomes apparent that it is difficult for a firm to keep variable costs under $30 per face cord. When fixed costs are included we see why firewood is a very low margin business with current price levels.

For larger firms depreciation is a major factor. One large dealer in the Lansing area reports that he goes through one $9000 pickup truck every two years, indicating an annual depreciation of about $4500. We would expect such a dealer to seek to sell enough firewood at a high enough price to cover his variable costs plus the depreciation on his equipment. Otherwise he couldn't afford to reinvest in vehicles every two years as he has for the last ten years, unless the depreciation on the truck can be charged to activities other than wood sales.

Frick gives fixed cost figures for a hypothetical firewood producing firm. He suggests an equipment cost of $4750 for a firm that uses old equipment.[4] Under this scenario, depreciation on a truck, trailer, splitter, two chainsaws, circular saws and modifications would be $1115 per year. Insurance on the truck would bring the total to $1615. Frick also shows the effect of changes in fixed costs on cost per cord for a hypothetical firm producing 315 cords annually.[5]

Very few firewood firms in the Lansing area keep detailed account of their costs or consider equipment depreciation as a cost to their firewood business. This may be another reason why costs reported are low and price variation is so common among firewood firms. In the short-run, however, such accounting methods are appropriate since vehicles and equipment will wear out anyway whether they're used or not.

Fixed costs should be a significant factor influencing the decisions of firewood firms to operate and the prices they charge in the long-run. As the market for firewood stabilizes, we should expect price per face cord to equal long-run average costs per face cord with a reasonable profit margin included for a typical firm. Some firms will be more efficient and

earn greater returns. Others may be satisfied with a lower profit margin. A rational firm will not operate over the long-run unless it can cover its costs plus a return on its capital comparable to its best alternative use of capital or investment funds.[6]

For a firm with a $10,000 investment in wood and equipment, a net return of between $1500 and $2000 (15%-20%) would be considered profitable in today's economy (with bond market rates of over 13%). This would require sales of about 300 to 400 face cords if we use $1615 as the fixed costs and $30 per face cord as the variable costs.

Although several firms do not consider the cost of their labor or capital costs in their pricing decisions, we would expect that in the long-run these costs will be considered and firms will withdraw from the market if they don't earn a reasonable return. This may explain why so many firms that operated last year have left the market and why price variation in the fall of 1980 was so much less than that in the winter of 1979.[7] Several of the lower priced firms have gone out of business or raised their prices to a level more consistent with costs. Nevertheless, there is still enough variation between firms respecting acquisition and capital costs, that several firms could charge lower prices and still meet their costs.

Competition

This bring us to another factor influencing the price of fuelwood - competition. As a rule, we would expect a rational firm to charge as high a price as possible at which its product would sell, provided price was at or above average cost. Even if we assume satisficing behavior

instead of maximizing behavior, a firm will often charge a price higher than costs plus normal profit and earn economic rent if such a price is reasonable or attainable. The price that a firm can charge and still move a certain quantity of product is largely dependent upon the price and market shares of other firms.

The firewood market has many features which fit the model of pure competition. There are many independent buyers and sellers, none of whom seem to be large enough to exert market power. Collusion is unlikely and entrance is easy. In such a situation, if price is too high and firms are earning economic rents, other firms will be attracted into the industry and some existing firms may benefit by increasing productive capacity. The aggregate effect will be that prices will fall as supply increases. Production will increase and new firms will enter until the marginal firm just earns enough to cover costs plus normal profits and until every firm produces just enough so that price equals marginal cost.

This is an oversimplified model in that risk and uncertainty may restrict the number of firms that enter or increase production. Prices will adjust slowly and may never reach or even approximate an equilibrium in a dynamic market. Nevertheless, if firms are earning substantial economic rents, there will be incentives for other firms to enter the industry and for existing firms to increase capacity. With uncertainty as important as it is in the fuelwood industry, new firms will want to make sure that they can sell a lot of wood quickly and so will be conservative in setting their prices to assure their selling all the wood they have to sell.

Uncertainty among firewood firms in planning for demand and competition from others can result in price wars. With high fixed costs many

firms will sell at prices below long-run average costs in order to meet variable costs in the short-run.

In the Lansing area firewood market in the winter of 1979-80 there was a situation where competition developed into something of a price war. New entrants, many of whom were laid off their jobs in December of 1979 flooded the market with firewood. Because of trends of increasing fuelwood demand from past years, many new entrants had unreasonable expectations. Demand fell far short of these expectations because of mild weather, little snow and abundant natural gas and oil supplies. A number of these new entrants were able to charge comparatively low prices by offering poor quality wood in some cases, by using equipment that was available for other purposes and not charged as a cost to their firewood operation, and by using labor that was unemployed otherwise, with very low opportunity costs. Many of these new firms didn't consider the difficulty of producing firewood and underestimated the value of their labor. Other firms who were charging higher prices more in line with costs were forced to cut prices in order to sell the wood that they had accumulated.

The situation that occurred last winter may not recur in the future as the firewood industry matures. Unusual weather will always be a factor in the firewood business, but as demand stabilizes and firms get a better understanding of their costs and of how to predict or prepare for contingencies in future demand, more informed production and pricing decisions will reduce the likelihood of such severe price wars as occurred in the winter of 1979-80.

Price wars are not likely to be a long-term solution for maintaining low firewood prices for consumers. Those who seek wood of dependable quality, especially if it is difficult for them to discern size and quality differences, will not benefit from price wars as much as others since the low priced firms usually offer lower quality firewood.

Quality

Another complicating factor in firewood markets is quality variation. A competitive model assumes that all firms in the market offer exactly the same product at the same price. If there is quality or service variation, then firewood from different firms should not be considered the same product. This explains why some firms in the firewood industry can charge consistently higher prices than others and still sell a large quantity of wood. If consumers know that a firm offers seasoned hardwood and gives tightly stacked face cords, many will gladly pay 10 or 15 dollars more for the firewood from such a firm. Specialty wood such as birch will be worth an additional 5 or 10 dollars. The key factor which enables a firm to charge higher prices is not so much quality as it is reputation. Those firms which maintained their prices at $40 or $45 per face cord with high sales last winter were largely firms that had been in operation for a long period of time and had consistently provided their customers with well-seasoned hardwood in ample quantity. Prompt service and courtesies such as stacking probably aided this reputation.

Advertising

Advertising can have a significant impact on the price that a firm is able to charge. Those who sell wood door-to-door have a real advantage

in pricing. They are especially successful among consumers who normally make small purchases and are less informed about market prices. They can charge higher prices, especially in higher income neighborhoods. Several dealers report selling firewood door-to-door for $55 to $65 in suburban Detroit, even though newspaper advertised prices were $45 or less in that area last year.

A firm achieves a good reputation primarily through advertising. Word of mouth is the most influential method of advertising in this respect. Explicit newspaper advertising of seasoning methods, species, services and perhaps even the use of trademarks will probably increase demand and enable firms to charge somewhat higher prices. Use of other advertising media such as billboards and telephone directory listings is also something which would probably enable a firm to charge slightly higher prices.

Season

Price can vary considerably from season to season. This is largely because of seasonal variations in fuelwood demand and supply. Price generally rises in mid-winter with snow accumulation as demand increases and supply diminishes. Price falls back down as demand decreases in the spring and remains low throughout the summer. Sometime in August or September prices rise to a common level and remain there throughout the fall.

Most individual firms do not vary their prices from season to season, especially small firms. If demand increases they run short; if it decreases they stockpile wood for the future. Those firms that operate in spring and summer usually lower their prices and offer discounts for

quantity or for green wood. Large firms operating in mid-winter will often raise prices if the market will bear such a price increase.

A consumer does best to purchase green wood in the spring and season a large quantity of it himself if the space is available. Purchasing seasoned wood in early fall is the next best opportunity, particularly if summer storage is a problem. Many consumers will find it necessary to purchase fuelwood in the winter if they use lots of wood and have little storage space or if their woodpile becomes inaccessible because of heavy snows.

Reasons Cited by Producers

Having considered the foregoing factors influencing fuelwood price, we can consider reasons cited by producers for charging the prices that they charged. Three basic reasons were given. They were:

(1) Price consistent with, slightly above or slightly below most other prices reported in the newspaper.

(2) Adjusted price so that the firm could sell a desired quantity of wood.

(3) Prices were set above costs to allow a certain margin for profit.

Of 55 who responded to this question, most listed other newspaper ads as the reason they set the price that they did (65%). About 25% cited costs as being the factor which influenced their price setting while the remaining 7% cited the fact that they tried to sell a certain quantity of wood and adjusted price as necessary.

This data demonstrates the importance of competition in determining the price that most firms charge for firewood. There was no unified effort to charge a consistent price or follow the price leadership of

one or a few firms, as has been the case in other areas.[8] A number of firms sought to undercut the market by going five or even ten dollars less than other firms advertising in the newspaper. Several others acknowledged charging higher prices to attract customers looking for a quality product.

Transactions Cost

Closely related to the price of firewood is the cost of the transaction. Part of the transactions cost is borne by the seller, part by the buyer and part is borne by society at large. That part which is borne by the seller is presumably capitalized into the price. It includes advertising costs, cost of receiving phone calls and usually includes delivery costs and stacking where applicable. Also included in transactions costs are sales taxes and any property rental fees if wood is sold or displayed from property other than the seller's residence.

Transactions costs relevant to the buyer include time and decision costs and any long distance phone bills in locating fuelwood dealers, as well as costs of picking wood up from the seller or delivery charges where applicable.

There are a number of transactions costs borne by society and others not directly participating in the fuelwood market. Costs of enforcing tax laws and of litigation of consumer or producer complaints are the most obvious.

Transactions costs are influenced by government policy - the more effectively sales tax laws are enforced the more firms to which sales tax will be a relevant transactions cost.

Advertising practices have some influence both on time and cost to sellers and may involve a slight monetary cost to buyers besides search time (cost of purchasing a newspaper for example). Both consumers and producers must make decisions about which advertising media to use. Many potential firewood consumers wouldn't know to look in the newspaper to find out where to purchase firewood. There is time cost involved in their finding this out.

Distance from dealer to consumer and frequency and size of purchases are two additional factors which influence transactions costs. Consumers can usually save money by purchasing larger quantities of wood at less frequent intervals. Dealers save on advertising and transportation costs by selling larger quantities. Many local dealers offer discounts for two or more face cords at a time. Substantial discounts are available for 10- or 20-cord loads. Perhaps neighbors or community groups could benefit by going together on a large load - as some have done in the past.

There are tradeoffs between savings on large infrequent purchases and storage costs, inconvenience and the risk of having large quantities of firewood lying around as a temptation to thieves. Also frequent small purchases allow the consumer increased choice between firms and may alleviate cash flow problems.

ACQUISITION COST

If a fuelwood consumer owns a chainsaw and a pickup truck or trailer or has a wooded area on his property, he has the option of cutting firewood himself. As we have already shown in Chapter I, most of those who own woodstoves choose this option.

In cutting wood for himself, the fuelwood consumer has chosen to give up many conveniences and is committing himself to work hard and spend a substantial amount of time making sure that he and his family have enough fuelwood to meet their needs for the winter. Getting wood free of charge seems like a great opportunity until a person realizes that there are quite a few costs involved.

At minimum a good chainsaw and hand-splitting tools must be purchased. A good chainsaw will cost a minimum of $100 plus fuel and maintenance. A splitting maul costs an additional $30 or more. Power splitting equipment can be rented or purchased for a price of $200 or more. If the wood has to be transported any distance some type of wagon, trailer or pickup truck must be purchased or rented if one is not owned or available to the consumer.

The labor time involved is likely to be a minimum of two hours per face cord and often close to three. Depending on a person's skill level this can be comparable to a labor cost of anywhere from $5 to $20 per hour or between $10 and $60 per face cord. Under these conditions the homeowner can expect a total cost of at least $20 per face cord of wood if he acquires the wood himself.

There are a number of factors which reduce this cost in the eyes of the wood consumer. Often he already owns a chainsaw and pickup truck, wagon or trailer in which he can haul wood. Since the vehicles and equipment are used for other purposes anyway, the cost charged to wood cutting and preparation should be no more than a few dollars per face cord plus mileage. Labor costs also can often be considered as minimal when allowance is made for the fact that teenagers and other underemployed

family members whose opportunity cost is close to zero can sometimes be employed to cut firewood.

Often cutting of firewood is therapeutic and considered as recreation by the fireplace or woodstove owner and not as a type of work. In his mind the therapeutic and recreational value of cutting wood offsets the opportunity cost of his time.

Many firewood consumers and potential firewood consumers would find acquiring their own wood to be far too costly. People located in the city without friends or relatives who own land often don't know where to look to find free firewood. Many urbanites can't operate a chainsaw and don't have a vehicle that they could use to haul wood. Others don't have the time or would consider their time far too valuable for firewood cutting, processing and hauling. Though most current woodusers cut their own; if firewood is going to become a significant source of fuel in Lansing most new woodusers will probably prefer to purchase wood at current price levels rather than cut it themselves.

DEPENDABILITY OF SUPPLY

If the price of firewood is kept at a reasonable level the next question becomes will there be enough wood to go around. If we compare current usage to the amount of wood in the forests we find that there is more than enough wood out there. The counties of Clinton, Eaton, Ionia and Ingham together have about 150 million cubic feet of standing timber or more than 1.5 million cords of wood on 220 thousand forested acres.[9] With growth rates of 1/2 to 2/3 of a cord per acre per year there is more than enough production to sustain current consumption in the Lansing area.[10] When forest statistics for all of the lower peninsula are added together the

total comes to almost 100 million cords of wood on 10 million acres of land; more than enough to provide over a cord per year for each of Michigan's 2-1/2 million households on a sustained basis.[11]

The fact that there is enough wood in the forests doesn't answer the question of whether there will be enough wood available on the market. This latter question depends on the willingness of suppliers to sell wood at different prices. If we apply basic principles of economics to firewood markets we should be able to make some predictions about the likelihood of excess demand or shortages.

Firewood suppliers will offer firewood for sale as long as the market price exceeds their costs including some allowance for a reasonable return to management and capital. If the quantity supplied is less than the quantity demanded those who can't buy wood will bid the price up. Assuming that supply elasticity is positive and finite, there will be new firms attracted by the higher price and existing firms will increase their production and rate of delivery as firewood becomes more profitable than other activities. This will continue until supply and demand just balance at equilibrium.

Because of uncertainty and the dynamic nature of the adjustment process, equilibrium will never be attained. There will always be excess demand or excess supply at different locations over time. In the very short-run, firms may not be able to cut and deliver enough wood to meet a surge in demand. This is most likely to occur in a period of inclement weather. Heavy snow and cold weather makes it difficult for people to cut wood or even have access to firewood that they've already cut. Storms also seem to have a psychological effect on consumers encouraging them to

purchase firewood. The combined effect of a surge in demand and a restriction in supply puts pressure on the few who have stockpiled wood to make a large number of deliveries in a short period of time.

Rising prices can counteract this excess demand situation but prices are sticky. Newspaper ads run for at least ten days at a time so that price adjustments may lag behind market pressures. Uncertainty and satisficing behavior will cause many firms to hold prices constant or raise them only slightly even if they are running out of wood as evidenced by practices reported by several firms. Other firms will not raise prices in order to maintain the goodwill of established customers. Firms that have been in business for a while plan ahead and urge established customers to buy early in the fall before prices rise.

Firms that are trying to establish themselves and encourage customer loyalty will do everything in their power to meet demand in such situations. Usually the most a consumer has to do is call around to several dealers and possibly wait a week or two until someone has time to get wood to him.

In the intermediate and long-run in the Lansing area, shortages are unlikely. There are too many landowners and people with four-wheel drive vehicles and chainsaws who could accumulate a pile of wood in several weeks in all but the worst weather conditions if it became sufficiently profitable.

Shortages are more likely if a person wants wood of a particular quality. In some years it is virtually impossible to find seasoned wood in the winter. Birch, apple, cherry and hickory may also be unavailable in midwinter. Nevertheless, reason tells us that if a person is willing to pay a high enough price he can probably find what he wants.

From a consumer's point of view, firewood is always available upon demand except in the severest storms of winter and in midsummer. Lack of a market is of no consequence in midsummer. Some consumers will suffer in midwinter, but the solution is a simple one - plan ahead. If a person wants to have seasoned wood to burn in January and February he would be wise to cut or purchase that wood by early December before snow accumulates. Loyalty to one dealer may be helpful if a consumer is likely to run short of wood in the winter. Several well-established dealers will give preference to their loyal customers in times of shortage. Also the consumer can ask this dealer to call him each year when seasoned wood is available.

COMMUNICATION

The fact that a dependable supply of quality firewood is available at a reasonable price in a convenient form is not enough to assure it's being purchased by those who want it. With as many choices as there are between fuelwood sellers in the Lansing area and as much quality variation as there is we can expect that many consumers will not always get the species or quality of wood that they want.

The problem is in the communication process. Consumers face two basic difficulties. The first is how to get accurate information about the products and services offered by the various firms, especially to find out how quantity and quality offerings compare between firms. The second problem is how to make firms aware of the preferences of those consumers who would prefer a product and service mix that is not currently available on the market.

The information problem is partly a result of the difficulty of finding an acceptable standard for measuring and classifying firewood by quality and quantity. There is no way for a consumer to compare the quantity, size of pieces or species mix of various firms offering a face cord of seasoned hardwood except by trial and error. Consumers can ask questions and state their preferences when inquiring over the phone about the product-service mix that is offered and usually find out some useful information in addition to advertised information. One problem with information obtained by such methods is that some firms are not totally honest in the claims they make in their advertisements or over the telephone.

As mentioned in Chapter III there are two ways a consumer can express his preferences in the market place, by using either the exit or the voice mechanism.

Economists such as Hirschman have noted that one problem with the exit mechanism is that it doesn't offer constructive suggestions to the firm as to what the consumer wants.[12] If a consumer doesn't purchase from a particular firewood firm or discontinues purchasing from a particular firm it can be difficult for the firm to discern what factor or combination of factors caused the dissatisfaction. In such circumstances it is even more difficult to find out exactly what the consumer wants.

Consumers can often more effectively express their preferences through the "voice" mechanism. They can let a particular dealer know what type of firewood and what services they would like. They can complain when they are dissatisfied provided that they know how to contact the dealer from whom they bought the wood.

Usually, dealers respond favorably to complaints by increasing the size of the load or replacing defective wood. Sometimes all that's necessary is for the dealer to show the consumer how to get a fire started. The effectiveness of voice in getting action on complaints about firewood helps to alleviate the concern about how to get effective legal action on a complaint.

There is a time cost involved when a consumer complains about a load of firewood. Using the voice mechanism may also encourage feelings of loyalty which make it more difficult to exit and try other dealers who may offer a better product and service mix at a better price. Both loyalty and voice are limited by the temporary nature of many fuelwood operations.

As a rule, a firewood consumer is better off using the voice mechanism before exiting because it increases his possible choice set. Exit is then a threat which makes the voice more effective.[13]

The effectiveness of communication and the information cost to the consumer depends on the method of advertising used. Newspaper advertising as with other written forms leaves a lot to the imagination. The best way for a consumer to tell how much wood he is getting is to look at the load himself. If he doesn't think he is getting enough wood he can ask for more or seek a discount equivalent to the shortfall. Many consumers may feel guilty about refusing a load after the dealer has made the delivery trip to their house since they had already agreed to purchase wood over the phone. Nevertheless, they have every right to demand that they are treated fairly.

Consumers have an advantage if they can see the wood before making a purchase decision. This is the case in retail outlets such as garden

stores. However retail outlets often don't offer delivery and therefore aren't convenient sources to many consumers.

Dealers who sell wood door-to-door offer an advantage in displaying the product to the consumer. This can be ideal for consumers who know enough about firewood to be able to discern quality and quantity by appearance.

Since most suburbanites know little about firewood quality they are often at a disadvantage in a direct sales situation in that they must make a quick decision without being able to consult with more knowledgeable friends and neighbors. They cannot compare prices and quality with other dealers. Also they may not be able to contact the seller if they have complaints.

There can be a time cost in waiting for a dealer to arrive with a load of wood, besides the cost of deciding which dealer to choose from the newspaper. Those who have busy schedules may prefer purchasing from someone who comes to the door to save time and decision costs.

Perhaps the biggest problem in communication between firewood buyers and sellers involves the consumer's lack of knowledge. Many novices don't know how much wood is supposed to be in a face cord and so are easily misled. Others don't know the difference between seasoned wood or unseasoned wood and the purpose that seasoning services. Species differences may have little meaning to many people. Some think they have to have a certain species such as oak and others aren't aware of the differences in burning properties of softwoods and hardwoods.

In some cases this may cause consumers to become discouraged with wood heat if firewood is too green to start a fire or if they pay a high price for a specialty wood that they really don't need. Mistakes in

purchasing can result in dangerous situations such as where overuse of green wood results in creosote buildup and chimney fires.

Key Performance Issues

We have shown how well the firewood market performs in terms of price, communication and dependability. Price is about as low as can be expected, given operating costs and shortages don't appear to be a major problem. Communication and preference articulation appears to be the weakest performance area in the firewood market.

When we reconsider our original goal of firewood as a fuel that is competitive with nonrenewable fossil fuels, price also appears to be a problem. As we have already mentioned in Chapter II, natural gas is still considerably less expensive than firewood as a heating fuel. Fuel oil, however, is comparable in price. If we use average market prices for fuelwood and fuel oil of about $40 per face cord and $1.00 per gallon respectively, firewood costs about $10 per million BTU's and fuel oil cost almost $11 per million BTU's.[14] Since homeowners use somewhere around 100 million BTU's of heat per year in the Lansing area, we can expect savings of close to $100 per year for those who heat entirely with wood.[15] This is hardly enough to cover the annualized cost of investing in woodburning equipment, much less the inconvenience of heating with wood for most consumers.[16]

Under such conditions, we shouldn't be too surprised if few people give serious consideration to wood heat. In order to meet our original goal, then, we need to consider ways of improving performance with respect to price and communication. The summary and conclusions, Chapter VI,

will discuss possible alternatives for reducing the price of firewood and improving communication and preference articulation between consumers and producers.

ENDNOTES

[1]Frick, p. 42; and Mosena, p. 11. Differences are largely in labor time between the two studies.

[2]Fixed costs and variable costs, long-run and short-run are not precise terms. There are degrees of fixity. Some costs are more variable than others. If the period is short enough there are almost no variable costs.

[3]Based on wages for woods labor mentioned by at least one firewood dealer or the approximate wage rate for unskilled labor in manufacturing in the Lansing area. Both the Massachusetts and Tennessee studies cited above used wage rates of about four dollars per hour.

[4]Frick, p. 36.

[5]Frick, pp. 44-46.

[6]This allows for the fact that costs and returns will not always be monetary but can be compared in monetary terms.

[7]The Lansing State Journal classified section in October of 1980 showed all but one or two firms offering prices of $40 per face cord delivered. In the winter of 1980 there wasn't a clear market price. Several dealers charged $30, several charged $35, several $40 and several $45 per face cord.

[8]Nagle and Manthy (pp. 11-12) maintained that price leadership by the largest retailer characterized the New Haven firewood market and helps explain why prices varied so little in the 1963-64 fireplace season.

[9]Data from each county are from U.S. Forest Service, The Growing Timber Resource of Michigan, 1966 (St. Paul, Minnesota, 1970), Table 16 and Table 31.

[10]This implies that 110,000 cords of wood could be harvested on a sustained basis in the four-county area. Recall that about 110,000 face cords or 40,000 cords of firewood was used last winter in the Lansing area. Allowing a substantial margin for error in estimates of annual growth and estimates of demand, it still appears that there is enough wood growing each year to meet demand.

[11]U.S. Forest Service, The Growing Timber Resource of Michigan, Table 17 and Table 29. The figure for the number of households is from the 1970 census and was taken from Michigan Statistical Abstract, 1978, Table I-20.

[12]Albert O. Hirschman, Exit Voice and Loyalty (Cambridge: Harvard University Press, 1970), pp. 21-29.

[13]Hirschman, pp. 76-105.

[14]Based on air dry red oak burned at 50% efficiency compared with #2 fuel oil burned at 65% efficiency. We assume three face cords are equivalent to one standard cord. For details see University of Minnesota, pp. 14-16.

[15]Based on results from the Oakland-Livingston Household Energy Use Survey conducted by Michigan State University in cooperation with the Oakland and Livingston Human Services Agency. This is a rough estimate of heating fuel consumption for Oakland and Livingston Counties which are comparable to Lansing in climate and standard of living.

[16]Woodstove acquisition and installation costs a minimum of $500. A woodburning system capable of heating an average sized home would probably cost almost $1000 to purchase and install, and could go as high as $3000 (based on interviews with local woodstove dealers and observation of prices). With annual savings of $100 the homeowner could only benefit if he could purchase a woodburning system for less than $750 at 6% interest, assuming a 10-year lifetime for the woodstove and everything else equal between the two. Since most people will only use wood as a supplemental heat source savings in fuel cost will often be considerably less.

CHAPTER VI

SUMMARY AND CONCLUSIONS

From the previous chapter, the key issues of performance in the fuelwood industry are price, and communication and product quality. One reason why firewood cannot compete with natural gas and does not offer much savings over coal or fuel oil is that costs of production are too high. As we have shown, there is good reason to believe that recent prices have been lower than average total costs, especially in the winter of 1979-80, so that attempts to increase competition or otherwise change market structure will probably not result in any direct long-term improvement in the price situation. The most feasible alternatives for reducing prices or at least keeping them from rising too much appear to involve controlling operating costs.

The problem of communication and product quality must be addressed simultaneously with the cost problem. Any lowering of operating costs must not significantly reduce the ability of a consumer to find wood with size, seasoning and species characteristics that are appropriate for his woodburning system. Also, ways must be found to enable consumers to make choices more consistent with their preferences. Other related concerns include transaction costs, dependability of supply and price stability. If policy measures to reduce costs or improve communications significantly increase transactions costs, increase the likelihood of shortages or reduce price stability, then they are of questionable worth.

Measures to Reduce Operating Costs

A number of approaches to reducing operating costs can be considered. The most obvious would be to encourage firewood producers to utilize improved technology and organization of activities. Another alternative would be to encourage certain types of dealers with low labor and capital costs to dominate the industry. Government policies influencing forests, especially timber sales could be used to provide lower cost raw material for fuelwood producers. Various other methods of direct and indirect government subsidization could also be used.

The most feasible alternative is to use methods to encourage the utilization of improved technology. Subsidization merely transfers costs from consumers to taxpayers, and is already being done by federal and state forest management agencies. Encouraging suppliers and producers with low operating costs may be helpful except that most such producers are already in the firewood business.

Those with low operating costs include:

(1) Unemployed individuals with pickup trucks, appropriate equipment and a source of wood.

(2) Pulpwood cutters and other loggers, especially when pulpwood and wood products markets are depressed.

(3) Tree removal companies.

Firms in the foregoing categories have low capital costs and in some cases, low labor costs too.

In periods of high unemployment such as in 1980, unemployed factory workers and pulpwood cutters can supplement their income from unemployment benefits by selling firewood. As long as firewood producers do not report

their income from firewood sales they will be eligible for full unemployment benefits. Since unemployment benefits usually provide a reasonable income, they do not need to earn very much from firewood sales, and will be willing to sell firewood at comparatively low prices, especially if they enjoy producing firewood. It is unlikely that much improvement over the current situation is possible unless unemployment should continue to rise in Michigan. Market forces seem to have drawn many unemployed individuals into the firewood business in the past year.

There are a number of alternative technological improvements through which fuelwood dealers in the Lansing area could cut costs. There are many things that a firm can do just to organize its operations more efficiently. Some appropriate ideas were discussed in Chapter III. Others are discussed in the articles by Frick and Mosena.[1]

Besides changes in organization, improvements in technology can reduce costs. In many cases the most cost-efficient system is not the most technologically advanced. A very small fuelwood operation may be more efficient using hand tools such as splitting mauls than investing in power-splitting equipment. Proper skidding equipment and trucks to use depend on the size and nature of the operation.

Specialization and vertical coordination may be one way to reduce costs. Pulpwood cutters and loggers are most experienced in harvesting large quantities of wood efficiently. A firm can sometimes reduce costs by purchasing wholesale from pulpwood cutters. If dealers can find enough wood locally they may be better off on their own since most pulpwood sources are over 100 miles away and involve high transport costs.

Large firms may find that some type of formal or informal agreement with wholesalers to make repeat purchases might enable them to receive discounts.

Many of these improvements in efficiency have been adopted to a greater or lesser extent by some firms in the Lansing area. Competition tends to encourage attempts at increased efficiency.

Government policy makers may be able to encourage improvements in efficiency by a number of means. One is to provide information to fuelwood dealers and producers through the Cooperative Extension Service. Meetings for fuelwood producers such as the one held at Michigan State in the summer of 1980 can be helpful in this regard along with publications.

Fuelwood producers' organizations can also be formed for the sharing of ideas and information. Such organizations have been helpful in states such as Massachusetts for exchanging information and supporting research.[2] The state may not wish to encourage producers' organizations if the threat of collusion is too great. Firewood markets are presently too informal in the Lansing area for collusion to be a major concern. Producers' associations may be difficult to organize in the Lansing area because of the informal nature of the industry.

Government subsidization or tax relief for research related to technology of firewood production may speed the development and implementation of new technology. This could be accomplished through private firms or universities in some situations. Private firms seem to be making good progress in developing technology for firewood production. Firms have developed techniques for mass producing firewood in ready-to-use form

and for utilizing sawdust and wood wastes for pressed logs for example.[3]

Market conditions have discouraged firms from adopting new technology in recent years. Prices have been too low and capital costs too high to justify such risky, long-term investments.

The most reasonable possibility for technological improvement in the Lansing area would be to use a mass-production system for fuelwood processing. Three companies have developed processing systems that are available commercially. One is the LaFont Processor, discussed in Chapter II. Another is produced by the Jeffrey trucking company.[4] The third is produced by the Forest-All Corporation, the Forest-All firewood mill. The Forest-All mill is being used by several firms in New England and reportedly can process more than one cord per man-hour, more than double the rate of a regular screw-type or hydraulic splitter and circular saw fed by hand.[5]

If a firm is large enough to use a mass production system for firewood, the decision as to whether to use one depends on logistics--whether the firm will process its wood at each harvest site, at various storage facilities close to markets or at one central location. If a firm has to move its processing equipment often, a less complicated setup will be cheaper. Portable processing rigs are available.[6]

The biggest problem with a mass production operation in the Lansing area is market size. The market is so small that a dealer producing 5000 cords of wood would cover close to half of the market. This limitation could be overcome if a firm sought to locate itself between several cities such as Saginaw, Flint and Lansing. A processing site could be chosen away from the cities and close to fuelwood supplies, and the wood

could be transported in quantity to distribution points near each city.

At present at least one firm mass produces firewood in the Detroit area.[7] The large metropolitan market of Detroit is much more lucrative than Lansing and other small cities so that large firms are more likely to ignore smaller cities in the central and southeastern lower peninsula and locate in or near Detroit.

The difficulty of transporting large quantities of wood from forested areas of northern Michigan to urban areas in the south has tended to favor small, localized producers who acquire their wood from small woodlots. This is different from New England where large forested areas are close to urban centers and large firms have thrived at both wholesale and retail levels. As the wholesale and retail markets develop and unemployment declines, mass production may become more profitable in south central Michigan, particularly with vertical coordination between pulpwood cutters in the north and retail outlets near cities.

If one or two large firms take over most of the market in the Lansing area, we might expect them to use market power to restrict production and raise prices. Current conditions, however, indicate that this would be unlikely. Localized producers will still be around for specialty wood and loyal customers. Opportunities for homeowners to cut their own wood and easy entrance for smaller producers will keep prices from rising to higher levels under monopoly conditions. A large firm probably could not survive unless it could offer lower prices than existing firms.

Any large firm would have to be especially creative in marketing to become established in the Lansing market. Firewood dealers in New England have tried a number of marketing schemes ranging from publicity

stunts which received national television coverage to marketing through woodstove dealers.[8] One large woodstove works in Connecticut, concerned about high fuelwood prices and their effect on woodstove sales, set up a large fuelwood discount center using a LaFont Processor.[9] The idea was to reduce transaction costs by selling wood by weight and having consumers pick up as much wood as they wanted in a centrally-located center similar to suburban shopping centers. This idea may not be as feasible in Lansing because there are no large woodstove dealers or manufacturers nearby. Large woodstove manufacturing facilities are located in isolated towns such as Big Rapids.

There are possibilities for arrangements between woodstove dealers and firewood producers in Michigan, though perhaps on a smaller scale. One firewood producer-retailer in Grand Rapids combined woodstove and fuelwood sales at the same location in a suburban shopping area. Though firewood sales were disappointing in the winter of 1979-80, diversification into other related products such as chainsaws and lumber may improve the situation this year.[10] Aggressive firewood entrepreneurs may find it highly profitable to convince woodstove dealers to display or advertise their firewood or diversify into firewood sales.

Communication and Product Quality

Problems with communication and product quality can be tackled in a number of ways. As we have already suggested, there is a measurement problem as well as occasional problems with species and seasoning. There is currently a high information cost to consumers.

Alternatives for reducing the information cost to consumers are numerous. Requiring that certain standards of measurement be used is

one possibility. Grading standards could be set up for seasoning and species determination. Requiring firms to be licensed could aid in the enforcement of standards.

A firewood producers' association could aid in the information dissemination process by giving their seal of approval to firms that meet certain quality standards. The producers' association could also encourage firms to use optional grading and measurement standards.

Consumers' organizations could attempt to compile information on firewood sellers. The Better Business Bureau might be helpful in this regard. This type of approach is likely to have very limited effects because of the informal nature of the industry.

Another possibility would be for the government to provide information to consumers about how to purchase firewood. Cooperative Extension offices currently provide some information to a limited clientele. Human services agencies could assist in providing such information to consumers.

A number of states have enacted laws regulating the units of measurement that are used in firewood advertising and marketing. New York requires that advertisements for firewood state the dimensions of the wood.[11] The state of Connecticut has banned the sale of firewood by weight or any other measurement other than standard cords.[12] Massachusetts requires that firewood be sold in cubic feet or cubic meters.[13]

One problem with such regulation is that it is hard to enforce. The law in New York could be costly to enforce and also costly to firms who are not accustomed to carefully measuring the load they sell. Firms

who advertise by newspaper will be easy to watch but others will be difficult to catch if they disobey this law. The new legislation effectively prohibits firms from selling firewood by weight in all three states. The fuelwood discount center in Connecticut had to change its plans and sell by half cords instead of weight, raising transactions costs considerably.[14]

Regulation of species mix and seasoning and enforcement of grading standards would be more costly to administer than measurement standards. First a grading system would have to be set up and then standards would have to be devised, a time consuming and expensive process. Licensing would also be costly to administer and would be a burden to taxpayers or fuelwood dealers depending on how it was financed. Many small dealers would be driven out of business or into a black market because of the cost and/or inconvenience of being licensed. Regulation in general is likely to discourage the new entrant and the small-scale operator and may result in a more oligopolistic industry with less product variety.

Optional grading or measurement standards encouraged by a firewood producers' association would avoid the problem of enforcement while providing a better means for comparison. Such an association does not appear likely in the near future in the Lansing area, however.

In terms of providing information to consumers it appears that the least disagreeable method would be to make more effective use of the media along with the expertise of the Cooperative Extension Service. The Cooperative Extension Service in Michigan has hosted 234 meetings throughout the state on the subject of home heating with wood in the last year.[15] T.V. and radio stations, particularly in smaller cities

and towns have been used for Public Service radio announcements and T.V. news releases about wood heating. Most of these meetings and announcements provide little information about markets although they do help consumers know what kind of wood to look for. Radio and T.V. spots are harder to come by in the Lansing area where there are many groups competing for public service time. If firewood should continue to increase in popularity, use of the news media in the Lansing area could be more easily justified.

One other possibility to improve the information available to consumers is for firewood firms to take the initiative in providing information to consumers. Firewood dealers who complain about competition from small dealers, who undercut prices and offer a low quality product, can seek to educate consumers. Distributing brochures or flyers for woodstove dealers to hand out would be helpful both as an advertising tool and as a means of providing low-cost information to consumers. Relevant information could include the following:

(1) Facts, about seasoned wood--why necessary and how long wood should be seasoned.
(2) Burning properties of various wood species.
(3) How to tell how much wood you are getting.
(4) Best time to buy firewood.
(5) How to season wood yourself.

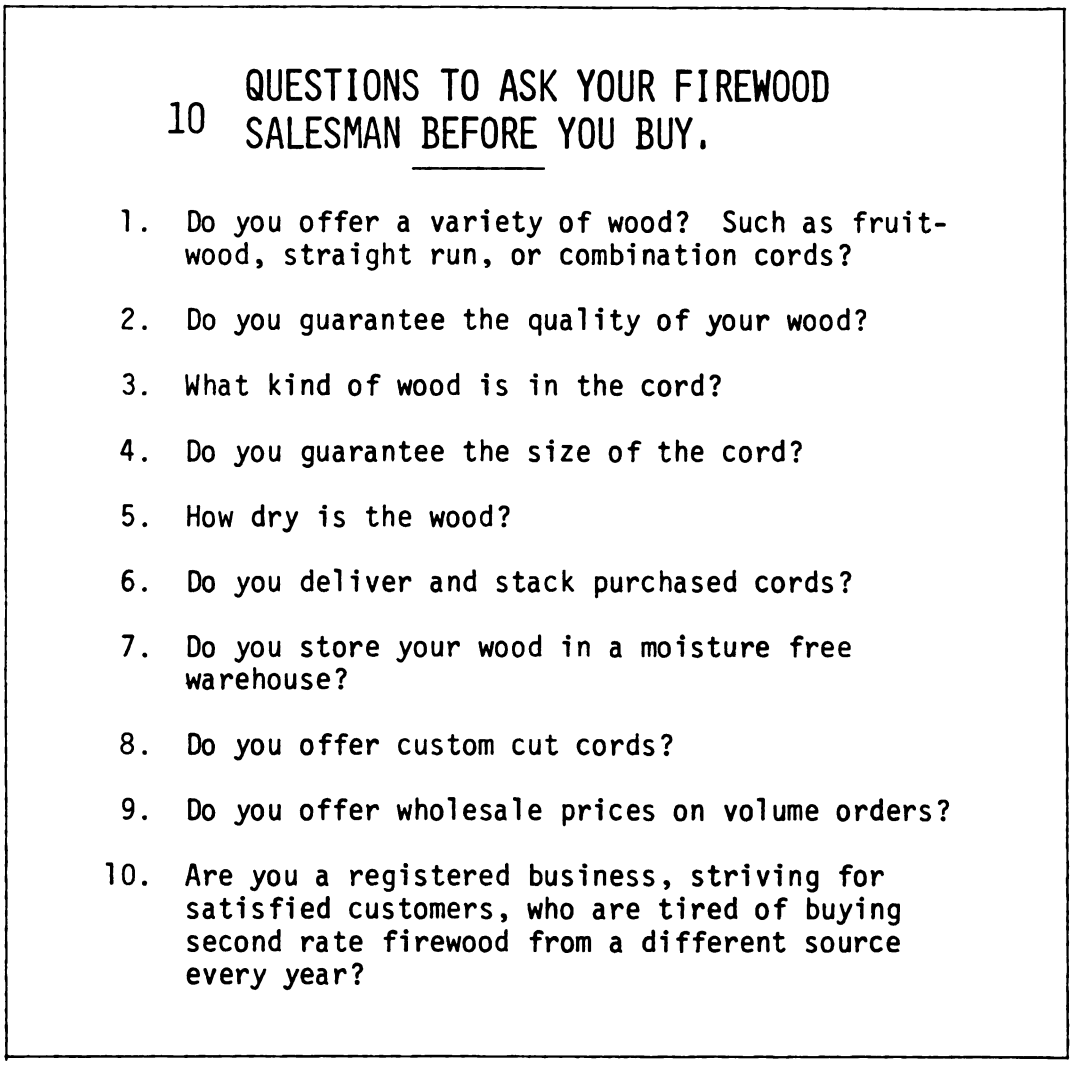
The information provided would depend partly on the practices of the firm so that each firm would include information that would tend to shed a favorable light on its practices.

One Lansing area firm has devised a newspaper advertisement with some of these ideas in mind. Though slanted towards the practices of this firm, consumers who read the ad can be better informed about things to consider when purchasing firewood (see Figure 6-1).

Two other ideas are worth considering which may help both to reduce costs and improve information. One involves a producers' or consumers' cooperative and the other involves utilizing waste wood to make artificial logs.

A cooperative could be organized by producers, consumers or a social service agency. If it were a consumers' cooperative, the co-op could purchase a large quantity of wood at wholesale prices. Members would organize to jointly provide a place to store the wood and people to man the co-op at appropriate times. Several different types of wood could be sold at different prices or all could be sold as mixed hardwood. If there are noticeable differences in the seasoning or species of wood purchased from different producers, it can be sold separately or mixed together in units of comparable quality. The difficulties with such an operation would include problems of organization, cost of wood storage and cost or time required to administer the co-op. Time could be saved by selling for a limited period of time, every Saturday in the fall for example. The co-op would be worthwhile if it could sell quality wood at a price lower than the market price and still cover operating costs. Arrangements for delivery might even be possible.

A producers' cooperative would be similar except that the producers would bear administrative and storage costs and the risk which would be reflected in the price. It would only be worthwhile to producers if it



10 QUESTIONS TO ASK YOUR FIREWOOD SALESMAN BEFORE YOU BUY.

1. Do you offer a variety of wood? Such as fruitwood, straight run, or combination cords?
2. Do you guarantee the quality of your wood?
3. What kind of wood is in the cord?
4. Do you guarantee the size of the cord?
5. How dry is the wood?
6. Do you deliver and stack purchased cords?
7. Do you store your wood in a moisture free warehouse?
8. Do you offer custom cut cords?
9. Do you offer wholesale prices on volume orders?
10. Are you a registered business, striving for satisfied customers, who are tired of buying second rate firewood from a different source every year?

Figure 6-1. Example of an Informative Firewood Display Ad

SOURCE: Lansing State Journal, classified section, Sunday, September 28, 1980.

could increase their net return in some way. The joint provision of advertising would be helpful. Pooling of administrative time and abilities might be less costly to the individual firewood producers.

Besides organizational problems, the problem of finding a place where the wood could be stored at low cost and still be accessible to consumers would discourage the formation of cooperatives. One idea to solve this problem would be to set up firewood cooperatives at exits to interstate 75 or U.S. 27 in resort areas of Michigan.[16] Vacationers from southern Michigan could purchase firewood on their way home from resorts at low prices rather than purchasing the same wood from a retailer at home for a price which includes transportation cost plus a markup. Such arrangements would only help a small proportion of the population that travels and could find room in their vehicle to haul firewood.

A technological alternative that hasn't been exploited in the U.S. as it has in Europe and Japan is to use wood wastes as fuel. One firm, in cooperation with the Department of Energy, has test-marketed a fuel made by compressing sawdust, sander dust and wood shavings into a highly densified form and sold as 2-inch diameter cylinders using the trademark TEK-FUEL.[17] TEK-FUEL has been sold at $80 per ton. It is of uniform quality, has superior burning properties and is easier to handle than conventional firewood. A ton of TEK-FUEL is comparable in price to a cord of firewood and has the same heat value.

Wood wastes manufactured in log or chunk form have properties which make them easier to package and of more uniform quality than natural firewood. They also lend themselves more easily to use in an

automated woodburning system operating in a manner similar to many coal-burning furnaces. If they can be produced at a cost comparable to the cost of natural firewood, they will provide a viable alternative. Perhaps as much as 5 to 10% of New England's energy needs could be met by utilizing wood wastes, according to various studies.[18] Wood wastes are already being used as fuel by many wood products firms, so that only the excess will be available for home heating.

To summarize, firewood is a bulky product which is expensive to handle and process and difficult to market. As long as wood is sold and used in log form it will be difficult to package and measure, expensive to transport and inconvenient for many consumers to use. These problems can be alleviated somewhat through the use of technology and better advertising.

Despite all of it's disadvantages, enough firewood is available to replace a large percentage of fossil fuels for home heating. Whether firewood becomes more popular depends largely on it's price relative to fossil fuels.

Firewood prices have been rising at no more than 20% per year over the last five years and appear to be leveling off relative to the general price level. On the other hand, the price of fuel oil has doubled since the winter of 1979 and is expected to continue increasing faster than the rate of inflation. Moreover, the price of natural gas is expected to increase even more rapidly as price controls are lifted over the next few years. If the expected price increases occur, especially in natural gas, and no better alternatives are found than are currently available

in Michigan, firewood will become increasingly feasible as a home heating fuel.

Opportunities for Future Research

Possible areas in which future research could be useful include advertising, effect of recent regulation in various states and detailed operational studies of individual firms. A study matching a large sample of firewood consumers to retailers from whom they purchased wood might provide information about advertising, complaints and preference articulation in general. An attempt could be made in cooperation with one or a few large-scale firewood retailers to test various advertising techniques as to their effectiveness in attracting customers.

Before and after studies could be made in states where regulation has been recently enacted such as New York, Massachusetts and Connecticut to ascertain the effect of this regulation on price, market structure and consumer satisfaction.

Operational studies are always useful because they show specific ways to improve the cost-efficiency of a firm. Studies of firms with unusual and innovative practices such as those described in the aforementioned USDA study who used LaFont Processors to mass produce firewood would be most helpful.[19] A detailed study of a firewood cooperative or of the firewood discount center mentioned previously are two good possibilities.

ENDNOTES

[1]Mosena, pp. 16-19, Frick, pp. 22-23.

[2]The Massachusetts Wood Producer's Association in cooperation with the Massachusetts Tree Farm Committee produced a manual for firewood producers, The Firewood Producers Manual (cited elsewhere), an invaluable aid to firewood producers in planning production and marketing strategies.

[3]Since harvesting technology is already well-developed from other wood industries the areas where technology can be most beneficial include splitting, seasoning and marketing firewood. Processing systems have been developed for splitting, and utilization of wood wastes may help overcome seasoning problems and provide a product that can be more easily marketed.

[4]No information was available on this one except that it is called the Automatic Wood Processor and is available from the Mike Jeffrey Trucking Company in Hudson, Michigan.

[5]George D. Fowler, "Firewood processing on a grand scale" Northern Logger, (February 1980), pp. 8-9; George D. Fowler, "The firewood mill Howard Baker almost didn't see" Northern Logger, (April 1980), p. 37. Both of these articles show production rates of 3 cords per hour for a two-man crew using a Forest-All firewood mill.

[6]Various ads in recent issues of the Northern Logger show portable LaFont Processors.

[7]According to reports from the Firewood Producer's Conference at Michigan State University, August 12, 1980.

[8]George D. Fowler, "The firewood king of New England" Northern Logger and Timber Processor, (October 1979) and letters to the editor in subsequent issues of the Northern Logger discuss the publicity stunts of "Butcher" Birch and his attempts to control firewood markets. He has received publicity from a number of national magazines.

[9]George D. Fowler, "A fuelwood discount store, A new concept in marketing firewood " Northern Logger, (July 1979), pp. 20-21.

[10]Based on a personal interview with owners of the H & H Wood Company, Grand Rapids, February 1980.

[11]"Late industry news " Northern Logger,(October 1979).

[12]Connecticut P.A. 79-281 discussed in "Late industry news" Northern Logger, (August 1979).

[13]"Late industry news" Northern Logger, 1980.

[14]"Late industry news" Northern Logger (August 1979).

[15]Telephone interview with Dr. Henry Huber, Professor and Extension Specialist, Michigan State University, Department of Forestry. December 5, 1980.

[16]Mary Zehner, Extension Specialist, Michigan State University, Department of Agricultural Economics. Unpublished report prepared for an MSU conference of fuelwood producers, August 12, 1980.

[17]"Wood waste turned into fuel" Northern Logger, No. 11 (April 1980), p. 54.

[18]As reported in "Wood waste turned into fuel."

[19]U.S. Forest Service, "Firewood Marketing and Manufacturing."

APPENDICES

APPENDIX A

APPENDIX A

CONSUMER SURVEY

I. Household Characteristics

1. What type of dwelling do you live in?

Single family home	1
Mobile home	2
Duplex	3
Townhouse	4
Apartment	5

2. Do you own or rent your home?

Own	1
Rent	0

3. Do you pay for your own heat?

Yes	1
No	0

4. What type of community do you live in?

Urban	1
Suburban	2
Rural	3
Small town	4
Small city	5

5. What is the principal heating fuel that you use?

Natural gas	1
Fuel oil	2
Electricity	3
LP gas	4
Wood	5
Coal	6
Solar	7

6. Do you have a woodstove or wood furnace in your home?

No	0
Yes, give number	___

7. Do you have a fireplace in your home?

No	0
Yes, give number	___

8. How many rooms are in your home (not including bathrooms and unfinished rooms)?

1 - 1 (2-4) - 2 (5-6) - 3 (7-8) - 4

(9-10) - 5 (11-12) - 6 13 or more - 7

9. How old is your home?

Less than 5 years	1
5 to 10 years	2
11 to 20 years	3
21 to 30 years	4
31 to 40 years	5
41 to 50 years	6
More than 50 years	7

10. How well insulated is your home?

Little insulation	0
Some insulation (about average)	1
Well insulated	2

II. Wood Energy Attitudes and Usage

A. For those who don't use wood for heat including occasional fireplace users.

I would like to find out some of your attitudes about wood heat.

1. Have you thought about the possibility of heating with wood?

No	0	Go to 2
Yes	1	Do parts a-c

a. Have you priced woodstoves?

No	0
Yes	1

b. Do you expect to buy one in the next six months (for next winter)?

No	0	
Yes	1	Go to part B after answering c
Maybe	2	

c. What type of stove do you have in mind?

Box stove	1
Airtight stove	2
Furnace	3
Fireplace insert	4
Furnace attachment	5
Fireplace	6
Other	7

2a. How much would the price of your current heating fuel need to rise for you to consider switching to wood heat, assuming the price of wood remained constant?

	Would Switch	Might Switch	Would not heat w/wood
Double	2	1	0
Triple	2	1	0

2b. The following is a list of possible reasons why people don't use wood. Please tell me how important each one is in your not using wood heat.

		Very Important	Fairly Important	Not Important
1)	Woodstoves are too expensive	2	1	0
2)	Firewood is too hard to find	2	1	0
3)	Firewood is too expensive	2	1	0
4)	I don't have time to operate a woodstove	2	1	0
5)	Woodstoves are too dangerous	2	1	0
6)	We don't have any place to put a woodstove	2	1	0
7)	Heating with wood is too much trouble and hard work	2	1	0
8)	We will be moving in a few years	2	1	0
9)	(ask only where relevant) I'm too old to bother with wood heat	2	1	0

2c. Which of the above is most important (give number)?

B. For those planning to purchase a woodstove, wood fireplace or wood furnace in the next six months . . . Answer the following numbered questions concerning your plans.

4. Do you ever expect to use your woodstove, wood fireplace or wood furnace as the only heat source or cooking source on a regular basis.

No	0
Heat only	1
Cooking only	2
Both	3

(If 0 or 2, skip 6c and 7)

6b. Can you tell me approximately how many hours per week you plan on using your woodstove or wood furnace?

less than 1 hr.	1	26 to 50 hrs.	5
1 to 5 hrs.	2	51 to 100 hrs.	6
6 to 10 hrs.	3	all the time	7
11 to 25 hrs.	4		

6c. How many hours per week will it be the only heat source?

less than 1 hr.	1	26 to 50 hrs.	5
1 to 5 hrs.	2	51 to 100 hrs.	6
6 to 10 hrs.	3	all the time	7
11 to 25 hrs.	4		

7. (If 6c is less than 50 hours) When will you use the woodstove as a primary heat source?

Daylight hours	1
Evening	2
Weekend	3
Evenings and weekend	4
Other, explain	5

10. How do you plan on getting your firewood?

Will buy	1
Will cut myself	2
None of the above	3

Do you know a particular person or place that will sell, exchange, or allow you to cut firewood?

Yes	1
No	0 (skip 3c, 3d, and 3e)

a. (If answer to 10 is 1) Where do you plan on purchasing your firewood?

From a private dealer	1
Retail outlet	2
Firewood company	3
Tree removal company	4
Lumber yard or wood products plant	5
City landfill, utility company, etc.	6
Other, explain_____	7

b. (If planning to get free firewood) Where will you get your firewood?

Friend, relative, or neighbor's woods	1
Dead or down wood from city landfill, highway dept., etc.	2
Own property	3

Cut on a cord for cord basis or similar exchange	4
Available from my work	5
Helped clear someone's land	6
Lumber yard or wood products plant	7

c. How far away is this source (from a or b)

Less than 10 miles	1
10-50 miles	2
More than 50 miles	3
Don't know	9

18. Do you own or plan to purchase any equipment to be used primarily for firewood?

Yes	1
No	2

a. Please tell me whether you own or plan to purchase any of the following equipment to cut, haul, process or store firewood.

	Won't Use	Own	Rent	Purchase	Borrow
Chainsaw	0	1	3	4	5
Pickup truck	0	1	3	4	5
Power-splitting equipment	0	1	3	4	5
Storage shed or bin	0	1	3	4	5
Trailer	0	1	3	4	5
Other vehicles (describe)	0	1	3	4	5

C. For those who use wood as a primary or supplemental source of heat or have a wood fireplace in the house. I would like to find out some things about the way you utilize wood energy in your home.

1. What type of wood burning system do you own/use in your home?

Fireplace	1 - skip 2b & c
Stove or fireplace insert	2
Furnace	3

2a. Does your wood fireplace or woodstove have some type of a blower system, a heat collector or other device for increased efficiency?

Yes	1
No	0

Describe...

2b. What type of woodstove do you own?

Box stove	1
Airtight stove	2
Furnace-combination fossil fuel & wood	3
Furnace - entirely wood	4

2c. Is it radiant stove or circulating stove?

Radiant stove	1
Circulating stove	2
Both	3

FIREPLACE OR STOVE USAGE

4. Is the woodstove, wood fireplace or wood furnace you own ever used as the only heat source or cooking source?

(If 0 or 2, skip 6c and 7)
No - 0 Heat only - 1 Cooking only - 2 Both - 3

5. Are you using your woodstove, fireplace or wood furnace today?

Yes - 1 No - 0

Answer question six by choosing one of the following for each part.

Less than 1 hr.	1	26 to 50 hrs.	5
1 to 5 hrs.	2	51 to 100 hrs.	6
6 to 10 hrs.	3	All the time	7
11 to 25 hrs.	4		

6. Can you tell me approximately how many hours per week you use your woodstove(s) and/or wood fireplace?

a. How many hours have you used it this past week (If away on vacation, find out about the last week they were home)?

b. How many hours per week do you usually use it during the winter (average)?

c. How many hours per week is it the only heat source?

7. (If 6c is between 0 and 50 hours) When will you use the woodstove as your only heat source?

Daylight hours - 1 Evening - 2 Weekend - 3

Evenings & weekends - 4 Other, explain... - 5

8. How much did you use your stove/fireplace last winter?

None - 0 Less - 1 The same - 2

More - 3 Just moved in - 4

9a. During what month of the year do you start using your woodstove or wood fireplace regularly? (assume normal weather)

Sept. - 1 Oct. - 2 Nov. - 3 Dec. - 4

Jan. - 5 Year around - 7

9b. Which is the last month that you used your woodstove or wood fireplace on a regular basis?

Jan. - 1 Feb. - 2 March - 3 April - 4

May - 5 June - 6 Year around - 7

10. How do you usually get your firewood?

Cut yourself - 1 Purchase - 2 Both - 3 Neither - 4

10a. If you have purchased any firewood in the last two years, please indicate the source of your most recent purchase.

Have not purchased wood (skip 11b)	0	(Skip questions with *)
From a private dealer	1	
Diversified retail outlet (garden store, etc.)	2	
Firewood company	3	
Tree removal company	4	
Lumber yard or wood products plant	5	
City landfill, utility company, etc.	6	
Other, explain	7	

10b. If you have gotten free firewood in the last two years (other than kindling), please indicate the source of your most recent acquisition (skip 11c).

I haven't cut or acquired any free firewood	0	(Skip questions
Friend, relative or neighbor's woods	1	with *)
Cut on a cord for a cord basis or similar exchange	2	
Dead or down wood from city landfill, highway dept., parks, utility company, etc.	3	
Own property	4	
Available from my work	5	
Helped clear someone's land	6	
Lumber yard or wood products plant	6	
Other, specify _____	7	

10c. What distance does the wood come from?

Less than 10 miles	1	Less than 50 miles	2
50 - 100 miles	3	Variable	5
Over 100 miles	4	Don't know	9

10d. (For those who get wood from their own property) How many acres of woods do you own?

Less than 1	0	11 to 20	4
1 to 2	1	More than 20	5
2 to 5	2		
6 to 10	3		

11. Please answer the following questions concerning the frequency of your wood acquisitions?

a. When was the last time you acquired firewood?

This month	1	Summer	4
Last fall	3	Before summer of '79	5
Midwinter	2		

*b. How many times have you purchased firewood in the last year (since March 1979 for the '79-80 winter)?

0 1 2 3 or more

*c. How many trips have you made to cut or gather firewood in the last year? (or had someone bring it to you)?

0 1 2 3 or more

12. Please answer the following questions regarding the amount of firewood that you use.

a. When you acquire firewood, how many face cords do you get at one time?

less than one	0	More than 16	6
1	1	Other units	7
2	2	List units and amount _____	
3-5	3		
6-10	4		
11-15	5		

b. How much wood have you used so far this winter? (face cords)

c. How much wood did you use last winter? (face cords as in part a)

d. How much wood do you have stored on your property now? (code as in part a)

13. Could you tell me how much you usually pay for firewood?

*a. If you buy by the face cord or pickup load, please give the price per unit.

Less than $25	0	$45-49	5
$25-29	1	$50-54	6
$30-34	2	$55 or more	7
$35-39	3	N/A (other units)	8
$40-44	4		

*b. What units are used in the price stated above?

*c. If you buy firewood in units other than face cords, what units do you use?

Pickup load - 1 Cord - 2 Ton - 3 Bundle - 4

Other - 5 Price _____

*d. Is the wood delivered? Yes No

*e. Do you pay extra for delivery or stacking? Yes-amt._____
No.

f. Do you expect wood to be available from your past supplier(s) in the foreseeable future? Yes No.

+g. (For those who currently have access to free firewood). Suppose that you could no longer find free firewood, would you be willing to pay the going rate for firewood (mention local price).

No, I won't use wood if I have to pay	0
Yes, but I would use less firewood	1
Yes, I'd use the same amount of wood as I do now	2

Comments _____

14. Please answer the following questions regarding where you obtain information concerning wood availability and price.

a. How did you hear about the last place where you acquired wood?

Friends, neighbors or relatives	1
Work associates	2
Newspaper	3
Woodstove dealer	4
Someone came to the door	5
Other	6

b. Which other source was most helpful? (Next to the one mentioned in a).

Friends or relatives	1	Extension Agent or School	5
Neighbors	2	Woodstove dealer	6
Work associates	3	Door-to-door wood salesman	7
Newspaper	4	Other (specify)	8

c. Have you ever been misled or cheated with respect to the amount or quality of firewood you were getting?

Yes 1 No 0 Explain _____

15. Please answer the following questions regarding the amount that your wood is seasoned.

a. The last time you bought or cut wood do you remember how long it had been seasoned?

cut or killed within one month	- 1	6-12 months	- 3
1-6 months	- 2	more than 12 months	- 4
We bought/acquired RRties, chips, scrapwood, or other processed wood	- 5	Don't know	- 9

b. How long do you usually store wood after you get it?

Use immediately	- 0	3-9 months	- 2
Less than 3 mos.	- 1	More than 9 months	- 3
		Varies	- 4

c. Where do you store the wood?

Woodbox, storage shed or bin (covered)	1
Inside the house, incl. basement or garage	2
Cover with plastic or canvas tarp	3
Store in the open air	4
Other, describe	5

16. What species of wood do you usually set?

No species in particular	0
Mixed hardwood	1
Oak, maple and/or beech exclusively	2
Hickory or walnut	3
Elm,ash or birch exclusively	4
Apple, fruit wood or cherry	5
Select hardwoods (not all)	6
Other, specify _____	7

17. Are you willing to pay more for:

a.	Seasoned wood?	yes	1
		no	0
b.	A specific species or quality of wood?	yes	1
		no	0
c.	Have you ever had a choice of price and quality (i.e., last time)?	yes	1
		no	0 - (go to 18)
d.	(If so) did you pay more for better quality?	yes	1
		no	0 - (go to 18)

e. Why did you pay more?

Seasoned wood	1
Hardwood	2
Fruitwood	3
Specific species pref.	4
Other, specify _____	5

18. Do you own any equipment which you use primarily for firewood (other than sove)?

yes	1
no	0

(If no and person cuts his own wood, ask 18a anyway, otherwise skip).

a. Please tell me whether you own or use any of the following equipment to cut, haul, process or store firewood.

	Don't Use	Own 2yrs. or more	Own 2yrs. or less	Rent	Will Buy	Borrow
Chainsaw	0	1	2	3	4	5
Pickup Truck	0	1	2	3	4	5
Power Splitting equipment	0	1	2	3	4	5
Storage shed, wood box, or bin	0	1	2	3	4	5
Trailer	0	1	2	3	4	5
Other vehicles (describe)	0	1	2	3	4	5

19. Does lack of space on your property limit the amount of wood you can store at one time?

Yes_____ 1 No _____ 0 Quantity _____

20. (For those who use their woodstove or fireplace more than 25 hours/week as a major heat source).

    a. Which of the following reasons best describes the reason you began heating with wood?

Always been heating with wood	1
Bought a house with woodstove or furnace	2
Wanted to save money on fuel and the house already had a woodstove or wood furnace	3
Bought a stove to save money on fuel	4
Afraid of a fossil fuel shortage	5
Wanted to do my part for the energy crisis	6
I like the feeling, beauty, etc. of wood heat	7
Other, specify _____	

    b. What advantages does it have?_____

    c. What do you dislike about wood heat? _____

(Those who have already answered part A, skip question 21)

21. (If current wood-burning system doesn't heat the whole house). Do you have any plans to purchase another woodstove, increase the use of your current wood-burning system or add an insert to your fireplace?

Yes	-2	(answer parts a, b, and c)
Maybe	-1	(answer parts a, b, and d)
No	-0	(skip a, b, c, d)

    a. Have you priced woodstoves? Yes_____ No_____

    b. What type do you have in mind?

Box stove	-1
Airtight stove	-2
Wood furnace	-3
Fireplace insert	-4
Other	-5

    c. Why did you decide to get a woodstove, add an insert, etc.?

Always been heating with wood	1
Bought a house with woodstove or furnace	2
Wanted to save money on fuel and the house already had a woodstove or wood furnace	3
Bought a stove to save money on fuel	4
Afraid of a fossil fuel shortage	5
Wanted to do my part for the energy crisis	6
I like the feeling, beauty, etc. of wood heat	7
Other, specify_____	

    d. What would influence your decision?

APPENDIX B

APPENDIX B

FIREWOOD SUPPLIER SURVEY

This survey was very informal. Not all questions were asked of each supplier. The emphasis was on objectives, price level and variation, type of service offered, source of wood supply, annual sales volume, advertising and future plans. More detailed information on costs, processing methods, equipment, product quality and customer characteristics was harder to obtain in a survey of this type. Where possible, information on the costs and practices of representative firms was compiled.

Information was recorded on survey sheets similar to the one shown. Response sheets were set up so that the interviewer wouldn't have to continually refer back to the questionnaire once he became familiar with the basic format of the questions. Most questions were open-ended. Many times additional information and details of the responses had to be recorded on the back of the survey form. This made analyzing the survey much more difficult.

Producer Questions

1. Objectives
   a. How long have you been in the firewood business?
   b. Why did you decide to get started?

2. Price
   a. (For those who don't specify price or units in their ad) How much do you charge per unit? (List price and units that are used in transactions.) Is there a discount for quantity? A charge for delivery?

   b. What species do you sell? Is there a difference in price between softwood and hardwood? Any other quality distinctions? (List species, quality and price of each if different.)
   b' (For specialty dealers) Do you sell chips, sawdust, railroad ties or other processed wood for firewood? (List categories by price.)

   c. (Price variation over time)
      (1) What price did you charge 5 years ago?
      (2) Three years ago?
      (3) Last year?
      (4) How has your price varied this winter?
      (5) What factors influence you to set the price that you charge? What causes you to change it?

3. Service
   a. What percentage of the wood that you sell do you deliver to your customers?
   b. Do you stack wood that you deliver? What price do you charge for stacking?
   c. Do you split the wood? What size pieces do you sell?
   d. Do you sell the wood green or seasoned? How long has your current supply been seasoned?
   e. Where do you store the wood?

4. Please answer the following questions about your source of wood supply:
   a. Do you cut the wood yourself? (If yes) Do you cut dead or downed wood, clearcut, selective cut? Explain.
   b. What type of ownership does it come from? (city, utility, private landowner, state or federal agency, etc.)
   c. Do you buy it wholesale or bid on timber? (If yes) Could you tell me what price per face cord that comes to? If you cut on shares, how are shares divided?
   d. Where does it come from? (city or county and distance)

5. Please answer the following questions about the size of your business.
   a. How many hours do you spend each week? How many did you spend last week?
   b. Is firewood your major source of income? (If not) What is your occupation?
   c. How many people are involved in your business? How many man-hours per week? (If operation is large) How many man-hours per year?
   d. (If full time) What do you do in the off-season? Are there alternative outlets for wood or alternative uses for employees time?

6. I would like to find out how much wood you sell.
   a. How many face cords do you sell each week during your busiest selling period?
   b. How many customers do you have each week?
   c. What is the typical purchase size?
   d. What is the total amount of wood you have sold this season?
   e. Are you selling more or less wood than in previous years? Why do you think that is? How much more or less than last year?

7. Inventory
   a. How much wood do you have on hand?
   b. How much do you like to keep around? Does it vary by season?
   c. Do you ever run out of wood and have to turn people away? When?

8. How do your firewood sales vary from season to season?
   a. What is your peak selling month or months?
   b. What is your lowest selling period?
   c. How many months do you sell firewood?
   d. Give percentage or quantity of wood sold in each season:
      (1) Fall
      (2) Winter
      (3) Spring
      (4) Summer

9. What type of harvesting, processing, transport and storage equipment and technology do you own and use? Do you rent or borrow any equipment for firewood production and sales?
   a. Chainsaws (give number).
   b. Power splitting equipment. Give type - hydraulic or screw-type and specify if homemade, rented or borrowed.
   c. Pickup trucks.
   d. Other vehicles or equipment.

10. Would you mind telling me approximately how much it costs you to cut, process, haul, store and sell one face cord of wood? (Include gas, equipment maintenance, advertising fees, etc.)

    Please give your best estimate of each of the following costs:
    a. Stumpage costs or price per face cord (if any).
    b. Harvesting costs per face cord - include labor time if possible.

c. Transportation costs per face cord - include cost for delivery if part of the selling price (can be calculated from cost per mile and average distance figures).
d. Capital costs - include vehicles, chainsaws, splitter and any other equipment used primarily for the firewood business.
e. Labor costs - especially labor required to process and handle the wood.

11. I would like to ask some questions about the type of customers you sell to.
    a. Do you sell to final users (retail) or to other retailers (wholesalers)? State portion of sales to each.
    b. Can you tell me which communities most of your business is in?
    c. Do you make special deals or offer discounts for friends or relatives? Have you ever exchanged wood for things other than cash? Have you ever sold wood on credit?
    d. Do you know approximately what portion of your customers fall into each of the following income classes?
        (1) Upper income
        (2) Upper middle income
        (3) Lower middle income
        (4) Lower income
    e. Do you know what age group your customers fall into?
        (1) Young families
        (2) Middle-aged
        (3) Elderly
        (4) Mixed
        (5) Other, specify...
    f. What percentage of your customers are established customers - people who have bought wood from you more than once?

12. How do you advertise?
    a. Which newspapers do you advertise in? For how long?
    b. Do you use business cards?
    c. Do you sell door-to-door?
    d. Do you call up old customers and ask whether they want more wood from you?
    e. Do you advertise at woodstove dealerships?
    f. Do you use any other methods of advertising - bulletin boards, billboards, etc.? (If unusual) How much does it cost?

13. What are your plans for the future? Do you have any plans to expand your operation or change the way you do business? If you want to expand, where will you get more wood? Have you considered land purchases or the possibility of purchasing more vehicles or better equipment? What factors will influence your decision about how much firewood to produce and sell next season?

Producer Survey

1. (Objectives) (a) t_____ (b) rea._____

2. (P/Q) (a&b)_____

_____

ΔP (c) 5 yrs._____ 3 yrs._____ 1 yr._____

Var._____

3. (Service) (a) del._____ (b) stk._____ (c) spl_____

(d) sn_____ (e) st._____

4. (Source) (a) cut_____ (b) t.o._____

(c) p _____ (d) loc._____

5. (Business) (a) hrs._____ (b) occ._____

(c) help_____ (d) tot. hrs._____

6. (Sales/trade) (a) u/wk_____ (b) c/wk_____

(d) u/yr_____ (c) size_____ (e) Δu_____

7. (Inventory) (a) Q_____ (b) QD_____

(c) short_____

8. (Season) (a) pk_____ (b) low_____(c) op.mn_____

(d) F_____W_____Sp_____S_____

9. (Tech/Equip) (a) cs_____ (b) spl_____ (c) vh_____

(d) _____

10. (Costs) c/fc_____ (a) sm_____ (b) hv_____

(c) tr_____ (d) cap_____ (e) labor_____

11. (Customers) (a) rt._____ whlsle_____

(b) loc_____ (d) inc_____ (e) age_____

(c) exc_____ (f) est_____

12. (Information) (a) Np_____ (b) BC_____ (c) D_____

    (e) WD_____ (d) Sol_____ (f) O_____

13. (Plans)

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