

AN EXAMINATION OF THE RELATIONSHIPS BETWEEN HARDWOOD LUMBER AND STUMPAGE PRICES IN OHIO

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ABSTRACT

Understanding the relationship between hardwood lumber and stumpage prices is critical in evaluating market efficiency and in understanding the potential impact of changing technology on stumpage markets. Unfortunately, the complexity of the hardwood lumber market and lack of reliable data make it difficult to evaluate this relationship using traditional econometric systems. However, the relationship can be evaluated using economic theory, a review of market history, and statistical procedures. This paper first presents a theoretical development of the demand and supply of hardwood stumpage and then examines the history of the white oak, red oak, yellow-poplar, and hard maple markets between 1970 and 1995. Using this information, a multi-period market margin model was developed. Analysis of short-term relationships between lumber price and stumpage price revealed that these series did not always move in the same direction, but tended to move in the same direction when there were large changes in lumber prices. However, continual declines in lumber prices did not always result in continual declines in stumpage price because of apparent price expectations of the stumpage owner. In the long run, the market margin between stumpage and lumber price has declined in a discrete manner. These declines are related to periodic increases in lumber production and price that occur at the beginning of the hardwood production and price cycle. Theory stipulates that during periods of declining prices, the less efficient sawmills will be forced out of the market. Following these periods, inventories usually are insufficient to satisfy any increase in lumber demand. Therefore, when demand increases, lumber prices increase sharply causing surviving, efficient mills to increase production and to bid up stumpage prices to new, higher levels. This bidding transfers any short-term economic gains that result from increased production or marketing efficiency to the resource owners.

Keywords: Hard maple, hardwood lumber prices, hardwood market history, hardwood stumpage prices, market margin, red oak, white oak, yellow-poplar.

INTRODUCTION

Understanding the relationship between stumpage prices and lumber price is pivotal in

evaluating market efficiency and understanding the potential impact of changes in technology and regulations on stumpage prices. Previous analysis of red oak and yellow-pop-

lar lumber, log, and stumpage prices in Ohio revealed that stumpage prices increased faster than lumber prices (Luppold and Baumgras 1995). This divergence was attributed to competitive market forces transferring any increase in production and marketing efficiency to the resource owners. However, the 1995 study did not determine how this transfer occurred.

One way of examining how this transfer occurs is to develop an econometric system that includes all relevant demand, supply, and price relationships. Unfortunately, the hardwood market is heterogeneous with each grade and species of lumber having a different set of markets. This difference is reflected in the findings of Luppold and Baumgras (1995) that real price of red oak lumber has increased by 1.7% annually over the last 20 years, while the price of yellow-poplar lumber has decreased 1.3% per year. Another factor that confounds traditional econometric analyses is the poor quality of secondary data for quantities produced and demanded. Estimates of hardwood lumber production have been plagued with errors (Cardellicchio and Binkley 1984; Luppold and Dempsey 1989), and there is no reliable estimate of production by species. Estimates of hardwood lumber consumption published every 5 years in the Census of Manufacturers are not developed by species. However, it may be possible to analyze market relationships using economic theory combined with a historical overview of hardwood markets.

In this paper we analyze the relationship of lumber and stumpage prices of four important hardwood species (white oak, red oak, yellow-poplar, and hard maple) in Ohio for periods between 1970 and 1995.¹ Since Ohio is a net importer of hardwood sawlogs (Widmann and Long 1992), this analysis also reflects stumpage markets in the bordering states of Kentucky, West Virginia, Indiana, and Pennsyl-

¹ Although Ohio stumpage prices were reported since 1960 by the Ohio Agricultural Statistical Service, the earlier reports provided prices only for regions of the state. After examining the data, we decided to focus on the period from 1970 to 1995.

vania. Specific issues examined are the market margin between stumpage and lumber prices, how this margin has been changing over time, and what these changes mean in terms of economic efficiency. This study focuses on stumpage by considering logs as an intermediate product. Although some large mills rely on gate logs, stumpage is the primary timber product purchased by most grade sawmills in the Appalachian Region (Ed Murriner, W.V. Div. of For. and M. Long, Ohio Dep. Nat. Resour., pers. communc.). Further, it is difficult to develop a weighted log price because grade definitions seem to have changed over time.

This paper consists of five sections. The first section presents a theoretical overview of the stumpage supply, stumpage demand, and stumpage/lumber price margin. This overview is followed by an examination of changes in the hardwood lumber market over the last 27 years, with emphasis on the changing demand for the four species being studied. The third section discusses data used in this study, defines variables, and develops the model used in the analysis. Results of analysis are presented in the fourth section, while major findings are reiterated in the final section of this paper.

THEORETICAL DEVELOPMENT

The economic relationships relevant to this analysis are the supply of, and demand for, hardwood sawtimber stumpage. Although the demand for stumpage emanates from a production function, the supply of stumpage emanates mainly from private, nonindustrial forest (NIPF) lands and is considerably more ambiguous. This section explores these relationships first as separate processes and then combines them in terms of market margins.

Nearly 80% of the hardwood stumpage in Ohio and adjoining states is controlled by NIPF land owners (Powell et al. 1993). These owners range from individuals controlling only a few acres to large institutional owners such as insurance companies. Forest industry (mainly sawmills and pulpmills) control an ad-

ditional 4.4%, while natural forest and other public sources own less than 16%. Since most of the sawtimber on industry land is not available for the open market and most public timber is either unavailable for harvesting or is sold to achieve some multiple use objective, NIPF lands are the primary open market source for hardwood sawtimber.

The fact that most of the hardwood timber supplied is from NIPF poses some difficult conceptual problems. Only 5% of NIPF owners and less than 20% of NIPF lands are managed for timber production (Birch 1996). Other factors that NIPF owners consider of greater priority are recreation use, esthetic enjoyment, and part of a farm or residence. Still 49% of NIPF land owners who control 75% of the timber had some portion of their land harvested in the past 10 years (Birch 1996). This large amount of harvesting experience indicates that regardless of primary interest, most NIPF lands are available for harvesting.

It is generally assumed that the physical supply of stumpage is fixed in the short-run, but supply of sawtimber is price-sensitive (not totally inelastic) because most individuals will sell their stumpage if a high enough price is offered. Still there has been no conclusive study on what motivates NIPF owners to sell timber and how these owners receive market information. Stumpage price is reported in Ohio on a semi-annual basis but is released 6 months after the reporting period (Ohio Agriculture Statistics Service). Most smaller NIPF owners probably are not aware of this information, but most of the larger owners such as insurance companies do monitor stumpage price. In this paper it is assumed that timber owners can receive information on the value of their timber by reading stumpage price reports, hiring a consulting forester, contacting a state forester, communicating with other land owners who have sold stumpage recently, or hearing from the firm that is offering to buy stumpage. Because of the various ways in which NIPF owners receive market information, timber prices across individual timber sales have the possibility to vary radically.

Although most NIPF owners may not have access to market information, it is assumed that more information exists during periods of high timber demand. The reason for this assumption is that the number of bidders for a specific timber stand increases, thus providing more information from buyers and more sales on neighboring lands providing more information from neighbors. Also, since economically mature stumpage can be held for several decades, there may be a point below which the price of stumpage will not decline further because of owner price expectations.

In this analysis, it is assumed that the demand for stumpage is the sum of the derived demand that emanates from the production functions of individual sawmills in a specific procurement area, and that procurement areas for individual mills overlap, creating a competitive market for stumpage. It also is assumed that in the long run adoption of new technologies causes hardwood sawmills to pay higher stumpage prices or sell lumber at lower prices. Also it is assumed that mills that do not have the capital or management necessary to adopt new technologies become relatively less efficient and eventually are forced out of the market. These assumptions imply that the market for stumpage is competitive and that the sawmilling industry has only minimal market power over the stumpage markets in the long run.

The margin between lumber price and stumpage price is primarily the result of processing and harvesting costs but may include short-term economic gains and losses (gains or losses above or below cost of production). Other factors that affect the margin between lumber and stumpage prices are the demand for high-grade veneer logs and exports of veneer and sawlogs. It is assumed that the competitive market structure causes sawmills and logging operations employed or contracted by the sawmills to adopt new production technologies and marketing procedures in an effort to increase profits. If these new methods seem to be profitable, then increased numbers of sawmills or logging operations adopt them, re-

