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Timber price dynamics after a natural disaster: Hurricane Hugo revisited☆

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ABSTRACT

Timber prices in the area struck by a natural disaster such as a hurricane or pest infestation are known to drop sharply immediately following the disaster, only to recover after about a year or so. Previous research attributes the rapid recovery to *shifts* in supply and demand curves. Our analysis suggests the more probable explanation is *rotation* in the curves. Supply and demand shifts come into play in the second and third years as rebuilding from the hurricane begins in earnest, and as timber inventory is rebuilt in response to elevated price expectations. But for the period in which price recovery occurs, model simulations based on data for Hurricane Hugo indicate the major causal factors of the observed price dynamics are curve rotation and trade with the surrounding undamaged region. Inventory-based supply shifts, the previously-identified causal factor, play a minor role in the observed price dynamics. Getting the causal factors right is important for predicting the price effects of forest inventory shocks, and for proper measurement of their welfare effects.

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Introduction

Hurricanes and other natural disasters such as insect infestation are relatively common phenomena affecting forest resources in the Southeastern portion of the United States. The effects of these natural disasters on timber prices have proved controversial. For example, in their analysis of the price effects of Hurricane Hugo, one of the more damaging natural disasters to affect the Southeastern forest industry in the last 50 years, Yin and Newman (1999) concluded that the major factor explaining price dynamics is trade links between the damage zone and the larger market for timber. In their studies of the same disaster, Prestemon and Holmes (2000, 2004, 2010) conclude the major factor affecting price dynamics is changes in market supply due to salvage sales and reduced timber harvests. Trade links, while recognized, are not explicitly included in these latter studies.

The purpose of this research is to determine the relative importance of trade links and supply shifts in explaining price dynamics following a natural disaster that destroys a portion of the available inventory of the resource. The issue is important because a correct understanding of causal factors is valuable in its own right, but also because it has important implications for welfare measurement. For example, if supply shifts are deemed the major causal factor, the price effects of an inventory shock obtained from a model that excludes trade are apt to overstate the actual price effects, and thereby overstate the welfare effects. The intuition for this result is that the demand curve that includes trade is more price elastic than the demand curve that excludes trade. With a steeper demand, supply shifts result in larger price movements.

If trade links are deemed important, the appropriate model for measuring welfare effects is one that includes interactions between the damage zone and the larger market. In this instance, rotations in the demand curve are germane for understanding price dynamics. The reason is that trade-inclusive demand curves rotate as trade flows change, becoming more elastic as exports from the damage zone increase, and less elastic as exports decrease. Exports in the immediate aftermath of a hurricane are apt to approach zero due to road closures and related impediments to trade, causing the demand curve to steepen relative to its pre-storm position. Ignoring this rotation would cause the price drop associated with salvage sales to be understated, and thus the welfare effects to be understated, at least for the time period in which trade was disrupted.

In this paper we re-analyze timber price dynamics after Hugo, and the underlying mechanism of price recovery. A more general model of timber supply and demand than the one used by Prestemon and Holmes (2004, 2010) is developed, and the relative effects of increases in supply due to salvage sales and decreases in supply due to inventory-induced reductions in timber harvests are explicitly considered. The potential importance of trade is assessed by simulating the model using parameter values taken from the literature. The simulations permit the supply curve to become more elastic as the recovery period lengthens in conformance with Le Chatelier's principle (Samuelson, 1947). Results suggest trade links are critical to a proper understanding of price dynamics following a hurricane.

Our findings are consistent with recent econometric evidence concerning price dynamics in the forestry sector that shows (1) there is a single market for lumber in the United States, i.e., the law of one price (LOP) holds (Yin and Baek, 2005); (2) stumpage markets in the southeastern region of the United States are highly integrated, especially during periods of strong growth in construction (Hood and Dorfman, 2015), as is apt to be true after a hurricane; and (3) supply and demand for stumpage in the short run is price inelastic (Parajuli and Chang, 2015).

The present analysis differs from Prestemon and Holmes (2004, 2010) in three ways. First, the salvage and inventory effects germane to Prestemon and Holmes' explanation of price dynamics are modeled explicitly. This enables each effect to be quantified, a level of precision not possible with Prestemon and Holmes' graphical approach. Second, the price effects of the supply shock are analyzed using a model that takes into account trade between the damage zone and surrounding markets for timber. The model used by Prestemon and Holmes ignores trade. Third, unlike in Prestemon and Holmes (2004, 2010), the price effects of a supply shock are quantified using an equilibrium displacement model. Equilibrium displacement models (EDMs) have proved useful in shedding light on a wide variety of problems in agricultural and resource economics as reviewed by Piggott (1992), Davis and Espinoza (1998), Wohlgenant (2011), Kinnucan and Zhang (2015), and Alston and Pardey (2016). Examples of applications in forest economics and policy include Sun and Kinnucan (2001), Kinnucan