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Regional impacts of environmental regulations and technical change in the US forestry sector: a multiregional CGE analysis☆

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Abstract

In this paper, a multiregional computable general equilibrium model, which divides the United States (US) into four broad geographical regions and aggregates other nations into the rest of the world, is used to analyze the effects associated with environmental and technological policy shifts in the US forest sector. In particular, we analyze the impacts of: (i) a 20% reduction in the harvest of timber in the Pacific Northwest relative to other regions; (ii) a 5% increase in the cost of timber production in the US South relative to other regions due to environmental regulations; and (iii) a 2% Total Factor Productivity (TFP) improvement in the South and 1% TFP improvement in the other three US regions. The results show that a 20% reduction in timber harvest induces a shift in regional production and visible gains in welfare, especially in the US South. Furthermore, higher technical progress in the South as compared to the other three regions contributes to an overall increase in forest products' output and welfare in the US and the rest of the world. On the contrary, an increase in the cost of production in the US South, in response to additional environmental regulations, is shown to reduce welfare for the US and globally. Results of this analysis help forest companies and landowners make production decisions and guide policy makers toward developing appropriate policies to further forest conservation and economic development in the US.

Keywords: CGE; Environmental regulation; Policy; Total Factor Productivity; Welfare

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1. Introduction

Historically, the United States (US) maintained a comparative advantage in industrial wood production based on the vast coverage of old growth forestlands. In the recent past, however, growing environmental concerns has ushered in new legislation regarding conservation and use of forestlands. On the one hand, there is growing pressure to limit timber harvest on national forestlands. For example, regulations for protecting the northern spotted owl and restrictions on the use of public lands in the Pacific Northwest (PNW) region has led to declining timber removals, shifts in timber production to the US South, and higher imports from Canada. More recently, congressional bill HR 1494 entitled the 'National Forest Protection and Restoration Act' proposed the elimination of commercial logging activity on all national forestlands. Further restrictions on timber production are possible, given increasing environmental concerns and associated regulations which are expected to increase production costs. On the other hand, technological change via advances in forest biotechnology and increasing investments in intensive forest management are improving forest productivity.

The anticipated impacts of environmental regulations and improvements in forest productivity may not be uniform across the US as there are significant regional variations in forest ownership and investment potentials for productivity enhancements. For example, private forestland is more concentrated in the US South while public forestland is more pronounced in the West. One can, therefore, expect higher forest investment and higher productivity improvements in the US South relative to the West. Alternatively, one can expect more forest set-asides in regions where public forests dominate relative to private forests. As such, the impact of HR 1494 or other forest set-asides may be more significant in the West relative to the South.

The purpose of this paper is to estimate the effects of a set of potential forest policy changes using an inter-regional model that divides the US into four broadly defined regions namely: the Pacific Northwest (PNW); the US South (South); the North; and the Pacific Southwest (PSW) (see Appendix A). We also assume that the forest sector is a significant part of the United States economy and the US is a major player in global forest products markets. Finally, we link US forest sectors with other sectors of the US economy and the US with the rest of the world by using an inter-sectoral and inter-regional model. The primary objective of this analysis is to illustrate regional impacts accruing from forest policy changes in different US regions. In this paper, a multi-regional computable general equilibrium model, which segregates the US into four broad geographical regions and aggregates the other foreign economies into the composite rest-of-the-world (ROW), is used to analyze the effects associated with environmental and technological policy repercussions. Thus, the analysis, by furnishing the impacts of potential policy changes, has significance for providing a basis for formulation of public policy in promoting investment in research in technological improvement in the forestry sector and also helps policy makers devise appropriate forest policies so as to foster economic benefits in the US. The applied general equilibrium framework enables us to evaluate the impacts via inter-sectoral and inter-regional linkages.

The paper is organized as follows. Section 2 provides an empirical basis for simulating: (i) the impact of a 20% reduction in logging output in the PNW; (ii) the effects of a 5% increase in the cost of logging production in the South; and (iii) the effects of differential rates of TFP improvements in the South (i.e. 2%) vis-à-vis the other three US regions (i.e. each 1%). Section 3 describes the methodology, model and database used to conduct simulations. Section 4 presents selective simulation results. Section 5 concludes.

2. Contemporary issues affecting the US forestry and simulation design

2.1. Reductions in timber harvest in the Pacific Northwest

Over the past 2 decades, the role of public forestlands in biodiversity conservation and ecosystem management has been emphasized (Thomas et al., 1990). For example, protection of the habitat for the northern spotted owl (Strix *Occidentalis Caurina*) has put more restrictions on the use of public lands in the PNW. According to Haynes (2001), timber harvest in the PNW fell from 26% of US production in 1986 to 15% in 1996, while the value of this timber fell from 40% to 24%. As a result, there has been a subsequent