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Pigovian Tax Dynamics and Net Income Earnings in Commercial Timber Plantations in South Africa: A General Algebraic Modeling System Analysis

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ABSTRACT From the 1997 Kyoto Protocol to the 2011 Durban Platform, the global lobby for pollution-free environment policies and regulations is greater than it has ever been. Governments have agreed to forge a global climate deal to curb greenhouse gas emissions and pollution by 2020 to slow climate change and global warming. A carbon tax is being considered among the range of powerful instruments available to these governments as part of the agreed upon global agenda of effective mitigation actions for pollution-free environment. This study aims to address the lack of studies that specify methods for calculations of the impact of Pigovian taxes on the competitiveness of businesses. Using a general algebraic modeling system analysis, the study expresses mathematically a "timber model" whose objective function is to maximize net-income earnings of commercial timber plantations subject to miscellaneous endowment constraints involved in timber production – including a given level of Pigovian tax. Results give one apparent pattern: the net-income earnings is at its peak (maximum level) when timber is in a "tax free" production process. A regime of Pigovian tax dynamics disproportionately impacts on the timber yield, water use, and net-income earnings of commercial plantations. While a regime of tax dynamics appears not to have significantly dampened the level of some timber yield and water use, all net-income earnings tumbled. This appears to have significant policy implications, particularly with respect to the way in which the viability and competitiveness of businesses in South Africa would respond to potential fiscal policy that incorporates Pigovian tax.