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Efficiency of Forest Carbon Policies on the Intensive Margin and Extensive Margin
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The economic potential of carbon sequestration in forests is widely acknowledged but there is no consensus on the policy instrument that should be adopted to promote it. This paper focuses on the comparison of efficiency of different forest carbon policies recommended by past studies. Different studies recommend different schemes that have varying levels of efficiency. Some approaches focus explicitly on measuring the carbon that is sequestered or emitted, whereas there are other approaches being proposed which deviate from accurate measurements of carbon to different extents. Some approaches do not consider the level of carbon stored in. These approaches provide a payment for land use change and vary the payment based on land opportunity costs. Although these approaches can sequester carbon, they are unlikely to be efficient.

This paper develops a framework to compare and measure the differences in efficiency of alternative forest carbon policies, taking into account forest management practices and market effects in a dynamic context. The simulation part develops a dynamic model of timber markets. We focus on choices of harvest ages and land use, which are two major land owners' decisions affecting the carbon stocks at the intensive margin and extensive margin separately. First, we find that a 'per hactare' policy could be 5 to 10 time more costly than a 'per ton' policy depending on the carbon prices and land use conditions because 'per hactare'policy could not effectively create incentive to sequester more carbon at the intensive margin. Second, a particular concern is raised with respect to the policy which taxes on emissions from the forests without subsiding sequestration because we find it leads to net carbon emissions on per unit of lands in addition to contraction of forestland area.

Our results demonstrates the importance of focusing on dynamic adjustments at management (i.e the intensive margins) for designing sequestration policies. Besides, the results provide practical implications for carbon policy designs with the land use sectors. While it is correct to directly tax on carbon emissions from energy uses, taxing on emissions from the forest sector without compensating sequestration leads to inefficiency outcomes because the carbon tax reduces the rate of carbon sequestration as well.