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Global trade impacts of increasing Europe's bioenergy demand☆

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ABSTRACT

European governments are rapidly turning to biomass to comply with the EU's legislated renewable energy targets for 2020 and 2030. To do so, EU member states will likely have to increase imports of biomass from timber rich regions, which will undoubtedly disrupt international wood product markets. In this study, a static global forest trade model of coniferous wood products is used to examine the effects of expanded demand for wood pellets in Europe to generate reliable electricity. Positive mathematical programming (PMP) is used to calibrate the model to 2012 bilateral trade flows. To assess the impact of increased wood-pellet demand on global forest products, we consider a scenario where EU demand for wood pellets doubles. Model results suggest increases in the world prices of industrial roundwood (1%), particleboard ($34/m^3), fibreboard ($30/m^3), pulp ($65/t) and pellets (71% to 128%), while the prices of sawnwood and plywood & veneer are projected to fall by $12/m^3 and $4/m^3, respectively. The gains and losses are unevenly distributed between timber rich and timber poor regions; Russia, Canada and the U.S. experience large net welfare gains of $706 million, $544 million and $416 million, respectively, while Asia loses $1.8 billion. In the forest products sector, the gains outweigh losses with economic benefits increasing by some $4.9 billion, but this is a cost to the consumers of electricity and/or taxpayers in the regions implementing these renewable energy

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policies. The price of wood pellets is projected to rise between $107 and $154 per tonne. The findings highlight the need to account for the interconnections among softwood forest products globally.

Introduction

To curb carbon dioxide (CO_2) emissions, EU governments are increasingly turning to biomass to meet renewable energy targets. This coincides with greater co-firing of solid biomass (wood pellets) with coal to reduce the CO_2-emissions intensity of existing coal-plants[1]. Forest biomass is expected to be the most significant future source of renewable energy within the EU, and likely to account for over half of total renewable energy production (European Commissions, 2013). Yet little is known about how increased demand for biomass in the EU will impact the global forest products sector. Timber rich regions will undoubtedly benefit from increased demand for wood fibre, but other wood product markets may experience significant changes in prices from increased competition for residual and other fibre.

The EU accounted for approximately 43% of installed global bioenergy capacity in 2012; installed biomass capacity in the EU increased from 1.44 GW in 2004 to 32.82 GW in 2012. European growth in the use of biomass energy is a direct result of aggressive EU climate policies whereby member states agreed to attain a minimum 20% share of renewables in energy production by 2020—an important component of the EU's "20–20–20" target. The European Commissions (2013) estimates that meeting the 20–20–20 target could result in an annual wood deficit for Europe of 200 to 260 million m^3 by 2020. For comparison, Canada is a major producer and exporter of wood products, but it only harvests about 200 million m^3 of fibre per year. In early 2014, the European Commissions (2014) proposed a new policy framework with a more ambitious greenhouse gas reduction target of 40% of 1990 levels by 2030, with renewable energy expected to account for 27% of the EU's total energy production.

With these targets in mind, European countries have implemented policies promoting the use of biomass to generate electricity. An overview of policies promoting the use of biomass energy is found in Table 1, while the economics of promoting coal and biomass co-firing is presented in Johnston and van Kooten (2015). The majority of the policies fall in one of three categories: (1) feed-in tariffs (FIT) for electricity produced from biomass, (2) direct subsidies for biomass electricity paid over and above the market price to a maximum price threshold, and (3) an emissions quota with a transferable permit that can be traded on the open market[2]. As a result, the EU has emerged as one of the most bioenergy intensive regions in the world with biomass electrical-generating capacity spread across many countries (Table 2). Although bioenergy includes the combustion of wood, wood waste, straw, corn stover, manure and other bio-materials, co-firing wood pellets in retrofitted coal plants is becoming the most significant form of bioenergy, which is increasing international trade flows (IEEP, 2010).

Wood pellet consumption within the EU is projected to rise by varying degrees over the coming decade from 13.6 million t (Mt) in 2012 to as much as 35.0 Mt in 2020 (Pöyry, 2011). The EU's National Renewable Energy Action Plan (NREAP, 2011) projects bioenergy to more than double from 5.4% of final energy consumption to 12.0% by 2020, with wood pellets continuing to be the major future source of bioenergy, contributing 36% of the 2020 target. Mantau et al. (2010), for example, argue that biomass

[1] Retrofitting coal plants to co-fire with biomass is attractive because of its low capital costs. More importantly, under IPCC (2006) reporting rules, the impacts of energy produced from biomass would not be reported in the energy sector but under Agriculture, Forestry and Other Land-Use (AFOLU), previously known as Land Use, Land-Use Change and Forestry (LULUCF). Because the IPCC guidelines assume that carbon lost during harvest equals carbon gained through re-growth, biomass energy is considered carbon neutral, so there are no net CO_2 contributions (see van Kooten and Johnston, 2014; van Kooten, 2013, pp.205–214).

[2] A FIT guarantees a certain price regardless of the market price, whereas a subsidy provides a payment over-and-above the market price and, unlike the FIT, varies with market price.