Knowledge Diffusion, Endogenous Growth, and the Costs of Global Climate Policy

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This paper examines the effects of knowledge diffusion on growth and the costs of climate policy. We develop a general equilibrium model with endogenous growth which represents knowledge diffusion between sectors and regions. Knowledge diffusion depends on accessibility and absorptive capacity which we estimate econometrically using patent and citation data. Knowledge diffusion leads to a “greening” of economies boosting productivity of “clean” carbon-extensive sectors. Knowledge diffusion lowers the costs of global climate policy by about 90% for emerging countries (China) and 20% for developed regions (Europe and USA), depending on the substitutability between different knowledge types. (JEL O33, O44, Q55, C68).

Knowledge capital accumulation and technology are important drivers for economic growth. In open economies, sharing knowledge—in contrast to acquiring rival factor inputs such as human and physical capital—provides an inexpensive way of fostering endogenous innovation (Eaton and Kortum, 1999; Keller, 2002). To the extent that knowledge diffusion enhances the productivity of “clean” carbon-extensive relative to “dirty” carbon-intensive inputs, it can also lower the costs of environmental regulation, in particular of policies that act on an international level, such as global carbon mitigation policies to combat climate change. Leading economic analyses have scrutinized the interactions between the environment, growth, and technology. For example, Nordhaus (1994) and Stokey (1998) show that growth can be limited by environmental constraints, while Aghion and Howitt (1998) and Acemoglu et al. (2012) demonstrate that sustainable growth is possible with climate policy that redirects innovation toward clean inputs. Also, firms may innovate more in clean technologies when they face a climate policy (Aghion et al., 2016; Calel and Dechezleprêtre, 2016). The role of knowledge diffusion for economic growth and for the costs of environmental regulation, however, has received surprisingly little attention.

This paper develops a multi-sector multi-region endogenous growth model to study the effects of knowledge accumulation and diffusion for growth and the costs...
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