

Intellectual property rights and the transfer of low-carbon technologies to other countries



Wide access to clean technologies is crucial to meet the Paris Agreement goal of limiting the increase in global temperatures to well below 2 degrees Celsius. This requires considerable technology transfers from North to South as [90 per cent](#) of the increase in global carbon emissions until 2050 is expected to occur in the developing world, while the vast majority of low-carbon technologies are still invented in developed countries. For example, Japan, USA, Germany, South Korea, and France together account for 75 per cent of the low-carbon inventions patented globally from 2005 to 2015.

Figure 1. GHG emissions and low-carbon inventions

United States of A European In

European Union

Inc

South
Saudi
South

A

Ar

Notes: CO2 emissions from the CAIT Climate Data Explorer. The stock of low-carbon inventions are author's calculations from the European Patent Office's Global Patent Statistical Database. Author-provided.

Figure 1 illustrates the important need for transfer from developed countries to developing countries by comparing the greenhouse gas (GHG) emissions in 2012 with the number of low-carbon inventions developed in each country until the end of 2014. It is clear from Figure 1 that there are huge discrepancies between countries' GHG emissions and their capacities to innovate in mitigation technologies. While Europe, Japan, the USA and South Korea have large innovative capacities compared to their GHG emissions, the opposite is true for emerging economies such as China, India, Indonesia, Russia, and Brazil.

The role of Intellectual Property Rights is highly contentious

The international diffusion of low-carbon technologies has been a cornerstone of international climate negotiations since the adoption of the United Framework Convention on Climate Change (UNFCCC). The necessity of greater international technology transfer has led to the creation of the [Technology Mechanism](#), which organizes UNFCCC efforts related to technology issues.

However, the impact that Intellectual Property Rights may have on international technology transfer is a [highly contentious](#) topic within the negotiations. On the one hand, developed countries see a strong IPRs regime as a necessary condition for technology transfer. On the other hand, some developing countries consider that strong IPRs protection may [hinder technology transfer](#). As a reflection of this lack of consensus, the Paris Agreement did not make any mention of intellectual property rights (IPRs).

What is the empirical evidence?

The disagreement over the effect of IPRs on low-carbon technology transfer is at least partly explained by the absence of empirical evidence on the subject. In a [recent paper](#), we empirically analyse whether increasing the level of IPRs protection in recipient countries increases or decreases the transfer of low-carbon technologies.

Green technology transfer mostly takes place through [two channels](#), i.e. international trade in capital goods that are used to reduce emissions (e.g. wind turbines, energy efficient furnaces, electric vehicles), and foreign direct investment (FDI) by multinational enterprises that own low-carbon technologies.

We collected data on cross-border technology flows through trade and foreign investment in eight low-carbon technologies: hydro power, solar PV, solar thermal, wind power, energy-efficient heating, buildings insulation, energy-efficient lighting, and electric and hybrid vehicles. Our data cover yearly trade and FDI flows from 2001 to 2011 between up to 92 countries. Importantly, the data set includes both industrialised countries and emerging economies such as India and China.

We measure the level of IPR protection by a [synthetic index](#) which aggregates several components of intellectual property protection such as extent of coverage, membership in international IP-related treaties, duration of protection, absence of restrictions on rights, and statutory enforcement provision.

Changes in IPR protection have large effects on technology transfer to developing countries

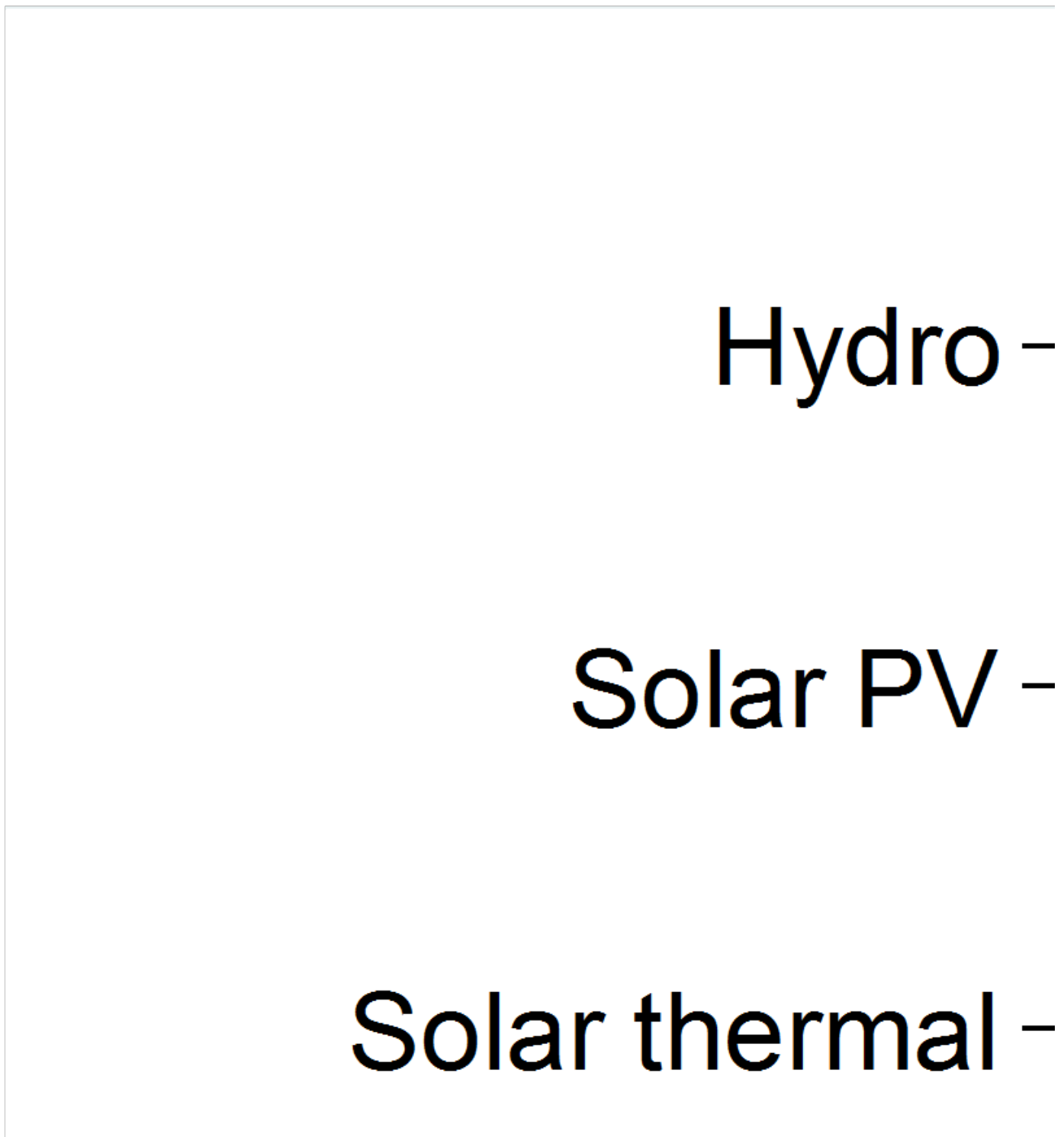
On average, we find that strong IPR is never a barrier to the transfer of low-carbon technologies. An increase in IPR protection is found to boost trade in hydro power equipment and cleaner vehicles as well as FDI flows in solar PV, solar thermal, heating, lighting, and cleaner vehicles.

However, these results on the average country hide heterogeneity between developed and developing countries. When estimating the effect of IPR protection on developing countries specifically, we find that the effect of IPR stringency on FDI – and the technology transfer that go with them – towards non-OECD countries is never negative. The impact is positive and statistically significant for several technologies (solar PV, wind power, and cleaner vehicles), and not statistically significant for the others.

The results concerning trade flows are more contrasted. Increasing the strictness of IPR is estimated to increase imports of hydro power equipment and electric cars, but would reduce imports of solar PV and solar thermal equipment into non-OECD countries. Note that this is not necessarily bad news if this indicates that the recipient country is able to substitute imported technologies with domestic innovation.

Figure 2 illustrates the magnitude of the effect of a typical (one standard deviation) increase in IPR protection on the import of low-carbon capital goods and inward FDI flows by technology. While imports of solar PV and solar thermal drop respectively by 30 per cent and 20 per cent, stronger IPR increase imports of hydro power equipment and cleaner vehicles by 25 per cent and 40 per cent. The magnitude is larger for FDI, which increases by between 25 per cent and 60 per cent for hydro power, heating, insulation, and lighting.

Figure 2. Percentage change in trade and FDI in non-OECD countries due to a standard deviation increase in IPR



Wind –

Heating –

Insulation –

Lighting –

Cleaner vehicles -

Hydro -

© | DV

Solar PV -

Solar thermal -

Wind -

Heating -



Insulation -

Lighting -

Cleaner vehicles -

-

Notes: Dussaux et al. 2018. Effect on non-OECD countries. The lines represent the 90% confidence interval. The standard deviation of IPR within country over the sample period equals 0.5.

Meeting the commitment made in the Paris Agreement will require all countries to adopt low-carbon technologies in all their sectors. Strengthening Intellectual Property rights can help enhancing FDI in some of these sectors but might also reduce technology imports in others. Therefore, any adjustment of the level of IPR protection should be made on a case-by-case basis, depending on which technologies each country wants to prioritize.



Notes:

- This blog post is based on the authors' [Intellectual property rights protection and the international transfer of low-carbon technologies](#), Working Paper 288. LSE's Grantham Research Institute on Climate Change and the Environment
 - The post gives the views of its author, not the position of LSE Business Review or the London School of Economics.
 - Featured image credit: [Photo](#), by [NASA's Marshall Space Flight Center](#), under a [CC-BY-NC-2.0](#) licence
 - When you leave a comment, you're agreeing to our [Comment Policy](#).
-



Damien Dussaux is a Post-Doc at the Center of Industrial Economics of MINES ParisTech, PSL Research University since October 2017. He is also Visiting Fellow at the Grantham Research Institute on Climate Change and the Environment of the London School of Economics and Political Science since October 2017. His research interests are environmental impacts of international trade, competitiveness impacts of environmental policies, and international technology diffusion.



Antoine Dechezleprêtre is Senior Economist at the OECD since June 2017. His areas of expertise include climate change policy, innovation policy, and international technology diffusion. Antoine was associate professorial research fellow at the LSE's Grantham Institute (currently on leave).



Matthieu Glachant is head of CERNA – Centre for industrial economics and a professor of economics at MINES ParisTech. He is also a Visiting Professor at LSE's Grantham Institute since 2012. His areas of expertise include the economics of green innovation, renewable energy, the economics of Corporate Social Responsibility, waste policies, and climate change issues.