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EAERE Magazine

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EAERE
European Association of Environmental and Resource Economists

EAERE Magazine serves as an outlet for new research, projects, and other professional news, featuring articles that can contribute to recent policy discussions and developments in the field of environmental and natural resource economics. It is published quarterly in the Winter, Spring, Summer, and Fall. Contributions from the wider EAERE community, especially senior level researchers and practitioners, and EAERE Country Representatives, are included in the magazine.

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Dear EAERE Colleagues and Friends,

I hope that all those who attended the EAERE conference in Manchester have returned home safely.

This issue and also the next one are dedicated to the researchers who have been awarded with an EAERE Award this year. The first article by **Mirjam Kosch**, from the Zurich University of Applied Sciences, winner of EAERE Award for Best Doctoral Dissertations, and her coauthor **Jan Abrell**, asks in how far the support of renewable energy really helps to reduce carbon emissions, what the major drivers are, and what we can learn from the past for the policy design of future support schemes for renewable energy. **Mar Reguant**, from the Northwestern University, winner of the Award for Researchers under the Age of 40, addresses the problem of leakage, the shift of emissions from regulated to unregulated industries, and presents a tool that can help policy makers to better understand and handle this risk. **Bård Harstad**, from the University of Oslo, and **Torben Mideksa,** from Uppsala University, winners of the Erik Kempe Award, write about the problem of tropical deforestation, why REDD+ agreements between receiver and donor countries can have different effects on deforestation in different countries, and how the agreements could be improved by taking country specifics into account.

EAERE recently inaugurated a new award to celebrate researchers in environmental and resource economics who are awarded Starting, Consolidator, or Advanced Grants by the European Research Council (ERC). And of course we cannot only celebrate the great success of these researchers but also try to learn from their experience. To provide some help to EAERE scholars seeking to apply for these prestigious and transformative multi-year grants, a special session was held in Manchester featuring the new awardees and a round-table discussion about the ERC grant application and award process. EAERE Council Member **Carolyn Fischer** (Vrije Universiteit Amsterdam), who had previously served on ERC grant review panels, chaired the session and, thankfully, has provided a summary of the key insights which you can find in this issue.

Finally, we have the Juniors-ask-Senior interview, this time with **Karine Nyborg**, from the University of Oslo, one of the newly appointed EAERE Fellows.

Enjoy reading!

Astrid Dannenberg, University of Kassel

The drivers of carbon abatement with renewables

Jan Abrell *and* **Mirjam Kosch**
Zurich University of Applied Sciences (ZHAW)

Jan Abrell *is senior lecturer at the Centre for Energy and the Environment at the School of Management and Law of the Zurich University of Applied Science. His research focuses on the design and evaluation of carbon abatement policies. Combining empirical work and numerical simulation models, his research in particular analyzes carbon abatement in the electricity sector.*

Mirjam Kosch *is a researcher at the Centre for Energy and the Environment at Zurich University of Applied Sciences. Her primary research interest lies in the ex-post analysis of climate policies with a focus on electricity and carbon markets. She received her PhD from ETH Zurich. Using econometric and machine learning techniques, she analysed the impacts of renewable promotion and carbon pricing policies in the European electricity sector.*

In the last two decades, European countries have implemented extensive RE support schemes, concentrating mainly on incentivizing the installation of wind and solar capacity. These support schemes in the form of feed-in tariffs, premiums or quota systems have led to an increase in wind and solar generation of up to 9.7% and 3.5% of net electricity generation, respectively (Eurostat, 2019).

After about 20 years of extensive RE support in many European countries, it is time to ask: What was the impact of RE support on carbon emissions? What are the major drivers of carbon abatement with RE? What can we learn from the past for the policy design of future RE support schemes? Using the cases of Germany, Spain, and the UK, we show that the availability of RE resources, the degree of market integration, and the mix and production cost of conventional electricity generators are the major determinants of RE abatement. Policymakers should take these determinants into account to design environmentally efficient support schemes. Furthermore, as carbon pricing impacts the environmental effectiveness of RE support by changing the cost of fossil technologies, RE and carbon pricing policies should not be designed independently.

Merit-order impacts of renewable energy generation

To analyze the impacts of RE on CO_2 emissions, as well as their interaction with carbon prices, the short-run electricity market model provides a useful framework. The left panel of Figure 1 shows a supply curve of a generic electricity market, the so-called merit order curve. The market operator orders generation technologies according to their marginal cost. Typically, the marginal cost for technologies such as hydro or nuclear power is low, whereas it is higher for fossil-fueled technologies. In each hour, the intersection of the supply and demand curve determines the wholesale market electricity price and the set of active technologies. Since RE technologies produce with near-zero marginal cost, they produce whenever the wind is blowing, or the sun is shining. Thus, conceptually the impact of an increased RE in-feed can be depicted as a decrease in demand for conventional electricity ("residual demand" in the picture), i.e., it replaces generation at the end of the supply curve (arrows in the Figure). The **replacement effect** decreases the generation of conventional technologies leading to carbon abatement. The impact on CO_2 emissions is the largest if RE generation replaces carbon-intensive coal or – to a

lower extent – natural gas generation. The replacement effect is accompanied by a second effect: As RE replaces the most costly generators in the market, wholesale market prices decrease. This price effect is called the **merit-order effect.**

Using hourly electricity market data of Germany and Spain, we estimated the replacement and price effects for wind and solar in-feed (Abrell et al., 2019a). Concentrating on carbon emissions, we find that in 2014, in Germany the total annual CO_2 offset induced by wind amounts to 2.9%

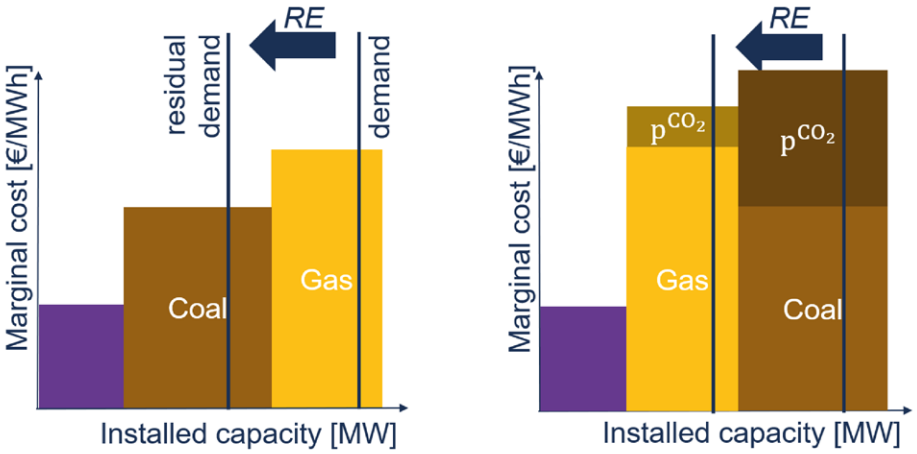

Figure 1: Stylized electricity market: RE reduce inelastic residual demand and lead to a replacement and a merit-order effect.

of total electricity sector emissions; for solar, the offset was about 2.0 %. In Spain, wind led to 3.0% and solar to 17.7% offset. While the differences in total abatement is mostly explained by the shares of renewables in total generation, we also find that the abatement impact of one unit of RE in-feed differs up to around 50% between countries and RE technologies.

This finding indicates a large variation in the environmental effectiveness of RE support schemes. This, in turn, implies a difference in the implicit cost of carbon abatement and brings us to the question: What are the drivers of abatement through RE promotion?

The determinants of renewable abatement

The three major determinants of the effectiveness of abatement of RE sources replacing conventional technologies are the production profile of the RE, the degree of international market integration, and the ordering of the supply curve. First, RE sources are not dispatchable, i.e., once facilities are installed, energy is produced whenever the wind is blowing, or the sun is shining. Figure 2 shows the average **production profiles of RE** for Germany: While wind availability is relatively constant over the day, solar has a pronounced peak at noon. When comparing RE production with demand profiles, one recognizes that wind production and demand are relatively uncorrelated. In contrast, solar production and demand are highly correlated due to their common peak at noon. Thus, solar power replaces the technology that is marginal during high demand hours while wind power also reduces residual demand during low demand hours. Production profiles, therefore, determine the hours in which RE replaces conventional technologies. As the carbon intensity of the replaced marginal generators changes depending on demand, the RE profiles determine which technologies are replaced and how much carbon is abated.

Second, the magnitude of carbon abatement also depends on the **degree of international market integration**. RE pro-

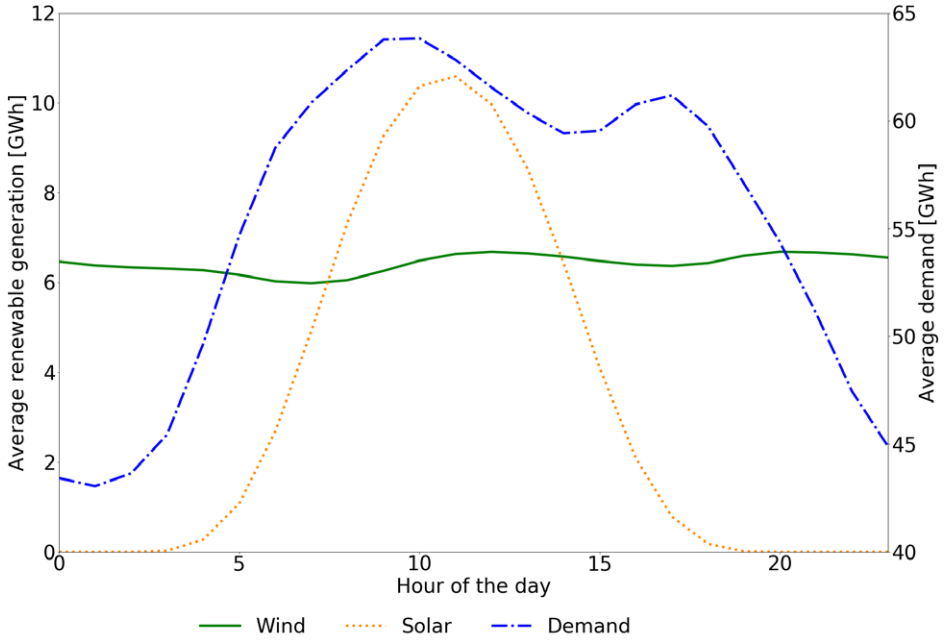

Figure 2: Daily profiles of average hourly wind and solar generation, and demand

duction leads to a price decrease due to the merit-order effect. Thus, the incentive to export electricity to neighboring countries increases. How much export materializes, depends on how well the country is connected to its neighbors. Countries with larger export possibilities are likely to export more during periods with high RE production. This, in turn, leads to a decline in the magnitude of the domestic replacement effect. In terms of Figure 1, the arrow indicating the shift of residual demand becomes smaller. Consequently, high market integration reduces the domestic abatement impact of RE. The impact on total (international) abatement then depends on the supply and demand of the neighboring countries.

We find that Germany exports about 35% of its RE production, whereas Spain exports only about 10% (Abrell et al., 2019a). The different degrees of market integration cause these differences in export reactions: Germany is centrally located in the middle of Europe and highly connected to its neighbors. Spain, on the contrary, only connects to France and Portugal and it's export capacities are rather limited. This difference is also reflected in the decrease in domestic abatement: For Germany, domestic abatement of RE without trade reactions would have been up to 2.3 times higher, whereas abatement in Spain would have increased by up to 1.6 times.

In both countries, solar generation leads to a larger export reaction compared to wind. Germany exports 37% of solar and only 31% of wind energy; Spain exports 18% of solar and only 7% of wind power. Again, this follows from the different production profiles of RE: Solar power is mainly available during peak periods when prices in neighboring countries and, thus, export incentives are high.

Third, the installed conventional production capacities and their marginal cost determine the **ordering of the supply curve**. As RE replaces generation at the end of the supply curve, this ordering defines which technologies are replaced and, consequently, how much carbon is abated: On the one hand, a higher carbon intensity of the existing plant portfolio increases the abatement impact of RE, as RE is more likely to replace carbon-intensive technologies. On the other hand, whether coal or gas is dispatched first, depends on fuel and carbon prices (compare left and right panel of Figure 1). This implies that the emission impact of a RE promotion also depends on carbon pricing policies.

In recent years, in most European countries coal generation was cheaper than gas generation; the case depicted in the left panel of Figure 1. Therefore, solar power, which is active during high demand periods, was more likely to replace natural gas, whereas wind also replaced coal in low demand periods. As natural gas is less polluting than coal, solar is likely to lead to lower carbon abatement compared to wind. As an example, during the years 2014 and 2015, Spanish solar power reduced on average 168 kg CO_2 per MWh, whereas on MWh of wind replaced 250 kg CO_2 (Abrell et al., 2019a).

The situation reverses if gas becomes relatively cheaper than coal generation, i.e., a fuel switch occurs, as shown in the right panel of Figure 1. Because of the change in the merit-order, solar generation then replaces coal power in high demand hours and, thus, becomes more effective in terms of abatement than wind power. We show that in the UK the carbon price support (CPS) – a CO_2 tax on electricity producers in addition to the emissions allowance price of the European Emission Trading System (EU ETS) – temporarily induced a fuel switch (Abrell and Kosch, 2019). Comparing the situations with and without fuel switch during the years 2015 and 2016, we find that when coal was cheaper, one MWh of wind led to 8% more abatement than one MWh of solar, while when gas was cheaper, the impact of solar was 26% higher compared to wind.

Implications for policy design

When talking about "abatement", one should remember that European carbon emissions of electricity generation are regulated under the EU ETS. Thus, offsetting emissions using RE policies reduces emissions in one country, but increases emissions in other countries as the total amount of allowances is fixed (the so-called waterbed effect). Given the recent introduction of the market stability reserve (MSR), carbon offsets by RE policy might reduce the overall cap but only imperfectly as one ton of carbon offset by RE reduces allowances supply by less than one ton. Nevertheless, our analyses can help to understand the drivers of abatement effectiveness:

First, abatement of RE in-feed depends on market characteristics such as the supply curve and interconnectors to neighboring countries, but also on the availability profiles of the renewable resource itself.

Second, minimizing the cost of carbon abatement induced by RE promotion means to get as much abatement per invested euro as possible. Thus, RE support should be differentiated reflecting the environmental effectiveness of the RE source. Consequently, RE with higher abatement per MWh should receive higher support.[1]

Third, the abatement impact of wind and solar, and thus the optimal differentiation between their subsidy levels, depends on carbon pricing policies. When coal is cheaper than natural gas generation, wind power is more effective in reducing carbon emissions and should thus, ceteris paribus, receive a higher subsidy. On the contrary, when a - sufficiently high - carbon price induces a fuel switch, solar leads to more abatement. Consequently, an optimal RE support policy takes its interaction with carbon pricing policies into account.

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Endnotes

1. Abrell et al. (2019b) analyze the optimal design of subsidies for intermittent RE in light of carbon abatement. They show that theoretically optimal RE subsidies should be differentiated according to the environmental value of the RE source, which reflects the amount of carbon abated. As the replacement effect determines the environmental value, the results imply that the production profile is a major determinant of the optimal policy design.

Cap-And-Trade in Practice: Dealing with Leakage, but How?

Mar Reguant
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Mar Reguant *is an Associate Professor in Economics at Northwestern University. Previously, she worked at Stanford GSB. She received her Ph.D. from MIT in 2011. Her research uses high frequency data to study the impact of auction design and environmental regulation on electricity markets and energy intensive industries. She is a Research Associate at the NBER and a Research Affiliate at CEPR. She was awarded an NSF CAREER grant in 2015, a Sloan Research Fellowship in 2016, the Sabadell Prize for Economic Research in 2017, and the EAERE Award for Researchers in Environmental Economics under the Age of Forty in 2019.*

As of today, climate change policies are growing but they are still incomplete. The global nature of climate change creates challenges for a policy regime that covers only a subset of the sources contributing to the problem. If these incomplete policies induce a reallocation of economic activity from regulated to unregulated jurisdictions, the associated "leakage" of greenhouse gas (GHG) emissions can offset emissions reductions and undermine cost effectiveness. Thus, concerns about emissions leakage loom large in debates about regional climate change policy, e.g., regional cap-and-trade initiatives.

Leakage is a term used to refer to the fact that regulating only domestic industries might shift emissions to other countries, instead of just reducing them, a concern that has also been present for polluting industries more broadly (Ederington, Levinson, & Minier, 2005; Jaffe, Peterson, Portney, & Stavins, 1995; Levinson & Taylor, 2008)but only one was found to be suitable for low radiation dose applications. The CT system with the lowest noise level was used for further detailed studies. A simple strategy for manual selection of patient-specific scan parameters, considering patient size and required image quality, was implemented and verified on 11 volunteers. Images were obtained with at least the prescribed image quality at significantly reduced radiation dose levels compared with standard scan parameters. Depending on the diameter of the tomographic section, i.e. size of the subject, the dose levels could be reduced to 1-45% of the radiation dose with standard scan parameters (120 kV, 250 mAs, 10 mm. Correctly identifying the kinds of economic activities most at risk of carbon leakage is a critical first step in the design of effective risk mitigation.

There is a sizeable gap between academic research and real-world policy implementation (Fowlie & Reguant, 2018). Industry stakeholders demand protection when climate change policies like cap-and-trade are enacted, in the form of rebates or free permit allocation, and policymakers need to negotiate tradeoffs between providing strong incentives for abatement at home versus limiting leakage to other jurisdictions. Given the presence of leakage risk, it is not uncommon to observe many climate change policies that grant substantial subsidies to the affected industries.[2] Yet, there is limited theoretical and empirical justification to support such large subsidies.

Calculating optimal subsidies

In a project with Meredith Fowlie (UC Berkeley), we aim to close this gap by developing a unified and publicly available framework that enables a transparent discussion between academics, policymakers and industry stakeholders about the design of more effective industrial climate change policy. The framework is theoretically grounded and empirically estimated, with the possibility to consider alternative sets of theoretical and empirical assumptions. We have constructed a dataset based on publicly available data at a high level of industry resolution (NAICS6-equivalent). The data, together with a theoretical model, can be used to derive optimal cap-and-trade schemes under a properly specified theoretical model that can be structurally calibrated. The estimation focuses on manufacturing industries, which are most at risk of leakage.

This approach is intended as a complement to computational general equilibrium (CGE) models. CGE models are more suited for forecasting and long-term planning, but do not typically exhibit the necessary level of resolution for detailed policy implementation.[3] The approach is also a complement to a more detailed analysis using micro-level data. There is now a growing literature using restricted-access data to understand the effects of energy costs and cap-and-trade policies on the manufacturing sector (Calligaris, D'Arcangelo, & Pavan, 2018; Ganapati, Shapiro, & Walker, 2018; Martin, de Preux, & Wagner, 2014; Petrick & Ulrich, 2014; Wagner, Wagner, Muûls, Martin, & Colmer, 2014)but not electricity use. We find no evidence that emissions trading lowered employment, gross output or exports of treated firms. * We owe a debt of gratitude to Katrin Rehdanz for countless discussions and her generous support at all stages of this project. We thank the research data centre (FDZ.[4] Whereas the analysis of highly disaggregated data can be extremely useful to understand the effects of these policies, it is harder to use these data in a practical fashion when fine-tuning the details of about-to-be-enacted policies.

Narrowing the implementation gap

The motivation for the project stems from observing a real need in policymaking when it comes to designing cap-and-trade policies in a theoretically and empirically grounded fashion. Meredith and I recently had the opportunity to interact with policymakers at the California Air Resources Board (CARB) while revising the 2020 cap-and-trade design in California (AB32). In a research project in close partnership with CARB, we used restricted-access confidential Census data to derive measures of leakage exposure and subsidy levels for several energy-intensive sectors (Fowlie et al., 2016a). One of the conclusions of the project was that, whereas industrial subsidies might be justifiable due to leakage risk, the current levels observed in practice are too high. We were surprised by the large interest that our theoretical framework generated to other agencies (e.g., Ontario), which are struggling on how to practically set industrial subsidies for leakage-exposed industries without resorting to very generous subsidies. Yet, the framework as proposed proved inoperable to make a difference in public policymaking. Whereas we initially thought the microdata available to us were the most ideal for the task, stakeholders from the affected industries easily criticized our analysis for not being replicable, which is a valid concern. Additionally, the results were noisy and sensitive to modeling details, and therefore could also be easily criticized by the industries for which we were proposing reductions in their subsidies. Indeed, a more transparent framework might be needed, one that is publicly available and that enables us to identify robust takeaways for how to improve climate policies.

Subsidies in practice

So, how are industrial climate change policies implemented in practice? Across existing and proposed programs, leakage risk is typically assessed on the basis of two metrics that can be calibrated in a methodologically consistent way across all affected industries (Martin, Muûls, de Preux, & Wagner, 2014). The first metric captures the emissions intensity (EI) of an industry (in terms of CO2e/$M value added or energy expenditures divided by value added). "Indirect" emissions associated with the consumption of electricity, as well as direct emissions from stationary energy and direct emissions from non-energy industrial processes are typically accounted for. The second metric is intended to capture the degree to which an industry is "trade exposed" (TE). Trade exposure is often calibrated as the value of imports and exports divided by the value of domestic production plus imports.[5] These metrics are calibrated separately for each industry using data on energy consumption, GHG emissions, production costs, imports, exports, and domestic production levels. Having calibrated these metrics, the location of each industry in the two-dimensional space defined by the EI and TE metrics determines its level of leakage "risk" (or the amount of the subsidy).

There are several important limitations in the use of these metrics for policymaking. For example, the relationship between these leakage measures and the level of granted subsidies is quite ad hoc and lacks

a theoretical quantitative justification. This leads to the use of these metrics in a coarse manner, such as classifying industries into three broad categories of leakage risk. In practice, these subsidies are also often very generous, which gets the support of the affected industries but limits the effectiveness of climate change policies. Furthermore, there is limited understanding about the sensitivity of leakage risk measures, and the recommendations that stem from them, to policy and econometric uncertainty.

Our findings

In our project, we improve upon these measures of leakage risk and elucidate a link between academic analysis and policy implementation. To execute the project, we combine a variety of methods and tools that together will hopefully contribute to a better understanding of the impacts of climate change policy on manufacturing industries and the role for policy design to enable more effective climate regulation. Building on the models by Meunier, Ponssard, and Quirion (2014), we derive a robust formula for establishing output-based subsidies. We then use data to calibrate the terms of the formula, using a combination of data collection and panel data instrumental variables techniques. Our goal is to make the framework available to agencies and stakeholders. We find evidence of transfer rates (the rate at which output that is replaced by imports) that are around 20 to 30 percent for the median industry. The results point at substantial leakage, but far from 100 percent. We find that transfer rates are largest for trade exposed sectors, and that energy intensive sectors that are not trade exposed do not appear to be particularly at risk. In spite of substantial reductions in output, we do not find that such reductions in domestic output are replaced by imports on a one-to-one basis.

Unfortunately, our results are still sensitive to the specification of choice, highlighting some of the difficulties for data-driven policy parameters. Yet, the results point some important takeaways. In particular, we robustly find that the estimated leakage rates justify the large subsidies observed in practice only for the very trade exposed sectors. Therefore, a call for revising these subsidies downward might be warranted.

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Endnotes

1. See for example the generous subsidies in the context of the AB-32 California cap-and-trade program (https://www.arb.ca.gov/cc/capandtrade/allowanceallocation/allowanceallocation.htm) or the EU European Trading System (https://ec.europa.eu/clima/policies/ets_en#Main_legislation).

2. CGE models are usually aggregated to broader sectors. They can be very useful to inform policies, but might not be calibrated at the fine industry-level required for detailed policy implementation.

3. See also Martin et al., 2016 for a review of evidence on the EU Emissions Trading System.

4. These are the quantitative criteria laid out in Article 10a of the ETS directive (2009/29/EC). Leakage protocols developed in the EU ETS, Australia, the proposed American Clean Energy and Security Act of 2009, and California's GHG Trading Program, use industry-specific measures of emissions intensity and trade share to gauge industry-level leakage risk and allocate leakage mitigating compensation. Emerging programs in China are following this example (Wang, Teng, Wang, Zhou, & Cai, 2018).

Conservation Contracts and Political Regimes

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Torben K. Mideksa *is an Assistant Professor of Economics at the Department of Economics, Uppsala University. He was a Postdoctoral Fellow at the Paulson School of Engineering and Applied Sciences at Harvard University, Postdoctoral affiliate at the Harvard Environmental Economics Program, Fellow of the Weatherhead Initiative on Climate Engineering at Harvard University, and a Research Associate at the Center for the Study of Equality, Social Organization and Performance at the Department of Economics of the University of Oslo. He has a PhD from the University of Oslo, and his research interests include environmental and resource economics, political economics, and development economics.*

Tropical deforestation is a major contributor to greenhouse gas emissions – in addition to being a tragic environmental problem in itself. Studies indicate that the cumulative effect of deforestation amounts to about one-quarter of the anthropogenic greenhouse gas emissions that generate global warming. Similarly, it contributes about 10% to the annual CO2 emissions. Over the past decades, tropical deforestation has been increasing.

To slow, ideally to reverse, the problem of increasing tropical deforestation, various countries have started resorting to bilateral conservation contracts, known as the REDD+ contracts. The goal of the REDD+ contracts is to enhance conservation and maintain biodiversity in countries such as Brazil, Guyana, Indonesia. With REDD+ contracts, tropical countries receive payments for avoided deforestation relative to a jointly negotiated benchmark deforestation level. The global north enjoys the conservation of virgin forests that are home to the planet's unique species that are essential for maintaining biodiversity. Because of these benefits, multilateral institutions such as the U.N. and the World Bank have taken important steps to invest in institutional preparedness and capacity building to ready tropical countries for REDD+ contracts with interested donor countries. Since REDD+ contracts present a potential win-win opportunity for countries both in the north and in the south, there is a substantial interest behind designing REDD+ contracts that promote conservation, maintain biodiversity, and incentivize countries for the right conservation effort.

On top of the interest in the REDD+ agreements, REDD+ policy-making is accelerating at a higher rate than does the research supporting effective REDD+ contracting. Such development brings many challenges forward. To begin with, REDD+ agreements are yet to prove that they work as intended or they will not backfire. In addition, studies indicate that the underlying drivers of deforestation leave puzzling insights. For example, the fact that decentralization of forest management practice has reduced conservation in Indonesia, while it had an opposite effect, in the Himalayas, has remained as a puzzle calling for a deeper understanding of the drivers of deforestation. It is not clear how diverse drivers affecting deforestation interact together and generate the intended effects of REDD+ contracts. Partly because policymakers still have limited understanding of deforestation

drivers as well as how the problem can be effectively solved, negotiators of the Paris Agreement have not yet concluded on how to credit conservation of tropical forests in the Paris Agreement.

How do the diverse causes of deforestation interact with the local political institutions owning tropical forests? How should the REDD+ agreements account for these interactions to succeed in enhancing conservation? In what ways should a contract of payment for avoided deforestation be modified to incorporate the effects of local political institutions? While these questions barely scratch the surface of the core problem and give a solid intellectual foundation for such contracts, we believe answering these questions is essential to take the conservation effort through the REDD+ contracts and the research one step in the right direction.

Our research addresses these questions head-on. We provide a unified framework that recognizes districts' financial motive to permit deforestation as well as the costs of monitoring and protecting conserved areas. In doing so, we allow for multiple drivers of deforestation and differential effects of political regimes and state capacity. The economic analysis suggests that if one district extracts less, the (timber) price increases and the other districts are better off. This pecuniary externality implies that if real decision powers were centralized to a federal government, extraction would be deliberately reduced in order to increase the profit for everyone. This insight is reversed if the enforcement cost is large, or if the districts are unable to benefit much from the profit of logging. In these cases, reducing extraction in one district raises the price and thus the enforcement cost for the others. The larger cost makes the other districts worse off. A central authority would take this negative externality into account so, in this situation, centralization would lead to more logging.

How do we make sense of the effect of decentralization on deforestation? If the financial motive behind deforestation is strong and the protection cost small, as is often the case in strong political regimes with a robust state capacity, then centralization reduces deforestation. The central government will internalize the pecuniary externalities across districts and limit logging in order to obtain higher prices on the timber or the agricultural products. If instead, the protection cost is large, as is the case weaker political regimes with shaky state capacity, then the main problem becomes illegal logging. In fact, a substantial part of deforestation is illegal. Since stricter enforcement in one region raises the pressure and the incentives for illegal logging next door, monitoring is higher in equilibrium and deforestation is lower if the districts rather than central governments protect the forest. While a higher price of a product is a fortune for the seller in political regimes with robust state capacity, it is a curse to the conserver is a weak state that has to incur extra costs to protect the more expensive product from the illegal poachers.

These mechanisms can explain the puzzle that decentralization increased deforestation in Indonesia, where the state is strong, and reduced deforestation in the Himalayas, where both the rugged landscape and weak institutions contribute to higher enforcement costs. This insight is essential for how the world can reduce deforestation. In addition, the insight points to how conservation contracts need to be modified to embrace the role of domestic political regimes. In fact, our framework suggests that a donor is better off cooperating with a central government when states are strong and deforestation is financially motivated, but with local jurisdictions when states are weak and the main problem is illegal deforestation.

The mechanisms have a far-reaching implication about designing the REDD+ agreements with the goal of generating the highest conservation per unit of resources spent. The existing one-size-fits-all REDD+ agreements, which are being offered to countries, ignore the political

institutions in the contracting countries, and this opens up a room to improve such contracts by taking into account in the contracts the political forces driving deforestation. By doing so, it is possible to raise the conservation benefit of a given conservation effort.

The insight also points to the potential danger when conservation contracts backfire. Building on our initial insight, recent research[1] has also shown that REDD+ agreements can motivate institutional change in the recipient countries. The reason is that decentralized management necessitates larger transfers from the donor when the states are strong (and deforestation is managed) but lower transfers under illegal logging. The larger transfers it elicits motivate this institutional change, but a side effect is that also deforestation increases. In fact, such institutional change can reduce (and possibly reverse) the positive, direct effect of REDD+ agreements on conservation. To discourage counter-productive institutional change, the donor needs to build a reputation for always negotiating with the "right" governmental level. This need adds to the necessity of building a reputation to compensate for conservation also in the future. After all, the market for conservation[2] will work today only if compensation tomorrow is credible.

References

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Endnotes

1. www.sv.uio.no/econ/personer/vit/bardh/dokumenter/cci.pdf
2. www.sv.uio.no/econ/personer/vit/bardh/dokumenter/conservation.pdf

Inspiring ERC grant winners

Carolyn Fischer
Vrije Universiteit Amsterdam

Carolyn Fischer is a senior fellow with Resources for the Future, and currently holds joint appointments as a professor of environmental economics at the Vrije Universiteit – Amsterdam and as a Canada 150 Research Chair in Climate Economics, Innovation and Policy at the University of Ottawa. She is also a Tinbergen Institute affiliate, a fellow of the CESifo Research Network, and a member of Environment Canada's Economics and Environmental Policy Research Network. She is a current Council Member of the European Association of Environmental and Resource Economists (EAERE) and previously served on the board of directors of the Association of Environmental and Resource Economists (AERE). She is co-editor of Environmental and Resource Economics and serves on the editorial board of the Review of Environmental Economics and Policy and the International Review of Environmental and Resource Economics.

This year EAERE inaugurated a new award to celebrate researchers in environmental and resource economics who are awarded Starting, Consolidator, or Advanced Grants by the European Research Council (ERC). These important grants offer substantial support for five years, giving researchers financial autonomy to develop a major program of research and a platform for collaboration.

New awardees **Nadia Ameli** (UCL, Institute for Sustainable Resources) and **Nikoleta Jones** (Anglia Ruskin University) were featured in a special parallel session that also included a round-table discussion about the ERC grant application and award process. The panel was joined by **Cees Withagen** (Vrije Universiteit Amsterdam and IPAG), who recently completed a successful Advanced Grant, and **Lino Paula** (ERC), who heads the Sector Social Sciences of the Social Sciences & Humanities Unit. The session was chaired by EAERE Council Member **Carolyn Fischer** (Vrije Universiteit Amsterdam), who had previously served on ERC grant review panels. This article highlights some of the key expert panel insights for EAERE scholars seeking to apply for these prestigious and transformative multi-year grants.

The **choice of grant** to target depends largely on the career stage of the applicant, as visualized in the graphic from Paula's presentation. It is always in the interest of the applicant to document career breaks, which can extend the period of eligibility and provide information for evaluating research output. Regarding the **timing** of the application, waiting to build one's experience is not always the best strategy; reapplications are possible and, with the benefit of feedback from the evaluation reports, have a higher success rate. Jones shared that her experience was a good example of this.

Perhaps the most important decision—and question raised by potential applicants—is to which panel to apply. For EAERE members, the most relevant social science panels (in the 2019 structure) are **SH1—Individuals, Markets and Organisations**—which includes economics, finance and management, and **SH2—Institutions, Values, Environment and Space**—which includes political science, law, sustainability science, geography, regional studies and planning. All recent EAERE awardees found their success in SH2, but Paula emphasized that one should identify to what area the path-breaking research will make the greatest contribution. For choosing a panel it is, for example, of lesser concern whether methodologies from e.g. economics or from environmental sciences are being used; what matters more is to identify to which discipline(s) the research is expected to contribute breakthroughs.

In either case, it is important to remember the audience and the evaluation criteria. The ERC is looking for non-incremental research programs that are both **high risk and high reward**. Panel members are directed that "Excellence is the sole criterion of evaluation" and is applied to the evaluation of "both the Research Project and the Principal Investigator in conjunction." Modesty is therefore discouraged. Although ERC funded projects are often impactful, note that societal impact is *not* an

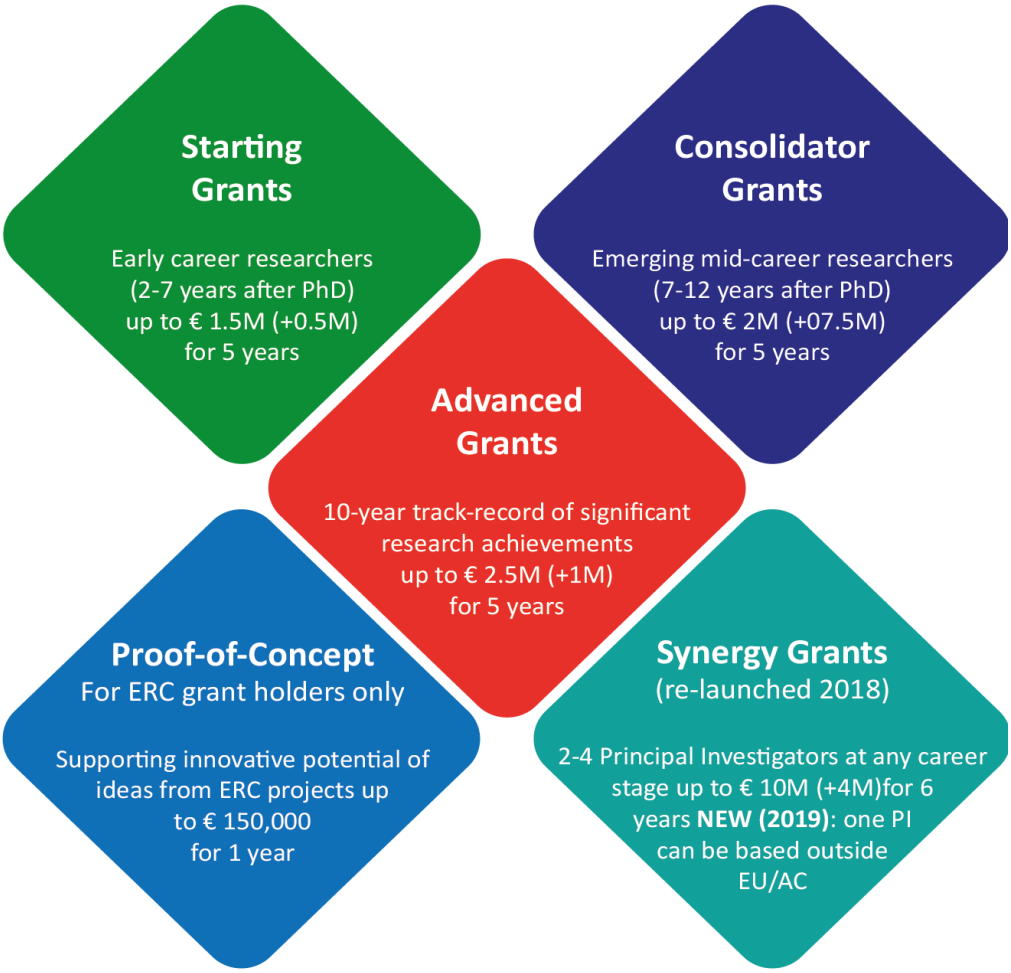

Figure 1: ERC Funding Schemes. Source: Paola (2019) presentation

evaluation criterion.

The **written application process** has two stages: 1) ERC panel members evaluate and rank proposals based on the overview (part B1), and 2) the top-ranked proposals are evaluated in detail (part B2) by selected outside experts as well as panel members. Thus, the two parts have different audiences: part B1 is read and evaluated by *generalists*, of which at most one would be an environmental economist, broadly speaking. Thus, it is important to make the case for excellence concise and intelligible for a broad audience, including, e.g., experts in finance who know little about the environment, or geographers who know little about economics. Part B2, in contrast, will be evaluated by *specialists*, and must hold up to technical scrutiny.

Those selected for stage 2 will (in the case of Starting or Consolidator Grants) be invited to Brussels for an **in-person interview** with the Panel. These are strictly time-limited, and applicants may be questioned about any aspect of their proposal. Our round-table members emphasized the importance of mock interviews for preparation.

Tips

Think big! How can your idea go substantially beyond the state of the art?

Take risks! A breakthrough cannot be guaranteed, but show that it is feasible.

Craft a credible program. Define a number of specific projects that are self-contained but connected. Each should have a defined workplan, including who is going to work on what. At the same time make sure that post-docs do have enough degrees of freedom.

Ask for help from your host institution! Your institution benefits from your ERC grant as well and should support you in the endeavor. Ask your department chair for time to write the proposal, for designated readers to give you feedback, and for co-pyeditors. Get help from an expert on administration and finance. Make sure your institution is committed to providing work space for the post-docs and PhD students you would hire, travel money, and assistance in complying with the required formalities in managing the project.

Leverage your grant. Make a prior (written) agreement with your institution regarding your teaching load, in case you get the award. You will be committed to the proposal vis-á-vis the EU and will need to devote the majority of your time to it. Although your host institution must write a letter of support, keep in mind you will not be bound to them—your ERC grant is portable, should you transfer to a different European institution.

Use your EAERE network! You are connected to a collegial group of people with experience applying for these grants and with expertise in your area. EAERE also provides dissemination tools for your job openings and research results.

More information

www.eaere.org/erc-grants-laureates

https://erc.europa.eu/ or watch: https://player.vimeo.com/video/154715819

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Juniors-ask-Senior

Interview with Karine Nyborg

Karine Nyborg *is Professor of Economics at the University of Oslo and IZA Research Fellow at the Institute for the Study of Labor. She has served as President, Vice President, and Council Member of the European Association of Environmental and Resource Economics. Karine is an Editorial Board member of the Review of Behavioral Economics, the Review of Environmental Economics and Policy, and the Journal of Environmental Economics and Management. In 2002 she won the Erik Kempe Award, a biannual prize for best European paper in environmental and resource economics. She has been a member of several Government-appointed expert commissions. Her research interests include environmental economics, economic analysis of social and moral norms, and behavioral economics.*

1. What is the most important advice you would give to young researchers starting a career in environmental and resource economics?

I believe that if you want to have an impact, first of all you need to excel in the language and methods of economics. After this, it is also important to learn about biology, environmental science, creativity... But it is crucial to firstly master the methods of economics, otherwise no one will listen to you.

2. How do you get the ideas for your research questions?

Several ways. One of them is if somebody provokes me: for example, when I hear something in the news that I feel I have to protest about, then I want to explore it. Also, often ideas come from previous works. You stumble upon some aspects that you didn't consider before, and it makes you want to find out more about those. Public debate is also of great inspiration to me.

3. Which research areas or questions in environmental and resource economics do you personally think deserve more attention?

Social interaction. I think it is very important to understand better the fact that our behavior is strongly dependent on what other people do: it has an enormous influence on our actions. For example, if my family and friends reduce their meat consumption I am likely to do so too, since there is often a need to coordinate food purchases, cooking, and which cafes or restaurants to visit. I believe our every-day lives are full of similar situations, to which we are almost blind, but which can have an enormous influence on environmental impacts.

4. How do you deal with very critical reviews of your papers?

It still happens to me to get rejections of my papers. If reviews are very critical, the first thing I do is I make a printout, get one of those yellow markers and mark anything that is even remotely positive. If I feel the report is too negative, I become blind to its constructive parts: to mark them makes me aware of the positive sides and keener on improving my work. Then, I make notes in the margins if I don't understand some comments. Even if the paper is rejected, I do these things anyway before submitting it anywhere else.

5. Young freshman students often loathe the idea of comparing costs and benefits when it comes to environmental protection and regulation. How do you convince them that these things are important?

To be frank, I don't feel that they loathe the idea of comparing costs and benefits. What I do feel is that some of them loathe the idea of doing it exclusively in monetary terms: the use of this monetary values as an answer to how important something is for society is what they are really against. In this sense, I believe that their negative reaction is actually healthy, and they do have a point. If we use only monetary evaluation in our analysis, we risk enlarging the existing inequalities between rich and poor by putting more emphasis on the utility changes for the rich. I try to convince them that we should compare costs and benefits, but we also need to look for different indicators to rely on.

6. Discrimination against women was probably a bigger problem when you started your career than it is today. Can you describe an example for the discrimination that you experienced and how you handled it?

I am not so sure that the situation has improved that much, at least in the economics world. If you look at some of the material that has appeared in the American economics community lately, there is a strong indication that women's presence in academia is not so much wider now than 20 years ago. It still seems harder for us to publish on the best journals and it still seems to be the case that women get less credit and tenure decisions for co-authored papers than men do. Empirical knowledge about this is growing, but I honestly would have expected more progress by now.

As for my experience, I haven't suffered many outright, obvious cases of discrimination. However, I think that another kind of discrimination is just as serious: low expectations and lack of interest. This is very subtle, and you cannot know in each instance if you are being less considered due to gender discrimination or just because you are making a poor performance in that context. Especially when you are a young woman, very often people will - probably unconsciously - expect that you are less experienced than you actually are, and that what you have to say is not going to be very interesting or relevant.

I believe it is important to put emphasis on this problem especially in the research world: indeed, research is about understanding, creativity and insight. If the reader or listener is having low expectations on you, the brain processes that allow openness, interest and understanding of your contribution are not going to happen. The result is that your work is really going to be less important in the perception of the receiver.

7. Which career / job did you have in mind when you finished high school?

Almost anything except becoming an economist: biologist, journalist, fiction writer (which has been partially accomplished) … I also wanted to create my own independent theatre… I had no plans of becoming an economist.

8. If you decided about your career today with hindsight, would you choose the same route?

I wish I had been braver in the very beginning and had taken the chance of being a fiction writer from the very start, which instead I didn't do until I was around 35 years old. But if you disregard that, I am very happy with the job I have. One thing I can say though, is that I don't know if I would go for this career if I were to begin now. It really worries me how poor opportunities for permanent jobs are nowadays. I personally think it is very important to combine career and family life, and this of course cannot happen if you have to travel

around the world until you are 40 due to job changes, which unfortunately I think is very common these days.

9. Which book are you reading (or writing) at the moment?

I have been writing a book for the past two years, but I suddenly don't like it. I think I'll have to start something else soon… And I am currently reading a book from Siri Hustvedt; she is an American fiction writer, despite her name coming from Norwegian ancestors. I really like her books. The book I am reading now is called "Memories of the future" and it talks about the author's younger years in New York, where she moved in her early twenties.

10. If you could select a person (alive or deceased) to have dinner with, who would that be?

A couple of weeks ago I was at a meeting and accidentally I was lucky enough to have lunch with Siri Hustvedt: that was good enough for me. Otherwise, I would have said Dostojevskij.

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