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Summer
2018

EAERE Magazine

Table of content

 5	Note from the Editor Astrid Dannenberg
 6	Feed-in Subsidies, Taxation, and Inefficient Entry Fabio Antoniou & Roland Strausz
 8	ENERGYA - ENERGY use for Adaptation Enrica De Cian
 11	The Future of Electricity Markets: More questions than answers Natalia Fabra
 14	Juniors ask Seniors Interview with Mordechai Shechter
 17	Juniors ask Seniors Interview with Aart de Zeeuw

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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 Friends and Colleagues,

I hope that all those who attended the WCERE in Gothenburg have returned home safely. Now that we know that environmental economists are “not sexy but useful” (Thomas Sterner’s summary of Gina McCarthy’s motivational speech), it seems clear what we have to do: enjoy the summer break and then go back to work in order to help make the world a better place.

This second issue of the new EAERE Magazine is all about this year’s Award Winners. The first article is a summary of the paper “Feed-in Subsidies, Taxation, and Inefficient Entry” by Fabio Antoniou and Roland Strausz, the Winners of the EAERE Award for Outstanding Publication in the Journal Environmental and Resource Economics. Enrica De Cian and Natalia Fabra, two of our Winners of the EAERE Award for ERC Grants laureates in the field of environmental and resource economics, have contributed articles about their ERC projects. The two winners of the European Lifetime Achievement Award in Environmental Economics, Mordechai Shechter and Aart de Zeeuw, have agreed to answer our Juniors-ask-Senior Interview questions. For those who have missed the first issue of the Magazine, these are questions developed by young PhD students and Postdocs for senior researchers who have had a long and successful career in environmental economics.

The articles and interviews with the remaining Award Winners will be presented in the next issue.

Enjoy reading!

Astrid Dannenberg

University of Kassel, Germany

Feed-in Subsidies, Taxation, and Inefficient Entry

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Prof. Roland Strausz chairs the Institute of Economic Theory 1 at the School of Business and Economics. He received his doctorate at the Free University of Berlin in 1998, where he finished his habilitation in 2005. He is currently a principal investigator in “Leibniz-Wissenschaftscampus: Berlin Center for Consumer Policy (BCCP)” (Leibniz-funded) and in the “Rationality and Competition” (DFG-funded). Prof. Strausz is member of the council “Economic Theory” and “Industrial economics” of the Verein für Socialpolitik and a research Fellow in the CESifo Network and CEPR. He is further a founding member of the Berlin Doctoral Program in Economics and Management Science (BDPEMS).

In order to mitigate climate change, countries all over the world have pledged to radically overhaul their energy systems. For instance, the EU member states voted to ensure that by 2030, almost one third of energy and half of electricity demand should come from renewables. This radical change can only succeed by the entry of large scale projects such as solar plants, offshore wind parks, and large dam-systems for water power facilities which imply mountain costs (see Gilles 2015¹).

To achieve and finance this radical switch, most countries do not rely on a heavy handed command-and-control system but instead opt for a more market based approach. Based in the hope that markets can bring about this transformation most efficiently, they leave actual production and technology decisions up to private markets, but use tools such as taxes and subsidies to guide these markets in the right direction. In particular, most countries put their faith in a combination of (direct or indirect) polluter taxes and subsidies in the form of feed-in subsidies for renewables (see IEA 2018²). On top of that, most governments also face budgetary concerns for financing their intervention schemes and thus many have resorted to a further tool, a consumption tax on electricity consumption (see COM 2018³).

An intuitive rationale for this tool set follows the standard principles of the Tinbergen rule of “one instrument per policy objective” which in the current debate translates as follows: Use a polluter tax to solve the externality problem, use a feed-in subsidy to solve the entry problem, and, Finally, use a consumption tax to balance budgets. In Antoniou and Strausz (2017), we caution that, even though the above reasoning sounds intuitive, it is misleading⁴. In general, the tool set cannot even solve the first two problems.

In a setup with dirty incumbents and costly entry by clean producers, we show that the clean sectors incentives to enter are inefficiently low when entry costs are relatively high. The reason is that the clean producers disregard the contribution to social welfare that is appropriated by the consumers. Despite of entry being socially efficient, the clean sector will not enter as the profits from entry are not sufficient to recoup its fixed costs.

The tool set of polluter taxes, feed-in subsidies and consumption taxes are, in general, unable to solve this entry problem efficiently. In particular, they cannot achieve the joint policy goals of efficient production levels and efficient entry. The reason for this failure is a market interaction

of the instruments, which prevents their use as independent policy instruments. Whenever the efficient outcome is implementable, then the regulator is able to do so only through the implementation of a polluter tax.

Interestingly enough, when the first best outcome is feasible the regulator can achieve it through different combinations of the policy instruments. In economic terms, these alternative options lead, however, to identical outcomes. The multiplicity result can therefore only be helpful if the regulator is somehow restricted in their use. For example, if the polluter tax is not under the full control of the regulator and does not match the marginal externality, then she may use an appropriate combination of feed-in subsidy and consumption tax to correct for this.

Since these policy instruments are in general unable to achieve the first best, it is of some interest to discuss the second best outcome. Intuitively, it trades off reductions in the incumbent's dirty production against inducing entry. In order to induce entry, the second best distorts upwards the production of the potential entrant so as to recover its entry costs. Interestingly, the second best overcorrects the polluter's output by inducing a production level below the efficient one. A social planner can achieve this second best with a tax on dirty production and a feed-in that subsidizes entry. Hence, only with regard to the second best, the feed-in subsidy becomes an effective, albeit suboptimal instrument. In addition to these two instruments, the consumption tax is however still redundant in that it does not enable the social planner to attain higher welfare compared to the case where only the polluter tax and the feed-in subsidy are at play. Since the second best allocation uniquely determines the budget, the consumption tax is also ineffective in balancing the budget of the overall set of instruments.

To conclude, the widely used schemes based on feed-in subsidies of any form do not constitute optimal support schemes for promoting renewable energy. Active directives such as COM (2013) suggesting

to switch from feed-in tariffs to feed-in premiums and tenders⁵ do not remove the problems described above. From a normative perspective, optimal policy should use a different set of tools. In particular, a tax on polluters should be combined with a lump-sum subsidy conditional on entry which covers the entrant's entry costs in excess of its expected profits in the market. From a practical perspective, such fixed lump sum transfers may be suspicious and difficult to implement. Feed-in subsidies are, however, not an adequate alternative for such lump-sum transfers, because they affect marginal considerations and are therefore distortive. Turning to our initial question, we conclude that feed-in subsidies are suboptimal instruments; even though they promote a switch to renewables, they do so in a costly, suboptimal manner.

Endnotes

1 Gillis, J., 2015. A Path for Climate Change, Beyond Paris. New York Times 1 December 2015. Retrieved December, 2015. <https://www.nytimes.com/2015/12/01/science/beyond-paris-climate-change-talks.html>

2 International Energy Agency (IEA), 2018. Global Renewable Energy. Retrieved June, 2018.

3 COM, 2018. Excise Duty Tables Part II Energy products and Electricity, European Commission, Retrieved June, 2018.

4 Antoniou, F. and Strausz, R., 2017, Feed-in subsidies, taxation, and inefficient entry, *Environmental and Resource Economics*, Vol.67, No 4: 925-940.

5 COM, 2013. European Commission Guidance for the Design of Renewables Support Schemes, European Commission, Retrieved June, 2018.

ENERGYA - ENERGY use for Adaptation

Enrica De Cian

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Enrica De Cian is associate professor in environmental economics at Ca' Foscari University of Venice (Italy) since December 2017 and research scientist at Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC), Italy. She is an ERC Starting Grant grantee with the project ENERGYA – Energy use for Adaptation - <http://www.energy-a.eu/>. She has collaborated with several research organizations in Europe (CEPS, ZEW) and in the US (JP at MIT, Boston University). In 2012 she was awarded a Global Marie Curie Research Fellowship.

We are used to thinking about energy as the main culprit behind climate change. Essentially because for almost two centuries we have been burning fossil fuels to provide cheap and abundant energy services. But energy is also key to coping with the consequences of climate change (Figure 1). We use for example air conditioning to adapt to hot temperature and high humidity levels across all sectors of the economy,

not only in the residential sector, but also in industrial and commercial activities. Since 2000 the use of energy for air conditioning services in the residential sector has been increasing steadily, with average annual growth rates above 15% per year in countries such as China, Turkey, Malaysia, and significant increases also in cold countries such as Canada (+8%). In the commercial sector the expansion of

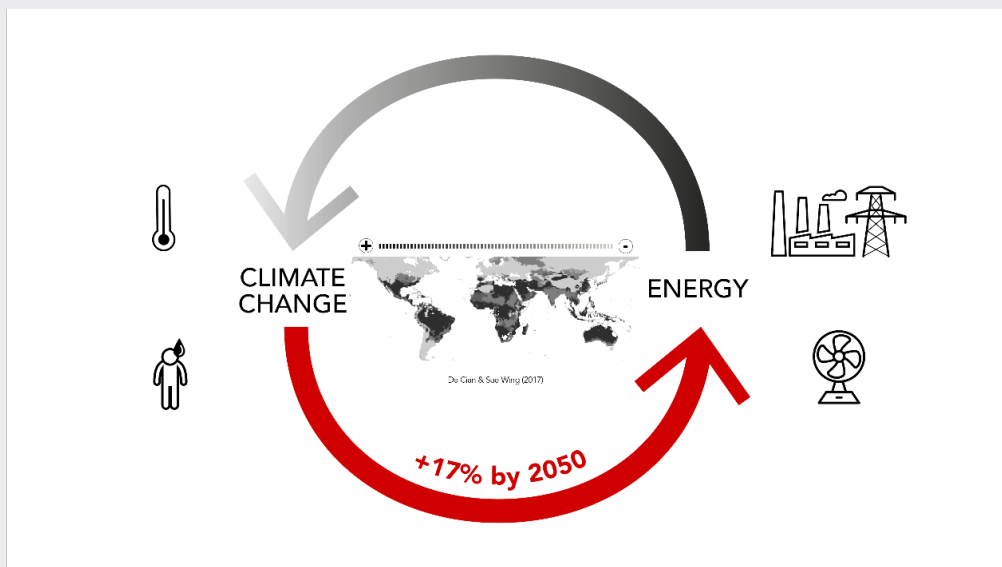


Figure 1. Energy use for Adaptation. The map shows the percentage change in final energy demand due to climate change based on De Cian and Sue wing, 2017

energy demand for cooling has outpaced that observed in private houses in several countries characterized by a hot climate such as in Mexico (7% versus 4% of the residential sector), Egypt (8% versus 5%), Thailand and Iran (about 5 % in both residential and commercial), Saudi Arabia (8% versus 7%)¹.

The evolution of cooling demand in residential and commercial activities is mainly affected by the sector growth in the

specific country. Although several studies confirm that socio-economic variables are the leading driver of energy demand², temperature and humidity fluctuations further contribute to increase energy needs. De Cian and Sue Wing (2017)³ show that climate change could increase global energy demand up to 17% in 2050 under vigorous warming. Climate-induced changes in energy demand would be disproportionately larger in tropical regions (Figure 1), where the overall percentage

increase in total final energy consumption (32%) is greater than the one estimated for the globe (17%).

Improvements in energy efficiency could at least partly compensate the additional energy demand needed to cope with warming. Looking at the commercial sector data between 2000-2015 period, only in a few countries (Canada, but also some emerging economies such as Indonesia and South Africa)⁴ improvements rate in energy efficiency outpaced the annual average growth rate in cooling demand.

Now, imagine the billions of people living on our planet in 2050 using energy to moderate harm from climate impacts on health, labour productivity, agriculture, economic production. More energy could mean more emissions and higher energy prices, with potentially negative consequences for poor households and economic competitiveness. However, today we still do not know whether these implications could hinder progress towards sustainability and decarbonization. The project ENERGYA deal with these questions through a 3-step investigation program that will:

- i) Analyze historical data on energy use in relation to climate and weather
- ii) Develop future scenarios of climate-induced energy demand at global scale, building on the evidence from the past
- iii) Assess the environmental and socio-economic implications under a range of uncertain alternative futures.

Looking at the first step, the few existing global studies either focus on the residential sector with a bias towards few industrialized countries or imperfectly characterize socio-economic and geographic heterogeneity. Surprisingly, also for Europe and OECD countries we still do not know much about energy use for adaptation. Moreover, the literature has mostly focused on the intensive margin, namely how users vary the intensity of energy use given the pre-existing stock of energy-using durables⁵. Another margin of adjustment comes from changes in the quantity and the characteristics of

energy-using appliances and durables, such as air conditioners or building characteristics (known as adaptation along the extensive margin)⁶. This project will combine subnational statistics and surveys on energy use with high-resolution geographic data including climatic variables to expand our knowledge to four key emerging economies, Brazil, India, Indonesia, Mexico and to go beyond the residential sector.

Regarding the future energy needs for adaption, we still do not have projections that integrate energy needs for adaptation into emission reduction scenarios in a coherent way, accounting for socio-economic and climate uncertainty. This project will provide this missing element by combining the empirical evidence based on historical data with the new scenarios for climate, GDP, population and urbanization scenarios the research modeling community is finalizing⁷. Given the considerable uncertainty in the future state of the climate and economy, it is paramount to clearly characterise future energy needs under multiple realizations of climate change and socioeconomic scenarios. Econometric impact models provide a computationally tractable alternative to process models and the sequential approaches used in literature⁸, and can accommodate a multiplicity of future climate and socioeconomic scenarios more easily. Such flexibility is needed because climate change impacts on energy use will crucially depend on the interaction between exposure to temperature extremes, the accessibility of energy services, affordability, desirability, as well as contextual factors such as infrastructure, electrification and urbanization⁹.

Climate impacts lead to a geographic re-distribution of energy consumption towards tropical regions, as most of the increase will be due to higher electricity use for cooling. As a consequence, global warming may amplify inequality because hot, low and middle income countries will face the largest increase in energy use. To understand the socio-economic and environmental implications of future energy needs, this project will elucidate the distributional implications

of adaptation to highlight potentially regressive consequences. Survey data gathered during the project will be used to model how energy expenditure could vary across income groups in selected emerging economies. Attempts to characterise income distribution and household heterogeneity in the macroeconomic models can be found in the literature on poverty analysis¹⁰, climate and energy policies, energy and emission scenarios¹¹. Yet, studies on the poverty-climate impacts nexus are limited and have focused on the potential regressivity of climate impacts on agriculture¹², and analyses of the macroeconomic, environmental, and distributional implications of adaptation-driven energy use are missing.

The underlying idea behind this project is that adaptation is one of the major global challenges of our century, and energy is a critical enabling factor. But how much energy will we need? Where could adaptation hotspots arise? Will increasing energy needs exacerbate poverty? These are the questions this project will address over the next five years, with an interdisciplinary research team, in collaboration with experts from key emerging economies, India, Indonesia, Mexico, and Brazil.

Endnotes

1 ENERDATA, accessed on June 26, 2018.

2 Isaac, M. & van Vuuren, D., P. (2009). Modeling global residential sector energy demand for heating and air conditioning in the context of climate change. *Energy Policy* 37, 507-521.

3 De Cian, E. and I. Sue Wing (2017). Global energy demand in a warming climate, *Environmental and Resource Economics*.

4 ENERDATA, accessed on June 26, 2018.

5 Auffhammer M, E. Mansur (2014). Measuring Climatic Impacts on Energy Expenditures: A Review of the Empirical Literature, *Energy Economics*. 14: 522-530; Schaeffer, R., (2012). Energy sector vulnerability to climate change: A review, *Energy* 38: 1-12.

6 For a recent exception going in this direction see Davis, L. W., Gertler, P. L. (2015) Contribution of air conditioning adoption to future energy use under global warming, *PNAS* 112, 19 5962-5967.

7 van Vuuren, D., et al. A proposal for a new scenario framework to support research and assessment in different climate research communities. *Global Environmental Change* 22, 21–35 (2012); Coupled Model Intercomparison Project, Phase 5 and 6 ensembles. Rihai et al. (2017). The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. *Global Environmental Change*, 42 (153-168).

8 See among others example Ciscar J.C. et al, (2011) Physical and economic consequences of climate change in Europe. *PNAS* 108:2678–2683, Warszawsk et al 2013, The Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP): Project framework, *PNAS* doi: 10.1073/pnas.1312330110, and Nelson G. et al 2014 Climate change effects on agriculture: economic responses to biophysical shocks *PNAS* 111 3274–9 for the use of a similar methodology in the context of agriculture.

9 Pachauri S. (2012) Demography, urbanisation and energy demand. In: *Energy for Development: Resources, Technologies, Environment*. Springer, Dordrecht.

10 Avar, L. (2005). Poverty and Inequality Analysis within a CGE Framework: A Comparative Analysis of the Representative Agent and Microsimulation Approaches, *Development Policy Review*, 2005, 23 (3): 313-331; Colombo G. (2008). Linking CGE and microsimulation models: A comparison of different approaches. *International J of Microsimulation* 3:72–91.

11 van Ruijven et al. (2011). Model projections for household energy use in India, *Energy Policy* 39, 7747–7761; O'Neill, B.C., et al. (2010). Global demographic trends and future carbon emissions. *PNAS* 107, 17521-17526; Krey, V., et al. (2012). Urban and rural energy use and carbon dioxide emissions in Asia. *Energy Econ*; Pachauri et al. (2013). Pathways to achieve universal household access to modern energy by 2030. *Environ. Res. Lett.* 8, 024015.

12 Skoufias E. et al. (2011). The Poverty Impacts of Climate Change A Review of the Evidence, Policy Research Working Paper 5622, World Bank.

The Future of Electricity Markets: More questions than answers

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Natalia Fabra is Professor of Economics at Universidad Carlos III de Madrid, Research Fellow at the Centre for Economic Policy Research, and Associate Member of the Toulouse School of Economics. Natalia works in the field of Industrial Organization, with emphasis in Energy and Environmental Economics and Regulation and Competition Policy. In 2014, Natalia got the Sabadell-Herrero Prize for the Best Spanish Young Economist, and in 2017 she has obtained an ERC Consolidator grant to analyze environmental policies in the power sector. Natalia received her PhD from the European University Institute (Florence).

Among the readers of the EAERE Magazine, there is probably no need to stress the urgency of reducing carbon emissions. In the coming two decades, we must accelerate the transition towards a low carbon economy to limit the rise in world temperature within the dangerous 2C limit. As [Nicholas Stern](#) puts it, “the opportunity is now”: delay is simply not an option.

However, whereas the objective is clear, the route we should follow is less so. Most of us agree on the need to support a least-cost energy transition but ... do we agree on the set of policies that would allow us to succeed? Policy innovation – an area to which we have much to contribute as economists – is probably as key as technology innovation is for a successful energy transition.

With the focus on the power sector, the objective of my ERC project ([ELECTRIC CHALLENGES](#), for which I have been honored to receive the [EAERE award](#)) is precisely to inform policy-making towards a least-cost energy transition. With only one summer apart from the start of the project, at this point I can only suggest questions – and very few answers – with the hope of inspiring much needed research in this exciting area. The future of electricity markets and the design of the policies that are best suited to meet the environmental targets are still open for debate.

Renewables, a game changer that opens several design questions

Renewables are called to play a major role in the process of decarbonizing our

economies. Complying with the recently set [EU climate and energy objectives](#) means that, by 2030, around two thirds of total electricity generation should come from renewables.¹

Renewables are a game changer in electricity markets for two reasons: first, they allow to producing electricity at almost zero marginal costs, and second, they are not always available. This poses several questions for market and regulatory design, which I group within three broad categories: (i) the design of electricity markets, (ii) the design of auctions and contracts for renewables, and (iii) the design of dynamic pricing incentives.

Regarding the design of electricity markets:

In most electricity markets, generation technologies (e.g. nuclear, coal, gas, hydro, etc) are paid at the market-clearing price, typically reflecting the marginal cost of the most expensive technology needed to meet demand. Greater reliance on renewables will push market prices down, eventually driving market revenues below the average costs of most, if not all, generation technologies. Is this market design well suited for renewables-dominated electricity systems?

In order to address this question, we would first need to understand competition among renewables. The so-called *merit-order effect* (namely, the role of renewables in depressing market prices) is based on the premise that renewables bid at zero marginal costs, thus shifting the market supply curve out and the market prices down. However, just as conventional

energy producers do not always bid at marginal costs, renewable producers need not always bid at zero.

The question of *How do renewables compete among them?* is still – as far as I am aware of – not fully answered.² In particular, at which prices will renewable producers offer their power? How will this depend on the pricing rule in place? Will ownership of renewables matter? Will the various renewable technologies bid differently? What will be the resulting market price patterns (i.e., the price level and its volatility)? Understanding these questions is key to assessing the future performance of electricity markets under a business-as-usual market design, or alternatively, for assessing the need to re-design it.

There are certainly many other questions related to market design issues that will become increasingly relevant. For instance, if renewable generation exceeds total demand, which units should be called to produce first? Should we allow producers to bid down negative prices, or should we rather rely on rationing rules that introduce efficiency considerations (e.g. minimizing network congestion)? How do the various rationing rules impact producers' uncertainty, and what are the effects on their investment incentives?

Regarding the design of the auctions and contracts for renewables:

One option for mitigating strategic bidding is to avoid renewables from facing the fluctuation of wholesale market prices. Ultimately, there are no major compelling efficiency reasons to do so given that their marginal costs are essentially constant, their fixed cost are unrelated to changes in the marginal costs of producing electricity in coal or gas plants, and their availability is mostly subject to exogenous weather shocks. The so-called Contracts for Differences (or CfDs, as in the UK) or the contracts with floating premia (as those used in Germany) reduce the price exposure of renewable producers, thus mitigating the investors' risk premia and reducing their costs of capital.³ Whether such lower costs are passed on to consumers critically depends on the design of the auctions and contracts for renewables.

This poses several unsettled issues: How long should the contracts for renewables be? Should several renewable technologies compete among them or should we rather rely on technology-specific auctions? Should we ask bidders to invest in renewable capacity only, or should we ask them to provide firm energy, e.g. to combine their investment in renewables with back up capacity, batteries, or demand response? The list of issues regarding the design of renewables auctions is long... not least because the costs and benefits of deploying renewables will largely depend on whether we get such design issues right.

Regarding the design of dynamic pricing incentives:

An alternative – or rather, a complement – to building back-up capacity to cope with the intermittency of renewables is to encourage demand to be more active. Dynamic pricing offers one option to induce changes in consumers' behavior: if consumers face price incentives to shift load from high-price periods (i.e., those with high demand/low renewables) to low-price periods (low demand/high renewables), there is scope to reduce the peaks of demand and thus mitigate the need to maintain excess capacity. But, do we know whether consumers would indeed respond to such pricing incentives? Prior work has taught us that consumers indeed respond to such price signals, and that information and automation enhance demand response. However, such analyses rely on data from field experiments with voluntary participation of a small, and thus potentially unrepresentative, set of consumers. The possibility to assess the external validity of such experimental evidence is limited as dynamic pricing has not been broadly implemented in practice (an exception is Spain, where the default option for all households is to pay electricity prices that change on an hourly basis, RTP).

If we face consumers with dynamic prices, would they respond to the hourly price changes? In particular, would they have the incentives to do so and would they gather then necessary price and consumption information? What would be the distributional impacts of such a pricing policy as consumers with different

consumption profiles face different price patterns over time? Do consumers dislike hourly price volatility? In particular, if given the option to opt out to flat tariffs, which consumers would be most likely to abandon dynamic prices? Shedding light on these issues is key to designing consumers' pricing schemes, and to ultimately quantify the role that demand response can provide in balancing renewables-dominated electricity systems where the extent of price variation can be large and where, absent demand response, the need to keep excess capacity would be greater.⁴

To conclude....

This is just a sample of the issues that we should understand in order to inform good policy making towards an efficient energy transition. They are certainly not the only ones. Other major issues regard the economics of energy storage, the potential for energy efficiency improvements, the economics of distributed generation, the impacts of a broader adoption of electric vehicles....And, as the state of technology evolves in this rapidly changing field, further policy issues will become relevant – new technologies for producing or storing electricity might arise; or the costs of the existing ones might fall; the involvement of consumers might become cheaper and quicker; or new forms of transportation might appear....Our role as economists is to make sure that society benefits from such technology breakthroughs through a set of good policies. And, as economists working in the area of Energy and Environmental Economics, we should feel reassured that our contribution will be key to achieving a least-cost energy transition. The stakes are high. We should work hard to get it right!

Endnotes

1 The objective is that 32% of total energy consumption will come from renewables. Since other sectors find it more difficult and more costly to rely on renewables, a big share of such effort will come from the power sector as electricity will increasingly provide clean energy for other sectors.

2 Together with [Gerard Llobet](#), we shed light on this matter in the on-going paper “Competition among Renewables”.

3 Indeed, as reported by [David Newbery](#) (2017), the switch to CfDs in the UK reduced cost of capital from 6% to 3%, saving GBP 2.25B per year.

4 Together with [Mar Reguant](#) and [David Rapson](#), we are analysing these issues, in the context of the Spanish market, through the lens of a big data set made of the hourly consumption of more than 4M households over two years.

Juniors ask Seniors



Mordechai Shechter (b. 1937) Professor Emeritus of the Department of Economics and of the Department of Natural Resource & Environmental Management, at the University of Haifa, Israel. Until recently also served as the Founding Dean of the School of Sustainability at the Interdisciplinary Center (IDC) – Herzliya, Israel. He is the founder (1985) and Director (until 2010) of the Natural Resource & Environmental Research Center. At the University of Haifa he served as Rector (Provost), Dean of Research, Head of the Economics Department and the Graduate Department of Natural Resource and Environmental Management Departments (which he founded 20 years ago), and Chair of the Senior Faculty Association. In 2000-2005 he served as President of Tel-Hai Academic College in northern Israel. He also chaired the governing board of Israel's National Parks and Nature Reserves Authority Council, founded and headed the Israel Information Center for Climate Change Adaptation, and chaired the Board of the City of Haifa's Museums. He holds a Ph.D. in Agricultural Economics from Iowa State University (1968), and taught and published extensively in the areas of environmental and natural resource economics and management.

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

This is what I've learned the hard way: we economists, not just environmental economists, are very egocentric. We think that for some reason we know the truth, that everybody else is blindfolded, and he or she should be told how to make decisions. I think that's kind of arrogant. I would say there must be an antidote against this arrogance of economists. We should be humble and remember that some of the opposition to economic teaching stems from the very fact that people either don't understand or they resent outright the advice of economists. We should also recognize that other disciplines have some important inputs to decision-making and we don't know the entire and whole truth. So, my advice would be to be a little humble and not think that we have all the truth in our hands.

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

This varies depending on one's interests. My point of view is that we need to study and learn more about the seas and marine resources, and what they have to offer mankind in order to sustain our life on this planet. I believe that in the future we will rely more and more on what the oceans and the seas have to offer us in terms of algae, for example. If we want to reduce the amount of protein that we take from animals, so there will be fewer animals like cows, pigs, and sheep grazing on land, then we'll have to rely more on the sea, in terms of algae, fish, and other products, to sustain us and support the increasing population in this world. We must learn about and conserve what the oceans and the seas will offer us and not make the same mistake that we did with regards to land resources.

What has been the main motivation for your research throughout your career?

Interest, pure interest.

How do you get the ideas for your research questions?

Simply by talking to people, observing, reading. There is no one resource. I think it's the interplay, and it's very important to talk to people, to learn, and to hear what they have to say, what bothers them, and then shape a way towards finding a solution to the problem. After all, what we do as environmental economists is make life more pleasant for everybody. We are at the service of people, that's what we do.

Out of 10 papers you start writing, how many do you never finish?

I think I've finished most of them. I can't recall a paper that I started and didn't finish. Maybe it took a long time, but I did finish. I think I owe it to myself or whoever else is involved in the effort.

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

What I try to do is to learn from them. Of course, one naturally is often offended because this is a human reaction. But after all is said and done, what's important is to learn and to absorb at least some advice, if we or others think that it is useful advice in terms of changing or correcting what was written, or done, or pronounced. So, it's an involved process. In the beginning there is a negative reaction but in the end, I think that most criticism, not all, is constructive in a way.

How do you choose the sessions that you attend at EAERE/WCERE conferences?

According to the topic. If I think I can learn from what people have to say. Based on my research and academic interests.

What is your first thought when you

register for the EAERE/WCERE conference and see the option to offset the emissions from your trip?

I think that it's a very thoughtful approach, but sometimes I feel that coming from my part of the world, which always involves more travel in terms of kilometers, I'm negatively selected because just to reach places in Europe or in the United States I must travel more than my colleagues. So, I'm asked to do more offsetting. In a way, I feel that I'm negatively discriminated because I must get to know what people have to say and what people are doing and researching in other parts of the world, because in the Arab countries there is very little environmental economic research. I must travel larger distances just to get to the source of information. I think perhaps this requirement should be weighted in some form as to not negatively discriminate people like myself just because we are in another part of the world.

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

In high school, what attracted me was economics. Although the economics that we studied in high school in my time was not economics as we know it today. If I go back now and think about it, it attracted me and I don't know why, but it had some fascination and I thought that's what I would do when I graduated, pursue economics. I attended an agricultural high school, but I didn't think about agricultural economics, I thought about economics straightforward. I got interested in environmental economics research only much later when I graduated as an economist. But maybe the seeds were sown in high school.

Which book are you reading at the moment?

What I'm trying to do now is read books that are not directly related to my professional interests, to environmental economics, but things that I missed

because I had to spend more time reading professional books during my career. Now I'm trying to read some things that are not necessarily in my line of professional work.

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

The straight answer would usually be some kind of prominent person. No. In my case it would just be anybody with whom I could carry out an interesting conversation and not necessarily a prominent person, because many times you are disappointed. You meet these people and then you have very little to talk about. What I'm interested in is somebody that has broad interests and to talk about things that interest us as human beings.

Juniors ask Seniors



Prof. dr. Aart de Zeeuw (1952) studied mathematics at the University of Groningen and received his PhD in economics at Tilburg University, both in the Netherlands. He has been professor of quantitative economics from 1989 until 1993, and since 1993 professor of environmental economics at Tilburg University. From 2006 until 2009 he has also been co-director of the Beijer Institute of Ecological Economics at the Royal Swedish Academy of Sciences in Sweden. Aart de Zeeuw has served as president of the European Association of Environmental and Resource Economists from 1998 until 2000, and as a co-editor of the Journal of Environmental Economics and Management from 2004 until 2008. At Tilburg University he held a number of other positions such as dean of the Faculty of Economics from 1992 till 1994, director of graduate studies from 1998 till 2001, scientific director of CentER from 2005 till 2007, and scientific director of the Tilburg Sustainability Center from 2009 till 2013. He has been a member of the Netherlands Advisory Council for Research on Nature and Environment (RMNO) and an advisor to the Netherlands Environmental Assessment Agency (PBL). Aart de Zeeuw published in a wide range of scientific economic journals. His current research interests focus on international environmental agreements and the economics of dynamical ecological systems.

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

You have to do two things. First, you have to become a good economist, which means that you have to keep track of developments in economics in general, and second you have to acquire sufficient knowledge of the environmental and resource topic that you are studying. You cannot go deep in both disciplines, but you need some understanding of natural science, which will actually help you to be novel and successful. Some form of cooperation with natural scientists is of course a good way to learn. On the other hand, you should not lose contact with the other economists. Environmental and resource economics as a field is growing and runs the risk of becoming like a warm bath. But you need to step out of the bath once in a while to see what other economists and natural scientists have to offer.

How do you get the ideas for your research questions?

You have to find out what really motivates you. For me this has been the integration of economics and the natural environment. Within this broader area you must find issues that are important but do not have an immediate answer, issues that are puzzling and challenging. More important than the questions themselves, however, are ideas on how to handle these questions. An idea can suddenly strike you, but mostly they come up in discussions with colleagues who have similar interests. It is therefore important to find these colleagues. It can happen anytime or anywhere. Once I was on a boat trip with a group of colleagues in Belize to watch manatees. As a colleague and I were talking, we got an idea, and the paper was finished in a few weeks and published in a few months. It doesn't always work so well. Sometimes it takes many years before you get an idea on how to move forward.

Out of 10 papers you start writing, how many do you never finish?

I am afraid it's 4 out of 10. At some point it becomes really frustrating to have a drawer full of unfinished projects. A few years before my retirement, I decided to select 10 projects from my drawer and I promised myself that I would finish them before I retired. I finished 6 and I continued to work after retirement. I am about to finish 2 more now, so it seems that I'm improving.

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

I think that a lot of what we do in environmental and resource economics is still just applied economics with an extra variable *E* for environmental quality. We should incorporate more knowledge from natural sciences into our economic analyses. Many natural scientists nowadays start to include human behavior and economics into their analyses, but their treatment of these issues is simplistic. We have much more to offer in this respect, but we won't be taken seriously if our treatment of the natural environment is simplistic. The future of our field, in my view, lies on the intersection between economics and the natural sciences. Otherwise, the choice of areas has its own momentum, driven by the societal debate and by new ideas within the scientific community. Dominance of theory triggers empirical testing, and dominance of empirics triggers the need for structural insights.

What has been the main motivation for your research throughout your career?

I started as an economic theorist and strategic behavior was almost absent in economic analysis. I joined the game theory revolution in economics, but I deviated by focusing on differential game theory in which the state of affairs changes over time. I have always found it strange that game theory is still mainly static or repeated, but not fully dynamical. Later I switched to environmental economics, simply because this is the main challenge that humanity is facing at this point in

time. Game theory remained important for me, for example in addressing the difficult problem of international cooperation on environmental policy. The meetings that were organized by the Beijer Institute in Stockholm with top economists and top ecologists have been another big source of inspiration. There I learned about tipping points in natural systems, which will become an important concept in my research agenda.

How do you choose the sessions that you attend at EAERE/WCERE conferences?

My algorithm is to go to every time slot, to choose one session per time slot, and be part of that session. In each time block, I compare the parallel sessions and I choose one on the basis of the topics and/or the presenters. Either I am familiar with the topic and the presenter and I want to learn what is new, or I want to get familiar with a topic or a presenter I do not know but raises my curiosity.

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

It depends. If the reviews are really bad, I just ignore them and move to another journal. I usually don't want to argue with the editor, because I understand his or her position. Once or twice, when the reviewer was clearly wrong or offending, I informed the editor, but left it like that. Critical reviews, however, can also be right. Reviewers often make good points. If the reviewers and the editor give you the opportunity to revise, it's a challenge to improve the paper. Some of my papers are much better when they are finally published at the end of this process than when they were submitted initially.

What was the funniest experience you have had when giving a lecture or a talk at a conference?

Well, it was actually not so funny for me. At the initial stage of my career, I was at a conference in London, and I was sitting at the table on a podium, waiting for my turn to present my paper. The screen was to my left, and I could not see the slides of the speaker. I moved my chair back to be able to turn a bit, and I fell backwards off the

podium, with my legs sticking up in the air. I don't know if many people remembered my paper, but they remembered me! After that everybody knew me.

What is your first thought when you register for the EAERE/WCERE conference and see the option to offset the emissions from your trip?

I always do it, simply because I always react positively to initiatives to improve the situation. On the other hand, I realize again that we are part of the problem. We travel and meet to discuss the problem that is to a large extent caused by all of the traveling. I could easily just accept reducing travel to get on a sustainable path, but it's hard to step out just by yourself.

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

I didn't have any idea of what I wanted to do. I wanted to continue studying, but I had no idea about which subject. Therefore, I started to study mathematics, because that seemed to be useful in any case. After some time studying abroad at Princeton in the USA, I decided to add economics, because I realized that this was the basis of human welfare. At the end of my studies in Groningen, a new professor arrived from

MIT. I still needed a few credits, so I took his course, and I completely changed. He was the first one to show me how much fun it is to teach and to do research. The rest is history.

Which book are you reading at the moment?

When I travel, I read. I am reading the latest book of Haruki Murakami, a Japanese novelist. A few years ago another Japanese writer won the Nobel Prize in literature, but my Japanese friends say that Murakami should have won the Prize. I don't know the other writer, but Murakami is excellent. For work, I mostly read papers.

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

Ken Arrow. I had the privilege of having dinner with him a few times when I was working in Stockholm. A discussion with him could help you more than anything else. He had the sharpest mind I have ever met. Moreover, he was a very nice person. He came to Stockholm every year up to a very old age, because he wanted to participate in the meetings of economists and ecologists at the Beijer Institute.



The European Association of Environmental and Resource Economists (EAERE) is an international scientific association which aims are:

- _to contribute to the development and application of environmental and resource economics as a science in Europe;
- _to encourage and improve communication between teachers, researchers and students in environmental and resource economics in different European countries;
- _to develop and encourage the cooperation between university level teaching institutions and research institutions in Europe.

Founded in 1990, EAERE has approximately 1200 members in over 60 countries from Europe and beyond, from academic institutions, the public sector, and the private industry. Interests span from traditional economics, agricultural economics, forestry, and natural resource economics.

Membership is open to individuals who by their profession, training and/or function are involved in environmental and resource economics as a science, and to institutions which operate in fields connected with the aims of the Association.

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