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OVERLAPPING ENVIRONMENTAL POLICIES

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Summary
About the authors

Prof. Paolo Falbo is associate professor at the Department of Economics and Management of the University of Brescia. His main research interests are related to the energy and the environment markets, risk management and to simulation methods, with a particular regard to Markov chain bootstrapping. He has been scientific responsible of national research projects. He serves regularly as peer reviewer for several major scientific journals. He has occasionally acted as scientific consultant for major companies in the energy, food, IT and manufacturing sectors. Paolo holds a PhD in Business, curriculum in Capital Markets and Corporate Finance, from the University of Bergamo.

D. Cristian Pelizzari is assistant professor at the Department of Economics and Management of the University of Brescia, Italy. His research is focused on environmental markets, risk management, and scenario generation. He has participated to national and local research projects on these topics. Cristian holds a Master of Arts in Mathematics with a Specialization in the Mathematics of Finance from Columbia University in the City of New York and a Ph. D. in Mathematics for the Analysis of the Financial Markets from University of Brescia.

Dr. Luca Taschini is a Research Fellow at the Grantham Research Institute on Climate Change and the Environment at LSE working mostly on the theory of market-based mechanisms, energy economics and technology change. His current research aims to understand both theoretically and practically the functioning and design of markets for permits, including questions of price containment mechanisms, participation restrictions, the linkage of markets and the investigation of policy controls able to promote technology deployment. Luca Taschini holds a Ph.D. in Economics from the University of Zurich and is a member of the CESifo Energy and Climate Economics Research Group in Munich and a visiting scholar at the Research Center for Sustainability Science at the Ritsumeikan University in Japan.

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For regulators concerned with achieving a low-carbon economy the merits of using a single or a mix of environmental policy instruments is important. On the one hand, if an efficient instrument to implement an environmental target exists, it makes little sense to introduce an additional one. In the words of Johnstone (2003) the use of a mix of policies in this case "will be at best redundant and at worst counterproductive." On the other, differentiated or multiple instruments can be justified where there is an inter-play of several policy objectives, such as those guided by social or technology-related criteria that may conflict with narrowly defined efficiency considerations (Tinbergen, 1952). Second-best regimes reflecting market power, transaction costs, uncertainty, etc. provide another general argument for differentiated regulation. In the recent past, overlapping, potentially less-efficient, regulations (e.g. renewable obligations, energy efficiency, etc) have been invoked in the face of new information and (political) impossibility to adjust existing policy.

In fact, numerous countries and regions that have embraced environmental targets seem to rely on several — rather than single — policy instruments, some of which cover the same emission sources. For example, in the European Union, CO2 emissions from the power sector are regulated (directly or indirectly) by the EU Emission Trading System, energy-efficiency standards, CO2 or energy taxes, energy-efficiency obligations, and by renewable energy power subsidies in the form of feed-in-tariffs or renewable energy portfolio obligations. The multiplicity of these policy instruments has been justified on several grounds, including market failures, regulatory failures and behavioural failures.

This research considers the problem of expanding electricity supply through only energy markets and questions whether these markets will be able to send clear signals for investments in new, flexible power plants. The study is premised on the fact that an expanded electricity supply is achieved through the remodelling of the existing energy system into one that is largely based on renewable energy sources. At the same time, given the intermittent generation of these sources, the research also assumes that, for the foreseeable future, flexible conventional generation capacities will still be required for safety and backup purposes.

We consider a representative energy producer and two alternative means of electricity generation: conventional (polluting) generation and non-conventional (carbon-free) generation. We test three possible policy scenarios: a carbon tax on conventional generation, a subsidy for non-conventional generation and a combination of the two. The optimal policy mix is found by maximising total welfare as measured by the sum of consumer and producer surpluses minus the environmental damage from the resulting level of conventional energy generation.

Reflecting merit order principles, electricity demand is satisfied using the production plants with the lowest marginal costs, i.e. non-conventional generation. When demand exceeds the non-conventional capacity, the entire non-conventional capacity is sold at (higher) conventional generation prices. Hence, we show that it is in the best interest of the electricity generator to bound the capacity of non-conventional generation to a level where the resulting electricity price equals the price that is set by the polluting and more expensive conventional plants most of the times.

References
