

Institution: City, University of London (City)		
Unit of Assessment: UoA16 Economics and Econometrics		
Title of case study: Informing energy market regulation and competition policy in Great Britain and Europe		
Period when the underpinning research was undertaken: 2006-present		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Albert Banal-Estanol	Professor	2005-present
Period when the claimed impact occurred: 2015-present.		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact (indicative maximum 100 words) <p>Changes in energy markets impact all energy consumers – large and small – and regulatory bodies are in place to protect their interests: ensuring fairness, efficiency, and security of supply. Professor Banal-Estanol's research on how wholesale electricity and gas markets function and the effects of the incorporation of new renewable technologies has: (i) influenced government regulatory and policy decisions in the UK and across Europe, and (ii) informed investment decisions on new technologies in the private sector in Spain. His expertise on competition policy and emissions-reducing technologies has also been applied in the landmark EU-wide truck-makers' cartel prosecution and cited in litigation.</p>		
2. Underpinning research (indicative maximum 500 words) <p>Energy is an "essential service" for homes and businesses across Europe. In Britain alone, households and businesses together spend around <u>£55 billion on energy each year</u>, according to Ofgem (The Office of Gas and Electricity Markets). Professor Banal-Estanol's research has developed techniques and concepts for understanding how energy markets operate and can be made more efficient. Using theoretical, numerical and empirical methods, his research examines four overlapping areas relating to market regulation and competition including the effects of introducing renewable energies.</p> <p>(i) Market power and efficiency in wholesale gas markets Over the last two decades, there have been structural and regulatory reforms to make the European natural gas industry competitive and to ensure a secure supply of natural gas. Wholesale markets for natural gas (the "gas hubs") emerged, connected by a pipeline network, such as the "Interconnector" pipeline linking Belgium and the UK. This line of research, initiated with Professor Banal-Estanol's PhD student at City, University of London, Olivier Massol, examined the performance of the gas hubs, the spatial arbitrage between hubs and the effects of mergers between hub participants [3.1, 3.2]. The research, which took place from 2016-19, used an innovative methodology, capable of breaking down the observed spatial price differences into factors such as transportation costs, transportation bottlenecks and the imperfect nature of the competitive behaviour of the arbitrageurs. It also confirmed that the remedies imposed by the European Commission may have done more than simply mitigate the potential anticompetitive effects of mergers – they may have effectively created competition.</p> <p>(ii) Agent-based simulations of price and efficiency in wholesale energy markets Traditional economic models, which to a large degree are based on highly stylised, analytically tractable models, are not always suitable for studying the problems in energy markets. This research, carried out from 2007-11 with Banal-Estanol's long-time co-author Augusto Ruperez Micola, developed and implemented agent-based simulation models to investigate and improve the efficiency of liberalised energy markets. They focused mainly on the horizontal</p>		

and vertical relationships between gas and electricity markets, diversification of electricity generation portfolios and the effects of the introduction of intermittent renewable technologies [3.3, 3.4]. Technological diversification, as well as the introduction of low-cost intermittent renewable technologies, were shown to yield lower wholesale electricity prices.

(iii) Technologies to reduce greenhouse gas (GHG) emissions from the power sector

Hydrocarbon fuels dominate the global primary energy mix and are major carbon dioxide (CO₂) emitters. This line of research (carried out from 2015-18) studied the benefits and costs of introducing technologies that reduce greenhouse gas (GHG) emissions into the electricity sector. Professor Banal-Estanol, together with Dr Massol and others, studied the price effects of introducing wind and solar generation. He studied the institutions and combination of policy efforts involved in extending electricity coverage – including the promotion of renewable energies that can reduce the costs of electrifying rural areas – as well as the remaining obstacles, at policy and institutional levels, to achieving full coverage [3.5]. These insights have informed expert contributions on sustainable cities, including the report “Shaping the Cities of Tomorrow: Renewable Energies and Sustainable Urban Ecosystems”, which was produced with support from the United Nations Economic Commission for Europe (UNECE). This showed that private firms and communities can collaborate with governments to develop small-scale, localised energy generation systems, both in rural and suburban areas: the adoption of renewable energies has emerged as a cost-effective solution around the world.

(iv) Competition policy implications of information sharing

Professor Banal-Estanol has also studied the causes and consequences of information sharing among competing firms (from 2006-07). Most of the literature has assumed that firms have perfect knowledge about market conditions. In practice, this is rarely the case. For instance, vehicle manufacturers do not have information about the costs (or the demand) for the introduction of emission technologies for trucks, and the passing on of these costs on the prices faced by their competitors. This line of research studies the effects of information sharing on prices and the corresponding consequences of mergers on social welfare [3.6]. Provided that the industry is not highly concentrated, information sharing via for instance mergers, even between competing firms, was found to reduce prices and boost social welfare.

3. References to the research (indicative maximum of six references)

- 3.1** Argentesi, E., Banal-Estanol, A., & Seldeslachts (2020). A Retrospective Evaluation of the GDF/Suez Merger: Effects on the Belgian Gas Hub. The Energy Journal. Volume 42. <https://doi.org/10.5547/01956574.42.6.earg>
- 3.2** Massol, O. & Banal-Estanol, A. (2018). Market Power and Spatial Arbitrage between Interconnected Gas Hubs. The Energy Journal, Volume 39, Special Issue 2, pp.117-138. <https://doi.org/10.5547/01956574.39.SI2.omas>
- 3.3** Banal-Estanol, A. & Ruperez Micola, A. (2011). Behavioural Simulations in Spot Electricity Markets. European Journal of Operational Research, Volume 214, Issue 1, pp.147-159. <https://doi.org/10.1016/j.ejor.2011.03.041>
- 3.4** Banal-Estanol, A., & Ruperez Micola, A. (2009). Composition of Electricity Generation Portfolios, Pivotal Dynamics, and Market Prices. Management Science, Volume 55, Issue 11, pp.1813-1831. <https://doi.org/10.1287/mnsc.1090.1067>
- 3.5** Banal-Estanol, A., Calzada, J. & Jordana, J. (2017). How to achieve full electrification: Lessons from Latin America. Energy Policy, Volume 108, pp.55-69. <http://dx.doi.org/10.1016/j.enpol.2017.05.036>
- 3.6** Banal-Estanol, A. (2007). Information-Sharing Implications of Horizontal Mergers. International Journal of Industrial Organization. Volume 25, Issue 1, pp.31-49. <https://doi.org/10.1016/j.ijindorg.2005.12.002>

Grants

Professor Albert Banal-Estanol (G-2006-60706). An analysis of how gas is regulated in Spain. European Climate Foundation. 01.07.20 to 30.09.20. €15,000.

4. Details of the impact (indicative maximum 750 words)

The contribution of Professor Banal-Estanol's research to the understanding of competition and regulation in the energy markets is demonstrated primarily through his advisory roles to business and government agencies. His expertise in modelling and understanding the market, established through his academic publications, and his own efforts at outreach – the World Bank and African Forum for Utility Regulators uses his work for teaching and he delivers executive training courses on competition and regulation – mean that he is in high demand among policy makers and in legal and regulatory fields.

(i) Influencing government regulatory and policy decisions

Changes to the UK energy market have implications for every consumer connected to the distribution network – whether they are a small domestic household or a vast industrial user. Independent regulatory bodies are in place to protect their interests. The Office of Gas and Electricity Markets (Ofgem) regulates the monopoly companies which run gas and electricity networks, with their stated aim “to protect consumers now and in the future by working to deliver a greener, fairer energy system”. The Competition and Markets Authority (CMA) works to promote competition for the benefit of consumers, both within and outside the UK.

Professor Banal-Estanol's research led directly to his appointments to the academic panels of the CMA in 2016 and Ofgem in 2017 [5.1]. Ofgem adopted the analysis framework he developed to evaluate the performance of the “gas hubs” [3.1, 3.2] – the wholesale market for natural gas. The Energy Act 2013 introduced a number of reforms to further ‘shake up’ the energy market, including new Capacity Market Auctions, set up to incentivise investment in sustainable, low-carbon electricity capacity at the least cost to energy consumers. The analysis of interaction between the wholesale market and the Capacity Market revealed that Early Auction reduced the spread between peak and base prices by £0.66/MWh [5.2]. The methodology from [3.1] was directly applied to this work; as Ofgem's Chief Economist confirms, “Banal-Estanol's contribution [was] of great value and was particularly important to our review of the impact of the Early Capacity Market Auction announcement on wholesale electricity prices and revenues” [5.1]. Additionally, Ofgem produce two annual reports to provide “current and clear analysis” on the impact of their policies: Consumer Impact and the State of the Energy Market. Professor Banal-Estanol was invited to provide advice on the analysis and draft of the State of the Energy Market Report 2017 [5.1] and he is personally thanked in State of the Energy Market Report 2017 – Technical Appendix (Footnote 1) for his contribution [5.2]. Subsequently, this document has been used on an international basis by The Australian Competition and Consumer Commission (ACCC). It is cited over thirty times in their report International Experiences in Retail Electricity Markets, which focuses on improving the effectiveness of retail electricity competition in Australia's National Electricity Market (NEM). The energy market reforms in Australia will come into play from 2025.

As a member of Ofgem's Academic Panel, he has also been involved in key decisions and was commissioned to write reports to adjust the new regulatory framework, RIIO (Revenue = Incentives + Innovation + Outputs), which was first introduced in 2013 and determines the allowed gas and electricity transmission and distribution charges across England, Scotland and Wales. He commented on a preliminary document entitled “Returns adjustment mechanisms in RIIO price control”, published as the “RIIO-2 Framework Consultation” [5.3] which subsequently involved key stakeholders across the whole of Great Britain. Under the RIIO price control framework, the eight-year price control settlement included a number of uncertainty mechanisms, one of which was the mid-period review (MPR) of outputs. Professor Banal-Estanol was invited to submit a literature survey on “Regulatory risk and the cost of capital”, focusing on matters which impact the security of electricity supply for consumers in England, Scotland and Wales, as well as the allowable revenue for the 14 Distribution Network Operators (DNOs) – totalling hundreds of millions of pounds. According to the former Chief Economist at Ofgem (2016-2020):

“This review enabled the Ofgem team to assess whether the potential benefits to consumers from reducing returns to companies was outweighed by a systematic uplift in the cost of capital for regulated companies. [It] found that the impact of these risks should

they materialise was sufficiently significant to outweigh any short-term consumer benefits. This literature survey went on to form part of an Ofgem Impact Assessment for Distribution Network Operators in 2018 [5.4], which was an important part of the evidence for Ofgem's decision not to extend the scope of the MPR". [5.1]

Furthermore, research output [3.2] was integral to the first analysis of the competition policy decisions undertaken by the European Commission's Directorate General in Competition (DG Comp), in which Professor Banal-Estanol acted as a technical expert. His co-authored report, "The economic impact of enforcement of competition policies on the functioning of EU energy markets" (2016), was cited as part of the Impact Assessment in a Commission Staff Working Document which proposed new "Regulations of the European Parliament and of the Council" for the electricity market [5.5a]. The Impact Assessment claims that one of the main problems is that "Retail markets for energy in most parts of the EU suffer from persistently low levels of competition, consumer choice and engagement" [5.5a, p.4]. It goes on to cite Banal-Estanol's report, saying that it "includes an assessment of the intensity of competition in the energy markets (both wholesale and retail) and points out that, between 2005 and 2012, the intensity of competition in European energy markets may have declined" [5.5a, p.32]. The resulting EU directive (2019/944) [5.5b] has now come into force, with the aim to ensure affordable wholesale and retail prices and a smooth transition towards a sustainable low-carbon energy system. It lays down key rules relating to the organisation and functioning of the EU electricity sector, in particular rules on third-party access to transmission and distribution infrastructure and unbundling requirements. The directive provides a framework for Member States to enact its requirements into national law.

(ii) Informing investment decisions in the private sector

Professor Banal-Estanol has used the knowledge acquired through his research [3.3] to [3.6] to inform decision-making as a member of Som Energia, a Spanish not-for-profit green energy consumer co-operative. He was invited to join the co-operative's Governing Council in January 2018 and became President in July 2020. Som Energia's main activities are the production and sale of renewable energy (i.e. sun, wind, biogas, biomass) and social innovation. They are committed to driving change in the current energy model to achieve a 100% renewable model and to reducing energy poverty. During 2019, Som Energia – which was established in 2010 – marketed 32% more electricity compared to 2018 and has achieved a co-operative membership of 70,000 people and 125,000 electricity contracts. They have been directly involved in a new, multi-million euro investment programme designed to expand the production of energy from wind and solar technology, whilst continuing to promote initiatives, such as electric vehicles, car sharing, and sustainable transport. Chief Executive Officer, Marc Rosello, reports that as a result of Professor Banal-Estanol's direct involvement since 2018, Som Energia has achieved:

- (i) "An improvement in the performance of the business through the introduction of improved processes and services, as shown in the 2019 business performance measures of turnover of 67 million euros, net profit of 1 million euros, 70 full-time employees.
- (ii) Better access to financial opportunities as shown by the 4.75 million euros raised (in a single day) in the form of voluntary contributions to share capital to reinforce cooperative activity and promote the construction of a new solar plant in Llanillos (Granada, Spain), which will have an estimated production of 7 GWh per year, equivalent to the energy needs of approximately 2800 households.
- (iii) Reduced carbon emissions through an annual production that has reached 18.5 GWh of renewable energy. Given that emissions avoided per GWh by using renewable technologies instead of coal equate to 2 million tonnes, this means that approximately 37 million tonnes of CO₂ emissions per year have been prevented.
- (iv) Social benefit to several local communities, evidenced by the "Germinador Social," an initiative that aims to stimulate the creation of innovative social models through a competition open to all" [5.6].

As a result of this work, in February 2020, he was invited by the European Climate Foundation, an international philanthropic funder, to produce an analysis of the role of natural gas in the

energy transition in Spain, focusing particularly on a policy analysis of the country's Liquefied Natural Gas (LNG) infrastructure compared to that of France and the UK [5.7a] and was awarded €15,000 grant funding to complete the study [5.7b]. He was also invited to join a panel of experts on the 'Foro de Alto Nivel Transición Energética Justa e Inclusiva' [Forum on Fair and Inclusive Energy Transition] which was set up by Teresa Ribera, Spanish Minister for Ecological Transition, launched in October 2020. Its purpose is to seek expert advice on the best use of Spain's resources, as part of the Government's Recovery, Transformation and Resilience Plan [5.8].

(iii) Application in an EU-wide manufacturing cartel prosecution

This third impact example brings together previous streams of work into a new type of impact on the law which is cited in court judgements. Because of his work on the consequences of information sharing between competing firms on prices [3.6] and his broader expertise in competition policy and on emission-reducing technologies, Professor Banal-Estanol was appointed an independent expert to estimate the cartel damages on vehicle prices [5.9].

Since January 2019, Banal-Estanol has been acting as an expert witness in litigation in Spain, following the EU Commission's landmark decision on the truck makers' cartel. This decision imposed the largest ever EU antitrust fine on a pan-European 15-year exchange of sensitive information, as well as delays to the introduction of new emission-reducing technologies for medium and heavy trucks. In practice, this meant that in July 2016, the EU Commission fined six manufacturers of medium and heavy-duty trucks (Man, Volvo/Renault, Daimler, Iveco, Daf) over €2.93 billion, with a subsequent fine of €880 million for Scania in September 2017. Following this decision, thousands of companies that had purchased, leased or rented trucks have filed actions against the manufacturers throughout Europe asking for compensation for damages. According to Dr Simone Kohnz, Director, E.CA Economics:

"Professor Banal-Estanol has co-authored a report for E.CA Economics estimating infringement damages in Spain, which has already been submitted in over 900 cases. He has so far appeared in more than 50 court proceedings all over Spain (e.g. Barcelona, Madrid, Valencia ... San Sebastian and Girona). His contribution has been of great value in these cases and has been particularly important for the assessment of damages by the Spanish courts" [5.10].

As this case will set a precedent throughout the EU, in addition to giving evidence in court, Professor Banal-Estanol's expertise is likely to be cited in other jurisdictions throughout Europe as this case is litigated in other national markets.

5. Sources to corroborate the impact (indicative maximum of 10 references)

- 5.1 Testimonial from Partner/Chief Economist, Ofgem – verifying membership of the Academic Panel and related contributions from 2017-present day. (07.01.21).
- 5.2 Ofgem's State of the Energy Market Report 2017 – Technical Appendix (Footnote 1).
- 5.3 RIIO-2 Framework Consultation, published by Ofgem in March 2018.
- 5.4 Impact Assessment Form, published by Ofgem in April 2018.
- 5.5 (a) Commission Staff Working Document: Impact Assessment SWD (2016) 410 final, European Commission, Brussels, 30 November 2016 (Footnote 23).
(b) EU directive (2019/944).
- 5.6 Testimonial from Chief Executive Officer, Som Energia – verifying contributions and achievements as President of Som Energia. (30.12.20).
- 5.7 (a) European Climate Foundation – Invitation to carry out an energy study (20.02.20)
(b) European Climate Foundation – Grant Agreement (09.10.20).
- 5.8 Formal membership list of 'Foro de Alto Nivel Transición Energética Justa e Inclusiva' [Forum on Fair & Inclusive Energy Transition] from Teresa Ribera – Spanish Minister for Ecological Transition.
- 5.9 EU-wide Manufacturing Cartel Prosecution – verifying as an Expert Witness:
(a) Court Judgements: San Sebastian – JM 1 – DAG (PO 370-2019) p.10
(b) Court Judgements: Girona – JM 1 – DAG (PO 500-2018) p.16.
- 5.10 Testimonial from Director, E.CA Economics – verifying contributions and achievements in the EU-wide Manufacturing Cartel Prosecution. (11.01.21).