

# ***ENVIRONMENTAL QUALITY COMPETITION: THE CASE OF THE FRENCH RETAIL ELECTRICITY MARKET***

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## **Overview**

Created following the liberalisation of the energy markets, the French retail electricity market has been fully operational since 2007. Although electricity cannot be physically differentiated on the grid, in the past few years, an increasing number of firms have entered this market offering green or renewable electricity, i.e. generated from renewable energy sources. They are competing with the incumbents' conventional electricity, which is produced from nuclear energy or fossil fuels. According to reports by the French Commission of Electricity Regulation (CRE), in 2007, only four firms offered green only electricity contracts for retail consumers, compared to 27 firms in 2020. Going green is perceived also as a strategy for retailers to increase their market shares (Levratto & Abbes, 2008). It seems to be the case of some well-known conventional electricity suppliers, which are now offering green electricity contracts alongside their conventional ones. In fact, at the end of 2020, almost a third of the retailers on the market were proposing both types of contracts. At the same time, 49 out of 75 electricity contracts available on the market were marketed as green. That is one of the reasons why the French Commission of Electricity Regulation stated that green electricity retailing is one of the main vectors for the increased competition on the retail market (CRE, 2020).

On the demand side, with growing environmental concern, several empirical studies have shown that consumers are willing to pay a premium for eco-friendly products such as those certified by an eco-label or such as green electricity (Oerlemans, Chang & Volschenk, 2016). Regarding the electricity industry, as Delmas et al. (2007) pointed out, the preference for this kind of products may have existed among some environmentally conscious consumers (regarding their electricity consumption) before market liberalisation. However, the industry specificities (historical price setting and organisation prior to liberalisation), prevented electricity producers from integrating this preference into their production programme as a strategic variable.

In this context, the aim of this paper is to examine whether the strategy of providing renewable electricity is profitable for firms, given that some consumers are environmentally conscious and given a higher marginal cost related to the supply of renewable energy. We also seek to show that different tariffs may be available on the market for such a homogeneous good as electricity is. To do so and for the specific case of electricity as a commodity, we consider renewable electricity as just another option available to consumers on the retail market. This means that not all consumers consider that green electricity is of higher quality than conventional electricity (as would be expected in a vertical product differentiation model). Therefore, some consumers prefer conventional to renewable electricity.

We assume that consumers who buy renewable electricity and are willing to pay more for it, rather than buying a higher quality product (environmentally speaking), they see themselves as contributing to a public good. Consequently, they enjoy a "warm-glow" (Andreoni, 1990) from their action. This applies particularly because the environmental quality that they are contributing to does not represent entirely a private benefit for them (unlike buying organic products). Moreover, as some empirical studies have shown, price alone may not suffice to induce consumers to switch electricity retailers (sticky consumers). However, some of them do switch when they see a significant differentiation, which would be the case for those environmentally conscious consumers who buy renewable electricity.

On this basis, we develop a product differentiation model, introducing consumer environmental consciousness explicitly into it. We analyse welfare outcomes and then discuss a little extension of the model in the presence of a decreasing cost gap between renewable and conventional energy supply.

## **Methods**

The analysis is carried out as a two-stage game where firms choose first the environmental quality provision (whether to sell renewable or conventional electricity) and then compete in prices. To simplify the analysis and taking renewable electricity as just another option for consumers on the market, we consider a duopoly model of horizontal product differentiation following the Hotelling (1929) tradition.

The model is developed using three scenarios: a conventional energy only supply, a renewable energy only supply and the energy mix supply. The analysis is followed by the study of social welfare. Finally, a possible extension of the model is discussed. This extension seeks to analyse whether keeping the extra cost of renewable energy supply to a minimum could lead to an equilibrium scenario with a renewable energy only supply and could explain in turn a retail electricity market that seems to become greener nowadays.

## Results

By taking consumer environmental consciousness into account, we found a unique Nash equilibrium in the case of maximum differentiation between firms. Regarding social welfare, the analysis includes the impact of externalities resulting from the electricity provision outcome. We found that as long as the extra cost of supplying renewable electricity remains positive, but lower than consumer environmental consciousness, the Nash equilibrium also holds for social optimum. Otherwise, when the extra cost is near zero, a renewable energy only supply would be socially optimal.

Regarding the model extension discussion, we showed that even if this extra cost is removed from the firms' maximisation programme, a renewable energy only supply cannot be guaranteed at equilibrium because one of the firms is indifferent to the type of energy to be supplied. Nonetheless, as two Nash equilibria result from this case (including the renewable energy only scenario), the cost decrease may be an incentive for some firms to enter the market as green retailers, even if other green retailers are already present.

## Conclusions

In this paper, we have shown that, when at least one firm supplies renewable energy, both firms benefit from consumer environmental consciousness in the form of higher prices and consequently higher profits, compared to the conventional energy only scenario. Furthermore, by taking the environmental externalities into account, we found that when the additional cost of supplying renewable energy is positive, but lower than consumer environmental consciousness, the maximum differentiation equilibrium scenario also corresponds to the social optimum. However, if the additional cost is sufficiently small, a renewable energy only supply would be socially optimal because it generates a larger positive environmental externality. Nonetheless, to tackle this cost may not suffice to guarantee the renewable energy supply as the equilibrium scenario.

Further research should explore whether a growing share of environmentally conscious consumers can explain why some conventional retailers are going green and have started offering green contracts alongside their conventional ones (becoming hybrid retailers), while renewable energy retailers remain on the greener edge of the scale. This may shed light on the conditions required to achieve a renewable energy only supply as the unique equilibrium scenario.

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