Rewarding or regulatory policies for energy savings? Perceived and modelled effectiveness in the case of an innovative instrument for the household sector.

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Résumé

The unsustainable trend of household energy consumption in the European Union seems hard to bend, and this despite the fact that many policy measures have already been deployed in this sector since the 1970s (Boardman, 2004; EEA, 2012; Geller et al., 2006). Those measures include economic incentives (e.g. subsidies for building insulation) and economic disincentives (e.g. energy and fuel taxes), informational efforts (e.g. energy labels), R&D programs, as well as setting energy efficiency standards for some types of household appliances (e.g. dishwashers, washing machines) or setting ambitious targets for new buildings and major renovations with near zero-energy standards to be applied by 2020.
Public authorities can thus choose from a variety of instruments and combine them to develop their policy mixes. Those policy instruments can be classified according to different criteria. In their compendium of selected instruments for sustainable consumption and production policies, GTZ (2006) define five different clusters of instruments: economic, regulatory, education and research, cooperation, and information. Similar classifications can also be found, with some slight variations, in EU official reports (e.g. EEA, 2012). However, there is another angle to look at those instruments that, in our view, distinguishes them on a more fundamental basis. Indeed, there is a fundamental difference between, on the one hand, instruments that rely on incentives to encourage energy savings and, on the other hand, instruments that use disincentives to discourage energy consumption.

The choice between using incentives to reward pro-environmental behaviours or disincentives in an attempt to externally regulate behaviours has received much attention of practitioners and researchers in the field (Attari et al., 2009; Boardman, 2004; Geller et al., 2006; GTZ, 2006; Steg et al., 2006). Although this distinction between using incentives (what we have called "rewarding" approaches) or disincentives (what we have called "regulatory" approaches) does not apply to all the policy instruments (e.g. education, information), it is nevertheless a crucial feature that will orientate the policies on very different paths. This tension between opting for voluntary or regulatory measures to increase energy efficiency

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can be witnessed, for instance, at the industry level. Indeed, despite the fact that minimum standards are considered to be a more effective policy, there seems to be a trend at the EU level to promote voluntary agreements with the industry rather than stringent regulatory standards (Boardman, 2004; Geller et al., 2006).

In the household sector, the policy mixes deployed in the EU to reduce energy consumption usually involve both types of measures: "rewarding" measures that promote energy savings (e.g. subsidies for building insulation) and "regulatory" measures that discourage the use of energy (e.g. fuel taxes, stringent standards for new buildings and renovation). As a result, the energy efficiency of dwellings and of some types of appliances has improved in the EU, but this has not led to the expected decrease in energy consumption. On the contrary, figures show a stabilisation for heating energy consumption and an increase in electricity consumption (EEA, 2012). This raises questions regarding the effectiveness of the underlying models of such policies. As an answer to it, innovative and sometimes more radical policy options are proposed.

Personal Carbon Trading (PCT) schemes are figureheads of those innovative and more radical policy options that put on the table the issue of using more of what we have termed "regulatory" approaches for the household sector. The two best-known proposals of PCT schemes (i.e. Tradable Energy Quotas and Personal Carbon Allowances) were developed in the United Kingdom where they gained political interest (Fleming, 1997; 2005; Fleming and Chamberlin, 2011; Hillman and Fawcett, 2004; Starkey and Anderson, 2005). As described in Fawcett (2010, p. 6868) both systems share the following features: "rights for carbon emissions are allocated to individuals for free; emissions from household energy use and/or personal (i.e. non-business) transport are covered; emissions rights are tradable; and emissions allocations reduce year-on-year in line with a declining national carbon cap". With their rights for carbon emissions per head and their market mechanisms to buy and sell emissions rights, PCT shares many similarities with the EU Emission Trading Scheme (EU-ETS) that is used for the industry. PCT, which is still a hypothetical instrument, can thus be considered as a proposition to extend and adapt EUETS from industry to individuals (Andersson, L'ofgren and Widerberg, 2011). The interest for PCT came not only from the political world but also from the academic world. Researches on this innovative instrument have covered various topics, of which the most interesting for this paper are the potential benefits of the PCT schemes (Capstick and Lewis, 2010; Wallace et al., 2010; Parag et al., 2011), as well as their fairness, costs and social acceptability (Elkins and Dresner, 2004, Fawcett, 2010; Lane et al., 2008; Starkey, 2008).

As regards innovation in "rewarding" policy measures, the emerging trend of using complementary currencies as policy instruments for sustainability is an avenue worth exploring. The concept of complementary currencies is grounded in the use of another standardised unit than official currency to mediate exchanges (e.g. points on a loyalty card, time unit in Local Exchange and Trading Systems). It is designed to "complement" official currencies by serving specific objectives (Lietaer et al., 2010; Seyfang and Longhurst, 2013). Local Exchange and Trading Systems (LETS) are probably one of the best-known forms of complementary currencies. However, there is a variety of other complementary currency systems in Europe (e.g. local currencies, Time Banking). In this paper, we focus on an emerging type of complementary currencies where public authorities play a major role and where the complementary currency is used as a policy instrument to promote pro-environmental behaviours (Blanc, 2011; Joachain and Klopfert, 2012). Indeed, a few pilot projects have been developed by public authorities in Belgium to reward specific sustainable behaviours with complementary currencies. E-portemonnee (in Limburg) and Eco-Iris (in Brussels) are leading experiments of this innovative type of "rewarding" instrument. Both projects are using complementary currencies as innovative policy instruments to "reward" pro-environmental behaviours without using official currencies. The principle is quite simple and based on a system using two lists: a first list with all the sustainable actions that are rewarded (e.g. switching to green electricity, following composting courses, placing a 'no junk mail' sign on the mail box) and a second list with all the possibilities to spend the complementary currencies obtained (e.g. tickets for public transportation, energy saving lamp bulbs, and, in some

systems, participating shops). Participants obtain complementary currency units (e.g. E-portemonnee points, Eco-Iris notes) by performing actions from the first list and consult the second list to choose how they will use the complementary currency units they have obtained.

Those pilot projects have broad sustainability aims (e.g. waste reduction, use of public transportation, reduction of CO2 emissions, promotion of local food shops, etc.) and it is challenging to find ways to use them with the specific aim of bending the unsustainable trend of household energy consumption. Indeed, a major issue to develop a system based on complementary currencies is the definition of a standardised unit that can be reliably measured. The "Innovative Instruments for Energy Saving Policies[1]" (INESPO) research project provides an answer to this issue. Indeed, grounded in the context of massive smart meter deployment that is planned in the EU, the INESPO project explores the possibility to couple complementary currencies to smart meters in order to add motivation for energy savings in the household sector (Joachain et al., 2012; Joachain and Klopfert 2012; 2014). In this coupling, smart meters provide the data on household energy consumption and complementary currencies provide an innovative incentive to save energy. The standardised unit is the kilowatt-hour primary energy (kWhpe) that allows different types of energy to be taken into consideration as smart meters for other energy sources than electricity are developed (transport is, however, not included in the system designs of the INESPO project).

When designing different systems coupling complementary currencies to smart meters, the choice between a "rewarding" and a "regulatory" system came up as a critical parameter. Indeed, even if the idea of coupling complementary currencies and smart meters was initially grounded in the emerging trend of using complementary currencies to "reward" pro-environmental behaviours, it rapidly became evident that a "regulatory" system could also be designed. In this respect, PCT that we have introduced here above provide inspiring examples of "regulatory" systems using a standardised unit based on CO2 emissions. Besides, pioneers in the field of complementary currencies also start to propose "regulatory" systems in the framework of pro-environmental policies (e.g. Lietaer et al., 2012).

Both types of systems, rewarding and regulatory, were thus developed in the INESPO project. In the rewarding system, households participate on a voluntary basis. Complementary currencies are used by public authorities as an incentive for households to save energy. In the regulatory system, all households have to participate and target of energy consumption are set for them, taking some of the profile of households into account (e.g. number of persons living in the household, principal / secondary residence, etc.). Each household receives for free the complementary currency units corresponding to its target. In case a household consumes more energy than its target, it has to buy extra complementary currency units. Conversely, if a household consumes less energy than its target, it can sell its surplus of complementary currency units. However, rather than allowing market mechanisms to play, as in PCT, complementary currencies have to be bought or sold directly to public authorities. In both cases, the buying or selling rate is determined by public authorities.

The choice between using rewarding or regulatory policy instruments is thus not only critical for existing policy instruments but also for designing innovative instruments for the future. It is also a difficult choice for policy-makers, as, not surprisingly, studies in the field of energy and transport confirm that people prefer rewards to penalties and find voluntary actions more acceptable than hard regulations (Schade, 2003; Steg et al., 2006; Attari et al., 2009). Social acceptability is thus a key issue that is likely to be even more sensitive in the case of innovative regulatory instruments. This has already proven to be the case for proposals of PCT systems in the United Kingdom that were considered as 'ahead of their time' by the Department for Environment, Food and Rural Affairs (Defra, 2008). Indeed, one of the key issues raised by Defra regarding PCT was the social acceptability of this innovative instrument, another major issue being its cost (Fawcett, 2010). Innovative rewarding complementary currency schemes are not protected from criticisms either. In their case, it is rather the low participation rates for the costs incurred that are pointed out (Kalinovski, 2014).

But what exactly makes a policy instrument more or less acceptable? Individual factors, such as awareness of the problem or feeling responsible for it, can influence social acceptability positively (Steg et al., 2006). Conversely, the loss of personal freedom (including the freedom of choice) is a major reason to reject regulatory measures, as well as other factors such as resistance to change or loss aversion (Attari et al., 2009). What also matters is the perception of the effectiveness of the policy measure. The more a policy measure is thought to be effective in protecting the environment, the more public support it should receive (e.g. Steg et al., 2006, Schlag and Teubel, 1997). However, there might also be some truth in the reverse: because a policy is acceptable to people, they might be willing to think it effective as well. As can be seen, the link between perceived effectiveness and acceptability of a policy measure is not unequivocal.

Studies have investigated the influence of individual factors on perceived effectiveness and acceptability of a policy measure. However, much less is known about the influence of key parameters of policy measures on their perceived effectiveness and acceptability. Most importantly, we argue that the choice between a 'rewarding' and a 'regulatory' type of measure is a such key parameter that influences perceived effectiveness and acceptability. Amongst the few existing studies devoted to this topic, the one performed by Linda Steg and her colleagues in 2006 is probably the closest to our object of investigation. They investigate the influence of four parameters of pricing policies aimed at reducing CO2 emissions (incentives vs. disincentives, technology vs. behavioural changes, direct vs. indirect energy use, and financing/allocation of revenues inside the policy domain vs. general public funds) on the perceived effectiveness and acceptability of the policy measures. Their results suggest that "the acceptability and perceived effectiveness judgements may be correlated" (Steg et al., 2006, p. 105). Besides they explained that "(w)hether incentives or disincentives are used is one of the most important policy features that influences perceived effectiveness and acceptability of energy policies." (Steg et al., 2006, p. 106). This confirms the critical role of choosing between a 'rewarding' and a 'regulatory' type of measure in designing policies in the field of energy. As expected, their study also confirms that people prefer 'rewarding' measures to 'regulatory' ones. However, regarding perceived effectiveness, their results are more surprising: 'rewarding' measures using incentives are perceived as more effective than 'regulatory' measures using penalties. As this perception does seems to contradict the actual effectiveness of the policy measures investigated, the researchers conclude to the need for further research "to examine the relationships between acceptability, perceived effectiveness, and actual effectiveness of pricing policies aimed at reducing energy consumption." (Steg et al., 2006, p. 106).

The aim of this paper is precisely to investigate the relationships between acceptability, perceived and expected effectiveness for the 'rewarding' and the 'regulatory' instruments developed in the framework of the INESPO project. Those two systems seemed perfect to investigate further the influence of the key 'rewarding' vs 'regulatory' parameter on the perceived effectiveness and acceptability of policy measures. Indeed, both interventions are hypothetical at this stage and based on the coupling of complementary currencies and smart metering. It is mainly the 'rewarding' vs 'regulatory' parameter that profoundly differentiates them. In order to explore the question of a possible discrepancy between perceived and actual effectiveness, we developed a mathematical modelling of both systems that provides an order of magnitude for their expected effectiveness. This provides the setting for a comparison between perceived and expected effectiveness for the rewarding vs. regulatory instruments.

A mix of methods was used to explore the relationships between acceptability, perceived and expected effectiveness for the 'rewarding' and the 'regulatory' instruments developed in the framework of the INESPO project. Focus groups and an online survey were used to assess perceived effectiveness. A mathematical modelling was developed to provide a first order of magnitude for expected effectiveness.

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