

POST-MATERIALIST VALUES AND THE ADOPTION OF ENVIRONMENTAL INNOVATION: THE CASE OF ELECTRIC VEHICLE

*Stéphane CALLENS*¹

*Sofiane CHERFI*²

*Charlène BOYOM*³

ABSTRACT

This research highlights the relationship between post materialist / materialist values and adoption / rejection by the consumer of an environmental innovation. The comparative study is based on data from the World Value Survey (2010-2014), made by a sample of 54 countries, representing the world's population. The adoption of electric vehicles as innovation differs across countries and post-materialist values. These differences give rise to new pro-environmental recommendations.

KEYWORDS: *electric vehicle, environmental values, innovation, sustainable consumption*

JEL CLASSIFICATION : L9

INTRODUCTION

The issue of innovation is part of a large multidisciplinary field. An innovation process always makes economic sense. However, its development cannot be considered without analyzing actors who carry this process (Alter, 2013). Thus, ownership is the pivotal step of the innovation process. The diffusion of innovation is an important area of focus for economists who are concerned about the technical progress (Flichy, 2003). Understand the process of diffusion of an innovation is a central concern in international marketing. It is essential to know how new products are spreading throughout the world and how the consumer reacts to these innovations as cultural references. Therefore, the adoption / rejection of an innovation is an important variable in research on dissemination. According to the diffusion theories, innovations are not adopted in the same manner and to the same extent (Rogers, 1983, 1995). The cultural context can play a role in the acceptance and diffusion of an innovation (Singh, 2006). The same innovation may be desirable for an individual and not be so for another whose situation differs from that of the first (Rogers, 1995).

The diffusion models has so far to answer many questions, including: behavioral differences between early and late users in innovation, the perceived influence of an innovation on the level of adoption attributes explanatory causes starting the diffusion curve "S" when interpersonal networks are activated (Hardgrave, Davis and Riemenscheider, 2003; Rogers, 1995; Cooper, Zmud, 1990; Nilakanta, Scamell 1990; Gatignon and Robertson, 1989). This theory has also given rise to numerous empirical contributions to the acceptance of new technologies such as computer programs (Venkatesh, Morris, Davis and Davis, 2003), records systems via the Internet (Argawad, Prasad, 1999) Windows operating systems (Karahanna, Straub and Chervany, 1999), computers (Davis, Bagozzi and Warshaw, 1989).

The fifth report of the Intergovernmental Panel on Climate Change (IPCC) recommends in transport improvements in energy efficiency to reduce emissions of greenhouse gases (IPCC, 2014). Sustainable consumption is becoming a major challenge for today's economies, advocating

¹ Stéphane CALLENS, LEM UMR 8179 CNRS, s.callens@sfr.fr

² Sofiane CHERFI, LEM UMR, 8179 CNRS, cherfi.sofiane@voila.fr

³ Charlène BOYOM, LEM UMR 8179 CNRS

increasingly green innovations or "eco-friendly" in the hope of reducing their dependency on fossil natural resources (EIO, 2011; Seyfang, 2007). The number of consumers environmentally responsible in their personal habits and lifestyle is growing in the USA and Western Europe (Stone et al., 1995). It was established that attitudes and environmental standards have an effect on product selection, information retrieval, recycling and many other behavioral intentions (Minton, Rose, 1997). According to the theory of Inglehart (1983, 1995), when a nation reaches a relatively high level of economic well-being, its people are more concerned about quality of life and environmental issues. Therefore, the pro-environmental values are specific to individuals who share the post-materialist values.

The relationship between Inglehart's post-materialist values, the wealth of nations and environmental intent was demonstrated by research (Mostafa, 2007, 2013; Kilbourne and Pickett, 2008; Dunlap et al 2000. Kim 1999; Norris, 1997). But there is almost no work on the relationship between post-materialist values of an individual or a nation, and the adoption of environmental innovation. Our research aims to fill this gap by assessing the relationship between environmental values and the adoption of environmental innovation.

This article helps to clarify the direction and future development of an industry of ecological transition (Rifkin, 2012). Moreover, it completes literature in consumer behavior environmentally responsible. A review of the literature and research hypotheses will be presented in the first place. Next, we discuss the methodology and results. Finally, the implications of the research, the limitations of the study and recommendations for future research will be explored.

1. LITERATURE REVIEW AND RESEARCH HYPOTHESES

1.1. THE DIFFUSION OF ENVIRONMENTAL INNOVATION

The diffusion research is an interdisciplinary field. It has interested researchers in various fields including economics and marketing. In economics, various econometric models have been developed to explain the diffusion of new products based on the costs and previous consumer behavior. In marketing, studies have increasingly turned to consumer behavior towards innovation, while sociologists are more interested in the factors influencing the diffusion of an innovation.

Rogers (1995) postulates the diffusion as a process by which an innovation is communicated through certain channels over time among members of a social system. Research on innovation is to identify general, the speed and direction of the adoption of an innovation. The model of innovation adoption will therefore depend on the interaction of several variables or dimensions: those relating to the Offer (characteristics of innovation); demand (profile potential adopters); nations (culture / values, religion, opinion leaders, etc ...), (Karakaya, Hidalgo and Nuur, 2014 Rogers, 1995). The adoption of a model proposed by Rogers (1983, 1995) innovation is the subject of some criticism, is accused in particular its lack of specificity (Chau, Tam, 1997); the theory of diffusion of innovation was developed at the base to apply to all kinds of innovations, or some innovations such as information technology can have special characteristics. It is in this momentum Argawal and Prasad (1997) will propose a model that explains 48% of the variance in the use of technology. Therefore, the attributes of the technology which would influence its use are most visible, the test facility and compatibility values. It has also been shown that the attributes of an innovation affect its rate of adoption. When an innovation is compatible with the values and beliefs of an individual, it will tend to pass it quickly (Agarwal, Prasad, 1999).

An environmental innovation refers to a wide range of innovations such as renewable energy, organic agriculture, waste management, prevention of pollution. Its definition is discussed in research (Arundel and Kemp, 2009; Andersen, 2008; Kemp and Pearson, 2007; Fusser and James, 1996). Fusser and James (1996) define it as a new product or process that delivers value to consumers and businesses while reducing its environmental impact. It can also be seen as the production, adoption and use of a product, production, process, service, method of management, a business model that is new to an organization that results in a significant reduction of environmental

risk, pollution and other negative consequences associated with the use of energy resources like compared to other techniques used during its life cycle (Kemp Pearson, 2007).

The term "eco-innovation" or eco-innovation is also used as a synonym for green innovation, sustainable innovation, environmental innovation and various technologies, managerial practices and services to reduce the negative impact on the environment (Karakaya, Hidalgo and Nuur, 2014). In a dynamic industry perspective, green innovation can be motivated by environmental or economic reasons, including goals to reduce the costs of managing waste and selling environmentally friendly products (Arundel, Kemp, 2009). The OECD will provide an ecological innovation is none other than the creation, implementation of a product, process, marketing methods, organizational structures, new institutional arrangements or significantly improved, which lead to improve the environment in comparison to other relevant alternatives.

1.2. PRELIMINARY STUDIES ON THE DETERMINANTS OF THE ACQUISITION OF ELECTRIC OR HYBRID VEHICLES

Willingness to pay increases with pro-environmental wealth of the individual (Franzen, Vogl, 2013). The lifestyle is more favorable to the acquisition of an electric or hybrid vehicle is one marked by a pro-active environmental commitment, less favorable, those of indifference to environmental issues - including among fans of new technologies which are often the early adopters of innovations (Axsen, Tyree-Hageman, Lentz, 2012). Few public policies erase the extra cost of acquiring an electric vehicle, reinforcing the call for militant look this good. The price of the vehicle and the gap between the price of electricity and diesel remain major determinants of long-term evolution of the electric vehicle. A diagnosis of behavioral economics for all markets can supplement the list of determinants of acquisition of electric vehicles (Callens, Shang Zhao, 2013). For frontier markets, through taking the most perceptive is the intertemporal myopia. In frontier and emerging markets, there is a lack of supply of low-cost consumer credit. A procurement strategy planned bypasses this difficulty for consumers in emerging countries. For BEV vehicles, a fear of running out of gas is found at a similar level in emerging markets and renewal. For replacement markets, technological conservatism is through the most addictive. Having a current technology use a structure induces preferences. Acquirers BEV vehicles have often already a hybrid vehicle, and thus confirm conservatism die after surgery with the hybrid vehicle change.

1.3. INGLEHART'S POST-MATERIALIST VALUES

The post-materialist theory was originally developed by Inglehart (1971.1977). This is the most influential theory in explaining the change in values (Dalton, 2008). According to this theory individuals and nations differ in their aversion to materialism. Two large blocks emerge : Materialists who believe that the company should focus on having a healthy economy and the post-materialists, who believe that ideas are worth more than money. These values differ from one nation to another and change over time (Inglehart, 1983). However, post-materialist values may be associated with level of economic development of a country, in the sense that when it reaches a sufficient level of development, its people will be more concerned with issues of social welfare and the environment (Inglehart, Abramson, 1995, 1999). Thus, developed countries will be more post-materialist compared to those in developing nations. This thesis does not raise everyone's approval, some believe that the citizens of industrialized nations or developing all show pro-environmental intentions (Roberts, 1996). Inglehart will later introduce the concept of "environmental problem objective" and "subjective environmental values" as a justification. In particular, it concludes that the pro-environmental intentions that display individuals in developing countries are related to the first serious environmental problems they encountered. While in developed countries, these intentions are related to subjective values they maintain to the environment. Works demonstrate the relationship between Inglehart post-materialist values and pro-environmental intentions between different nations and within a nation (Kilbourne and Pickett, 2008; Mostafa, 2007; Goksen et al,

2002. Olli et al, 2001. Dunlap *et al.* 2000, Kim, 1999; Diekmann and Franzen, 1999). For example, a positive correlation was found between post-materialist values and intentions to adopt pro-environmental behaviors (Inglehart, 1995). The more a country or individual would be post-materialist, the greater would be his intention to adopt pro-environmental behaviors. This relationship is, however, disputed based on the universality of pro-environmental values in the world (Mostafa, 2013). All this discussion leads to the following assumptions, discuss in the case of electric vehicles:

H1: The wealth of a nation (GDP / capita), positively influences the adoption of environmental innovation.

H2: A country's post-materialist values positively influence the adoption of environmental innovation.

H3: Environmental problems objectives positively influence the adoption of environmental innovation.

2. METHODOLOGY AND RESULTS

2.1. DATA

The study is based on data from the World Values Survey; the last wave (2010-2014 data) has been made available to researchers in May 2014, as well as comprehensive data marketing electric vehicles worldwide. The World Value Survey 2010-2014 wave is composed of a sample of 74,000 people from 54 countries, representing the world's population. These 54 countries account for only two-thirds of emissions of greenhouse gas emissions from transport. The sales data of electric vehicles cover the period 2010-2013. They come from professional associations of car and only allow for comparisons between countries on environmental values and materialistic and post-materialistic attitudes. Available data comparisons on buying motives and the level of adoption of electric vehicles by consumers in the three types of market, renewal, emerging or pioneer are missing. Data on small slow-moving vehicles (electric rickshaw, electric cart, two or three wheels...) are not taken into account. Here are regarded as vehicles, and special utility that can access the entire road network.

Table 1. Typical Properties of electric vehicles sold in France in 2014

industry	global industry park 1.1.2014	Type ⁴	average battery capacity (kWh)	Average Vehicle Length (m)	Average price € in France	Issue average Reservoir Road / gram CO ²	average battery life (km)
HEV	5.595.000	HEV	1,1	4,5	37.055	106	836
PEV	405.000	PHEV	8,3	4,5	60.945	43	563
		BEV	24,2	3,9	72.484	0	101
		EREV	22	4	39.800	13	380
FCEV	172	FCEV	24	4,4	35.000*	0	594

Source: Average prices announced by manufacturers; source: UTAC, 2014.

⁴ BEV : *Battery Electric Vehicle* (véhicule électrique à batterie); EREV: *Extended Range Electric Vehicle* (voiture électrique à autonomie prolongée); HEV: *Hybrid Electric Vehicle* (voiture électrique hybride); FCEV: *Fuel Cell Electric Vehicle* (voiture à pile à combustible); PHEV: *Plug in Hybrid Electric Vehicle* (voiture électrique hybride rechargeable).

Three sectors have been borrowed for the development of electric vehicles. BEV industry is that of "all electric" vehicles has a significant capacity to store electrical energy and simplify their components around an all-electric scheme. The FCEV pathway is that of a vehicle with a fuel cell requiring a supply of hydrogen. Dies HEV, PHEV, EREV are hybrid courses, with a twin engine, conventional and electric. Storage of electrical energy is experiencing a growth in the lowest (HEV) to the highest (EREV), the extension of the electric vehicle autonomy. Hydrogen vehicles require large investments for the network of charging points in fuel. The investment in the charging network for PEV vehicles is more modest. HEV vehicles use existing networks.

However, the principle of recovery of energy, loss specific to hybrid vehicles, can be applied to any type of vehicle in any type of environment. Conversely, for a full eco-efficiency, the PEV and FCEV vehicles need to produce for charging stations energy to low carbon.

2.2. RESULTS

In 31.12.2013, the VEGF pathway is the least developed. One manufacturer began broadcasting a pre-production model, several competing models announced for the years 2015-2016. Dies EPI (the set of vehicles that may be connected to the mains: BEV, PHEV and EREV) experienced strong recent growth. Hybrid courses have been introduced there fifteen years and make up the bulk of the six million electric traction vehicles in circulation worldwide. 31.12.2013, there are 100 times more charging stations for electric (PEV) for vehicles to fuel cell (FCEV), while there was 15 times more hybrids sold as vehicles "all-electric" BEV.

Table 2. Result

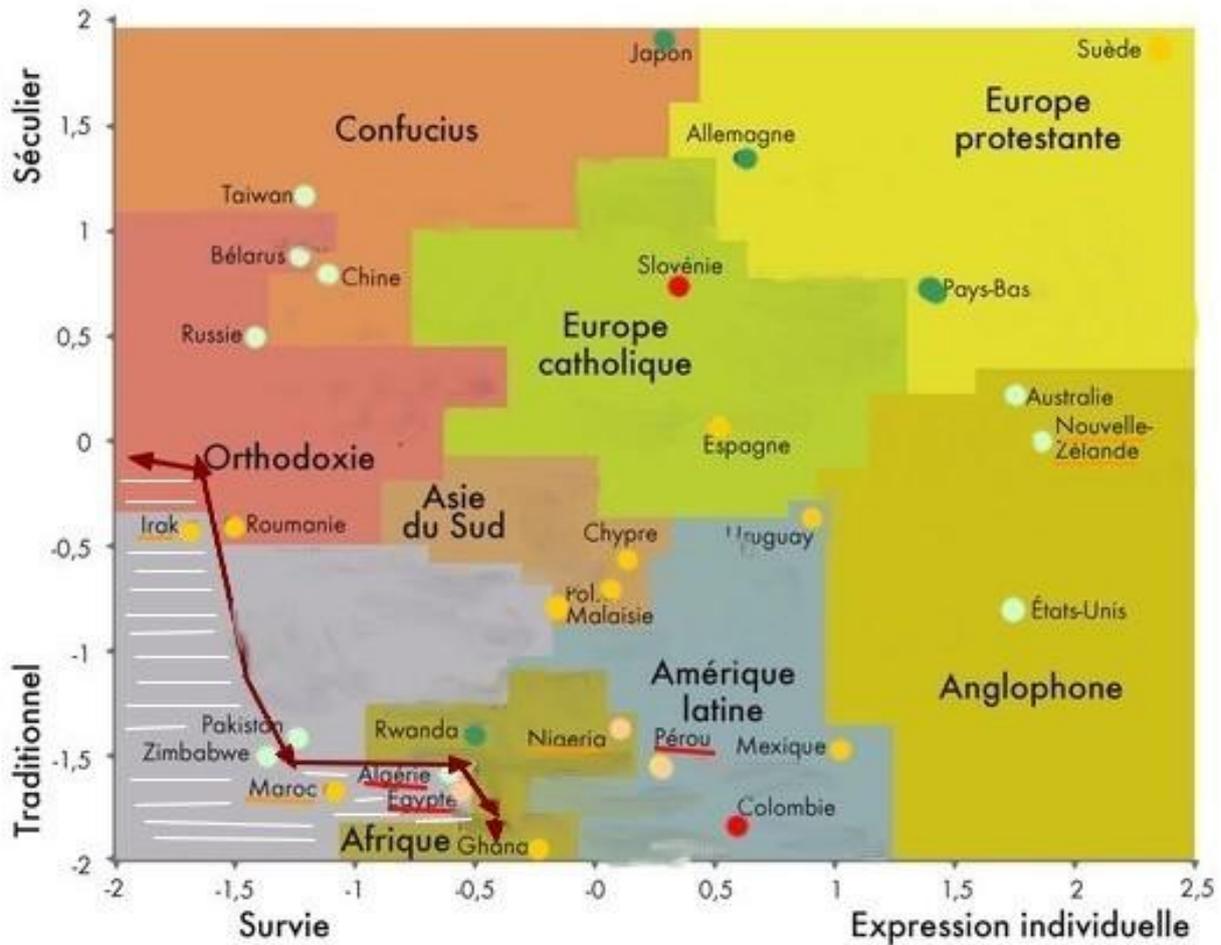
Sales EV 2013	HEV	PEV	FCEV
Pioneer market	0%	0%	0%
Emerging Markets	21%	10%	0%
Renewal	79%	90%	100%
Annex B countries / Total	39%	20%	70%

Source: Sales 2013 depending on the market

Electric vehicles diffuse from replacement markets. Sales of the oldest sector (HEV) in emerging markets accounted for 21% of sales in the sector in the world, the most recent (FCEV), 0%.

In 31.12.2013, plug-in electric vehicles represent about 7% of global electric vehicle park. Indeed, the global park PEV is estimated at 405 000 vehicles, and the total number of electric and hybrid vehicles to 6 million vehicles. The distribution network for FCEV vehicles is 208 stations worldwide, and more than 20,000 stations for PEV vehicles. Three geographic areas are found in the preferred diffusion of electric vehicles PEV: North America, Northern Europe and the three countries of East Asia (Japan, China, and Korea). These areas concentrate users, the most developed networks and production sites. In the map of world cultures Inglehart, this represents the most secular cultures and more focused individual expression of a lifestyle. The few countries where the electric vehicle has not been introduced are intermediate country in place of the care for the environment in individual identity, but often with the public policies of the oil fuel subsidy.

Figure 1: Diffusion in the world of electric and hybrid vehicle in 2013.

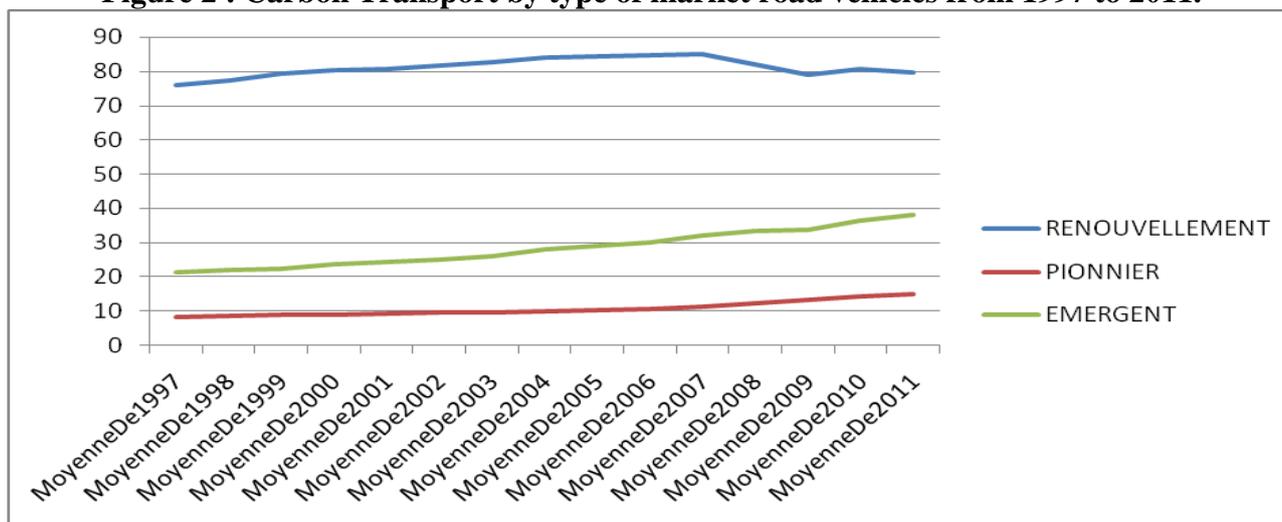


Source : R. Inglehart, C. Welzel, "Changing Mass Priorities: The Link Between Modernization and Democracy", Perspectives on Politics, vol. 8, n° 2, 2010.

█ Limite de la zone où le véhicule hybride et électrique est absent
█ Algérie Pays encourageant la consommation d'hydrocarbures
█ Maroc Pays favorable à la motorisation de masse
● Soins à l'environnement faible dans l'identité personnelle
● Soins à l'environnement inférieur à la moyenne dans l'identité personnelle
● Soins à l'environnement supérieur à la moyenne dans l'identité personnelle
● Soins à l'environnement important dans l'identité personnelle
 Source : World Value Survey vague 6 (2010-2013), ventes 2013 véhicules dans le monde.

A first composite picture emerges. Pioneer markets, which together have the largest failure to control the environmental impact of transportation and the most important environmental commitment in the population level, can be distinguished; then, emerging markets that are correlated with the lowest values of environmental commitment. Contracts are renewed with an intermediate level of environmental commitment, but only with a significant market share for electric vehicles and exceeding a tipping point in the time series of carbon emissions for transport.

Figure 2 : Carbon Transport by type of market road vehicles from 1997 to 2011.



(Average group of countries million tons)

2.3. VALUES AND THE TYPE OF MARKET

Two terms of environmental commitment is mixed:

- The one in the replacement markets, with a membership to temperate environmental organizations, which results in particular through a financial contribution. This profile corresponds to that of purchasers of electric vehicles that combine financial capacity and environmental values.
- The one in frontier markets, with active participation and activist more pronounced, but also a priority for economic growth.

The situation facing the less civic engagement is that of emerging markets. In the balance sheet of carbon emissions for transport, degradation results comes to 59% of these emerging markets (calculated from the year 1990). The replacement markets, by definition, low volume growth. Stabilize annual emissions there has recently been obtained but not yet offset the growth in emissions in the early years of the 1990s.

Average group of countries active in Finance ecologist environmental organization participates in an environmental protest Confidence in environmental organizations Pollution Problem 1 The first growth

Tableau 4: Environmental values, depending on type of market

Average group of countries	Finance in ecologist	active in ecologist organization	participates in a demonstration ecologist	Confidence in environmental organizations			Pollution Problem n°1	The first growth
				so much	enough	very or somewhat		
Renewal	18,6%	2,9%	5,4%	10,4%	45,7%	56,1%	14,8%	43%
Pioneer	13,5%	5,4%	8,4%	21,1%	42,6%	63,7%	6,2%	47,3%
Emergent	8,6%	1,9%	7,6%	15,2%	36,1%	51,3%	11,8%	42,5%

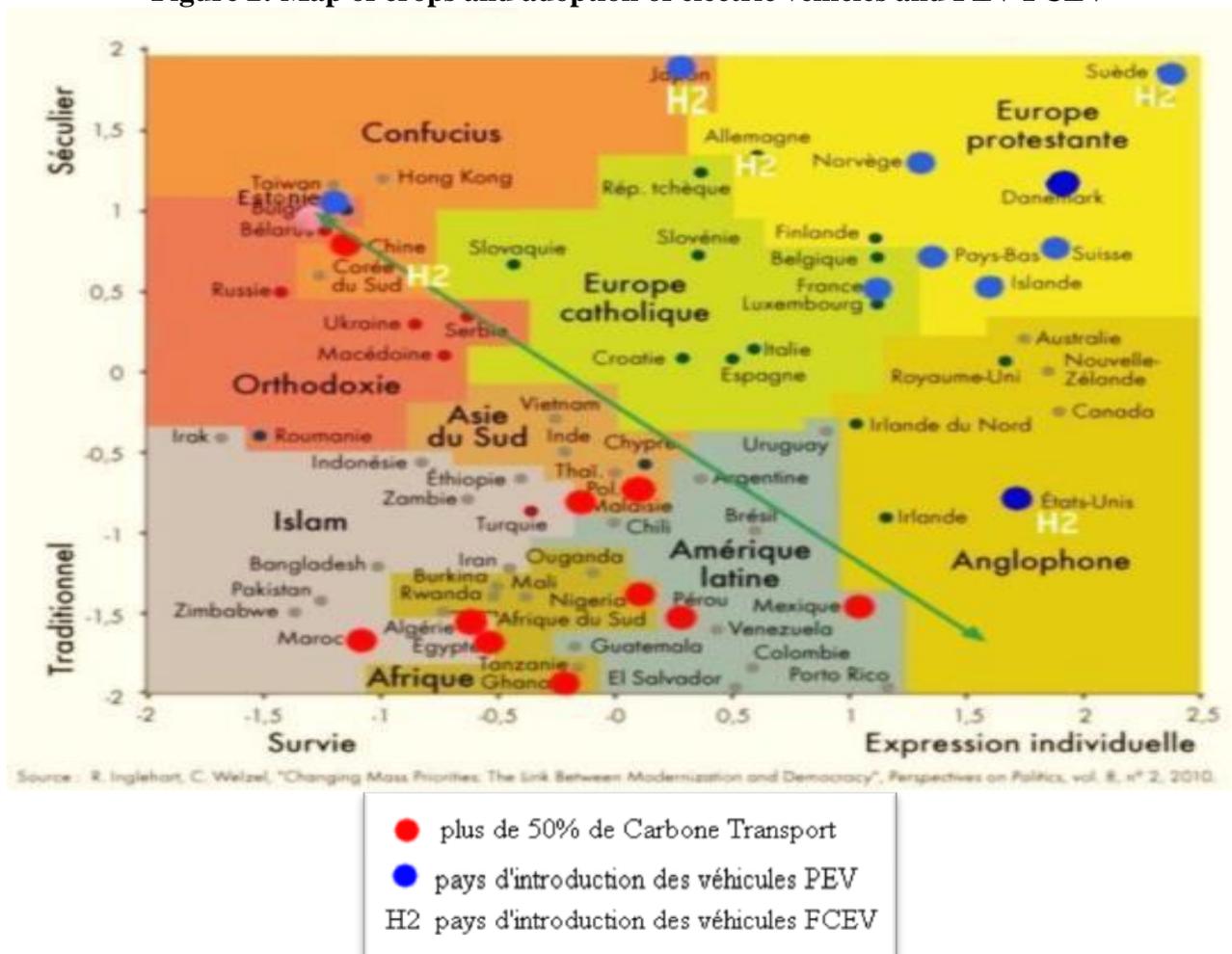
In 2013, the ten countries with the largest share of the market for EPI replacement markets (Norway, Netherlands, Iceland, Japan, France, Estonia, Sweden, USA, Switzerland, and Denmark). These ten countries are above the bisecting NW-SE in Inglehart map of world cultures. They belong to five of the eight cultural Inglehart areas and three major geographic areas: North America, East Asia, and Europe.

Tableau 5: Carbon Transport between 1900 and 2012

	Base 100 in 1990 (Kyoto goal: 92 countries in Annex B in 2012)	Change 1990/2011 million tons of carbon	Part of the variation	Number of countries considered
Renewal	120	+542	27%	40
Pioneer	194	+278	14%	36
Emergent	194	+1177	59%	61

Among the sample of 54 countries from the World Values Survey, 20 countries experienced a greater than 50% reduction in Carbon Transport between 1998 and 2011 increased Trinidad and Tobago, Peru, Malaysia, Poland, Jordan, Tunisia, Qatar, Armenia, China, the Kyrgyz Republic, Ecuador, Azerbaijan, Kazakhstan, Nigeria, Mexico, Egypt, Algeria, Kuwait, Ghana, Morocco. These countries are below the bisecting NW-SE in Inglehart map of world cultures.

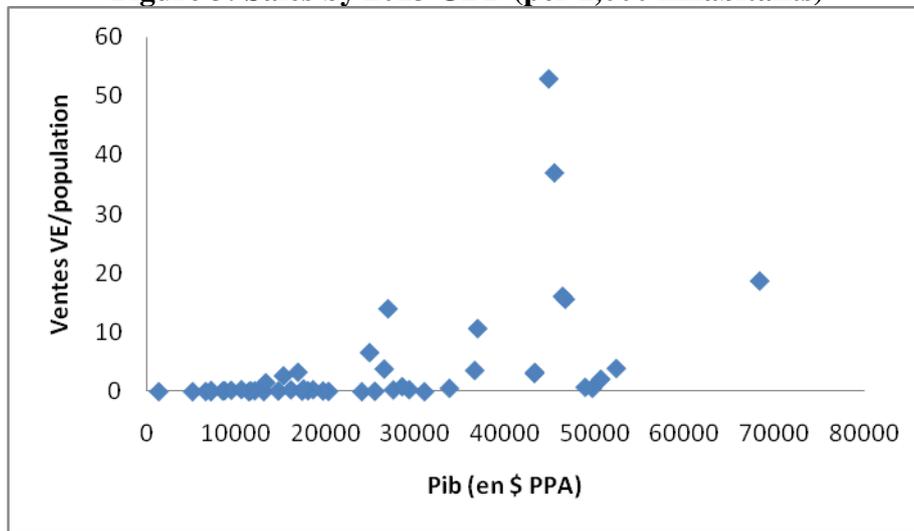
Figure 2: Map of crops and adoption of electric vehicles and PEV FCEV



Electric or hybrid vehicle is usually introduced to the market at a high price, and the countries where are the early adopters are high living. As these are countries with more than 45,000 dollars of income that are most owners of electric vehicles, the "relative speed of adoption" of electric vehicles depends on the level of wealth. The hypothesis H1 is true in general but can be discussed in greater detail.

H1: The wealth of a nation (GDP / capita), positively influences the adoption of environmental innovation.

Figure 3: Sales by 2013 GDP (per 1,000 inhabitants)



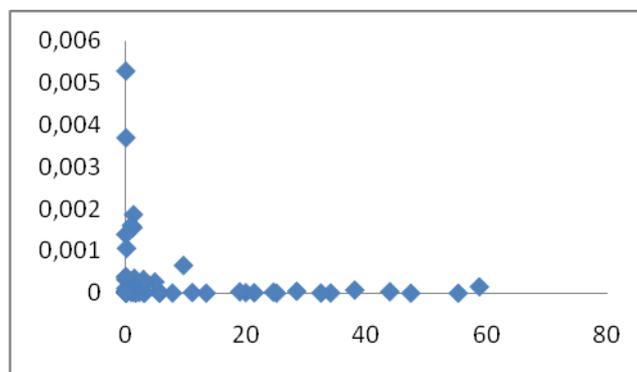
The electric vehicle has a higher price than the same goods 'conventional' acquisition cost. It is advantageous for intensive use, with the price of fossil fuel. For the latest (VEGF) pathway, the location of the first users responds only to determinations "in the vicinity of the plant," in pre-marketing phase. These are the industry groups that invest in new industry and commission of preproduction. In this case, the link "wealth" is not the most important: it is not the richest country the early adopters, but countries that have research services and development for the automotive industry. The prices quoted are those of a luxury sedan.

This wealth link is stronger for the BEV industry with marketing of luxury vehicles. The small city "all electric" also introduced in countries with an average level of income above \$ 45,000.

Hybrid vehicles are older introduction. They are sought on the second hand market by professionals, such as taxi drivers Pakistan looking for a simple and robust vehicle profitable by heavy use. The link with wealth is distended in the case of the hybrid industry.

The positive influence of wealth on the purchase of an electric vehicle stops if a significant share of the wealth comes from oil and gas rents. The orientation of unfavorable public policies to reduce carbon emissions from transportation manifests low values of oil and gas revenues in GDP (between 2 and 3%), changes in buying behavior towards a value slightly more high (10%).

Figure 4: Share of oil and gas rents in GDP in 2013 and sales



H2: A country's post-materialist values positively influence the adoption of environmental innovation.

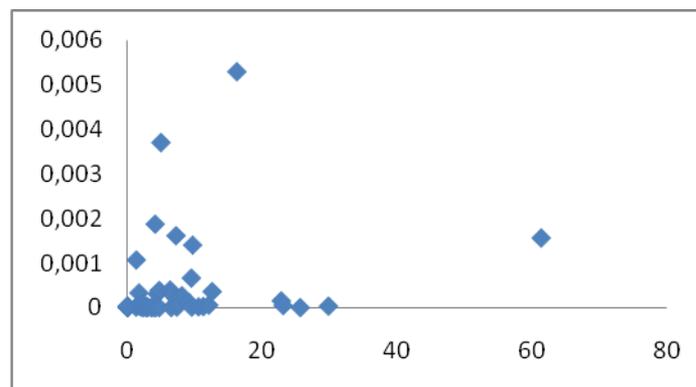
A country that will have "more" post-materialist values will go faster in adoption. The rate of adoption reads the diagonal SW-NE map of Ingelhart cultures. The SW corner is on the side of the rapid adoption and post-materialist values. The NE corner is where the countries have not yet introduced the electric vehicle.

The representation to two factors gives clearer results with only one factor, for example is built with question 80 (5 items) or 81 (2 items) questionnaire wave 6 of the World Value Survey. Question 81 opposes "growth" and "environmental protection" and the numbers of adopters of electric vehicle decreases the percentage reporting privilege in all cases protect the environment.

When the question 80, which asks what is their priority to respondents; is used, the indicator is constructed by adding the two items over "materialist", "fight against poverty", "improvement of living conditions." A summary measure of materialism 63 is the average of the first adopters countries worth more than 79 to a lack of sales. Associated with views and not too dogmatic to their individual lifestyle, buying behavior of the electric vehicle reflects post-materialist values.

H3: Environmental problems objectives positively influence the adoption of environmental innovation.

Figure 5: Exposure to flooding and sales in 2013



In the context of climate change, the acquisition of an electric vehicle cannot be interpreted consistently as a self-protection behavior. The example of the Netherlands, with an exposure to flooding and a high rate of acquisition of electric vehicles does not give a simple relation between these variables on the entire sample of 54 countries.

The purchasing behavior of many "electric vehicle" has an individual ethical basis, due to the diffuse nature of the threat of climate change, and the potential for opportunistic behavior for a property that does not have the characteristics of equipment tamper. The percentage of environmental activists in the population is no apparent link to the purchasing behavior of electric vehicles.

3. DISCUSSIONS AND IMPLICATIONS

On a global scale, highly contrasting between streams of electric vehicles results are observed; dies without issue tank road, BEV, Hydrogen, struggling to marketing, while channels "step by step", HEV / PHEV (hybrid vehicles) were so successful a wide distribution. The "all electric" vehicles

have large diffusion in the area of small slow vehicles. Two main routes of interpretation can be borrowed to explain the differences between sectors and countries:

- Either refers to a universal model and explains the contrasting results by Additional considerations: China, for example, huge environmental problems. However, politics is like Top Down without relay by environmental associations; the sheer size of China's environmental problems that the relative environmental performance of individual choice is low. By against Norway, with clean energy, environmental relative performance is ten times higher.
- Either one refers to a real dichotomy in the minds of the models Maslow-Ingelhart. Primary concerns are first round material needs, and environmental concerns are fully operating in a post-materialist later stage. China would primarily be "materialistic" and not a "trap pollution"; while Norway would be "post-materialist".

The data collected provide both arguments for a universal vision, indicating environmental concerns widely expressed and shared around the world, and culturalist arguments, indicating a differential translation of these concerns. These results do not bow to decide one way or another, but rather form a synthesis between the two visions offered. Indicators of materialism in China are low (value of the synthetic indicator of materialism: 51) close to that of the Republic of Korea, according to Inglehart (1983.1995). The preferences of consumers in emerging countries are more environmental than the policies, either deliberately or by the difficulties inherent in the development of coordination needed to achieve results in the reduction of pollution levels, according to the literature (Mostafa , 2013, Roberts, 1996).

The diffusion of an innovation such as the electric vehicle varies by wealth. It will be faster in countries where wealth is high, with the exception of countries to oil and gas income. These heterogeneous adoptions are consistent with the literature (Mostafa, 2013; Inglehart, Abramson, 1995). Culturally different markets attach importance to different degrees of environmental issues, according to the literature (Mostafa, 2013; Kilbourne and Picket, 2008; Dunlap et al 2000. Kim, 1999; Norris, 1997).

All told, the electric vehicle is part of the assertion of a civic culture, both individual and collective. This common culture of sustainability is widely expressed throughout the world, and results in a renaissance of technological process explored early automobile (BEV, 30% of the fleet in 1900) and new channels (hybrid hydrogen). Wheat Rousseau placed before Iron: technology shocks alter the established beliefs, and the invention of the sickle would have altered lifestyles. But the wheat is before Iron: equipment moves little, and they are essentially changes in lifestyle and values of reference that brings technological revolution. We would rather here in this case: the capital good "electric vehicle" reflects a positive and original creation of large-scale shared values.

4. LIMITATIONS OF THE STUDY

In this study, we have integrated the national dimension of adoption. The individual aspect of the adoption of electric vehicles as innovation appears very little. This is explained by the fact that the World Value Survey questionnaire contains no specific question about the attitude to innovation, especially in front of the electric vehicle. Post-materialist values of individuals strongly influence the adoption of environmental innovation only direct introduction of this type of issue in as comprehensive as the World Value Survey would test this on a large scale investigation.

RÉFÉRENCES

- Agarwal R., Prasad J. (1997), The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies, *Decision Sciences*, 28, 3, 557-582.
- Agarwal R., Prasad J. (1999), Are individual differences germane to the acceptance of new information technologies? , *Decision Sciences*, 30, 361-391.
- Alter N. (2013), *L'innovation ordinaire*, 4ème édition, Paris, PUF.
- Andersen M.M. (2008), Eco-innovation: Towards a taxonomy and a theory. In : Proceedings of the 25th DRUID conference 2008 on Entrepreneurship and innovation- organisations, Institutions, Systems and Regions, Copenhagen, Denmark.
- Arundel A., Kemp R. (2009), Measuring eco-innovation, Maastricht: United Nations University- Maastricht Economic and Social Research and Training Centre on innovation and Technology.
- Axsen J., Tyree-Hageman J., Lentz A.(2012), Life style practices and pro-environmental technologies, *Ecological Economics*, 82, 64-74.
- Bell S., Morse S. (1999), *Sustainable indicators: measuring the immeasurable*, London, Earthscan Publications Limited.
- Callens S., Shang L., Zhao F. (2013), L'émergence attendue du véhicule électrique, *Préludes. Les cahiers de l'Association Tiers Monde*, 28, 201-212.
- Chau P., Tam K. (1997), Factors affecting the adoption of open systems: an exploratory study, *MIS Quarterly*, 21, 1, 1-21.
- Cooper R. B., Zmud R. W. (1990), Information Technology Implementation Research: A Technological Diffusion Approach, *Management Science*, 36, 123-139.
- Dalton R. J. (2008), *Citizen Politics: Public Opinion and Political Parties in Advanced Industrial Democracies*, 5th ed. Washington, D.C.: CQ Press.
- Davis F. D., Bagozzi R. P. et Warshaw P. R. (1989), User acceptance of computer technology: A comparison of two theoretical model, *Management Science*, 35, 8, 982-1003.
- Diekmann A., Franzen A. (1999), The wealth of nations and environmental concern, *Environment and behavior*, 31, 540-549.
- Dunlap R, Van Liere K, Mertig A., Jones R. (2000), Measuring endorsement of the new ecological paradigm: a revised NEP Scale , *Journal of Social Issues*, 56, 425-442.
- Eco-innovation observatory (EIO) (2011), The eco-innovation challenge: pathways to a resource-efficient Europe. Brussels: EIO, 2011.
- Flichy P. (2003), *L'innovation technique : récents développements en sciences sociales. Vers une nouvelle théorie de l'innovation*, Paris, La découverte.
- Franzen, A., Vogl, D. (2013), Acquiescence and the willingness to pay for environmental protection: A comparison of the ISSP, WVS, and EVS. *Social Science Quarterly*, Vol 94(3), Sep, 637-659.
- Fusser C., James F. (1996), *Driving eco-innovation, a breakthrough discipline for innovation and sustainability*, London, Pittman Publishing.
- Gatignon H., Robertson T. S (1989), Technology Diffusion: An Empirical Test of Competitive Effects, *Journal of Marketing*, 53, 35-49.
- Goksen F. Adaman F., Zenginobuz E. (2002), On environmental concern, willingness to pay, and post-materialist values: evidence from Istanbul, *Environment and Behavior*, 34, 616-633.
- Hardgrave B., Davis F. et Riemenschneider C. (2003), Investigating Determinants of Software Developers' Intentions to Follow Methodologies, *Journal of Management Information Systems*, 20,1, 123-151.
- Inglehart R. (1971), The silent revolution in Europe: Intergenerational change in Post-industrial societies, *American Political Science Review*, 65, 991-1017.
- Inglehart R. (1977), *The silent revolution: changing values and political styles among western publics*, Princeton: Princeton University Press.

- Inglehart R. (1983), The Persistence of Materialist and Post-Materialist Value Orientations: Comments on Van Deth's Analysis, *European Journal of Political Research*, 11, 81-91.
- Inglehart R. (1995), Public Support for Environmental Protection: Objective Problems and Subjective Values in 43 Societies, *Political Science and Politics*, Vol. 28, 1., Mar., 57-72.
- Inglehart R., Abramson P.R. (1995), *Value change in global perspective*, Ann Arbor: University of Michigan Press.
- Inglehart R., Abramson P.R. (1999), Measuring post-materialism, *The American Political Science Review*, 93, 3, 665-677.
- Intergovernmental Panel on Climate Change (2014), Working Group III contribution to the IPCC 5th Assessment Report "*Climate Change 2014: Mitigation of Climate Change*", chapter 8 : Transport, 39th Session of the IPCC on 12 April 2014 in Berlin, Germany.
- Karahanna E., Straub D.W., Chervany N. L. (1999), Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs, *MIS Quarterly*, 23, 183-213.
- Karakaya E., Hidalgo A., Nuur C. (2014), Diffusion of eco-innovations : A review, *Renewable and Sustainable Energy Reviews*, 33, 392–399.
- Kemp R., Pearson P. (2007), Final report of the MEI Project measuring eco-innovation, UN MERIT.
- Kilbourne W., Pickett G. (2008), How materialism affects environmental beliefs concern, and environmentally responsible behavior, *Journal of Business Research*, 61, 885-893.
- Kim D. (1999), Environmentalism in developing countries and the case of a large Korean city, *Social Science Quarterly*, 80, 810-829.
- Minton A, Rose R. (1997), The effects of environmental concern on environmentally friendly consumer behavior: an exploratory study, *Journal of Business Research*, 40, 37-48.
- Mostafa M.M. (2007), A hierarchical analysis of the green consciousness of the Egyptian consumer, *Psychology and Marketing*, 24, 445-473.
- Mostafa M.M. (2013), Wealth, Post-materialism and consumers pro-environmental intentions: a multilevel analysis across 25 nations, *Sustainable development*, 21, 385-399.
- Nilakanta S., Scamell R. W. (1990), The Effect of Information Sources and Communication Channels on the Diffusion of an Innovation in a Data Base Environment, *Management Science*, 36, 24-40.
- Norris P.(1997), Are we all green now? Public opinion environmentalism in Britain, *Government and Opposition*, 32, 320-329.
- Olli E., Grenstad G., Wollebaek D. (2001), Correlates of environmental behaviors: bringing back social context, *Environment and Behavior*, 33, 181-208.
- Rifkin J. (2012), *La troisième révolution industrielle: comment le pouvoir latéral va transformer l'énergie, l'économie et le monde*, tr. fr., Paris : Les liens qui libèrent.
- Roberts B. (1996), The Social Context of Citizenship in Latin America, *International Journal of Urban and Regional Research*, 20,1,38-65.
- Rogers E.M. (1995), *Diffusion of innovations*, 4th edition, New York : The Free-Press.
- Seyfang R. (2007), Growing sustainable consumption communities: the case of local organic food networks, *International Journal of Sociology and Social Policy*, 27, 120-134.
- Singh S. (2006), Cultural differences in, and influences on, consumers' propensity to adopt innovations, *International Marketing Review*, 23, 2, 173-191.
- Stone G., Barnes J., Montgomery C. (1995), Ecoscale: a scale for measurement of environmentally responsible consumers, *Psychology and Marketing*, 12, 595-612.
- Venkatesh V., Morris M., Davis G., et Davis, F. (2003), User acceptance of information technology: Toward a unified view, *MIS Quarterly*, 27, 3, 425-478.