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'Shop Until You Drop': the Unexpected Effects of Anti-consumerism and Environmentalism*

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Abstract

In an economy where consumers are heterogeneous in their preferences over the hedonic and environmental attributes of goods on sale, we explore the effects of anti-consumerism and environmentalism. We show that when the environmental attributes of products come at the expense of the hedonic attributes, a higher supply of anti-consumerism and environmentalism yields the expected positive effect on the environment. In contrast, when hedonic and environmental attributes are jointly met by a good, higher levels of anti-consumerism and environmentalism negatively affect the society's environmental footprint. Moreover, the impact of anti-consumerism and environmentalism on social welfare is far from being obvious, giving rise to unexpected redistributive effects between firms and consumers.

Keywords: *environmentalism*, *hedonism*, *anti-consumerism*, *hedonic and environmental product attributes*, *vertical product differentiation.*

JEL Classification: D11, L13, Q50

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"Roll out from under the sumptuous hempfiber sheets on your bed in the morning and pull on a pair of $245 organic cotton Levi's and an Armani biodegradable knit shirt. Stroll from the bedroom in your eco-McMansion, with its photovoltaic solar panels, into the kitchen remodeled with reclaimed lumber. Enter the three-car garage lighted by energysipping fluorescent bulbs and slip behind the wheel of your $104,000 Lexus hybrid." (Buying Into the Green Movement, New York Times, July, 2007)

"Capitalism is killing the planet – it's time to stop buying into our own destruction." (G. Monbiot, The Guardian, October 2021).

1 Introduction

Marketed products are differentiated. Luxury sports cars are faster and provide consumers with a much wider range of accessories and kits exclusively designed, better tech features and more sophisticated sound systems than economy ones. Analogously, while there are many types of smartphones on sale, premium variants embed more advanced core communications features, wider ranges of apps and gadgets with superior functionalities compared to less recent, economy or obsolete smartphone variants. In short, firms endow luxury products on sale with higher *hedonic qualities* than economy ones.

For a long time, the cultural paradigm of *consumerism* has pushed forward the idea that to possess goods of high hedonic quality is a direct gateway for individuals to obtain admiration and respect in society (Frank 1985, Bagwell and Bernheim, 1996). The choice of buying certain goods to advertise personal wealth in view of obtaining higher social status as well as for conformity or snobbish purposes (Leibentstein 1950, Corneo and Jeanne, 1997, Grilo et al. 2001) is a widely debated issue, tracing back to Rae (1834)'s seminal contribution and, almost a century later, to Veblen (1922)'s well-known treatise on conspicuous consumption.

However, an increasing number of studies have recently started to question the unidimensional view according to which accumulating goods of high hedonic quality warrants individuals happiness or higher social status. On the one hand, a broad supply of *environmentalism* proclaiming that friendly behaviour toward the environment is socially worth (Ostrom, 2000), has been disseminated worldwide by numerous environmental doctrines (see on this, for instance, Kahn, 2007 and Glaeser, 2014) as well as, recently, by social movements (*Friday for Future*, *inter alia*).[1] Nowadays, environmentally conscious consumers may incur a social stigma when purchasing polluting goods (Kotchen and Moore, 2007) as well as, symmetrically, obtain social esteem among peers through pro-environmental consumption (Sexton and Sexton, 2014). Moreover, a huge amount of economic literature has shown that people actually behave according to endogenous preferences (Bowles 1998) which, in turn, tend to comply with group norms

[1] For an extended survey on the evolution of environmental values see, for instance, Dietz *et al.* (2005).

(Akerlof and Kranton 2000, Sobel 2005). In many communities, these group norms are *green* norms (Dietz et al 2005, Peattie 2010).[2] Whatever the mechanism at work, environmentalism seems to provide buyers with some psychic benefits beyond the material needs satisfied by the products, increasing consumers' willingness to pay for the *environmental quality* of goods (see e.g. on this, Benabou and Tirole 2006, Mantovani *et al.* 2016, Marini *et al.* 2022 and Ambec and Donder 2022).[3]

On the other hand, and in parallel with the consumers' activism for reducing their carbon footprint through the choice of greener variants of the products, *anti-consumerism* movements supporting a new "frugal living" have emerged (e.g., Miles, 1998, Stearns, 2006).[4] Anti-consumerism is a visceral protest against luxury consumption as well as against what is perceived as the global dominance of multinational brands. It advocates a new economic conduct made of *reduction,* also known as *"happy degrowth"* (Latouche, 2020).[5] Interestingly, happy degrowth can be also driven by the desire to protect the environment: environment-oriented anti-consumerism induces consumers to refrain from accumulating luxury items, promoting "frugal affluence" as the *only mean* to save the earth.

In this paper, we investigate to which extent the idea that environmentalism and anti-consumerism are effective to improve the ecological footprint of market outcomes is well-grounded. We show that, although in some circumstances these social forces lead to a better market ecological footprint, their positive effects on the environment are not always fully guaranteed. In particular, we prove that *in a society where consumers are strongly environmentally concerned and hedonic attributes do not come at expense of environmental attributes, promoting anti-consumerism and environmentalism may be detrimental to the environment.*

To this aim we introduce a model in which two firms produce differentiated goods along a hedonic and an environmental dimension. In our analysis we formalize *two cases*. In the first one, the *green* product (denoted G), i.e. the higher-environmental quality product also possesses the higher hedonic quality, while the less environmentally-friendly or *brown* product (denoted B) is the one with lower-hedonic quality. In this case, we say that hedonic and environmental attributes of the goods are *aligned.* This first scenario captures a recent and increasing trend of luxury *as well as* sustainable items: firms which sell traditionally prestigious products are heavily investing not only in high performance but

[2] The idea that psichic benefit inspire a green behaviour is confirmed by a lot of anedoctical evidence. For example, in 2007, the New York Times reported the top five reasons why Toyota Prius owners bought their hybrid cars. The main reason was that "it shows the world that its owner cares".

[3] One can measure the ecological footprint or environmental quality (we use the two terms as synonimous) of a good in terms of CO_2 emissions: the higher the level of emissions, the lower the corresponding environmental quality. This approach is not new. See, for instancee, Lombardini, 2005.

[4] In 2015, REI, an outdoor supply retailer, began a campaign imploring consumers to "opt outside" on Black Friday. For the past four years, on the day following Thanksgiving, the company closes all its retail locations, including the website.

[5] Because of the symbolic benefits which would, in this case, drive consumers' choices, the expression *conspicuous anti-consumption* has been coined to describe such attitude to resist consumption (Sekhon et al 2019).

also in their ecological sustainability. The *BMW Group* was recently ranked first in the "Automobiles" category of the *Dow Jones Sustainability Index* (*Automotive World Magazine*, November 2020). *Estée Lauder Companies* announced in 2020 that, in their fight against climate change, they have achieved carbon neutrality and sourced 100% renewable electricity for their direct operations. In 2020 the first sustainable collection by *Gucci*, titled *Off The Grid*, has been launched. *Stella McCartney*'s new Pre-Fall 2021 collection was created from eco-friendly materials. The British brand even launched a campaign 'Our Time has Come' to raise awareness about the cruelty inflicted on animals in the fashion industry as well as the environmental impacts of what are defined "horrend practices" in the sector.

There exists, however, also a second case where the good attributes are *misaligned* and the *hedonic* quality of B exceeds that of G, although the latter is environmentally superior. Although currently the trade-off between these two dimensions of qualities is confined to some specific sectors, for several decades environmental and hedonic attributes of the products on sale have not been in sync, with the environmental quality coming in several cases at the expense of their hedonic performances. For example, greenwashing products had lower cleaning performance, initial prototypes of electric cars were noisy and uncomfortable, while organic foods had poor taste. Many examples can be also found of luxury and highly polluting items with a very low environmental quality. Look at the powerful SUV: according to the International Energy Agency (IEA), the growth of the world's SUV fleet caused an uptick of 0.55 gigatons of CO_2 over one decade, to 544 million tons of CO_2, making SUVs "the second-largest contributor to the increase in global CO_2 emissions since 2010 after the power sector." (IEA, 2019).[6] In a similar vein, one can think of prestige cosmetics: the big corporations have been deeply criticized for water consumption, animals testing, chemicals ingredients, and a large amount of plastics for packaging. Similar concerns were raised in fashion industry.[7]

For each of these *two polar cases*, we illustrate the equilibrium configuration with firms competing in prices and analyze the impact of environmentalism and anti-consumerism on the market, their ecological footprint and welfare.

We show that the effects of environmentalism and anti-consumerism are not so obvious. In particular, whether environmentalism and anti-consumerisms lead to a worse or a better ecological footprint ultimately depends on the alignment of hedonic and environmental characteristics of the green and brown products and the relative level of environmental concern in society. For example, a strong anti-consumerism campaign unambiguously improves the ecological footprint of a market whenever the qualities of goods are misaligned. In contrast, if the good qualities are aligned and consumers are highly

[6] https://www.iea.org/commentaries/growing-preference-for-suvs-challenges-emissions-reductions-in-passenger-car-market.

[7] See, for example, the 2020 British Beauty Council's report: https://www.trvst.world/sustainable-living/environmental-impact-of-cosmetics/, and also Forbes: https://www.forbes.com/sites/stephanegirod/2021/07/01/luxury-is-learning-to-deal-with-the-contradictions-of-sustainability/?sh=1a27510a5266.

concerned with the environment (i.e. if we are in presence of a large supply of environmentalism) a further increase of anti-consumerism is detrimental for the environment. Moreover, we do not only confirm a well-known result that environmentalism cannot be viewed as the only mean to decarbonize the market. Even worse, we show that increasing the supply of environmentalism when the society is *already* strongly environmentally concerned reduces the ecological footprint of the market. Such puzzling results are confirmed from a *normative* point of view: when good attributes are *aligned*, a higher supply of environmentalism reduces both consumers' and social welfare, if evaluated at their *ex ante* preferences. In contrast, anti-consumerism advantages consumers whereas penalizes social welfare. When goods possess *misaligned attributes*, all normative results depends on the relative strength of anti-consumerism and environmentalism.

These findings open the door to some policy implications. The celebration of the *happy degrowth paradigm* as a way to save the planet is baseless and *outdated*. Reducing consumption to abate emissions can be a good strategy in the sectors where the trade-off between hedonic and environmental quality is still valid. However, whenever *the environmental concern among consumers is strong and qualities are aligned*, the campaigns of anti-consumerism and environmentalism risk to be misplaced. Moreover, the impact of anti-consumerism and environmentalism on social welfare are far from being obvious and generates unexpected redistributive effects on firms and consumers. No doubt, the impact of environmental policies on inequality is a key dimension for the social and political debate on the green transition, as shown, for instance, by the *Gilets Jaunes* movement in France. Thus, uncovering the channels through which the redistributive processes occur as effect of green campaigns should be a key priority of policy-makers' agenda.

1.1 Related Literature

To the best of our knowledge, our paper is the first to jointly tackle the role of *environmentalism* and *anti-consumerism* in a *vertically differentiated* setting with *two dimensions* of qualities.

There is a long-standing strand of literature focusing on the behaviour of environmentally aware consumers with products being vertically differentiated on the basis of their environmental quality. In accordance with this, firms segment strategically the market supplying green and brown variants of the same good, which are sold at a high and low price (see, on this line, Moraga Gonzales and Padron-Fumero, 2002, Bansal and Gangopadhyay, 2003, Rodriguez-Ibeas *et al.*, 2003, Amacher et al., 2004, Conrad, 2005, Lombardini 2005 and Bansal, 2008). Differently from our setting, the market considered by these papers is a segment, as the quality ladder along which products are ranked has a unique dimension. There exist some contributions dealing with two dimensions of quality in this strand of literature: for example, Mantovani et al. (2016), similarly to Garella and Lambertini (2014) assume that the quality of products develops along two dimensions, an hedonic and an environmental dimension.

Nonetheless, the willingness to pay for the environmental attribute is not consumer-specific but related to the society as a whole.

In a way, from a modeling viewpoint, our setting can be viewed as an extension of the two-dimensional vertical differentiation model by Vandenboschand and Weinber (1995) and Lauga and Ofek (2011). Inspired by their modeling framework, however, we purposely assume that one of the characteristics of the goods is the environmental quality, whereas the other is the hedonic quality. Furthermore, we introduce two additional parameters which represent the strength of anti-consumerism and environmentalism freely circulating in a society. In our model, the levels of these forces shape consumers' preferences in proportion to their initial willingness to pay for the environmental and hedonic quality of the goods, respectively. As we will show, in our approach, it is not the ranking of qualities that determines the equilibrium configuration but, instead, the relative intensity of the two social drivers. Finally, this ingredient opens the door to some policy implications that go beyond the scope of the above evoked papers.

Our analysis is also related to a further strand of literature. We question the effectiveness of environmentalism and anti-consumerism in increasing the ecological footprint of a market and show that in some circumstances these social forces are environment detrimental. Admittedly, the fact that a higher social awareness may lead to worse market outcomes is not entirely new. For example, Garcìa-Gallego and Georgantzìs (2009) find, in a context where firms sell products embedding different degrees of corporate social responsibility, that an increase in social awareness (as due to campaigns by firms) does not necessarily generate higher social welfare. Grolleau *et al.* (2009) show that the presence of consumers with high willingness-to-pay for green products prevent in some cases other consumers from purchasing them, hence leading to a socially inefficient outcome. Deltas et al. (2013) focus on the existence of negative effects associated with policies aimed to improve the environmental performance of the market. In a very recent paper where consumers perceive psychic costs and benefits from brown and green consumption, Marini *et al.* (2022) show that a higher level of environmentalism may reduce the environmental surplus of the economy, just because endows the green firm with higher market power.[8]

Close in spirit to the scope of these analysis, we depart from them in (at least) two respects. First of all, we describe not only the effects of environmentalism, but also of anti-consumerism on firms and the ecological footprint of the market. Moreover, we analyse how these effects change depending on the (mis-) alignement of hedonic and environmental attributes.

The paper is organized as follows. The model is illustrated in Section 2, whose details are briefly presented in Appendix 1 and 2. Section 3 describes the equilibrium of the market whereas Section 4

[8] As noted there, these results are reminiscent of Jevons's paradox (see, for instance, Alcott, 2005 and Sorrell, 2009) which states that energy-saving policies may increase rather than decrease energy consumption. *Direct* and *indirect rebound effects* can occur, where the former is obtained under a *ceteris paribus* assumption, while the latter occurs taking into account the endogeneity of a few other variables.

illustrates the role of environmentalism and anti-consumerism in shaping the equilibrium configuration, profits, ecological footprint and consumers' and social welfare. Finally, we briefly conclude our analysis in Section 5. All major proofs are relegated to the Appendices.

2 Two-Characteristic Model

Let us consider a market with a unit mass of consumers, where each consumer buys one unit of a product (Mussa and Rosen, 1978, Gabszewicz and Thisse, 1979, Shaked and Sutton, 1983, Tirole, 1988). As in Neven and Thisse (1990), Irmen and Thisse, (1998) and Lauga and Ofek (2011), we consider a two-dimensional setting where, for our purpose, consumers are heterogeneous in their attitudes toward the *hedonic* and the *environmental* quality of the products. Formally, every consumer is characterized by an indirect utility function

$$U(\theta_\gamma, \theta_\varepsilon) = \begin{cases} R + \gamma \cdot \theta_\gamma q_G + \varepsilon \cdot \theta_\varepsilon e_G - p_G & \text{when consuming } G \\ R + \gamma \cdot \theta_\gamma q_B + \varepsilon \cdot \theta_\varepsilon e_B - p_B & \text{when consuming } B, \end{cases} \tag{1}$$

being heterogeneous in θ_γ which is uniformly distributed in $[0, 1]$ and that denotes her willingness to pay (henceforth WTP) for the *hedonic quality* q_i of good $i = G, B$, which we label *green* and *brown* product, respectively. *A priori,* it can be either $q_G \gtrless q_B$. Similarly, θ_ε is uniformly (and independently of θ_γ) distributed in $[0, 1]$ and measures each consumer's willingness to pay for the *environmental quality* e_i of the good. By definition, the *green* product (G) has a milder environmental impact (and a higher environmental quality) than the brown one (B). Therefore, it holds that $e_G > e_B$. In addition, let $\gamma \in (0, \infty)$ express the level of *consumerism* existing in society and $\varepsilon \in (0, \infty)$, the existing level of *environmentalism*. *Ceteris paribus*, an increase in either γ or ε from their initial values corresponds to a boost of consumers' willingness to pay for the hedonic or environmental quality of goods, respectively.[9] Finally, R represents each consumer's reservation utility, which is exogenously given and positive. As a result, every consumer is represented geometrically by a single point of a unit square of coordinates $(\theta_\gamma, \theta_\varepsilon)$. Consumers with a high WTP for the hedonic quality and low for the environmental quality of the goods are located at the south-east of the square and are individuals who are prominently interested (resp. uninterested) in the hedonic (resp. environmental) quality of goods: in brief, they are *consumerists*, i.e. highly sensitive to the sirens of consumerism. On the other hand, those with a very low WTP for the hedonic quality and very high WTP for the environmental quality are located at north-west of the square and can be loosely labelled as *anti-consumerists* and *environmentalists*: in short, people with low hedonic and high environmental sensitiveness. Obviously, there also exist people who are highly or lowly reactive to both attributes. Finally, the people located at the center of the square are simply people who have a *moderate* concern for both attributes of the goods.

[9] Notice that for any given γ and ε, such a boost is bigger, the higher the level of consumer's WTP.

For our purpose, what is relevant in the taxonomy is the yielded indifference line, i.e. the line of all consumers who are exactly indifferent between the *green* and the *brown* product. This indifference line simply divides the unit-square in two, partitioning the consumers in two groups: those preferring to buy the green good G and those preferring to buy the brown one, B. Solving the simple indifference condition:

$$R + \gamma\theta_\gamma q_G + \varepsilon\theta_\varepsilon e_G - p_G = R + \gamma\theta_\gamma q_B + \varepsilon\theta_\varepsilon e_B - p_B \tag{2}$$

yields the following *indifference line*:

$$\theta_\varepsilon(\theta_\gamma) = \frac{p_G - p_B}{\varepsilon e} - \frac{\gamma\,(q_G - q_B)}{\varepsilon e}\theta_\gamma, \tag{3}$$

where $e = (e_G - e_B) > 0$ denotes the existing environmental gap between products, whereas $(q_G - q_B)$ describes their hedonic gap. The latter is positive for $q_G > q_B$ and negative for $q_G < q_B$.

The slope of the indifference line can be easily obtained as

$$\frac{d\theta_\varepsilon(\theta_\gamma)}{d\theta_\gamma} = -\frac{\gamma\,(q_G - q_B)}{\varepsilon e},$$

whose sign, as $e > 0$, depends on the sign of: $q_G - q_B \gtreqless 0$. Thus, we simply say that the *attributes are aligned* whenever $q_G > q_B$, whereas they are *misaligned* for $q_G < q_B$. The aligned case may be observed, e.g. when a hybrid or electric car is also endowed with a powerful engine as well as, say, a comfortable interior design. In contrast the case of misalignment is typically the case of a beautiful and highly performing car with a bad environmental impact. It follows that the indifference line is, in turn, positively sloped with goods possessing misaligned attributes and negatively sloped when the attributes are aligned. Moreover, denoting by $q = |q_G - q_B|$, we observe that $\gamma q/\varepsilon e \lesseqgtr 1$ depending on whether $\varepsilon e \gtreqless q\gamma$.

With this in mind, we introduce the following additional taxonomy of the parameter space:[10]

Definition 1 *Society is characterized by (i) environmental (resp. hedonic) dominance whenever* $2q\gamma > \varepsilon e > q\gamma$ *(resp.* $2\varepsilon e > q\gamma > \varepsilon e$*), and by (ii) strong environmental dominance (resp. strong hedonic dominance) whenever* $\varepsilon e > 2q\gamma$ *(resp.* $q\gamma > 2\varepsilon e$*).*

From the above definition it is clear how the (strong) environmental or hedonic dominance between goods depends on two features: the hedonic (and environmental) quality gap existing between the products on the one hand, and the strength of environmentalism and consumerism existing in a given society, on the other.

[10] This taxonomy will be used for the characterization of the Nash equilibria (see, Section 3).

From (3), the vertical intercepts of the indifference line, are simply given by

$$\theta_{\varepsilon}(0) = \frac{p_G - p_B}{\varepsilon e}, \text{ and } \theta_{\varepsilon}(1) = \frac{p_G - p_B}{\varepsilon e} - \frac{(q_G - q_B)\,\gamma}{\varepsilon e}, \tag{4}$$

whereas, in turn, the horizontal intercepts are

$$\theta_{\gamma}(0) = \frac{p_G - p_B}{\gamma\,(q_G - q_B)}, \text{ and } \theta_{\gamma}(1) = \frac{p_G - p_B}{\gamma\,(q_G - q_B)} - \frac{\varepsilon e}{\gamma\,(q_G - q_B)}. \tag{5}$$

Figure 1 below illustrates the indifference line in the two cases of aligned (upper panels (a) and (b)) and misaligned attributes (lower panels (c) and (d)) under either *environmental* (continuous line) or *hedonic dominance* (dashed line).[11]

Under aligned (resp. misaligned) attributes, the indifference lines are negatively (resp. positively) sloped as $q_G - q_B$ has either positive (resp. negative) sign. Nonetheless, its steepness varies according on whether we are under *environmental* or *hedonic dominance*. In particular, the continuous line in Figure 1 represents the case of environmental dominance $\varepsilon e > q\gamma$, whereas the dashed line the one of hedonic dominance, with $\varepsilon e < q\gamma$.

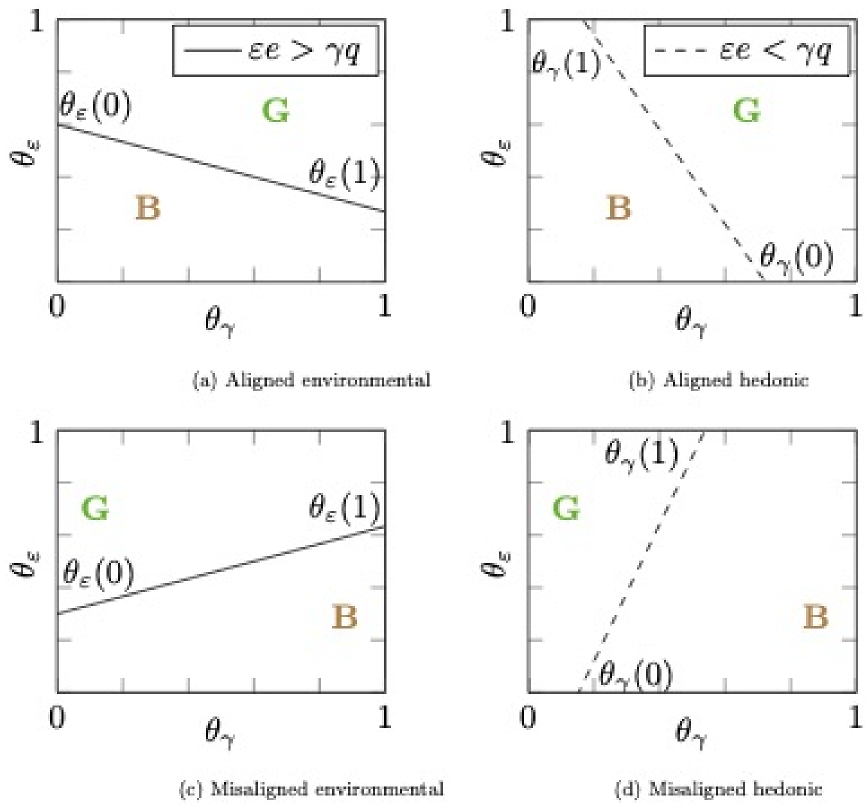

Figure 1 - The Indifference line under different types of alignment and dominance.

[11] It is worth noting that, for the demands characterization, we only refer to *environmental* and *hedonic dominance*, since *strong dominance* does not play any role.

Since the indifference lines define the market shares of the B- and G-firm, we immediately see that under attributes alignment, the consumers purchasing good G are those with a high WTP for both hedonic and environmental quality of the good, with the G-market located at the north-east of the unit square. In contrast, the consumers who buy B are those with a low WTP for the environmental quality, located at the south-west of the unit-square.

Along the same *rationale*, under good misalignment, the consumers buying G (resp. B) display a relatively low (resp. high) WTP for the hedonic quality and a relatively high (resp. low) WTP for the environmental quality of the products. We are now in the position to derive the demand functions in each case.

2.1 Demand functions

From the analysis of the indifference line it immediately turns out that there are *four* different situations for which is relevant to derive firm i's demand function (for $i = G, B$): (i) *aligned attributes* and *environmental dominance*; (ii) *aligned attributes* and *hedonic dominance*; (iii) *misaligned attributes* and *environmental dominance*; (iv) *misaligned attributes* and *hedonic dominance*.

We are mainly interested in cases (i) and (iv) as they better fit with the past and current/future scenarios of modern societies, as discussed in the introduction. Moreover, to keep the analysis concise, we illustrate how to derive the demand functions in the *aligned case* and *environmental dominance*, whereas relegating to the Appendix 1 the construction of the demand function for all remaining cases.

2.1.1 Aligned attributes and environmental dominance

Using the indifference line (3), we obtain the demand function of firm $i = G, B$ as a function of its own and rival's price. In particular, we identify three different zones Z_j with $j = I, II, III$, which mainly depend on the parameter space. A specific zone refers to the specific part of the unit square crossed by the indifference line (3). As illustrated grafically in Figure 2 below, a negative (or positively) sloped indifference line can cross the square in different zones, thus partitioning the unit mass of consumers in distinct ways. This, in turn, characterizes the demand functions of the two firms in the different zones. In particular, the demand of firm B under (i) *environmental dominance*, (i.e. for $e\varepsilon > \gamma q$) is characterized by the indifference line with intercepts given by (4) and (5). Thus, firms' prices at all corners of the square can be easily obtained as

$$p_B(0,0) = p_G,\ p_B(1,0) = p_G - \gamma(q_G - q_B)$$

and

$$p_B(0,1) = p_G - \varepsilon e,\ p_B(1,1) = p_G - \varepsilon e - (q_G - q_B)\gamma,$$

respectively. Figure 2 below illustrates the demands for the two goods (the two areas divided by the indifference line) under *aligned* (*misaligned*) attributes and *environmental* (*hedonic*) *dominance* on the left (right) panels. Dashed and dotted lines depict the movement of the indifference line (and of firms' demands) as caused by a price change.

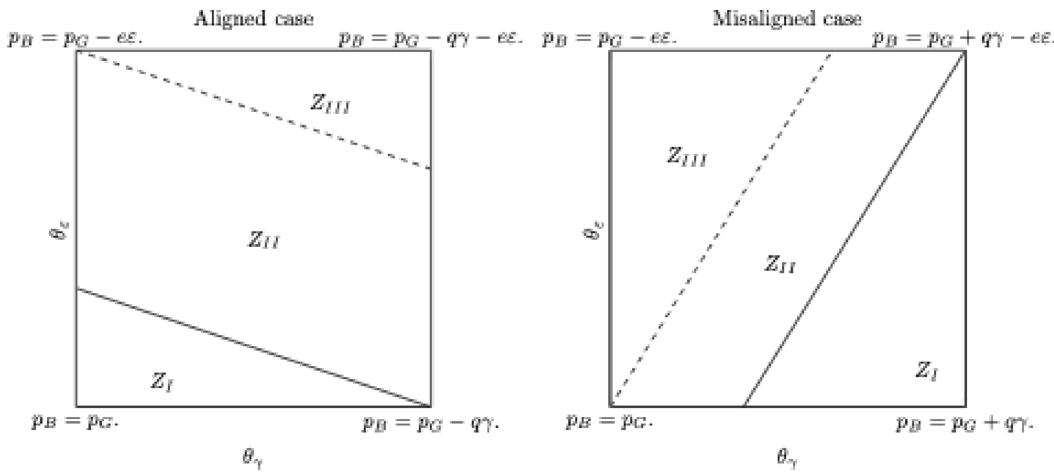

Figure 2 - Price zones under aligned and misaligned good attributes.

In zone Z_I, i.e. the one occurring for the price range $p_B \in [p_G - q\gamma, p_G]$, the demand of firm B is the area of the triangle (Figure 2) obtained as:

$$D_B^I(p_G, p_B) = \frac{\theta_\gamma(0) \cdot \theta_\varepsilon(0)}{2} = \frac{(p_G - p_B)^2}{2\gamma(q_G - q_B)\varepsilon e}. \tag{6}$$

Alternatively, in zone Z_{II}, i.e. the one arising for $p_B \in [p_G - \varepsilon e, p_G - q\gamma]$, the demand function of firm B is the area of the trapezoid having bases, respectively, of length $\theta_\varepsilon(0)$ and $\theta_\varepsilon(1)$, and height 1. This is,

$$D_B^{II}(p_G, p_B) = \frac{1}{2}\left(\theta_\varepsilon(0) + \theta_\varepsilon(1)\right) = \frac{2\left(p_G - p_B\right) - (q_G - q_B)\gamma}{2\varepsilon e}. \tag{7}$$

Finally, in zone Z_{III}, arising for $p_B \in [p_G - q\gamma - \varepsilon e, p_G - \varepsilon e]$, firm B's demand is obtained as

$$D_B^{III}(p_G, p_B) = 1 - \frac{(1 - \theta_\gamma(1))(1 - \theta_\varepsilon(1))}{2} = \frac{\varepsilon e\left(2\left(p_G - p_B\right) - \varepsilon e\right) - \left(p_B - p_G + (q_G - q_B)\gamma\right)^2}{2\gamma(q_G - q_B)\varepsilon e}. \tag{8}$$

The demand of firm G in all different zones (i.e. price ranges) can immediately be derived exploiting the fact that $D_G^j(p_G, p_B) = 1 - D_B^j(p_G, p_B)$.[12] The Appendix 1 illustrates the two firms' demands in all remaining cases not reported here.

[12] Interestingly, the demand of firm B is convex in zone Z_I, linear in zone Z_{II} and concave in zone Z_{III} with respect to price p_B for any given rival's price p_G: $\partial^2 D_B^I(p_G, p_B)/\partial p_B^2 = \frac{1}{eq\gamma\varepsilon} > 0$, $\partial^2 D_B^{II}(p_G, p_B)/\partial p_B^2 = 0$ and $\partial^2 D_B^{III}(p_G, p_B)/\partial p_B^2 = -\frac{1}{eq\gamma\varepsilon} < 0$. As $D_G^j = 1 - D_B^j$, it immediately descends that the demand of firm G is concave in zone Z_I, linear in zone Z_{II} and convex in zone Z_{III} in its own price.

3 Nash Equilibrium Configurations

In view of characterizing the interior Nash equilibrium prices, we proceed as follows. Firstly, given firms payoffs $\pi_i(p_G, p_B) = p_i D_i(p_G, p_B)$, where $i = G, B$, we compute, for every possible zone Z_j, the existing *candidate Nash equilibrium prices.* Hence, we verify if the prices obtained in each zone *actually* belong to the price-range that characterizes the demand functions of the two firms in that zone. If this does not occur, we conclude that at least one firm has an incentive to deviate profitably from this, to a different price zone. This invalidates the possibility for such a price to be part of an interior Nash equilibrium. The existence of an interior Nash equilibrium requires therefore some restrictions to the parameter space. In particular, as we will see below, the model reveals the importance for the existence of a Nash equilibrium of the alignment (or misalignment) of good attributes on the one hand, as well as of the strength of social forces and quality gaps between goods, on the other.

The proposition below reveals that an interior Nash (duopoly) equilibrium can only be observed in zones Z_I and Z_{II}, in accordance to the alignment of attributes and the type of quality dominance.

Proposition 1. *Assume first that good attributes are aligned. Thus, (i) under either environmental or hedonic dominance, a Nash interior equilibrium only occurs in Z_I; (ii) under either strong environmental or strong hedonic dominance, an interior Nash equilibrium only occurs in Z_{II}. Finally, (iii) when the good attributes are misaligned, independently of the type of dominance, an interior Nash equilibrium always takes place in Z_{II}.*

Proof. See Appendix A.2. ■

In what follows, we focus our attention on the interior equilibria occurring in zone Z_{II}, characterized in (ii) and (iii) of the above proposition. The reason is twofold. Firstly, the interior Nash equilibrium occurs in zone Z_I only for a very narrow parameter space. Secondly, and most importantly, under this equilibrium the two firms' market shares are fully inelastic to environmentalism and anti-consumerism. Put it differently, a campaign increasing the supply of either anti-consumerism or environmentalism would be fully *neutral* from an environmental and an economic viewpoint. In order to generate an effect, these forces have to increase to such an extent that the dominance becomes strong. In that case, the equilibrium would no longer be in Z_I, occurring instead in Z_{II}.

Therefore, in what follows, we will fully detail the interior equilibrium and the comparative statics both under aligned attributes and strong environmental dominance (*Al* case) as well as under misalignment and hedonic dominance (*Ml* case). As explained in the introduction, these *two polar cases* nicely fit the *past* and the *current trends* of our societies.[13]

[13] An interior Nash equilibrium in zone Z_{II} also occurs under *aligned attributes* and strong hedonic dominance as well as under *misaligned attributes* and environmental dominance. The detailed analysis of these two cases are available upon request.

3.1 Nash Equilibrium in the Aligned Case

For this specific case, the following pair of Nash equilibrium prices arise:

$$\tilde{p}_G^{Al} = \frac{4\varepsilon e + \gamma(q_G - q_B)}{6} \text{ and } \tilde{p}_B^{Al} = \frac{2\varepsilon e - \gamma(q_G - q_B)}{6},$$

where it appears clear that $\tilde{p}_G^{Al} > \tilde{p}_B^{Al}$.

We can immediately notice that, whereas $\tilde{p}_G^{Al}$ decreases with the anti-consumerism (i.e. when γ falls), $\tilde{p}_B^{Al}$ increases with it. In contrast, both prices are positively affected by an increase of environmentalism (i.e. a rise in ε). Surprisingly, they do not meet the standard property of strategic complementarity between prices observed in oligopoly under price competition. The reason is that the two-characteristic model alter the standard mode of competition observed in vertically differentiated market with some *a priori* unexpected results, as we clarify below.

With the above equilibrium prices, the equilibrium demands of each firm can be immediately found as

$$\tilde{D}_G^{Al}(\tilde{p}_G^{Al}, \tilde{p}_B^{Al}) = \frac{4\varepsilon e + \gamma(q_G - q_B)}{6\varepsilon e}, \ \ \tilde{D}_B^{Al}(\tilde{p}_G^{Al}, \tilde{p}_B^{Al}) = \frac{2\varepsilon e - \gamma(q_G - q_B)}{6\varepsilon e}.$$

The comparative statics of the two firm equilibrium demands with respect to γ and ε clearly shows that the traditional mechanisms of vertical product differentiation no longer holds in this bi-dimensional setting.

As far as the role of anti-consumerism, a higher level of anti-consumerism (fall in γ) decreases both the equilibrium price $\tilde{p}_G^{Al}$ and the corresponding equilibrium demand $\tilde{D}_G^{Al}$, while magnifying the market demand of firm B, in spite of its higher price. Typically, in vertical product differentiation, whenever the price of the high quality variant increases, the low quality firm rises its equilibrium price, too. Then, depending on the price gap and qualities, market shares change either in favour or at expense of either firm. In our analysis, the price gap unambiguously decreases, so that the high quality good becomes relatively cheaper with anti-consumerism. Nonetheless, consumption rebellion penalizes to such an extent the high quality variant, that firm G loses consumers although its good is (even relatively) cheaper.

The impact of environmentalism on the equilibrium configuration is different. In particular, in the case of alignment and strong environmental dominance, both firms benefit from a higher supply of environmentalism (a higher ε). In this case, the strategic complementarity between prices in restored: a higher ε enables the green firm to raise its equilibrium price since it positively affects the WTP for the high quality variant. As a consequence, firm B takes advantage of that and raises its own price. Since $\tilde{p}_B^{Al}$ increases relatively less than the price $\tilde{p}_G^{Al}$, some consumers switch from G to B.

Finally, firms' profits write at the equilibrium as:

$$\tilde{\pi}_G^{Al}(\tilde{p}_G^{Al}, \tilde{p}_B^{Al}) = \frac{(4\varepsilon e + \gamma(q_G - q_B))^2}{36\varepsilon e}$$

and

$$\tilde{\pi}_B^{Al}(\tilde{p}_G^{Al}, \tilde{p}_B^{Al}) = \frac{(2\varepsilon e - \gamma(q_G - q_B))^2}{36\varepsilon e}.$$

3.2 Nash Equilibrium in the Misaligned Case

When we turn to *misaligned attributes*, we can immediately derive the interior Nash equilibrium prices as

$$\tilde{p}_G^{Ml} = \frac{2\gamma(q_B - q_G) + \varepsilon e}{6} \text{ and } \tilde{p}_B^{Ml} = \frac{4\gamma(q_B - q_G) - \varepsilon e}{6},$$

where now, differently from the aligned case, $q_B > q_G$ and $\tilde{p}_B^{Ml} > \tilde{p}_G^{Ml}$. In this scenario, if $\tilde{p}_G^{Ml}$ increases whereas $\tilde{p}_B^{Ml}$ decreases with the environmentalism, both prices are negatively affected by the anti-consumerism. The corresponding equilibrium demands are immediately found as follows:

$$\tilde{D}_G^{Ml}(\tilde{p}_G^{Ml}, \tilde{p}_B^{Ml}) = \frac{2\gamma(q_B - q_G) + \varepsilon e}{6\gamma(q_B - q_G)} \text{ and } D_B^{Ml}(\tilde{p}_G^{Ml}, \tilde{p}_B^{Ml}) = \frac{4\gamma(q_B - q_G) - \varepsilon e}{6\gamma(q_B - q_G)}.$$

It is interesting to notice that now the demand of the green firm increases with anti-consumerism (i.e. with a fall in γ). Indeed, since the price $\tilde{p}_G^{Ml}$ decreases with anti-consumerism, a larger set of consumers are willing to buy the cheaper variant, thereby switching from the brown to the green good. Finally, we complete the characterization of the equilibrium by finding the two firms' equilibrium profits as:

$$\tilde{\pi}_G^{Ml}(\tilde{p}_G^{Ml}, \tilde{p}_B^{Ml}) = \frac{(2(q_B - q_G)\gamma + \varepsilon e)^2}{36\gamma(q_B - q_G)} \text{ and } \tilde{\pi}_B^{Ml}(\tilde{p}_G^{Ml}, \tilde{p}_B^{Ml}) = \frac{(\varepsilon e - 4\gamma(q_B - q_G))^2}{36\gamma(q_B - q_G)}.$$

Having in mind the mechanisms through which prices and market shares at equilibrium are affected by the two social forces under investigation, we can now evaluate the role of anti-consumerism and environmentalism in society.

4 The Role of Anti-consumerism and Environmentalism

In what follows, we first evaluate the effects of anti-consumerism and environmentalism on firm profits, thereby moving to the analysis of their impact on the carbon footprint.

4.1 The Effects on the Firms' Profits

From standard algebra, we find that:

Proposition 2 *(i) In the aligned case (Al) anti-consumerism always reduces the equilibrium profit of the green firm while increasing that of the brown rival. (ii) In contrast, in the misaligned case (Ml) anti-consumerism decreases the profits of both firms.*

Proof. This simply follows from straightforward differentiations:

$$\frac{\partial \tilde{\pi}_G^{Al}}{\partial \gamma} = \frac{4\varepsilon e(q_G - q_B) + \gamma(q_G - q_B)^2}{18\varepsilon e} > 0, \quad \frac{\partial \tilde{\pi}_B^{Al}}{\partial \gamma} = -\frac{(q_G - q_B)(2\varepsilon e - \gamma(q_G - q_B))}{18\varepsilon e} < 0,$$

and

$$\frac{\partial \tilde{\pi}_G^{Ml}}{\partial \gamma} = \frac{4\gamma^2(q_B - q_G)^2 - \varepsilon^2 e^2}{36\gamma^2(q_B - q_G)} > 0, \quad \frac{\partial \tilde{\pi}_B^{Ml}}{\partial \gamma} = -\frac{\varepsilon^2 e^2 - 16\gamma^2(q_B - q_G)^2}{36\gamma^2(q_B - q_G)} > 0.$$

■

The above result comes with no surprise, given what we have illustrated in the previous section. In particular, we know that in the *aligned attribute* case a higher level of anti-consumerism (a reduction in γ) decreases the equilibrium price $\tilde{p}_G^{Al}$. The price $\tilde{p}_G^{Al}$ is indeed extremely high, since the product sold by firm G embeds both a high hedonic and a high environmental quality. As soon as the supply of anti-consumerism increases, the price $\tilde{p}_G^{Al}$ dramatically decreases. Still, this reduction does not suffice to sustain the demand for firm G, which decreases too, thereby generating a larger market demand for firm B in spite of its higher equilibrium price. The economic *rationale* behind the fall of both firms' profits as consequence of the anti-consumerism with *misaligned attributes* is even more intuitive. A higher supply of anti-consumerism reduces both equilibrium prices, as previously explained. The reduction in the price $\tilde{p}_G^{Ml}$ is such that some consumers switch from the brown to the green good, since the environmental quality is relatively more appreciated by consumers, given the rise in anti-consumerism. As a result, the equilibrium profit of firm B unambiguously decreases. The equilibrium profit of firm G decreases too: the larger demand does not suffice to compensate the lower price.

When moving to environmentalism, we find that:

Proposition 3 *(i) In the aligned attribute case (*Al*), environmentalism unambiguously increases the equilibrium profits of both firms; (ii) in the misaligned attribute case (*Ml*) it increases the equilibrium profit of the green firm, while reducing that of the brown rival.*

Proof. Straightforward differentiations yield:

$$\frac{\partial \tilde{\pi}_G^{Al}}{\partial \varepsilon} = \frac{16\varepsilon^2 e^2 - \gamma^2(q_G - q_B)^2}{36\varepsilon^2 e} > 0, \quad \frac{\partial \tilde{\pi}_B^{Al}}{\partial \varepsilon} = \frac{4\varepsilon^2 e^2 - \gamma^2(q_G - q_B)^2}{36\varepsilon^2 e} > 0$$

and

$$\frac{\partial \tilde{\pi}_G^{Ml}}{\partial \varepsilon} = \frac{(e\varepsilon + 2\gamma(q_B - q_G))\, e}{18\gamma(q_B - q_G)} > 0, \quad \frac{\partial \tilde{\pi}_B^{Ml}}{\partial \varepsilon} = \frac{(e\varepsilon - 4\gamma(q_B - q_G))\, e}{18\gamma(q_B - q_G)} < 0.$$

■

Notice that, under *aligned attributes (Al)* case, the positive impact of environmentalism on $\tilde{\pi}_G^{Al}$ and $\tilde{\pi}_B^{Al}$ develops along two different mechanisms. In the case of $\tilde{\pi}_G^{Al}$, the price of the green variant increases with environmentalism to such an extent that, in spite of a reduction in the corresponding demand, the equilibrium profits increase. At the opposite, in the case of $\tilde{\pi}_B^{Al}$, the equilibrium price increases with a moderate intensity (the price gap enlarges with ε) so that the corresponding demand increases, too.

In the *misaligned attribute case (Ml)* case, a higher supply of environmentalism increases the equilibrium profit of the green firm that benefits from a higher price and demand. At the opposite, it hurts the brown firm: although firm B reduces its price, its demand decreases at equilibrium, since some consumers, induced by the higher level of environmentalism, switch from the brown to the green variant.

4.2 The Effects on the Ecological Footprint

We are now in the position to consider the impact of the social driver γ and ε on the environment. Following Marini *et al.* (2021), we postulate a linear positive relationship between the amount of the final good produced and the quantity of emissions in the market and define the ecological footprint E_F as[14]

$$E_F = D_G(p_G, p_B) \cdot e_G + D_B(p_G, p_B) \cdot e_B. \tag{9}$$

Since the market is covered, the value of E_F always increases when a growing number of consumers buy the green variant, since this larger demand comes at the expense of the demand for the brown rival. By contrast, the opposite holds when more consumers purchase the brown variant.

Substituting the equilibrium prices observed in Z_{II} in (9) and focusing on the *aligned case*, we obtain:

$$\tilde{E}_F^{Al} = \left(\frac{4\varepsilon e + \gamma(q_G - q_B)}{6\varepsilon e} \right) e_G + \left(\frac{2\varepsilon e - \gamma(q_G - q_B)}{6\varepsilon e} \right) e_B. \tag{10}$$

Symmetrically, the ecological footprint at the interior Nash equilibrium in the *misaligned case* is:

$$\tilde{E}_F^{Ml} = \left(\frac{2\gamma(q_B - q_G) + \varepsilon e}{6\gamma(q_B - q_G)} \right) e_G + \left(\frac{4\gamma(q_B - q_G) - \varepsilon e}{6\gamma(q_B - q_G)} \right) e_B. \tag{11}$$

Therefore, given (10)-(11), we can state the following:

Proposition 4 *In the* aligned attribute *case* (Al)*, a higher supply of anti-consumerism and environmentalism are detrimental for the environment. In contrast, in the* misaligned attribute *case* (Ml)*, they always have a positive impact on the environment.*

[14] The same approach is in Sanin and Zanaj (2011) and Ceccantoni *et al.* (2018).

Proof. It follows from standard algebra that

$$\frac{\partial \tilde{E}_F^{Al}}{\partial \gamma} = \frac{q_G - q_B}{6\varepsilon} > 0, \text{ and } \frac{\partial \tilde{E}_F^{Al}}{\partial \varepsilon} = -\frac{\gamma(q_G - q_B)}{6\varepsilon^2} < 0,$$

as well as

$$\frac{\partial \tilde{E}_F^{Ml}}{\partial \gamma} = -\frac{e^2 \varepsilon}{6\gamma^2(q_B - q_G)} < 0, \text{ and } \frac{\partial \tilde{E}_F^{Ml}}{\partial \varepsilon} = \frac{e^2}{6\gamma(q_B - q_G)} > 0.$$

■

Thus, the simple comparative statics presented above shows that, in the *misaligned case*, *anti-consumerism* increases the demand of firm G selling the lower quality good at the expense of that of firm B offering the high quality one. In terms of equilibrium profits, since anti-consumerism pushes equilibrium prices down, both profits decrease in spite of the larger demand of firm G. Nonetheless, the ecological footprint of the market improves. The economic intuition for this effect can be summarized as follows. Anti-consumerism has an impact on the WTP for the hedonic quality of a good. *Ceteris paribus*, this WTP decreases progressively more, the higher is the hedonic quality of the variant. This reduction determines two effects: (i) both equilibrium prices decrease and (ii) the WTP for the environmental quality becomes *relatively* more relevant. As a result, although the price gap $(\tilde{p}_B^{Ml} - \tilde{p}_G^{Ml}) > 0$ decreases too ($\tilde{p}_G^{Ml}$ decreases less than $\tilde{p}_B^{Ml}$), the higher environmental quality of the green variant sold by firm G attracts to such an extent consumers that the demand of firm B falls. Then, the equilibrium demands change in favor of the green firm and, as a consequence, the society ecological footprint enhances. Incidentally, it is worth remarking that the same effect on the ecological footprint holds in the case of *misaligned attributes* and *environmental dominance*. In that case, anti-consumerism increases the price of the green good and the demand for firm G, at the expense of that for firm B. As a consequence, the society ecological footprint improves.

At the opposite, in the *aligned attribute* case, anti-consumerism increases the demand faced by firm B while reducing that of firm G, with a negative impact on the market ecological footprint. It is worth noting that in this case, anti-consumerism hurts firm G, since it reduces both its demand and its price at equilibrium, with an obvious reduction of the corresponding equilibrium profit. In contrast, it increases the equilibrium profit of firm B, as it raises not only its demand but also its equilibrium price.

As a natural complement of the above Proposition, we notice that for any $\varepsilon \gtrless \gamma$, it holds that $\left| d\tilde{E}_F^{Al}/d\gamma \right| \gtrless \left| d\tilde{E}_F^{Al}/d\varepsilon \right|$. Therefore, we can state the following:[15]

Corollary 1. *In a society where the supply of environmentalism is higher (resp. less) than the supply of consumerism, anti-consumerist campaigns are more (resp. less) environment detrimental than environmental campaigns.*

To capture the economic *rationale* underlying the above findings, let us briefly remind the impact of anti-consumerism on the equilibrium variables. In the case of a level of ε extremely high, consumers

[15] We skip the case of $\varepsilon = \gamma$, as it is a zero measure case.

are very concerned with the environment and willing to pay a very high price premium for it. If anti-consumerism gets stronger and stronger, the eco-friendly firm is particularly penalized. Although its price decreases with anti-consumerism, the corresponding demand for the green firm never increases.[16]

4.3 Welfare Analysis

Having considered above the effects of social forces on firms' profits, we now address the question of the effects of anti-consumerism and environmentalism on both consumers' surplus and social welfare. This requires an explicit specification of the social welfare function, which is non-trivial in a model with endogenous consumers' preferences, as we explain below.

Concerning the utility of consumers, the presence of an endogenous component of preferences, due to the variability of the social forces, i.e. existing supply of anti-consumerism and environmentalism within the society, poses a well-known conceptual problem. How should consumers' surplus be evaluated, given that anti-consumerism and environmentalism *de facto* modify consumers' preferences?[17] This problem is similar to the one arising, for instance, in the welfare analysis of (non-informative) advertising. One solution to this problem was proposed by a seminal paper by Dixit and Norman (1978). It consists in setting the pre-advertising identity of consumers, and using this benchmark to evaluate the post-advertising outcomes. We adopt the same solution here. Specifically, we set the identity of the consumers at the *status quo,* i.e. at the initial levels of environmentalism and consumerism (denoted $\overline{\varepsilon}$ and $\overline{\gamma}$). Then, we evaluate the market equilibrium generated by the change of each one of these two social forces (individually taken) against such initial benchmark. Therefore, denoting the indirect utility of consumers (1) at their *status quo* as

$$\overline{U}_i = R + \overline{\gamma} \cdot \theta_\gamma q_i + \overline{\varepsilon} \cdot \theta_\varepsilon e_i - p_i \quad \text{for } i = B, G, \tag{12}$$

taking into account of the heterogeneity of consumers in $(\theta_\gamma, \theta_\varepsilon) \in [0,1] \times [0,1]$, their surplus W^C can be written as:[18]

$$W^C = \int_0^1 \left(\int_0^{\theta_\varepsilon(\theta_\gamma)} \left(\overline{U}_B\right) \mathrm{d}\theta_\varepsilon \right) \mathrm{d}\theta_\gamma + \int_0^1 \left(\int_{\theta_\varepsilon(\theta_\gamma)}^1 \left(\overline{U}_G\right) \mathrm{d}\theta_\varepsilon \right) \mathrm{d}\theta_\gamma. \tag{13}$$

Notice that any shift in either environmentalism or consumerism affects both equilibrium prices and firms' demands, with an immediate change in consumers' surplus, as evaluated at their *ex ante* preferences.

[16]See Proposition 3 and 4.

[17]The voice of NGOs, social movements and public opinions determines, in fact, an increasing supply of environmentalism and anti-consumerism which, in turn, affects individuals' preferences.. About the welfare effects of competiting NGOs on consumers (and donors') choices see, among others, the recent works by Aldashev et al. (2014, 2020) and Kopel and Marini (2022).

[18]We report here the expression of consumers' surplus and social welfare for the case of *aligned attributes.* In Appendix 4 below we consider also the case with *misaligned attributes*, in which case the two expressions are slightly different.

The social welfare is given by the sum of consumers' surplus W^C and firms' surplus W^F, which coincides with the sum of the two firms' profits, $W^F = \pi_G + \pi_B$. Therefore, it ensues that

$$SW = W^F + \lambda W^C,$$

with λ reflecting implicitly the relative weight given to the consumers' welfare as compared to firms' welfare. In what follows, we will focus on the utilitarian case, where $\lambda = 1$. Recalling that $\pi_i = p_i D_i$, for $i = G, B$, the social welfare writes as:[19]

$$SW = \int_0^1 \left(\int_0^{\theta_\varepsilon(\theta_\gamma)} \left(\overline{U}_B + p_B\right) \mathrm{d}\theta_\varepsilon \right) \mathrm{d}\theta_\gamma + \int_0^1 \left(\int_{\theta_\varepsilon(\theta_\gamma)}^1 \left(\overline{U}_G + p_G\right) \mathrm{d}\theta_\varepsilon \right) \mathrm{d}\theta_\gamma. \tag{14}$$

While relegating to the Appendix all detailed computations of consumer surplus and social welfare in the different equilibria, we can state here the main normative results of the analysis.

Proposition 5 *Assume that good attributes are aligned. Thus, (i) a not too strong (resp. too weak) increase of anti-consumerism rises (resp. reduces) consumers' surplus and always reduces social welfare regardless of the magnitude of the increase. Moreover, (ii) an increase of the environmentalism always decreases both consumers' surplus and social welfare.*

Proof. See the Appendix 3. ■

Proposition 6 *Assume that good attributes are misaligned. Thus, (i) a not too strong (resp. too weak) increase of anti-consumerism causes a rise (resp. a reduction) of consumers' surplus and social welfare. Similarly (ii) a not too strong (resp. too weak) increase of environmentalism causes a rise (resp. a fall) of both consumers' surplus and social welfare.*

Proof. See the Appendix 4. ■

The two propositions provide an illustration of the contrasting effects that anti-consumerism and environmentalism exert on consumers' and social welfare in the two polar cases, namely those of *aligned* and *misaligned* attributes.

To capture the economic *rationale* underlying the above results, let us once again briefly recall the effect of the two social forces on prices and demands at the equilibrium. Under *aligned* attributes, a rise of the anti-consumerism *increases* the price of the *brown* firm and *decreases* that of the *green* one. Therefore, the equilibrium price gap $(p_G - p_B)$ *falls*. Nevertheless, due to the anti-consumerism, the

[19] It appears clear here that since profits are a simple transfer from the consumers to the firms, in equilibrium the social welfare can simply be computed as the consumers' surplus gross of their total money expenditure.

mass of *green consumers* at the new equilibrium decreases, while that of the brown good increases. As a result, for a modest rise of anti-consumerism, the combined discount effect on the luxury (green) good and price boost on the cheaper (brown) good can end up favoring consumers. On the opposite, a too high rise of anti-consumerism is detrimental to consumers. It is worth noting that the one described here is a mere *redistributive effect* from firms to consumers. Interestingly, under aligned attributes the effect of a rise of anti-consumerism on welfare is always *negative*. Indeed, it generates a higher mass of consumers buying the (hedonically and environmentally) lower quality good, who therefore suffer a disutility (computed at the *ex ante* level of consumerism) because of the switch from the higher to the lower quality good, with a consequent welfare reduction of the society as a whole.

In contrast, a rise of the environmentalism increases both firms' prices as well as the price gap $(p_G - p_B)$. As a result, the demand of the green good decreases while that of the brown one increases, with a reduction of the consumers' surplus evaluated, as mentioned above, at the *status quo* preferences. As far as the welfare is concerned, the lower (higher) demand of the green (brown) good inevitably causes a reduction of the social welfare as a whole. Therefore, comparing the effects of the two social forces when goods attributes are aligned, we observe that they both *reduce* social welfare, switching consumers from the green (high quality) to the brown (low quality) good. This benefits consumers at the expense of firms in the case of anti-consumerism and firms at the expense of consumers in the case of environmentalism.

The normative analysis under *misaligned* attributes is definitely more complex, since now goods possess conflicting environmental and hedonic attributes. In this case, we show above that the anti-consumerism causes a reduction of both good prices. Also, since the price gap $(p_B - p_G)$ shrinks, the market share of the green firm increases at the expense of the brown one's. Thus, in this case, when the rise in anti-consumerism is relatively mild, the reduction of prices combined with a not too strong switch from the brown to the green good can determine a positive effect on both consumers' surplus and social welfare. Of course, this comes at the expense of firms' profits. In contrast, a too strong increase of anti-consumerism will affect negatively both consumers' and social welfare.

Somehow similarly, under *misaligned attributes* the effect of a strong rise of environmentalism evaluated at the *status quo* preferences is detrimental to both consumers' and social welfare. This is because the price of the green good increases while that of the brown one falls and, thus, the price gap $(p_B - p_G)$ shrinks. Since the market share of firm G which is selling the low quality good increases, consumers' surplus, in this case, decreases. The same occurs to social welfare: it is negatively affected by the new equilibrium market shares, now much more in favor of the green (and low quality) good. This shift affects negatively the consumers at their *status quo* preferences: they are able to appreciate such a demand shift only *ex post*, namely when the higher supply of environmentalism will be internalized in their new and altered preferences over goods. Similarly as for the effect of anti-consumerism, a moderate rise of environmentalism can be beneficial to consumers' and social welfare, even if the effect of environmentalism is ultimately to benefit firms at the expense of consumers.

5 Concluding Remarks

In presence of a misalignment between environmental and hedonic quality of goods on sale, the supply of environmentalism and anti-consumerism exerts a positive impact on the environment. In the case of aligned attributes, both cease to be environment enhancing. Thus, the main message of our analysis could be that these campaigns are effective in abating emissions only under specific circumstances. More explicitely, we could conclude that, in the past decades, campaigns promoting anti-consumerism and environmentalism were tailored to meet the actual features of societies. Nowadays, however, and specially in some specific industries, they may not represent the appropriate measures to improve the society ecological footprint.

Although the above statements are no doubt an immediate by-product of our model results, there is a further, and maybe more subtle insight that can be drawn from it. Indeed, the two campaigns do not play the same role in society, as it clearly emerges when considering their redistributive impact on consumers and firms. At first sight, a not too strong increase of anti-consumerism and environmentalism generate a positive effect on social welfare under misaligned attributes, while causing its reduction when good attributes are aligned. However, when looking at the drivers of the effects on social welfare, we observe that anti-consumerism increases consumers' surplus and decreases that of producers under both alignement and misalignement of attributes. At the opposite, environmentalism reduces consumers' surplus in favour of producers' surplus. More precisely, anti-consumerism unambiguously hurts the green firm that instead, is always benefitted by the environmentalism. We can, therefore, claim that anti-consumerism generates a tranfer of wealth from the firms to the consumers, whereas the reverse occurs under environmentalism.

While the analysis of the trade-off between green transition and redistribution goes beyond the aim of this paper, the impact that "going green" can exert on social inequality turns out to be crucial in shaping the social and political debate, as recently shown, for instance, by the *Gilets Jaunes* movement in France. This opens the door to the need of further investigation, which we leave, however, for future work.

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Appendix 1: Demands Functions

Following the geometric procedure presented in Section 2.1, we detail here the construction of firms' demands in all remaining cases uncovered above in the main text, where we only considered the case of *aligned attributes* with *environmental dominance*, denoted *case* (i). In this appendix, we consider the two firms demands for the (ii) *aligned* case with *hedonic dominance*; (iii) *misaligned* case with *hedonic dominance*; (iv) *misaligned* case with *environmental dominance*.

Case (ii). For the *aligned* case with *hedonic dominance* (i.e., for $2\varepsilon e > \gamma q > \varepsilon e$ and $q = q_G - q_B > 0$), since in zone Z_I and Z_{III} firms' demands are invariant to the type of (hedonic vs. environmental) *dominance* of goods, they are exactly as in (6)-(8), although with modified price ranges: $p_G \in [p_B, p_B + \varepsilon e]$ and $p_B \in [p_G - \varepsilon e, p_G]$ for zone Z_I and $p_G \in [p_B + q\gamma, p_B + q\gamma + \varepsilon e]$ and $p_B \in [p_G - q\gamma - e\varepsilon, p_G - q\gamma]$ for zone Z_{III}. In contrast, in zone Z_{II} the *hedonic dominance* matters and the demands can be computed, specifically as:

$$D_B^{II}(p_G, p_B) = \frac{1}{2}\left(\theta_\gamma(1) + \theta_\gamma(0)\right) = \frac{2\left(p_G - p_B\right) - e\varepsilon}{2q\gamma} \text{ and } D_G^{II}(p_G, p_B) = 1 - D_B^{II}(p_G, p_B),$$

for firm B and G, respectively. Henceforth, to economize on space, we illustrate only firm B's demand, since that of firm G's can be directly obtained as $D_G^j(p_G, p_B) = 1 - D_B^j(p_G, p_B)$.

Case (iii) In the *misaligned* case with *hedonic dominance* (i.e. for $2\varepsilon e > \gamma q > \varepsilon e$ and $q = q_B - q_G > 0$) firm B's demand is

$$D_B^I(p_G, p_B) = \frac{\left(p_G - p_B + q\gamma\right)^2}{2\gamma q\varepsilon e} \text{ for } p_B \in [p_G + q\gamma - \varepsilon e, p_G + q\gamma] \tag{15}$$

in zone Z_I,

$$D_B^{II}(p_G, p_B) = \frac{2\left(p_G - p_B\right) - \varepsilon e + 2\gamma q}{2\gamma q} \text{ for } p_B \in [p_G, p_G - \varepsilon e + q\gamma]$$

in zone Z_{II} and

$$D_B^{III}(p_G, p_B) = 1 - \frac{\left(p_B - p_G + \varepsilon e\right)^2}{2\gamma q\varepsilon e} \text{ for } p_B \in [p_G - \varepsilon e, p_G] \tag{16}$$

in zone Z_{III}, respectively.

Case (iv). In the *misaligned* case with *environmental dominance* (i.e., for $2\gamma q > \varepsilon e > \gamma q$ and $q = q_B - q_G > 0$), firms' demands in zone Z_I e Z_{III} are invariant to the attribute dominance, thus remaining exactly as in (15)-(16) with modified ranges: $p_G \in [p_B - q\gamma, p_B]$ and $p_B \in [p_G, p_G + q\gamma]$ in zone Z_I and $p_G \in [p_B + \varepsilon e - q\gamma, p_B + \varepsilon e]$ and $p_B \in [p_G - \varepsilon e, p_G + q\gamma - \varepsilon e]$ in zone Z_{III}. In contrast, in zone Z_{II} the dominance of goods matters and Firm B's demand is

$$D_B^{II}(p_G, p_B) = \frac{2\left(p_G - p_B\right) + \gamma q}{2\varepsilon e} \text{ for } p_B \in [p_G - \varepsilon e + q\gamma, p_G]. \tag{17}$$

Appendix 2: Proof of Proposition 1

Proposition 1. *Assume first that good attributes are aligned. Thus, (i) under either environmental or hedonic dominance, a Nash interior equilibrium only occurs in Z_I; (ii) under either strong environmental or strong hedonic dominance, an interior Nash equilibrium only occurs in Z_{II}. Finally, (iii) when the good attributes are misaligned, independently of the type of dominance, an interior Nash equilibrium always takes place in Z_{II}.*

Our aim here is to characterize the existence of interior Nash equilibrium prices in all zones Z_j of the unit square, for $j = I, II, III$. To accomplish this task, we use the demands (characterized above in Appendix 1) and derive from the FOCs for a profit maximum of each firm the candidate Nash equilibrium prices and, hence, check whether such prices are actually *feasible*, i.e. if they belong to the price interval specific for the indicated zone. Additionally, in each case we have to check the strict concavity of profits to ensure that also the second-order conditions for a profit maximum hold. We divide the proof in part (i), (ii) and (iii) according to the three statements of the proposition.

(i) Starting with the *aligned* case under *environmental dominance* (i.e. for $q\gamma < e\varepsilon < 2q\gamma$ and $q = q_G - q_B$), firms' prices in zone Z_I belong to the interval $p_G \in [p_B, p_B + q\gamma]$ and $p_B \in [p_G - q\gamma, p_G]$ and the system of FOCs for the two firms yields the following two candidate Nash equilibrium prices:

$$\tilde{p}_G^{Al,I} = \frac{3}{4}\sqrt{2q\gamma e\varepsilon} \text{ and } \quad \tilde{p}_B^{Al,I} = \frac{1}{4}\sqrt{2q\gamma e\varepsilon}. \tag{18}$$

Second order conditions are also satisfied for both firms, since

$$\frac{\partial^2 \pi_B^I(p_G, p_B)}{\partial p_B^2} = -\frac{2p_G - 3p_B}{qe\gamma\varepsilon} < 0 \tag{19}$$

and

$$\frac{\partial^2 \pi_G^I(p_G, p_B)}{\partial p_G^2} = -\frac{3p_G - 2p_B}{qe\gamma\varepsilon} < 0 \tag{20}$$

hold, since from (18) it directly follows that $\tilde{p}_G^{Al,I} > 2\tilde{p}_B^{Al,I}/3$ e $\tilde{p}_B^{Al,I} < 2\tilde{p}_G^{Al,I}/3$. To check that the prices in (18) are the interior Nash equilibrium prices, it remains to verify that they belong to the appropriate price intervals, that here are

$$\tilde{p}_B^{Al,I} + q\gamma > \tilde{p}_G^{Al,I} > \tilde{p}_B^{Al,I} \quad \Rightarrow \quad q\gamma > \tilde{p}_G^{Al,I} - \tilde{p}_B^{Al,I} > 0. \tag{21}$$

Plugging-in (18) into (21), it is obtained that

$$q\gamma > \frac{1}{2}\sqrt{2q\gamma e\varepsilon} > 0, \tag{22}$$

which, after some straightforward manipulation, yields

$$2q\gamma > e\varepsilon > 0,$$

a condition always holding under *environmental dominance*. Thus, this ensures that the candidate equilibrium prices obtained in (18) are actually interior Nash equlibrium prices.

Secondly, consider now the *aligned* case under *hedonic dominance* (i.e. for $2\varepsilon e > q\gamma > \varepsilon e$ and $q = q_G - q_B$). We remind here that in zone Z_I (and Z_{III}) firms' demands are invariant to the type of good *dominance* and, therefore, they are exactly as the demands defined in (6) with price ranges: $p_G \in [p_B, p_B + \varepsilon e]$ and $p_B \in [p_G - \varepsilon e, p_G]$. Thus, also the candidate equilibrium prices obtained from the FOCs are the same as in (18) and the second-order conditions for a maximum similarly hold. Hence, if we exclude the case for $p_G = p_B$, where only one firm (firm G) sells its product, inside the price range of zone Z_I the following condition is needed:

$$\tilde{p}_B^{Al,I} + \ \varepsilon e > \tilde{p}_G^{Al,I} > \tilde{p}_B^{Al,I} \quad \Rightarrow \ \varepsilon e > \tilde{p}_G^{Al,I} - \tilde{p}_B^{Al,I} > 0.$$

which, using the prices in (18) becomes

$$\varepsilon e > \frac{1}{2}\sqrt{2q\gamma e\varepsilon} > 0,$$

which after a few straightforward manipulations yields

$$2\varepsilon e > q\gamma > 0,$$

always holding under *hedonic dominance*. Therefore, also under *aligned attributes* and *hedonic dominance* the prices in (18) are interior Nash equilibrium prices for zone Z_I. This completes the initial part of the proof of (i) stating that under environmental (or hedonic) dominance an interior Nash equilibrium can occur in Z_I.

We now complete the proof of point (i) of Proposition 1 by showing that in *aligned* case with either *environmental* or *hedonic dominance* a Nash equilibrium never occurs in zones Z_{II} and Z_{III}.

The price range of zone Z_{II} for the *aligned* case with *environmental dominance* ($2\gamma q > \varepsilon e > \gamma q$ and $q = q_G - q_B$) is $p_G \in [p_B + q\gamma, p_B + \varepsilon e]$ and $p_B \in [p_G - \varepsilon e, p_G - q\gamma]$ and the candidate Nash equilibrium prices obtained from the FOCs are, therefore:

$$\tilde{p}_G^{Al,II} = \frac{1}{6}\left(4e\varepsilon + q\gamma\right) \ \text{and} \ \tilde{p}_B^{Al,II} = \frac{1}{6}\left(2e\varepsilon - q\gamma\right). \tag{23}$$

Second order conditions are satisfied for both firms, since

$$\frac{\partial^2 \pi_B^{II}(p_G, p_B)}{\partial p_B^2} = \frac{\partial^2 \pi_G^{II}(p_G, p_B)}{\partial p_G^2} = -\frac{2}{e\varepsilon} < 0.$$

To check whether the prices in (23) are an interior Nash equilibrium, we have to verify whether they belong to the appropriate price interval, which for Z_{II} is

$$\tilde{p}_B^{Al,II} + \varepsilon e > \tilde{p}_G^{Al,II} > \tilde{p}_B^{Al,II} + q\gamma \;\Rightarrow \varepsilon e > \tilde{p}_G^{Al,II} - \tilde{p}_B^{Al,II} > q\gamma. \tag{24}$$

Plugging-in (23) into (24), we obtain:

$$\varepsilon e > \frac{1}{3}\left(e\varepsilon + q\gamma\right) > q\gamma, \tag{25}$$

which violates *environmental dominance*. Therefore, this fact proves that a Nash equilibrium price can never occur under *aligned attributes* and *environmental dominance*. In particular, the required condition in (25) is $e\varepsilon > 2q\gamma$, which is respected only under *strong environmental dominance*, a fact that will be used for the proof of point (ii) of Proposition 1 below. We now turn to the price range for Z_{II} in the *aligned* case with *hedonic dominance* (i.e. for $2e\varepsilon > q\gamma > e\varepsilon$ and $q = q_G - q_B$), with price range $p_G \in [p_B + \varepsilon e, p_B + q\gamma]$ and $p_B \in [p_G - q\gamma, p_G - e\varepsilon]$. Here the obtained candidate Nash equilibrium prices are:

$$\tilde{p}_G^{Al,II} = \frac{1}{6}\left(4q\gamma + e\varepsilon\right) \;\text{ and }\; \tilde{p}_B^{Al,II} = \frac{1}{6}\left(2q\gamma - e\varepsilon\right). \tag{26}$$

Second order conditions are satisfied for both firms, since

$$\frac{\partial^2 \pi_B^I(p_G, p_B)}{\partial p_B^2} = \frac{\partial^2 \pi_G\left(p_G, p_B\right)}{\partial p_G^2} = -\frac{2}{q\gamma} < 0.$$

To check whether the prices in (26) are an interior Nash equilibrium, we have now to verify whether they belong to the appropriate price interval, which for this case is

$$\tilde{p}_B^{Al,II} + q\gamma > \tilde{p}_G^{Al,II} > \tilde{p}_B^{Al,II} + \varepsilon e \;\Rightarrow\; q\gamma > \tilde{p}_G^{Al,II} - \tilde{p}_B^{Al,II} > \varepsilon e. \tag{27}$$

Plugging-in (26) into (27), we obtain

$$q\gamma > \frac{1}{3}\left(e\varepsilon + q\gamma\right) > \varepsilon e. \tag{28}$$

that, however, violates *hedonic dominance*. Hence, also in this case a Nash equilibrium price can never occurs under *hedonic dominance*. In particular, the condition in (28) requires $q\gamma > 2\varepsilon e$, namely a *strong hedonic dominance*, a fact that, again, will be used in point (ii) of this proof.

We now conclude point (i) of Proposition 1 by checking the case of zone Z_{III}. In the *aligned* case under *environmental dominance* (i.e. for $2\gamma q > \varepsilon e > \gamma q$ and $q = q_G - q_B$), the price interval of zone Z_{III} is $p_G \in [p_B + \varepsilon e, p_B + q\gamma + \varepsilon e]$ and $p_B \in [p_G - q\gamma - \varepsilon e, p_G - \varepsilon e]$. In this case the FOCs for a profit maximum of both firms yield the following two candidate Nash equilibrium prices:

$$\tilde{p}_G^{Al,III} = \frac{1}{8}\left(\sqrt{e^2\varepsilon^2 + q^2\gamma^2 + 10q\gamma\varepsilon e} + e\varepsilon + q\gamma\right), \tag{29}$$

$$\tilde{p}_B^{Al,III} = \frac{1}{8}\left(3\sqrt{e^2\varepsilon^2 + q^2\gamma^2 + 10q\gamma e\varepsilon} - 5\left(\varepsilon e + q\gamma\right)\right). \tag{30}$$

Second order conditions are satisfied for both firms, since

$$\frac{\partial^2 \pi_B^{III}(p_G, p_B)}{\partial p_B^2} = \frac{2p_G - 3p_B - 2(e\varepsilon + q\gamma)}{\varepsilon e q\gamma} < 0$$
$$\frac{\partial^2 \pi_G^{III}(p_G, p_B)}{\partial p_G^2} = \frac{3p_G - 2p_B - 2(e\varepsilon + q\gamma)}{\varepsilon e q\gamma} < 0,$$

hold for $\tilde{p}_G^{Al,III} < \left(2\tilde{p}_B^{Al,III} + 2(e\varepsilon + q\gamma)\right)/3$ and $\tilde{p}_B^{Al,III} > \left(2\tilde{p}_G^{Al,III} - 2(e\varepsilon + q\gamma)\right)/3$ which, using (29) and (30) are always satisfied. To check whether these prices constitute an interior Nash equilibrium, we can again verify whether they are feasible in the appropriate price intervals of zone Z_{III}:

$$\tilde{p}_B^{Al,III} + q\gamma + \varepsilon e > \tilde{p}_G^{Al,III} > \tilde{p}_B^{Al,III} + \varepsilon e \;\Rightarrow\; \gamma q + \varepsilon e > \tilde{p}_G^{Al,III} - \tilde{p}_B^{Al,III} > \varepsilon e. \tag{31}$$

Thus, plugging-in (29)-(30) into (31), we obtain

$$\gamma q + \varepsilon e > \frac{1}{4}\left(3(\varepsilon e + \gamma q) - \sqrt{\varepsilon^2 e^2 + \gamma^2 q^2 + 10\gamma q \varepsilon e}\right) > \varepsilon e,$$

that, after a few straightforward manipulations of the above right-hand inequality requires $e\varepsilon < (q\gamma)/2$ to hold, a condition violating *environmental dominance*. Therefore, for the case of aligned attribute and *environmental dominance* an interior Nash equilibrium price can never occur in zone Z_{III}.

Finally, under aligned attributes and *hedonic dominance* (i.e. for $2\varepsilon e > q\gamma > \varepsilon e$ and $q = q_G - q_B$) the candidate Nash equilibrium prices in zone Z_{III} are the same as in (29)-(30) although in a different price range, i.e, $p_G \in [p_B + q\gamma, p_B + q\gamma + \varepsilon e]$ and $p_B \in [p_G - q\gamma - e\varepsilon, p_G - q\gamma]$. We have to verify that the candidate Nash equilibrium prices belong to the intervals

$$\tilde{p}_B^{Al,III} + q\gamma + \varepsilon e > \tilde{p}_G^{Al,III} > \tilde{p}_B^{Al,III} + q\gamma \;\Rightarrow\; \gamma q + \varepsilon e > \tilde{p}_G^{Al,III} - \tilde{p}_B^{Al,III} > \gamma q, \tag{32}$$

that, plugging-in (29)-(30) into (32), yields

$$\gamma q + \varepsilon e > \frac{1}{4}\left(3(\varepsilon e + \gamma q) - \sqrt{\varepsilon^2 e^2 + \gamma^2 q^2 + 10\gamma q \varepsilon e}\right) > \gamma q,$$

which requires $e\varepsilon > 2q\gamma$ to hold, a condition never occuring under *hedonic dominance*. Thus, also in the case of aligned attributes and *hedonic dominance* a Nash equilibrium price can never occurs in zone Z_{III}. This completes the proof of statement (i) of Proposition 1.

(ii) So far we have proved that, under *aligned attributes* an interior equilibrium in zone Z_I can only occur under *environmental or hedonic dominance*, therefore excluding that in this zone an interior Nash equilibrium can take place under *strong environmental* (or *strong hedonic dominance*). In contrast, we proved above that in zone Z_{II} an interior Nash equilibrium can only occur under *strong environmental* (or *hedonic*) *dominance*. We finally proved that an interior Nash equilibrium in zone Z_{III} is not compatible with any type of *dominance* (included the strong one). All together, this completes the proof of point (ii).

(iii) Repeating now the procedure followed above for the case of aligned attributes, we consider now the case of *misaligned attributes*. We begin with the *misaligned* case under *hedonic dominance* (i.e. for $2\varepsilon e > q\gamma > \varepsilon e$ and $q = q_B - q_G > 0$), reminding that in this case the price range for zone Z_I is given by $p_G \in [p_B - q\gamma, p_B - q\gamma + e\varepsilon]$ and $p_B \in [p_G - e\varepsilon + q\gamma, p_G + q\gamma]$, respectively. In such a case the following two candidate Nash equilibrium prices arise:

$$\tilde{p}_G^{Ml,I} = \frac{1}{8}\left(3\sqrt{q^2\gamma^2 + 8q\gamma e\varepsilon} - 5q\gamma\right) \text{ and } \tilde{p}_B^{Ml,I} = \frac{1}{8}\left(\sqrt{q^2\gamma^2 + 8q\gamma e\varepsilon} + q\gamma\right). \tag{33}$$

Second-order conditions hold, since

$$\frac{\partial^2 \pi_G^I(p_G, p_B)}{\partial p_G^2} = -\frac{2q\gamma - (2p_B - 3p_G)}{\varepsilon\gamma q e} < 0$$

and

$$\frac{\partial^2 \pi_B^I(p_G, p_B)}{\partial p_B^2} = -\frac{2p_G - 3p_B + 2q\gamma}{\varepsilon\gamma q e} < 0,$$

which, by (33) are respected for $\tilde{p}_G^{Ml,I} > 2(\tilde{p}_B^{Ml,I} - q\gamma)/3$ and $\tilde{p}_B^{Ml,I} < 2(\tilde{p}_G^{Ml,I} + q\gamma)/3$. Thus, for the equilibrium prices to belong to Z_I, we need that

$$\tilde{p}_B^{Ml,I} + e\varepsilon - q\gamma > \tilde{p}_G^{Ml,I} > \tilde{p}_B^{Ml,I} - q\gamma \quad \Rightarrow e\varepsilon - q\gamma > \tilde{p}_G^{Ml,I} - \tilde{p}_B^{Ml,I} > -q\gamma.$$

which using (33) becomes

$$e\varepsilon - q\gamma > \frac{1}{4}\left(\sqrt{q^2\gamma^2 + 8q\gamma e\varepsilon} - 3q\gamma\right) > -q\gamma. \tag{34}$$

Notice that the left-hand side inequality of (34) holds if and only if $e\varepsilon > q\gamma$, which contradicts the definition of *hedonic dominance*. Therefore, under *misaligned attributes* and *hedonic dominance*, an interior Nash equilibrium can never occur in zone Z_I.

Now, for the *misaligned* case under *environmental dominance* (i.e. for $2\gamma q > \varepsilon e > \gamma q$ and $q = q_B - q_G > 0$), the demands and prices in equilibrium are exactly as before, although in the price ranges: $p_G \in [p_B - q\gamma, p_B]$ and $p_B \in [p_G, p_G + q\gamma]$. Thus, for this case, the candidate Nash equilibrium prices (33) respect the price range of Z_I for

$$\tilde{p}_B^{Ml,I} > \tilde{p}_G^{Ml,I} > \tilde{p}_B^{Ml,I} - q\gamma \ \Rightarrow 0 > \tilde{p}_G^{Ml,I} - \tilde{p}_B^{Ml,I} > -q\gamma,$$

which using (33) becomes

$$0 > \frac{1}{4}\left(\sqrt{q^2\gamma^2 + 8q\gamma e\varepsilon} - 3q\gamma\right) > -q\gamma.$$

which, again, is never satisfied since $0 > \tilde{p}_G^{Ml,I} - \tilde{p}_B^{Ml,I}$ needs $e\varepsilon < q\gamma$ that, in turn, contradicts *environmental dominance*. Therefore, prices in (33) cannot be interior Nash equilibrium prices.

We move now to zone Z_{II} for the *misaligned* case under *hedonic dominance* (i.e. for $2\varepsilon e > q\gamma > \varepsilon e$ and $q = q_B - q_G > 0$) where the price range is $p_G \in [p_B - q\gamma + e\varepsilon, p_B]$ and $p_B \in [p_G, p_G - e\varepsilon + q\gamma]$, and the candidate Nash equilibrium prices are:

$$\tilde{p}_G^{Ml,II} = \frac{1}{6}(2\gamma q + \varepsilon e) \text{ and } \tilde{p}_B^{Ml,II} = \frac{1}{6}(4\gamma q - \varepsilon e). \tag{35}$$

Second-order conditions are always satisfied for both firms, since

$$\frac{\partial^2 \pi_B^{Ml,II}(p_G, p_B)}{\partial p_B^2} = \frac{\partial^2 \pi_G^{Ml,II}(p_G, p_B)}{\partial p_G^2} = -\frac{2}{q\gamma} < 0.$$

To check whether the prices in (32) are an interior Nash equilibrium prices, we now have to verify whether they belong to the appropriate price interval, which for Z_{II} is

$$\tilde{p}_B^{Ml,II} > \tilde{p}_G^{Ml,II} > \tilde{p}_B^{Ml,II} + \varepsilon e - q\gamma \Rightarrow 0 > \tilde{p}_G^{Ml,II} - \tilde{p}_B^{Ml,II} > \varepsilon e - q\gamma. \tag{36}$$

Plugging-in (35) into (36), we obtain:

$$0 > -\frac{1}{3}(q\gamma - \varepsilon e) > e\varepsilon - q\gamma,$$

where the two inequalities above are always verified under $e\varepsilon < q\gamma$, i.e. the condition characterizing *hedonic dominance*. Therefore, this fact proves that an interior Nash equilibrium price can occur in Z_{II} under *misligned attributes* and *hedonic dominance*.

We can now consider the *misaligned* case with *environmental dominance* ($2\gamma q > \varepsilon e > \gamma q$ and $q = q_B - q_G$) where the price ranges for zone Z_{II} are $p_G \in [p_B, p_B + \varepsilon e - q\gamma]$ and $p_B \in [p_G - \varepsilon e + q\gamma, p_G]$ and the candidate equilibrium prices are:

$$\tilde{p}_G^{Ml,II} = \frac{1}{6}(4e\varepsilon - q\gamma) \text{ and } \tilde{p}_B^{Ml,II} = \frac{1}{6}(2e\varepsilon + q\gamma). \tag{37}$$

Second-order conditions are always satisfied for both firms, since

$$\frac{\partial^2 \pi_B^{Ml,II}(p_G, p_B)}{\partial p_B^2} = \frac{\partial^2 \pi_G^{Ml,II}(p_G, p_B)}{\partial p_G^2} = -\frac{2}{e\varepsilon} < 0.$$

To check whether the prices in (37) are interior Nash equilibrium, we have to verify whether they belong to the appropriate price interval, which for Z_{II} is

$$\tilde{p}_B^{Ml,II} + \varepsilon e - q\gamma > \tilde{p}_G^{Ml,II} > \tilde{p}_B^{Ml,II} \Rightarrow e\varepsilon - q\gamma > \tilde{p}_G^{Ml,II} - \tilde{p}_B^{Ml,II} > 0. \tag{38}$$

Plugging-in (37) into (38), we obtain:

$$e\varepsilon - q\gamma > \frac{1}{3}(e\varepsilon - q\gamma) > 0,$$

where the two inequalities above are always verified under $e\varepsilon > q\gamma$, i.e. the condition of *environmental dominance*. Therefore, this fact proves that an interior Nash equilibrium price can occur under *misaligned attributes* and *environmental dominance* in Z_{II}.

To conclude the proof of point (iii), we consider the case of misaligned attributes and *hedonic dominance* (i.e. for $2\varepsilon e > q\gamma > \varepsilon e$ and $q = q_B - q_G > 0$) for the zone Z_{III}. The price intervals of zone Z_{III} is $p_G \in [p_B, p_B + e\varepsilon]$ and $p_B \in [p_G - e\varepsilon, p_G]$ and the candidate Nash equilibrium prices are:

$$\tilde{p}_G^{Ml,III} = \frac{1}{8}\left(4\sqrt{e\varepsilon\left(\frac{1}{16}(e\varepsilon + 8q\gamma)\right)} + e\varepsilon\right), \tag{39}$$

and

$$\tilde{p}_B^{Ml,III} = \frac{1}{8}\left(12\sqrt{e\varepsilon\left(\frac{1}{16}(e\varepsilon + 8q\gamma)\right)} - 5e\varepsilon\right). \tag{40}$$

Second-order conditions are satisfied for both firms also in this case, since

$$\frac{\partial^2 \pi_B^{Ml,III}(p_G, p_B)}{\partial p_B^2} = -\frac{3p_B - 2p_G + 2e\varepsilon}{\varepsilon e q\gamma} < 0 \text{ and } \frac{\partial^2 \pi_G^{Ml,III}(p_G, p_B)}{\partial p_G^2} = -\frac{2p_B - 3p_G + 2e\varepsilon}{\varepsilon e q\gamma} < 0,$$

which both holds for $\tilde{p}_G^{Ml,III} < \left(2(\tilde{p}_B^{Ml,III} + e\varepsilon)\right)/3$ and $\tilde{p}_B^{Ml,III} > \left(2(\tilde{p}_G^{Ml,III} - e\varepsilon)\right)/3$ that, using (39)-(40) are always satisfied. To check whether these prices are an interior Nash equilibrium, we can again verify whether they are compatible with the appropriate price intervals of zone Z_{III}, i.e:

$$\tilde{p}_B^{Ml,III} + \varepsilon e > \tilde{p}_G^{Ml,III} > \tilde{p}_B^{Ml,III} \Rightarrow \varepsilon e > \tilde{p}_G^{Ml,III} - \tilde{p}_B^{Ml,III} > 0. \tag{41}$$

Plugging-in (39)-(40) into (41) yields:

$$\varepsilon e > \frac{1}{4}\left(3\varepsilon e - 4\sqrt{\varepsilon e\left(\frac{1}{16}(\varepsilon e + 8\gamma q)\right)}\right) > 0,$$

that, after a few straightforward manipulations of the right-hand inequality above implies $\varepsilon e > \gamma q$, a condition violating *hedonic dominance*. Therefore, in the case of mialigned attribute and *hedonic dominance* a Nash equilibrium price can never occur in zone Z_{III}.

Finally in the case of misaligned attributes and *environmental dominance* ($2\gamma q > \varepsilon e > \gamma q$ and $q = q_B - q_G$) for zone Z_{III}, the price ranges are $p_G \in [p_B + \varepsilon e - q\gamma, p_B + \varepsilon e]$ and $p_B \in [p_G - \varepsilon e, p_G + q\gamma - \varepsilon e]$. Since in zone Z_{III} the candidate equilibrium prices are the same as under *hedonic dominance*, we only need to check that:

$$\tilde{p}_B^{Ml,III} + \varepsilon e > \tilde{p}_G^{Ml,III} > \tilde{p}_B^{Ml,III} + \varepsilon e - \gamma q \Rightarrow \varepsilon e > \tilde{p}_G^{Ml,III} - \tilde{p}_B^{Ml,III} > \varepsilon e - \gamma q, \tag{42}$$

Plugging-in (39)-(40) into (42), we obtain

$$\varepsilon e > \frac{1}{4}\left(3\varepsilon e - 4\sqrt{\varepsilon e\left(\frac{1}{16}\left(\varepsilon e + 8\gamma q\right)\right)}\right) > \varepsilon e - \gamma q,$$

which, again, requires $\gamma q > \varepsilon e$ to hold, a condition violating *environmental dominance*. This completes the proof of statement (iii) of Proposition 1 and, therefore, the whole proof.

Appendix 3: Welfare Analysis under Aligned Attributes

In this appendix we prove the following proposition:

Proposition 5. *Assume that good attributes are aligned. Thus, (i) a not too strong (resp. too weak) increase of anti-consumerism rises (resp. reduces) consumers' surplus and always reduces social welfare, regardless of the magnitude of the increase. Moreover, (ii) an increase of the environmentalism always decreases both consumers' surplus and social welfare.*

We remind here that under *aligned attributes* (for $q = q_G - q_B$) and *strong environmental dominance* ($\varepsilon e > 2q\gamma$), i.e. the polar case that we consider, according to Proposition 1 the interior Nash equilibrium prices are:

$$\tilde{p}_G^{Al,II} = \frac{1}{6}\left(4\varepsilon e + \gamma q\right) \text{ and } \tilde{p}_B^{Al,II} = \frac{1}{6}\left(2\varepsilon e - \gamma q\right).$$

(i) To analyse the effect of a rise of anti-consumerism (that is, a decrease in γ), we keep constant the level of environmentalism at the status quo $\bar{\varepsilon}$ and we consider the effect of a variation of γ on the consumers' surplus and social welfare when consumers have preferences evaluated at the *status quo*, as in (12).

Therefore, prices are

$$\tilde{p}_G^{Al,II} = \frac{1}{6}\left(4\bar{\varepsilon} e + \gamma q\right) \text{ and } \tilde{p}_B^{Al,II} = \frac{1}{6}\left(2\bar{\varepsilon} e - \gamma q\right), \tag{43}$$

and the indifference line is

$$\theta_\varepsilon(\theta_\gamma) = \frac{\tilde{p}_G^{Al,II} - \tilde{p}_B^{Al,II}}{\bar{\varepsilon} e} - \frac{\gamma\left(q_G - q_B\right)}{\bar{\varepsilon} e}\theta_\gamma.$$

We highlight here that since consumers are uniformly heterogenous along two dimensions (i.e. their willingness to pay for the hedonic and environmental qualities $(\theta_\gamma, \theta_\varepsilon)$) to compute the consumers surplus requires a double integral whose extremes depend on the alignment of the goods attributes. In the case of *aligned attributes*, plugging-in (43) into the consumers' surplus as defined in (13), the effect of a change of anti-consumerism on consumer surplus yields the following expression:

$$\frac{\partial W^C}{\partial \gamma}=\frac{\partial\left(\int_0^1\left(\int_0^{\theta_\varepsilon(\theta_\gamma)}\left(\bar{U}_B\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma+\int_0^1\left(\int_{\theta_\varepsilon(\theta_\gamma)}^1\left(\bar{U}_G\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma\right)}{\partial\gamma}=-\frac{q\left(3\bar{\varepsilon}+q\left(4\gamma-3\bar{\gamma}\right)\right)}{18e\bar{\varepsilon}}$$

and, thus, a rise of anti-consumerism (represented by a reduction of γ) has the following sign

$$-\frac{\partial W^C}{\partial\gamma}=\frac{q\left(3\bar{\varepsilon}+q\left(4\gamma-3\bar{\gamma}\right)\right)}{18e\bar{\varepsilon}}\gtreqless 0,$$

which holds if and only if

$$\gamma\gtreqless\frac{3}{4}\bar{\gamma}-\frac{\bar{\varepsilon}}{4}\frac{e}{q}. \tag{44}$$

As it appears from (44), the final effect of a reduction of γ on consumer surplus (evaluated at the *status quo* preferences) depends on the strenght of the reduction with respect to the initial level of anti-consumerism of society (i.e. $\bar{\gamma}$). More specifically, when the anti-consumerism rises sufficiently and, thus, γ is sufficiently smaller than $\bar{\gamma}$, its impact on the consumers' surplus is negative. Vice versa, if the increase of anti-consumerism is moderate (and, then, γ is not much smaller than $\bar{\gamma}$), the impact on consumer surplus is positive.

We now turn to the effect of anti-consumerism on social welfare. Plugging (43) into social welfare defined in (14), the effect of a change of anti-consumerism on social welfare yields the following:

$$\frac{\partial SW}{\partial \gamma}=\frac{\partial\left(\int_0^1\left(\int_0^{\theta_\varepsilon(\theta_\gamma)}\left(\bar{U}_B+p_B\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma+\int_0^1\left(\int_{\theta_\varepsilon(\theta_\gamma)}^1\left(\bar{U}_G+p_G\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma\right)}{\partial\gamma}=-\frac{q\left(q\left(2\gamma-3\bar{\gamma}\right)-\bar{\varepsilon}e\right)}{18e\bar{\varepsilon}}$$

and, hence,

$$-\frac{\partial SW}{\partial\gamma}=\frac{q\left(q\left(2\gamma-3\bar{\gamma}\right)-\bar{\varepsilon}e\right)}{18e\bar{\varepsilon}}<0,$$

since, by definition anti-consumerism is rising, namely $\gamma<\bar{\gamma}$.

(ii) In the same vein of point (i) above, in order to analyse the effect of a rise in environmentalism (that is, an increase in ε), we keep constant the level of anti-consumerism at the status quo $\overline{\gamma}$ and we consider the effect of a variation of ε on consumer surplus and social welfare when consumers have preferences evaluated at the status quo as in (12). In this case prices becomes

$$\tilde{p}_G^{Al,II}=\frac{1}{6}\left(4\varepsilon e+\bar{\gamma}q\right)\ \text{and}\ \tilde{p}_B^{Al,II}=\frac{1}{6}\left(2\varepsilon e-\bar{\gamma}q\right), \tag{45}$$

and the indifference line is

$$\theta_\varepsilon(\theta_\gamma)=\frac{\tilde{p}_G^{Al,II}-\tilde{p}_B^{Al,II}}{\varepsilon e}-\frac{\bar{\gamma}\left(q_G-q_B\right)}{\varepsilon e}\theta_\gamma.$$

Plugging-in (45) into consumer surplus as defined in (13), the effect of a change of anti-consumerism on consumer surplus can be computed as

$$\frac{\partial W^C}{d\varepsilon}=\frac{\partial\left(\int\limits_0^1\left(\int\limits_0^{\theta_\varepsilon(\theta_\gamma)}\left(\bar{U}_B\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma+\int\limits_0^1\left(\int\limits_{\theta_\varepsilon(\theta_\gamma)}^1\left(\bar{U}_G\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma\right)}{\partial\varepsilon}=\frac{-\bar{\varepsilon}\bar{\gamma}q\varepsilon e-10\varepsilon^3e^2-2\bar{\gamma}^2q^2\left(\varepsilon-\bar{\varepsilon}\right)}{18e\varepsilon^3}<0,$$

as, by definition, $\varepsilon>\bar{\varepsilon}$.

We now turn to the effect of the environmentalism on social welfare. This is

$$\frac{dSW}{d\varepsilon}=\frac{d\left(\int\limits_0^1\left(\int\limits_0^{\theta_\varepsilon(\theta_\gamma)}\left(\bar{U}_B+p_B\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma+\int\limits_0^1\left(\int\limits_{\theta_\varepsilon(\theta_\gamma)}^1\left(\bar{U}_G+p_G\right)\mathrm{d}\theta_\varepsilon\right)\mathrm{d}\theta_\gamma\right)}{d\varepsilon}=\frac{\left(-\bar{\gamma}q\left(3\varepsilon-2\bar{\varepsilon}\right)-\varepsilon\bar{\varepsilon}e\right)q\bar{\gamma}}{18e\varepsilon^3}<0$$

since, again, $\varepsilon>\bar{\varepsilon}$.

Appendix 4: Welfare Analysis under Misaligned Attributes

In this appendix we prove the following proposition:

Proposition 6. *Assume that good attributes are* misaligned*. Thus, (i) a not too strong (resp. too weak) increase of anti-consumerism causes a rise (resp. a reduction) of consumers' surplus and social welfare. Similarly (ii) a not too strong (resp. too weak) increase of environmentalism causes a rise (resp. a fall) of both consumers' surplus and social welfare.*

In the case of *misaligned attributes* (where now $q=q_B-q_G$) and *hedonic dominance* ($q\gamma>\varepsilon e$), i.e. the opposite polar case we are considering, following Proposition 1 the Nash equilibrium prices are:

$$\tilde{p}_G^{Ml,II}=\frac{1}{6}\left(2\gamma q+\varepsilon e\right),\text{ and }\tilde{p}_B^{Ml,II}=\frac{1}{6}\left(4\gamma q-\varepsilon e\right).$$

(i) To analyse the effect of an increase of anti-consumerism (i.e. a decrease in γ), we keep constant the level of environmentalism at the status quo $\bar{\varepsilon}$ and consider the effect of a variation of γ on consumers' surplus and social welfare when consumers' preferences are evaluated at the status quo as in (12).

Therefore, prices are

$$\tilde{p}_G^{Ml,II}=\frac{1}{6}\left(2\gamma q+\bar{\varepsilon}e\right)\text{ and }\tilde{p}_B^{Ml,II}=\frac{1}{6}\left(4\gamma q-\bar{\varepsilon}e\right).\tag{46}$$

and the indifference line can be expressed this time as

$$\theta_\gamma(\theta_\varepsilon)=\frac{\tilde{p}_G^{Ml,II}-\tilde{p}_B^{Ml,II}}{\gamma q}+\frac{\bar{\varepsilon}e}{\gamma q}\theta_\varepsilon.$$

In the case of misaligned attributes, plugging-in (46) into consumers' surplus, the effect of a change of anti-consumerism on consumer surplus yields:

$$\frac{\partial W^C}{\partial \gamma}=\frac{\partial\left(\int\limits_0^1\left(\int\limits_{\theta_\gamma(\theta_\varepsilon)}^1\left(\bar{U}_B\right)\mathrm{d}\theta_\gamma\right)\mathrm{d}\theta_\varepsilon+\int\limits_0^1\left(\int\limits_0^{\theta_\gamma(\theta_\varepsilon)}\left(\bar{U}_G\right)\mathrm{d}\theta_\gamma\right)\mathrm{d}\theta_\varepsilon\right)}{\partial\gamma}=-\frac{5}{9}q+\frac{\bar{\varepsilon}^2e^2\left(\bar{\gamma}-\gamma\right)}{9\gamma^3q}+\bar{\gamma}\bar{\varepsilon}\frac{e}{18\gamma^2}$$

and therefore, after straightforward manipulations, it is obtained that

$$-\frac{\partial W^C}{\partial \gamma}=\frac{5}{9}q-\frac{\bar{\varepsilon}^2e^2\left(\bar{\gamma}-\gamma\right)}{9\gamma^3q}-\bar{\gamma}\bar{\varepsilon}\frac{e}{18\gamma^2}\gtreqless 0$$

which holds if and only if

$$\bar{\gamma}\lesseqgtr 2\gamma\frac{\bar{\varepsilon}^2e^2+5\gamma^2q^2}{\bar{\varepsilon}e\left(\gamma q+2\bar{\varepsilon}e\right)}. \tag{47}$$

Since the right-hand side of inequality (47) above is increasing in γ (and then, decreasing in the strenght of anti-consumerism), when the new level of anti-consumerism is not too high (low) compared to its *status quo* level, the effect of an increase of the anti-consumerism is positive (negative) on the consumers' surplus.

We now turn to the effect of the anti-consumerism on social welfare. This is

$$\frac{\partial SW}{\partial \gamma}=\frac{\partial\left(\int\limits_0^1\left(\int\limits_{\theta_\gamma(\theta_\varepsilon)}^1\left(\bar{U}_B+p_B\right)\mathrm{d}\theta_\gamma\right)\mathrm{d}\theta_\varepsilon+\int\limits_0^1\left(\int\limits_0^{\theta_\gamma(\theta_\varepsilon)}\left(\bar{U}_G+p_G\right)\mathrm{d}\theta_\gamma\right)\mathrm{d}\theta_\varepsilon\right)}{\partial\gamma}=-\frac{\bar{\varepsilon}e\left(\bar{\varepsilon}e\left(3\gamma-2\bar{\gamma}\right)-\bar{\gamma}\gamma q\right)}{18\gamma^3q}$$

and therefore,

$$-\frac{dSW}{d\gamma}=\frac{\bar{\varepsilon}e\left(\bar{\varepsilon}e\left(3\gamma-2\bar{\gamma}\right)-\bar{\gamma}\gamma q\right)}{18\gamma^3q}\gtrless 0,$$

that, after a few straightforward manipulations implies that the effect of a rise in the anti-consumerism has a positive (or negative) on social welfare if and only if

$$\gamma\gtrless\frac{2\bar{\gamma}\bar{\varepsilon}e}{3\bar{\varepsilon}e-\bar{\gamma}q} \tag{48}$$

which, since the right-hand side is monotonically increasing in $\bar{\gamma}$, (48) holds if and only if the new level of anti-consumerism is not too strong (too weak) compared to its *status quo level.*

(ii) We now consider the effect of environmentalism (that is, an inrease in ε) on the consumers' surplus and social welfare for the case of *misaligned attributes* and *hedonic dominance.* Prices used here are

$$\tilde{p}_G^{Ml,II}=\frac{1}{6}\left(2\bar{\gamma}q+\varepsilon e\right),\ \text{and}\ \tilde{p}_B^{Ml,II}=\frac{1}{6}\left(4\bar{\gamma}q-\varepsilon e\right). \tag{49}$$

and the indifference line is

$$\theta_\gamma(\theta_\varepsilon) = \frac{\tilde{p}_B^{Ml,II} - \tilde{p}_G^{Ml,II}}{\overline{\gamma} q} + \frac{\varepsilon e}{\overline{\gamma} q}\theta_\varepsilon.$$

Plugging-in (49) into the consumers' surplus, the effect of a change of the environmentalism on the consumers' surplus is:

$$\frac{\partial W^C}{\partial \varepsilon} = \frac{\partial \left(\int\limits_0^1 \left(\int\limits_{\theta_\gamma(\theta_\varepsilon)}^1 \left(\bar{U}_B\right) \mathrm{d}\theta_\gamma \right) \mathrm{d}\theta_\varepsilon + \int\limits_0^1 \left(\int\limits_0^{\theta_\gamma(\theta_\varepsilon)} \left(\bar{U}_G\right) \mathrm{d}\theta_\gamma \right) \mathrm{d}\theta_\varepsilon \right)}{\partial \varepsilon} = \frac{e^2 \left(3\bar{\varepsilon} - 4\varepsilon\right) + \bar{\gamma} q e}{18\bar{\gamma} q} \gtreqless 0$$

and, thus, the effect of the environmentalism on the consumers' surplus is positive (negative) if and only if

$$\varepsilon \lesseqgtr \frac{3}{4}\bar{\varepsilon} + \frac{\bar{\gamma}}{4}\frac{q}{e}$$

that is, when the new level of environmentalism in the society is not too strong (too weak) compared to its *status quo* level.

Finally, the effect of the environmentalism on social welfare can similarly be computed as

$$\frac{\partial SW}{\partial \varepsilon} = \frac{\partial \left(\int\limits_0^1 \left(\int\limits_{\theta_\gamma(\theta_\varepsilon)}^1 \left(\bar{U}_B + p_B\right) \mathrm{d}\theta_\gamma \right) \mathrm{d}\theta_\varepsilon + \int\limits_0^1 \left(\int\limits_0^{\theta_\gamma(\theta_\varepsilon)} \left(\bar{U}_G + p_G\right) \mathrm{d}\theta_\gamma \right) \mathrm{d}\theta_\varepsilon \right)}{\partial \varepsilon} = \frac{-e^2 \left(2\varepsilon - 3\bar{\varepsilon}\right) - \bar{\gamma} q e}{18\bar{\gamma} q} \gtreqless 0$$

and then the effect of environmentalism on social welfare is positive (negative) if and only if

$$\varepsilon \lesseqgtr \frac{3}{2}\bar{\varepsilon} - \frac{\bar{\gamma} q}{2e}$$

namely when the new level of environmentalism in society is sufficiently low (high) compared to its *status quo* level.