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Essays on Environmentally Friendly Behaviour and Environmental Policy

Luis Alberto Serra Barragán

A thesis submitted in partial fulfillment of the requirements for

the degree of Doctor of Philosophy in Economics

The Department of Economics, The University of Warwick

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Declaration

I declare the following:

The material contained in this thesis is my own work.

The thesis has not been submitted for a degree at any other university.

Abstract

The thesis consists of three chapters of self-contained studies.

In Chapter 1, I examine the decision of individuals to secure the provision of an environmental service under a Psychological Games framework. Since environmental services are considered public goods, there is an ongoing depletion of natural resources. While standard economic theory predicts the introduction of a PES is supposed to correct the associated externality by establishing a market which offers a monetary compensation to owners of vital natural resources as a recognition of their effort in providing the environmental services, this chapter argues such intervention might backfire: a motivation crowding-out arises if individuals believe others reciprocate friendly behaviour solely to receive the monetary compensation, ultimately decreasing total environmental protection. Even if environmental protection does take place, the motivation of individuals to secure the provision of the environmental service becomes commodified by the PES. Finally, awarding the PES only to a subset of individuals will also have negative effects on environmental protection, since those not receiving the PES will not want to do for free something that others are being paid to do. Environmental policy implications of this economic instrument are further discussed.

In Chapter 2, a sample of the World Values Survey dataset is analyzed to show there are substantial behavioural differences between immigrants and native-born regarding pro-environmental action. In particular, while neither native-born nor immigrants are more willing to sacrifice money to save the environment, immigrants actually engage more on activities like choosing products that are better for the environment, recycling, and reducing water consumption. The engagement in pro-environmental behaviour of immigrants is region-specific and depends on their source region. Moreover, such relatively higher actual engagement in environmentally friendly behaviours can be explained by their high socio-economic status and their high education level, i.e. "selective immigration". When the behaviour of immigrants by their length of residence in the host country is analyzed, no differences in pro-environmental attitudes or pro-environmental behaviour are found, a result which suggests they do not develop a "sense of belongingness" to the host country. Finally, in line with the standard finding in the literature of acculturation in environmental behaviour, this chapter finds that immigrants conform through time to some of the pro-environmental actions of native-born.

In Chapter 3, I investigate the indirect effects on norm activation produced by monetary environmental policy instruments which introduce a situational cue that fosters a change of identity among individuals with potential negative consequences on their pro-environmental behaviour. For that purpose, a two-period identity selection model based on self-verification theory is developed. In each period there are two types of selves an individual can adopt: selfish and pro-environmental. The process of identity selection is driven by the desire of individuals to be consistent across the two periods in order to avoid social disapproval due to self-change. Results show that the monetary environmental policy introduces an asymmetry in the identity selection process that produces a failure of norm activation: while selfish agents preserve their selfish identity after the policy is implemented, pro-environmental agents might change their identity despite they experience social disapproval due to a reduction in the cognitive benefits of keeping such identity produced by the monetary component of the policy. Implications for environmental policy design are discussed.

Introduction

The thesis *Essays on Environmentally Friendly Behaviour and Environmental Policy* consists of three self-contained studies. These are (i) Payments for Environmental Services and motivation crowding-out: A Psychological Games approach, (ii) This land is your land, this land is my land: The environmental behaviour of native-born and immigrants and (iii) Identity selection and the activation of pro-environmental behaviour. Here, an introduction to each chapter is addressed.

1 Payments for Environmental Services and motivation crowding-out: A Psychological Games approach

Research produced by the Millenium Ecosystem Assessment of the United Nations showed that over the past 55 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history due to fast growing demand for food, fresh water, timber, fibre and fuel.[1]

Since the environmental services that natural resources provide are considered public goods,[2] depletion often occurs because of the difficulty of excluding

[1] http://www.maweb.org/en/index.aspx

[2] Natural ecosystems provide multiple environmental services: consumption goods and production inputs; regulation of climate, and air and water quality; cultural services (e.g. recreation and aesthetic enjoyment); support to other ecosystem services (e.g. soil formation); and provision of a living (e.g. agriculture, fishing, and forestry). Apart from contributing to key sectors in developing countries like tourism, the provision of environmental services improves the resilience of people to natural disasters and health risks, particularly of the poor.

potential users from its benefits. The problem is originated by the individuals' incentives to free ride from the provision activities of others, which is reflected in a straightforward and pessimistic fashion in Hardin's [26] *tragedy of the commons*, Olson's [40] *impossibility of collective action* argument, and the Prisoner's Dilemma.

While some successful cases of independent sustainable management of natural resources have been documented, the problem persists in most parts of the world. Land is usually managed for private benefit and, since the cost of securing the provision of the environmental services falls only on local land managers, it is generally more attractive for them to convert their land into more profitable uses, such as agriculture, rather than maintain it in its natural state.

Economists argue that this externality would be corrected by establishing a market which offers a monetary compensation to owners of vital natural resources as a recognition to their effort in providing an environmental service which generates benefits to other individuals. Such market, denominated Payments for Environmental Services (PES), is regarded as the efficient means to provide environmental services.[3]

However, some researchers have discussed the possibility that the monetary reward can erode culturally-rooted conservation values (Wunder [60]; Kosoy et al [34]; and Vatn [57]), and a few have empirically tested such issue (Reeson and Tisdell [45] and Kerr et al [32]).[4]

While standard economic theory predicts that landowners would react to the monetary payment of the PES scheme by increasing the provision of environmental services, there is substantial evidence from the psychology and economic

[3] A commonly accepted definition of PES is found in Wunder [60]. PES are: i) a voluntary transaction in which; ii) a well-defined environmental service (ES) or a land-use likely to secure that service; iii) is being purchased by at least one ES buyer; iv) from at least one ES provider; v) if, and only if, the ES provider ensures the supply of the ES (conditionality).

[4] Cardenas et al [1] and Velez et al [58] have tested motivation crowding-out originated by the introduction of a non-monetary formal regulation in a framed-field common-pool extraction setting.

literature pointing out that this (external) incentive might actually have the opposing effect and undermine the internalized motivation of the landowners to behave in such way.[5] Such phenomenom is known in the literature as *motivation crowding-out*.[6]

Once a PES has been established the following questions arise: Is the motivation of participants to protect the environment undermined by the monetary payment? Even if participants do secure the environmental provision, will they do it because their culturally-rooted values are strengthened by the reward or merely because of the monetary payment?[7] If some potential participants are excluded,[8] will their motivation be undermined once they realize others are paid for doing something they do (i.e. environmental protection) for free?

To address such issues, Chapter 1 sheds light on a mechanism through which a monetary payment negatively affects the motivation of individuals for environmental protection. Moreover, it establishes a set of conditions under which: a) environmental protection takes place because individuals are motivated to reciprocate others' friendly behaviour; b) environmental protection takes place because individuals receive a monetary payment in compensation, but their motivation is undermined; c) environmental protection does not take place even if a payment is offered in return; and d) partial environmental protection might or might not take place if a payment is offered only to a subset of potential

[5] See Chapter 1 for references on such evidence.

[6] The idea of motivation crowding-out was pointed out as early as Titmuss [54], who claimed that paying blood donors deters their social values and reduces their willingness to donate blood. See Chapter 1 for references on further motivation crowding-out literature.

[7] A plausible culturally-rooted value which dictates individuals to preserve the environment is a "sense of belongingness" or "sense of place". If individuals hold an attachment to a particular physical space, they would take the necessary action to preserve it without any external motivation. Would the monetary payment reinforce such positive emotional bond or would it replace it instead? Section 4 in Chapter 1 discusses this issue in more detail.

[8] Some PES-like programmes do not establish a market and they are government managed instead. In such case, a limited budget impedes to include all potential participants. Two examples of PES programmes of this type are *Pago por Servicios Ambientales* (PSA) in Costa Rica and *Pago por Servicios Ambientales Hidrológicos* (PSAH) in Mexico, the two most ambitious PES in Latin America.

participants.

Chapter 1 proposes a Psychological Games approach (Geanakoplos et al [24]) to analyze the consequences of introducing a subsidy to contributions into a *2*-player public good game where the individual preferences about contributions to the public good are assumed to be belief-dependent. Moreover, the model includes two relevant behavioural features widely studied in Economics and Social Psychology: reciprocity and self-sacrifice. With respect to the former, most experimental results coincide that a consistent feature of the individuals' behaviour is conditional cooperation. For that reason, the model assumes individuals are driven by reciprocity and they are able to coordinate efforts to provide the public good.[9] With respect to the latter, reciprocity norms are strengthened by sacrificial behaviour, especially when such sacrifice helps a group of individuals to attain a particular goal.[10] Taken together, these behavioural modifications to the (standard) rational paradigm imply that individuals would be able to provide the public good (i.e. secure the provision of the environmental service) as long as they believe others sacrifice personal gains in favour of a social gain, and when they believe others believe that as well, and when they believe others believe they believe that as well, and so on. Moreover, not only does the inclusion of such behavioural features allow the representation of a variety of public good games outcomes also produced by the rational paradigm and alternative influential economic models (e.g. Fehr and Schmidt [19] and Rabin [43]), but it also facilitates the representation of the motivation crowding-out effect, something those models cannot do.

Most economic models of motivation crowding-out conceive such effect as a

[9]See Chapter 1 for references on experiments which show results on rewarding good behaviour, sanctioning bad behaviour, and reciprocity.

[10]See Chapter 1 for references on empirical evidence that self-sacrifice contributes to the production of norms of reciprocity among individuals, and that it is enhanced when caring for others. See also Chapter 1 for references on evidence that individuals sustain personal costs to serve the mission of a group or an organization.

product of a change in (Frey and Stutzer [23]): individual's preferences; the perceived nature of the performed task; the task environment; or the individual's self-perception. Models related to moral motivation consider that motivation crowding-out occurs when the monetary payment produces a dissonance within the individual's personal norms realm (Brekke et al [12]). Others (Bénabou and Tirole [7]) consider that since individuals do not know their own moral values perfectly and they only learn how "good" they are by observing their own behaviour, monetary payments might make the individuals unsure of why they contributed in the first place; hence, the monetary payment destroys the own-signaling effect of doing good deeds. With respect to the environment, motivation crowding-out has been studied by Ballet et al [4], Grepperud [25], and Nyborg [38] (in the context of the effects of taxation on individual responsibility), Barile et al [5] (in the context of *nudging* vs mandatory policies), Feldman and Perez [20] and Ferrara and Missios [21] (in the context of framing effects on recycling behaviour), and Reeson and Tisdell [45] (in the context of provision of environmental services). However, none of the studies related to the environment have proposed a new analytical framework to understand motivation crowding-out.

Yet, Chapter 1 stresses something not captured in previous models: the crowding-out effect can also be triggered by a change in the individual's perception of others' motivation once the monetary payment is delivered. Such change of beliefs might destroy the underlying contract of mutual acknowledgment between parties about each other's engagement regarding the provision of the environmental service. Moreover, Chapter 1 makes the case that the proposed framework is more suitable to analyze the motivation crowding-out problems posed by PES in the provision of environmental services than any of the aforementioned studies.

Additionally, Chapter 1 studies the impact on the individuals' motivation of non-monetary incentives and a combination of monetary and non-monetary incentives. Finally, it analyzes the policy implications of both types of incentives and provides a discussion which compares the results of the model to those of other motivation crowding-out models and situates its results within a theoretical environmental protective behaviour sphere.

2 This land is my land, this land is your land: The environmental behaviour of native-born and immigrants

Immigrants and problems are words commonly (and unfairly) used in the same sentence by governments, particularly those of developed countries.[11] They are seen as a burden which puts pressure on the job market through wage inequalities and higher unemployment rates. They are feared to have a detrimental effect on the fiscal sustainability of the welfare state. Finally, immigrants are also thought to increase crime rates and have a negative impact on the social cohesion of the host country.[12]

Since the United Nations Conference on Human Environment held in Stockholm in 1972, the environment became a matter of national (and international) concern. Not surprisingly, immigrants were also blamed to contribute to the environmental degradation of the host country.[13] One of the most relevant manifestations of such belief is the debate led by the Sierra Club (the most influential grassroots environmental organization in the U.S.) about the environmental im-

[11] Despite the general aversion to immigration, at least four types of potential gains to the host country are acknowledged (Nannestad [37]): 1) the "immigration surplus", i.e. immigrants could make a society richer; 2) the positive effect on the age distribution of the host society; 3) a "smoothing effect" on the labour market; and 4) the increase in the aggregate demand for domestic goods and services. Borjas [9] also considers that benefits of immigration to native-born result from production complementarities between immigrant workers and other factors of production. Further potential benefits are discussed in Ratha et al [44].

[12] See Chapter 2 for literature which provides evidence that does not support either of such negative impacts of immigration on the host country.

[13] See Chapter 2 for literature which provides evidence that contradicts this perception.

pact that immigrants posed in the U.S. and global ecosystems (Harris [28]). The stance of immigration restriction supporters was that immigrants engage in negative environmental behaviours just like Americans, therefore assuming no immigrant/native-born environmental behaviour differences. If such argument is true, then immigration should be restricted in the U.S. but promoted in countries where the native-born display a strong pro-environmental behaviour. But, do immigrants really have the same environmental behaviour than native-born? Research on the topic is scarce and so far, it has provided mixed results. Moreover, it has focused on the environmental behaviour of native-born and immigrants at state and national levels only.[14]

The results provided by the literature on the environmental behaviour of immigrants and native-born can be accomodated by two competing hypotheses regarding the individuals' environmental attitudes: the New Environmental Paradigm (NEP) proposed by Dunlap and Van Liere [17], and the Post-materialistic hypothesis (PMH). The former proposes that the pro-environmental attitudes of individuals are a global phenomenon. Thus, individuals would hold the same environmental attitudes regardless of their culture, income, and education level attained. The latter claims that individuals develop pro-environmental attitudes once they achieve a standard of living such that they can shift their attention from economic security concerns to quality-of-life issues.

Is the behaviour of immigrants a real threat to the host country's environment? Should immigration policies therefore remain restrictive? Should environmental awareness programmes and environmental policy in general be group-targeted? If there are environmental behavioural differences between native-born and immigrants, do all immigrants display the same behaviour? In order to tackle such questions, Chapter 2 uses a sample of the World Values Sur-

[14] See Chapter 2 for a literature review on the environmental attitudes of immigrants and native-born.

vey dataset to analyze worldwide behavioural differences between immigrants and native-born by looking at the probability of engagement of both groups of individuals across a wide range of pro-environmental behaviours like water consumption reduction, recycling and contributing to environmental organizations, among others. The method used for the analysis consists in a series of ordered probit and probit estimations that analyze each of the environmental behaviour indicators. The proposed model predicts the probability that the individual engages in a specific environmental behaviour considering his immigrant status or his length of residence in the host country (in the case of immigrants). The parameters offered by the estimations would give information about which group holds stronger environmental attitudes, but they will not give information about how much stronger they are. Thus, marginal effects are computed to provide a quantitative measure of environmental behaviour differences between immigrants and native-born.

It is the aim of Chapter 2 to pin down the origin of any behavioural discrepancy encountered. If the NEP holds, immigrants and native-born individuals will show no environmental behavioural differences because environmental concern is a global phenomenon (Yearly [61]; Breching and Kempton [11]; and Dunlap and Van Liere [17]). But if the PMH holds, two possible scenarios can be observed: a) native-born hold stronger environmental attitudes than immigrants insofar as the latter are traditionally a vulnerable and poorer group which come from less developed countries (Inglehart [30]; and Lapham et al [35]); b) immigrants hold stronger environmental attitudes than native-born, thus indicating the presence of "selective immigration" of individuals with relatively high socio-economic status and education levels as well (Kidd and Lee [33]; and Abrahamson [1]), and who have embraced post-materialistic views even prior to their migration.

The PMH, though, is not the only reason why environmental behavioural differences between immigrants and native-born may arise. As Pffefer and Mayone Stycos [42] point out, an alternative explanation to immigrants holding stronger environmental attitudes than native-born might be that environmental problems in their country of origin sensitized them and motivated them to engage in pro-environmental action (Martinez-Alier and Hershberg [36]). Likewise, an alternative explanation to immigrants holding weaker environmental attitudes than native-born is that immigrants lack a "sense of belongingness" or a "sense of place" that would make them feel attached and identified to their physical surroundings.[15] Without that close relationship between immigrants and their place of residence, the need to take pro-environmental actions when required could be absent.

The Sierra Club's assumption of immigrants having the same environmental behaviour as U.S. native-born is closely related to another central theme in the discussion: the effect on such behaviour of their length of residence in the country. This process, denominated as "environmental acculturation" by Padilla [41], helps the immigrants to learn the ways of the dominant culture. Thus, the more time an immigrant spends on the host country, the more likely he is to adhere to the behavioural rules of the native-born.[16]

Since acculturation seems to drive the environmental behaviour of immigrants by their length of residence, Chapter 2 incorporates such feature into the analysis. Furthermore, since it has been acknowledged that environmental behaviour differences among immigrants and native-born might arise because of the presence (or lack) of a "sense of place", the analysis uses an instrument

[15] The first to conceptualize the "sense of place" of individuals was Tuan [55]. He regarded the place as the centre of meaning or field of care which emphasizes human emotions and relationships. The individuals' "sense of place" is the perspective from which individuals position themselves in relation to others to advocate particular standpoints regarding natural resources management (Cantrill and Senecah [14]).

[16] See Chapter 2 for literature on acculturation.

to avoid comparing individuals with heterogenous attachment to their place of residence: the immigrants' offspring. Hence, by comparing the behaviour of native-born to that of "second generation immigrants", it is assured that there will not exist a variation in "sense of place" due to immigrant status, while allowing to isolate the effect of length of residence on their environmental behaviour.

3 Identity selection and the activation of pro-environmental behaviour

Psychologists, sociologists and a growing number of economists have now recognized that worldwide environmental degradation is not merely a by-product of industrial and technological evolution, but behavioural and attitudinal as well. A certain environmentally friendly behaviour might be followed by those individuals who are attached to a specific set of norms. Norms are shared beliefs about how the individuals should act, and they are enforced by the threat of sanctions or the promise of rewards (Schwartz and Howard [47]). Norms can be divided into two groups according to their level of internalisation: *personal* and *social* (Thøgersen [52]).

A personal norm is a self-expectation of specific action in a particular context, commonly experienced as a feeling of moral obligation (Schwartz [46]). Inasmuch as norms are a behavioural guide for individuals, their violation leads to sanctions. When a sanction is executed by the same individual it is said that the norm has been internalised. According to Schwartz [46], and Schwartz and Howard [47], internalised norms are personal norms. Thus, personal norms are followed because of internalised values and conceptions of what is right and wrong.

On the other hand, a social norm is based on a group-expectation where the rewards and punishment are externally enforced. Hence, individuals follow a

social norm on account of (real or imagined) social pressure (Ajzen [2]). Biel and Thøgersen [8] consider that social norms are a reason for departure from rational choice insofar as they prescribe the manifestation of a particular behaviour and the proscription of other in a given context. In that sense, Fehr and Fischbacher [18] explain that, despite little is known about the formation process of social norms, they are greatly driven by non-selfish motives and largely enforced by sanctions.

Norm adhesion is of great relevance to the analysis of pro-environmental behaviour. Bamberg and Schmidt [6], Bratt [10], Harland et al [27] and Thøgersen have documented an important correlation between environmentally responsible behaviour and social and personal norms. While there is research which demonstrates that personal norms often have stronger and more reliable behavioural implications than social norms (Thøgersen [51]), other studies have shown there are cases where this need not be true (Bamberg and Schmidt [6] and Hunecke et al [29]), at least in an indirect way.

It is possible for individuals to display pro-environmental behaviour if norms which prescribe such type of behaviour are somehow activated. In social dilemmas, norm activation depends on personal and situational factors (Biel and Thøgersen [8]). Personal factors are associated to an obligation that lies within the individuals to protect a particular natural resource. The norms activated by these factors are considered to be moral norms that individuals internalise and that have a direct effect on the environment. They determine the environmental responsibility held by individuals through the establishment of environmental values. Conversely, situational factors are associated with norms related to cooperation, or in Kerr's taxonomy (Kerr [31]), general interaction norms that are elicited by the behaviour of others and which have an indirect effect both on other individuals' welfare and on the environment. Situational factors that

affect the activation of norms indirectly encompass the salience of need and actions, benefits and costs, framing effects (e.g. market vs non-market frames), behaviour of others, and communication. These situational factors alter the individuals' perception of fairness and justice, reciprocity and commitment in social dilemmas with consequences on cooperation.

The personal factors refer to the environmental responsibility that arises in individuals from the activation of personal norms. One influential model representing this activation mechanism is Schwartz's Norm Activation Theory (Schwartz [46]). Under such model, a norm is activated when: a) the individual recognizes his private actions have a public good aspect, or in other words, become aware of the consequences of his actions; and b) the individual ascribes personal responsibility for the issue at hand.

Although Schwartz's theory seems to enjoy empirical validation (Van Liere and Dunlap [56], and Stern et al [48]), a group of researchers claim that some environmental policies might actually disrupt such process of norm activation. One plausible mechanism (Bruvoll and Nyborg [13]) occurs when information campaigns seek to increase consumers' voluntary contributions to a public good. Once consumers ascribe responsibility for a certain contribution level, they may experience a *warm glow* of giving and a *cold shiver of not giving enough*. By tightening the norm and thus requiring higher contributions from the individuals, environmental policy will usually increase the *cold shiver*. Another mechanism (Brekke et al [12]) explains that environmentally friendly behaviour may represent a burden, and so duty-oriented individuals (i.e. those who prefer to think of themselves as a responsible person) may consciously or unconsciously avoid settings in which they suspect a heavy burden of responsibility will be lay upon them. Lastly, other mechanism (Nyborg [39]) considers individuals simply do not want to know that contributions to a public good are socially valuable.

Hence, information campaigns which promote environmental responsibility can trigger irksome feelings of cognitive dissonance on individuals, imposing on them an excessive feeling of moral responsibility.

The type of norms activated through situational factors are norms related to cooperation or social norms. Communication, fairness, reciprocity and framing effects have been the drivers of social norms activation which have received most attention by researchers.[17]

Most research focused on social norms activation failure due to a change in the prevailing situational factors is related to the analysis of framing effects. In particular, interest has been drawn to analyze the effects of monetary incentives on the behaviour of individuals in laboratory experiments (Frey and Jegen [22] and Reeson and Tisdell [45]).

Yet, an issue overlooked by the literature of norm activation is that the identity of individuals can also trigger a specific norm of environmental behaviour given that identities describe social roles. An identity is a set of meanings related to the self that functions as a reference that guides behaviour in different contexts (Stets and Biga [49]). An environmental identity prescribes a course of action that is compatible with the individuals' sense of who they are (Clayton and Opotow [16]). Furthermore, Weber et al [59] stress that the identity of the decision maker is a significant factor for cooperation in social interaction scenarios.

Stets and Biga [49] claim that while traditional environmental sociology linked attitude processes to the determination of environmentally responsible behaviour, it is the identity process which influences such type of behaviour. The identity of the individual is also relevant for policy design. An individual's sense of self is linked to his social environment (Akerlof and Kranton [3]), and so it is

[17] See Chapter 3 for references on studies about situational factors which facilitate social norms activation.

reasonable to suspect that by changing situational factors, environmental policy might in turn affect the individuals' sense of who they are. Hence, understanding which identities are salient is important to evaluate how individuals react to a particular threat or distribution of rewards (Clayton and Opotow [16]).

In order to fill the aforementioned gap, Chapter 3 outlines an identity selection model based on Teraji [50] and self-verification theory, and inquires about how identity selection can activate a particular environmentally friendly norm. In a two-period economy, there are two types of selves or identities the individual can adopt: selfish and pro-environmental. In the first period and given a particular self, individuals decide their level of contribution to a public good and obtain material payoffs associated to such contribution. Pro-environmental selves additionally receive cognitive payoffs related to a *warm glow* of giving. In the second period, individuals decide whether to keep their identity. If they keep the same identity their payoffs are materialized and are equivalent to those of period one. But if they change their identity they face a cost of social disapproval. Chapter 3 shows that without any external intervention, individuals prefer to be consistent across the two periods with respect to their identity selection. However, if a monetary environmental policy (a situational factor) is introduced, the identity selection process is affected in an asymmetric fashion: while selfish selves still remain selfish, pro-environmental selves might now change their identity because of a situational factor that no longer allows the activation of the social norm which prescribes a pro-environmental behaviour.

It is worth to notice though, that the issue at hand (i.e. social norms activation failure due to situational factors) should not be confounded with motivation crowding-out. Whilst both can represent cooperation failure in a public good provision setting, and so both can explain why individuals might not display pro-environmental behaviours, motivation crowding-out theory does not seek to

establish the origin of the environmentally friendly inclination of the individual, just the mechanism through which such preference is distorted. In turn, Chapter 3 proposes that the literature has paid no attention to the identity of individuals as a source of pro-environmental behaviour or to environmental policies as key determinants of such source.

The remainder of the thesis consists of three chapters of self-contained studies. Chapter 1: Payments for Environmental Services and motivation crowding-out: A Psychological Games approach, Chapter 2: This land is your land, this land is my land: The environmental behaviour of native-born and immigrants and Chapter 3: Identity selection and the activation of pro-environmental behaviour. Conclusions and implications of each chapter and conclusions of the thesis are addressed in the Conclusion.

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Chapter 1: Payments for Environmental Services and motivation crowding-out: A Psychological Games approach.

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Abstract

Payments for Environmental Services (PES) are widely regarded as the state-of-the-art environmental policy to address the ongoing depletion of natural resources. The rationale is that since the environmental services that natural resources provide are considered public goods, depletion occurs because of the difficulty of excluding potential users from its benefits. Thus, since the cost of securing the provision of the environmental services falls only on local land managers, it is more attractive for them to convert their land into more profitable uses than maintain it in its natural state. PES are supposed to correct this externality by establishing a market which offers a monetary compensation to owners of vital natural resources as a recognition of their effort in providing the environmental services. This chapter argues that even in the absence of PES, individuals can secure the provision of an environmental service by reciprocating friendly behaviour when they believe others are willing to make a personal sacrifice. Yet, the introduction of a PES might backfire: a motivation crowding-out arises if individuals believe others reciprocate friendly behaviour solely to receive the monetary compensation, ultimately decreasing total environmental protection. Even if environmental protection does take place, the motivation of individuals to secure the provision of the environmental service becomes commodified by the PES. Finally, awarding the PES only to a subset of individuals will also have negative effects on environmental protection, since those not receiving the PES will not want to do for free something that others are being paid to do. Environmental policy implications on other economic instruments are further discussed.

"*There are thousands of individual rules that can be used to manage resources. No one, including a scientifically trained professional staff, can do a complete analysis of any particular situation*" E. Ostrom, 2000.

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KEYWORDS: psychological games; crowding-out; reciprocity; public good; payments for environmental services; natural resources management; environmental policy; sense of place.

Introduction

Research produced by the Millenium Ecosystem Assessment of the United Nations showed that over the past 55 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history due to fast growing demand for food, fresh water, timber, fibre and fuel.[1]

Since the environmental services that natural resources provide are considered public goods,[2] depletion often occurs because of the difficulty of excluding potential users from its benefits. The problem is originated by the individuals' incentives to free ride from the provision activities of others, which is reflected in a straightforward and pessimistic fashion in Hardin's [53] *tragedy of the commons*, Olson's [76] *impossibility of collective action* argument, and the Prisoner's Dilemma.

While some successful cases of independent sustainable management of natural resources have been documented, the problem persists in most parts of the world. Land is usually managed for private benefit and, since the cost of securing the provision of the environmental services falls only on local land managers, it is generally more attractive for them to convert their land into more profitable

[1] http://www.maweb.org/en/index.aspx

[2] Natural ecosystems provide multiple environmental services: consumption goods and production inputs; regulation of climate, and air and water quality; cultural services (e.g. recreation and aesthetic enjoyment); support to other ecosystem services (e.g. soil formation); and provision of a living (e.g. agriculture, fishing, and forestry). Apart from contributing to key sectors in developing countries like tourism, the provision of environmental services improves the resilience of people to natural disasters and health risks, particularly of the poor.

uses, such as agriculture, rather than maintain it in its natural state.

Economists argue that this externality would be corrected by establishing a market which offers a monetary compensation to owners of vital natural resources as a recognition of their effort in providing an environmental service which generates benefits to other individuals. Such market, denominated Payments for Environmental Services (PES), is regarded as the efficient means to provide environmental services.[3] However, some researchers have discussed the possibility that the monetary reward can erode culturally-rooted conservation values (Wunder [98]; Kosoy et al [66]; and Vatn [96]), and a few have empirically tested such issue (Reeson and Tisdell [83] and Kerr et al [63]).[4]

While standard economic theory predicts that landowners would react to the monetary payment of the PES scheme by increasing the provision of environmental services, there is substantial evidence from the psychology and economic literature pointing out that this (external) incentive might actually have the opposing effect and undermine the internalized motivation of the landowners to behave in such way.[5] Such phenomenom is known in the literature as *motivation crowding-out*.[6]

[3] A commonly accepted definition of PES is found in Wunder [98]. PES are: i) a voluntary transaction in which; ii) a well-defined environmental service (ES) or a land-use likely to secure that service; iii) is being purchased by at least one ES buyer; iv) from at least one ES provider; v) if, and only if, the ES provider ensures the supply of the ES (conditionality).

[4] Cardenas et al [12] and Velez et al [97] have tested motivation crowding-out originated by the introduction of a non-monetary formal regulation in a framed-field common-pool extraction setting.

[5] In the Psychology literature see Deci and Flaste [20] and Deci et al [21] for a supportive comprehensive summary on the negative effects of external incentives on intrinsic motivation. In the Economics literature see Frey and Jegen [38] for an overview. For survey-based and econometric evidence see Frey and Oberholzer-Gee [40], Frey and Götte [39], Torgler et al [93], Greiner and Gregg [50], and Georgellis et al [44]. For experimental evidence see Gneezy and Rustichini [45] and [46], Irlenbusch and Sliwka [56], Eckel et al [25], Meier [71], Mellstrom and Johannesson [72], Reeson and Tisdell [83], Perino et al [81], d'Adda [17], Bernasconi et al [7], and Goeschl and Perino [47]. In the environmental policy arena see Frey [37] and Frey and Stutzer [41]. Finally, for evidence that do not support motivation crowding-out see Cameron and Pierce [11], Eisenberger et al [26], Thøgersen [90] and Lacetera and Macis [67].

[6] The idea of motivation crowding-out was pointed out as early as Titmuss [92], who claimed that paying blood donors deters their social values and reduces their willingness to donate blood. The present model is closer to cognitive evaluation theory models such as Frey [36] and Bénabou and Tirole [6]. Economic models based on cognitive evaluation theory have generalized the "hidden cost of rewards" and established three main results (Frey and Stutzer

Once a PES is established the following questions arise: is the motivation of participants to protect the environment undermined by the monetary payment? Even if participants do secure the environmental provision, will they do it because their culturally-rooted values are strengthened by the reward or merely because of the monetary payment?[7] If some potential participants are excluded,[8] will their motivation be undermined once they realize others are paid for doing something they do (i.e. environmental protection) for free?

To address such issues, this chapter sheds light on a mechanism through which a monetary payment negatively affects the motivation of individuals for environmental protection. It proposes a Psychological Games approach (Geanakoplos et al [94]) to analyze the consequences of introducing a subsidy (PES) to contributions into a *2*-player public good game where the individual preferences about contributions to the public good (environmental service) are assumed to be belief-dependent. The motivation of individuals to provide the public good is given by a sense of reciprocity[9] and self-sacrifice[10]. Taken together, these behavioural features imply that individuals would be able to

[41]): all external interventions affect intrinsic motivation, not just rewards; such interventions crowd-out individuals' motivation if they are perceived to be controlling, whereas they crowd-in intrinsic motivation if they are perceived to be supporting; lastly, the relative price effect should be considered simultaneously to the motivation crowding-out effect. See Nyborg and Rege [75] for a survey of motivation crowding-out economic models based on: altruism, social norms, fairness, commitment, and cognitive evaluation theory.

[7] A plausible culturally-rooted value which dictates individuals to preserve the environment is a "sense of belongingness" or "sense of place". If individuals hold an attachment to a particular physical space, they would take the necessary action to preserve it without any external motivation. Would the monetary payment reinforce such positive emotional bond or would it replace it instead? Section 4 discusses this issue in more detail.

[8] Some PES-like programmes do not establish a market and they are government managed instead. In such case, a limited budget impedes to include all potential participants. Two examples of PES programmes of this type are *Pago por Servicios Ambientales* (PSA) in Costa Rica and *Pago por Servicios Ambientales Hidrológicos* (PSAH) in Mexico, the two most ambitious PES in Latin America.

[9] See Section 2 for a justification and references.

[10] See Section 2 for a justification and references

provide the public good (i.e. the environmental service) as long as they believe the other sacrifices personal gains in favour of a social gain, and when they believe the other believes that as well, and when they believe the other believes they believe that as well, and so on.

Because of these behavioural features, the approach presented in this chapter is related to the social preferences literature, specifically to models like Fehr and Schmidt (FS) [31], Rabin [82], Dufwenberg and Kirchsteiger [24] (DK) and Falk and Fischbacher [28] (FF). However, it especially shares more similiarities with reciprocity models insofar as the motivation to provide the environmental service is intention-driven like in Rabin [82] and the DK and FF models. It is even closer to the FF model because such motivation is also outcome-dependent. Although most differences betweeen the FF model and the framework provided in this chapter will be addressed in the Discussion, let us state the following: while it is true that the FF model can predict the same outcomes provided by the reciprocity analysis of this chapter, their framework cannot -without any substantial modifications- analyze this chapter's main result: the motivation crowding-out produced by a PES. The reason is that the intention-based reciprocity present in the FF model is not enough to establish the motivation that drives the actions of the individuals (see Stanca et al [89]). Therefore, the novelty of the current approach is that it both predicts the same results provided by stylized facts about linear public goods games, and something social preferences models -in general- and reciprocity models -in particular- cannot: motivation crowding-out.

This chapter's framework is also related to motivation crowding-out models. Most of them conceive such effect as a product of a change in (Frey and Stutzer [41]): individual's preferences; the perceived nature of the performed task; the task environment; or the individual's self-perception. Models related to moral

motivation consider that motivation crowding-out occurs when the monetary payment produces a dissonance within the individual's personal norms realm (Brekke et al [10]). Others (Bénabou and Tirole [6]) consider that since individuals do not know their own moral values perfectly and they only learn how "good" they are by observing their own behaviour, monetary payments might make the individuals unsure of why they contributed in the first place; hence, the monetary payment destroys the own-signaling effect of doing good deeds. With respect to the environment, motivation crowding-out has been studied by Ballet et al [4], Grepperud [51], and Nyborg [74] (in the context of the effects of taxation on individual responsibility), Barile et al [5] (in the context of *nudging* vs mandatory policies), Feldman and Perez [32] and Ferrara and Missios [33] (in the context of framing effects on recycling behaviour), and Reeson and Tisdell [83] (in the context of provision of environmental services). However, none of the studies related to the environment have proposed a new analytical framework to understand motivation crowding-out.

The present chapter proposes a novel application to understand the motivation crowding-out produced by PES. First, the chapter argues that even in the absence of PES, individuals can secure the provision of an environmental service by reciprocating friendly behaviour when they believe others are willing to make a personal sacrifice. Second, the chapter claims that the introduction of a PES might backfire: a motivation crowding-out arises if individuals believe others reciprocate friendly behaviour solely to receive the monetary compensation, ultimately decreasing total environmental protection. Even if environmental protection does take place, the motivation of individuals to secure the provision of the environmental service becomes commodified by the PES. Third, the chapter argues that awarding the PES only to a subset of individuals will also have negative effects on environmental protection, since those not receiving the

PES will not want to do for free something that others are being paid to do. Thus, the chapter proposes something that is not captured in any of the previous models: the crowding-out effect can also be triggered by a change in the individual's perception of others' motivation once the monetary payment is delivered. Such change of beliefs might destroy the underlying contract of mutual acknowledgment between parties about each other's engagement regarding the provision of the environmental service. Finally, this chapter makes the case that the proposed framework is more suitable to analyze the motivation crowding-out problems posed by PES in the provision of environmental services than any of the aforementioned studies.

The plan for the rest of the chapter is the following. The next section explains the reciprocity nature of the motivation of individuals to secure the provision of an environmental service. Section 3 proposes a Psychological Games approach to analyze the consequences of introducing a subsidy to contributions into a public good game, and it elucidates the mechanism through which the motivation of individuals for environmental protection is changed. It further analyzes the impact on such motivation of non-monetary incentives and a combination of monetary and non-monetary incentives. In section 4, policy implications about both types of incentives are presented. Section 5 discusses the results of the chapter. Finally, conclusions and future lines of research are outlined.

2 A plausible motivation to provide an environmental service

As an illustration to the motivation crowding-out problem produced by PES and the mechanism through which it is originated, consider the following situation. Suppose Helen (H) and Nick (N) are neighbours and that they must decide how to allocate their time between two activities. One is a private activity (e.g. reading) and the other is a public activity (e.g. taking care of a common garden that lies within their properties). Both of them have the same amount of time and have the same preferences for reading and for taking care of the garden. If Helen (Nick) chooses to take care of the garden, Nick (Helen) obtains a higher reward from reading, i.e. collaboration is dominated by betrayal, and if Helen (Nick) chooses to read, then choosing to read also gives Nick (Helen) a better reward. The following is a representation of their payoffs:

$_H/^N$	Gardening	Reading
Gardening	4,4	0,5
Reading	5,0	1,1

It is immediate to see that this game is a Prisoner's Dilemma and that although both Helen and Nick would benefit from cooperating to provide the public good, it is in their self-interest to defect. Hence, in the Nash Equilibrium of the game, gardening (i.e. the public good) is not provided.[11]

[11] For a detailed account on public goods provision see Ledyard [68] and Gächter and Herrmann [42].

Robust experimental evidence has shown that such gloomy scenario for Helen and Nick is not inescapable, and also put forward different explanations as for why they might in fact be willing to cooperate to do some gardening.[12]

Most experimental results coincide that a feature that is present in the individuals' behaviour is conditional cooperation. Thus, driven by reciprocity, Helen and Nick could be able to coordinate efforts to do some gardening.[13] Additionally, there is evidence from the Social Psychology literature that reciprocity norms are strengthened by sacrificial behaviour, especially when such sacrifice helps a group of individuals to attain a particular goal.[14]

Consider again Helen and Nick's situation, only this time suppose that the amount of time they would spend gardening does not depend only on the other's decision, but also on their expectation about the other's decision, and on their expectation of the other's expectation about their decision, and so on. In other words, suppose that the benefits that Helen and Nick derive from their decision do not depend only on the amount of time spent on reading or gardening,

[12]Communication as a driver for cooperation is discussed in Isaac and Walker [57], and Ostrom and Walker [79]. The use of selective incentives to promote cooperation has been explored by Ostrom et al [80], Fehr and Gächter [29], and Andreoni et al [3]. Social preferences are modeled in Rabin [82], Fehr and Schmidt [31], Dufwenberg and Kirchsteiger [24], and Falk and Fischbacher [28]. Institutional arrangements are investigated by Ostrom et al [78]. In-group identification is analyzed by Ellemers et al [27], and Hewstone et al [54]. Finally, when social interaction is repeated, credible threats or promises about future behaviour can influence current behaviour. So, according to the *Folk Theorem*, cooperation is attainable if individuals are patient enough. See Dal Bó [18] for experimental evidence on this matter.

[13]In a survey of several one-shot public goods experiments, Dawes and Thaler [19] showed that rewarding good behaviour was contingent on others' behaviour. With respect to the sanctioning of bad behaviour, evidence is provided by Goranson and Berkowitz [48], Greenberg [49], Güth et al [52], Kahneman [60], Kahneman et al [61], Roth et al [84], and Fehr and Gächter [29]. The analysis of reciprocity is found in Sudgen [88], Keser and van Vinden [64], Fischbacher et al [35], Charness and Rabin [13], Croson et al [16], Croson [15], and Fischbacher and Gächter [34].

[14]Evidence that self-sacrifice is enhanced when caring for others is provided by Ames et al [1]. In the context of leadership, De Cremer and van Knippenberg [22] found that individuals sustain personal costs to serve the mission of a group or an organization. Singh and Krishnan [86] found a positive relationship between self-sacrifice and caring for others, and claimed that not only does self-sacrificial behaviour increases contributions to the public good, but it also facilitates in-group cooperation and group belongingness. Furthermore, self-sacrifice contributes to the production of norms of reciprocity among individuals (Choi and Mai-Dalton [14]) and it also builds trust among them (Yukl [99]).

but also on their expectation about the other's decision.[15] As supported by experimental evidence, suppose that motivated by a positive inclination towards reciprocity (and possibly gardening), each player is willing then to sacrifice some payoffs in order to attain a social gain (by increasing the payoffs of the other player). In consequence, the payoffs of players in this game consist in: *material payoffs,* which are suitable to sacrifice and are a product of their time's allocation for reading or gardening; and *psychological payoffs*, which are a product of players' expectations about the sacrifice made by each other. The following is one possible representation of this feature:

$_H/^N$	Gardening	Reading
Gardening	$4+w\,,4+w$	$0+x\,,5+x$
Reading	$5+x\,,0+x$	$1+z\,,1+z$

Where $w > z > 0$, $x < 0$, and $z - x > 1$. Suppose Helen decides to cooperate. Then she makes a sacrifice because she does not select the strategy that maximizes her material payoffs while increasing Nick's. If Helen believes Nick sacrifices, and Nick believes Helen believes he does, then Nick finds fruitful to sacrifice to benefit Helen because she will do the same for him in return. So,

[15] It is fairly reasonable to assume belief-dependent individual preferences about contributions to a public good. Either Helen or Nick might be slightly more inclined to spend time taking care of the garden because (s)he might hold "greener preferences". In general, though, they are willing to take care of the garden if the other does it as well since the benefits of unilateral gardening do not compensate its costs. If Helen believes Nick will spend time to take care of the garden, she will be tempted to do the same, because of reciprocity. Moreover, if Helen believes Nick believes she will spend time taking care of the garden, then she might feel bad about disappointing him (probably even embarrassed). And so, she will decide to spend time taking care of the garden. Finally, suppose that she has greener preferences and she plans to do some gardening. But if she believes that he will not spend time gardening, she might feel angry that her effort is not corresponded and decide not to spend time taking care of the garden in the end. Thus, beliefs play a major role in the decision of individuals to contribute to a public good.

if both cooperate, they obtain high psychological payoffs denoted by w because of the "friendly" environment created by positive reciprocity. Moreover, if both players hold such beliefs, they might actually do some gardening.

If Nick selects to read (do some gardening) while Helen does some gardening (reads) he betrays (is betrayed by) her. Hence, his psychological payoffs are negative and denoted by x. This occurs because betrayal (or being betrayed) triggers a feeling of remorse (anger) on him. However, this situation is unlikely to hold because both are driven by reciprocity to the other player's sacrifice (or betrayal).

If Nick decides to read he does not make a sacrifice because, conditional on Helen's best reply, he selects the strategy that maximizes his material payoffs while not helping to increase hers. Then, if Helen believes Nick does not sacrifice, and Nick believes Helen believes so, Nick finds fruitful not to sacrifice because Helen will do the same in return. So, both will read and attain low (but positive) psychological payoffs denoted by z. It is true that *(gardening,gardening)* is Pareto superior to *(reading,reading)*, but it is also true for both players that *reading* is a preferred strategy when the other player also chooses to read.

At first glance, this motivation does not seem to differ from fairness considerations. If we consider Rabin's equilibrium concept (Rabin [82]), both *(gardening,gardening)* and *(reading,reading)* are *Fairness Equilibria* because both players are willing to reciprocate kindness and unkindness.

However, suppose now that an external party (Leo) derives benefits from Helen and Nick's garden when it has been taken care of. So, to motivate them to do some gardening, Leo offers a payment of 2 units is to that who takes care of the garden. Then, the structure of the game is changed in the following way:

H/N	Gardening	Reading
Gardening	6,6	2,5
Reading	5,2	1,1

It is immediate to see that by considering material motives only, the reward to contributions gives the incentive to both individuals to cooperate. Therefore, in the Nash Equilibrium, they do some gardening.

Rabin's prediction remains the same despite the introduction of the payment, i.e. both players reciprocate kindness and unkindness. Thus, *(gardening,gardening)* and *(reading,reading)* are *Fairness Equilibria*. The reward to contributions does not change the perception of kindness among players. If one player *defects* the other believes he is not being kind to him because he obtains less than his equitable payoff from such action, and in reciprocity he *defects* too. If one player *cooperates* the other believes he is being kind to him since he obtains more than his equitable payoff out of such action, and in reciprocity he *cooperates* too.[16] But, what if Helen and Nick have a positive attitude or inclination towards gardening given by sacrifice and reciprocity?

H/N	Gardening	Reading
Gardening	$6+x\,,6+x$	$2+x\,,5+z$
Reading	$5+z\,,2+x$	$1+w\,,1+w$

[16] Notice that this claim does not hold for all values of the monetary payment. A higher subsidy to contributions to the public good increases the material payoffs of the game, and as Rabin [82] shows, there is a value of such material payoffs for which *Fairness* considerations are weakened and for which the only *Fairness equilibrium* of the game is the *Nash equilibrium*. However, this is not a motivation crowding-out effect in the spirit of this chapter since the beliefs of players regarding the kindness of others remain the same.

And again $w > z > 0$, $x < 0$, and $z - x > 1$. If Nick selects to do some gardening, and Helen believes Nick does, and Nick believes Helen believes he does, gardening might not take place. The reason is that since Helen believes Nick does some gardening and receives the reward for doing it, she deems that he does not sacrifice any material payoffs to benefit her, and he is rather pursuing his own interest. Thus, Helen reciprocates such action by not gardening herself because she is better off than doing it. Since Nick believes the same about Helen, he ends up not gardening himself as well. Their beliefs are confirmed, and none of them takes care of the garden.

These examples have shown that introducing a monetary payment to incentive individuals to contribute to the provision of a public good might actually backfire and result in (lower or) no contributions. The next subsections formalize the notion of the sacrifice made by individuals with a reciprocal behaviour, and details the process through which such payment changes the beliefs of individuals about the behavioural motivation of others.

3 The Model

3.1 A Psychological Games approach

In this part of the chapter, the framework developed by Geanakoplos et al [46] is used to formalize the idea presented in the *2*-player examples.

Consider a *2*-player, normal-form game with strategy sets A_1, A_2 for player i=1, 2. Let π_i:A_1x$A_2 \rightarrow \mathbb{R}$ be player i's *material payoffs*. Following Rabin [82], I assume that each player's utility when he chooses his strategy depends on three factors: (i) his strategy, (ii) his beliefs about the other player's strategy choice,

and (iii) his beliefs about the other player's beliefs about his strategy. I also keep Rabin's notation: $a_i \in A_i$ is the action chosen by player i, where $i = 1, 2$; $b_{ji} \in A_i$ represent player i's beliefs about what strategy player j chooses, where $i = 1, 2$, $j = 1, 2$, and $j \neq i$; $c_{ij} \in A_i$ stand for player i's beliefs about what player j believes player i's strategy is, where $i = 1, 2$, $j = 1, 2$, and $j \neq i$.

3.1.1 The altruistic-sacrifice function

An *altruistic-sacrifice* is defined as the renouncement of something of certain value for the benefit of someone.[17] In this model, an altruistic-sacrifice is denoted as player i choosing a strategy by which he renounces to some material payoffs for the benefit of player j. Thus, the "altruistic-sacrifice function" $s_i(\cdot)$ denotes the tradeoff faced by player i in terms of material payoffs that are forfeited so as to produce a social benefit by increasing the payoffs of the other player.

Definition 1. Player i's altruistic-sacrifice is given by:

$$s_i\left(a_i, b_{ji}\right) \equiv \frac{\pi_i^{max}(b_{ji}) - \pi_i(a_i, b_{ji}) + \pi_j(b_{ji}, a_i) - \pi_i(a_i, b_{ji})}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

The first term in the numerator of the altruistic-sacrifice function represents the maximum payoffs that could be attained by player i, given his beliefs about the strategy chosen by j. The second term stands for player i's actual payoffs, i.e. the payoffs he receives from choosing strategy a_i, given his beliefs about

[17] This concept of sacrifice is contrary to the one defined in Rand's "Objectivism" where sacrificing is the act of rejecting the "good" for the "evil". In my opinion, human beings are "altruistic-egoists" as in Seyle [85], i.e. they do not supress their natural instinct to look after themselves first, but they also keep their natural instinct to do some good to others. Furthermore, notice that this is a broader notion than the standard self-sacrifice definition which only stipulates that individuals give something up, but that does not specify who the recipient of the benefits originated by such sacrifice is. In this sense, the definition of sacrifice I use resembles that of De Cremer and van Knippenberg [22].

the strategy chosen by j. Hence, the first two terms in the numerator represent the material payoffs renounced by player i when he chooses strategy a_i. The last two terms of the numerator reflect the difference between the payoffs of player j and the payoffs of player i; the greater the difference, the bigger the altruistic-sacrifice made by player i is, because it implies that his behaviour is not reciprocated by the other player.[18] The last two terms are thus used to make an interpersonal comparison between player i and the average player of the group excluding i. Notice that it is possible that the numerator of the altruistic-sacrifice function is equal to zero whenever, given his beliefs of the j's strategy, player i chooses a strategy that maximizes his material payoffs and which gives him the same material payoffs as j.

In the denominator, if $\pi_i^{max}(a_i) - \pi_i^{min}(a_i) = 0$ then $s_i(a_i, b_{ji}) = 0$. As in Rabin [82], the denominator of the altruistic-sacrifice function only considers the payoffs player i receives independent of j's action because in that way the function is normalised along the Pareto frontier for i. Thus, a player's altruistic-sacrifice must lie strictly between his worst and best Pareto efficient payoffs whenever the Pareto frontier is not a singleton, in which case the altruistic sacrifice function is equivalent to zero. This might occur if any response of j to a_i yields i the same payoffs; in reciprocity, player i will not sacrifice.[19]

Player i does not sacrifice if $s_i(a_i, b_{ji}) \leq 0$, which results from him not giving up any material personal gains to create a benefit for j, i.e. a social benefit. In

[18] According to MacCrimmon and Messick [69], an individual manifests a social motive when he takes the others' outcomes into consideration in making a choice. In turn, social motives can interact to create composite motives which can better account for observed behaviour. Choi and Mai-Dalton [14] relate self-sacrifice to Egalitarianism and claim that the former does not necessarily result in equality in the sense that the one who sacrifices might end up better or worse than the beneficiary. Moreover, Brandts et al [9] consider the interaction between sacrifice and reciprocity and found experimental evidence that the former depends on whether the individual is in an advantageous or disadvantageous position (i.e. being ahead or behind) in monetary payoffs.

[19] Furthermore, by representing the denominator in this way, the altruistic-sacrifice function is bounded away from zero even when the material payoffs are very small, which makes issues relative to the environmental protection motivation relevant despite the altruistic-sacrifice of the players is small.

turn, if player i chooses an action which does not maximize his material payoffs and provides higher payoffs for j then $s_i(a_i, b_{ji}) > 0$.

The example of last section stressed that the (altruistic) sacrifice made by i not only depends on his strategy choice, but also on his beliefs about the (altruistic) sacrifice of the other player. The analysis of the reciprocity which prevails in a group under this psychological games framework considers the intention of individuals and the consequences of their actions. Individuals might have a good or bad belief about what the others action is, but if second order beliefs are considered, then the intentions of individuals can be inferred, and will guide their behavioural response.[20] Therefore, we require to consider both first order and second order beliefs.[21]

Let the function $\tilde{s}_j(b_{ji}, c_{ij})$ denote player i's beliefs about the altruistic-sacrifice made by j. This function is conceptually equivalent but notationally different to $s_i(a_i, b_{ji})$.

Definition 2. Player i's beliefs about the altruistic-sacrifice made by j are given by:[22]

[20] Consider the standard payoffs in the Prisoner Dilemma presented in section 2. Suppose only first order beliefs are considered. Suppose further player 1 cooperates and he believes player 2 cooperates. Their payoffs are (4,4). But clearly, player 1 will be better-off defecting and winning 5>4. Since he does not have any inference about 2's intention, he will end up doing it. Now suppose second order beliefs are considered,. Suppose further player 1 cooperates; and 1 believes 2 cooperates; and 1 believes 2 believes 1 cooperates. Thus, 1 infers that 2 has the intention to reciprocate 1. So, he ends up cooperating and their payoffs are (4,4). Why would 1 not defect this time? If 1 would try to do that, 2 will infer his intentions and would defect as well in reciprocity. Their payoffs would be (0,0). Hence, to analyze the intention of actions in a reciprocity environment, second order beliefs are required.

[21] Rabin [82], Dufwenberg and Kirchsteiger [24], and Falk and Fischbacher [28] consider also second order beliefs because they model the impact of the intention of the individual on reciprocity. However, while the first two models are only intention-driven, the latter also captures the consequences of the actions of individuals. So, psychological games models that analyze reciprocity through behavioural intention, require to consider second order beliefs.

[22] Player i might have beliefs about the altruistic-sacrifice made by one particular player j. In that case, his beliefs are defined by: $\tilde{s}_j(b_{ji}, c_{ij}) \equiv \frac{\pi_j^{max}(c_{ij}) - \pi_j(b_{ji}, c_{ij}) + \pi_i(c_{ij}, b_{ji}) - \pi_j(b_{ji}, c_{ij})}{\pi_j^{max}(b_{ji}) - \pi_j^{min}(b_{ji})}$.

$$\tilde{s}_j\left(b_{ji}, c_{ij}\right) \equiv$$

$$\frac{\pi_j^{max}(c_{ij}) - \pi_j(b_{ji}, c_{ij}) + \pi_i(c_{ij}, b_{ji}) - \pi_j(b_{ji}, c_{ij})}{\pi_j^{max}(b_{ji}) - \pi_j^{min}(b_{ji})}$$

In this case, if $\pi_j^{max}\left(b_{ji}\right) - \pi_j^{min}\left(b_{ji}\right) = 0$, then $\widetilde{s}_j\left(b_{ji}, c_{ij}\right) = 0$.

These altruistic-sacrifice functions are one way to interpret a motivation for environmental protection that individuals produce through social interaction. There are other intuitive forms to express a sacrifice of course, but as it is shown in Appendix C, none of those alternate forms can comply with the experimental evidence about reciprocity, self-sacrifice and motivation crowding-out detailed in the last section. Only the particular type of sacrifice denoted by $s_i\left(a_i, b_{ji}\right)$ and $\widetilde{s}_j\left(b_{ji}, c_{ij}\right)$ can account for such behavioural regularities. The three requirements that need to be fulfilled for any function to be considered an "altruistic-sacrifice (AS) function" are:

1. The AS function is *bounded* and *increasing*. Thus:

   - $\exists$ a number $N : s_i\left(a_i, b_{ji}\right) \in [-N, N]\ \forall a_i \in A_i$ and $\forall b_{ji} \in A_j$.
   - $s_i\left(a_i, b_{ji}\right) > s_i\left(a_i^{\dagger}, b_{ji}\right) \iff \pi_i^{max}\left(b_{ji}\right) - \pi_i\left(a_i, b_{ji}\right) + \pi_j\left(b_{ji}, a_i\right) - \pi_i\left(a_i, b_{ji}\right) > \pi_i^{max}\left(b_{ji}\right) - \pi_i\left(a_i^{\dagger}, b_{ji}\right) + \pi_j\left(b_{ji}, a_i^{\dagger}\right) - \pi_i\left(a_i^{\dagger}, b_{ji}\right)$.

   Hence, because $s_i(\cdot)$ is bounded, the individuals cannot make an infinite altruistic-sacrifice. This is intuitive since the size of the altruistic-sacrifice is determined by the size of the renounced material payoffs and the difference between player i's and j's material payoffs. Furthermore, an altruistic-sacrifice is deemed greater when the underlying action choice

induces a higher renouncement of material payoffs and a higher material payoffs difference between players j and i.

2. Consider $\Pi(b_{ji})$ as defined in this chapter, then any function displays an altruistic-sacrifice if there exists some π_i^{sac} and π^{adv} such that:

   - $\pi_i^{sac}(a_i, b_{ji}) > \pi^{adv}(a_i, b_{ji})$ implies that $s_i(a_i, b_{ji}) > 0$.
   - $\pi_i^{sac}(a_i, b_{ji}) = \pi^{adv}(a_i, b_{ji})$ implies that $s_i(a_i, b_{ji}) = 0$.
   - $\pi_i^{sac}(a_i, b_{ji}) < \pi^{adv}(a_i, b_{ji})$ implies that $s_i(a_i, b_{ji}) < 0$.
   - The intensity of sacrifice is represented, i.e.: $s_i\left(a_i, b_{ji}^*\right) \geq s_i(a_i, b_{ji}) \geq s_i\left(a_i^*, b_{ji}^*\right) \geq s_i(a_i^*, b_{ji})$ where $a_i^* \in \text{argmax}_{a \in A_i} \pi_i(b_{ji})$ and $b_{ji}^* \in \text{argmax}_{b \in A_j} \pi_j(c_{ij})$.

For the particular AS function of this chapter $\pi_i^{sac}(a_i, b_{ji}) = \pi_i^{max}(b_{ji}) - \pi_i(a_i, b_{ji})$ and $\pi^{adv} = \pi_i(a_i, b_{ji}) - \pi_j(b_{ji}, a_i)$. So, two things are required: a measure of the renouncement or sacrifice of material payoffs incurred by one player, and a measure of the advantageous position (in terms of material payoffs) of the player making the sacrifice. The combination of this self-sacrifice and interpersonal comparison yields an altruistic-sacrifice.

With respect to the intensity of the sacrifice it does not suffice that a player renounces to higher material payoffs, it also matters if he is being reciprocated. So, a player's sacrifice would be deemed weakly higher if he renounces to material payoffs whilst getting the sucker payoffs than if he still renounces to the payoffs and is reciprocated by the other player.

3. The AS function is *affine*. Therefore, $s_i(a_i, b_{ji})$ is affine if changing all payoffs for both players by the same affine transformation does not change the value of $s_i(a_i, b_{ji})$. Hence, an individual's altruistic-sacrifice remains the same despite the material payoffs of both players change by the same amount.

3.1.2 Equilibrium

With these altruistic-sacrifice functions, the players' preferences can be completely specified. Thus, player i chooses a_i to maximize his expected utility $U_i(a_i, b_{ji}, c_{ij})$ which incorporates the traditional material payoffs of the game and the players' altruistic-sacrifice:

$$U_i(a_i, b_{ji}, c_{ij}) = \pi_i(a_i, b_{ji}) + \theta_i \widetilde{s}_j(b_{ji}, c_{ij}) \cdot (1 + s_i(a_i, b_{ji}))$$

θ_i denotes how salient are altruistic-sacrifice considerations for i. If $\theta_i = 0$, i is solely motivated by material interests and the rational paradigm predictions apply. If $\theta_i \neq 0$, these preferences reflect the reciprocal nature of the individuals' willingness to cooperate, in the sense that i will put in some altruistic-sacrifice as long as he believes j does it as well. On the contrary, when i believes j does not give up personal benefits to produce a social benefit, he will not sacrifice in return.[23] I will assume henceforth that $\theta_i = 1$.

Notice that these type of preferences can be accomodated within a Psychological Game, and therefore the concept of *psychological Nash Equilibrium* as defined by Geanakoplos et al [46] becomes relevant. In this chapter, the analog

[23] When $\theta_i = 1$, such functional form is the same explored by Rabin [76] to conduct his analysis of fairness. See Appendix B for a discussion about the implications of the adoption of an alternative functional form.

to such equilibrium will be referred to as "altruistic-sacrifice Equilibrium", and henceforth "AS Equilibrium".

Definition 3. The tuple of strategies $(a_1, a_2) \in (A_1, A_2)$ *is an AS Equilibrium if, for* $i = 1, 2$, $j = 1, 2$, $j \neq i$*:*

1. $a_i \in \text{argmax}_{a \in A_i} U_i\left(a_i, b_{ji}, c_{ij}\right)$
2. $c_{ij} = b_{ji} = a_i$

3.2 Baseline provision setting

To put this solution concept in action, I refer to the 2-player standard public good game where each player has an endowment normalised to 1 that has to be spread to consume either a private good or a public good. Therefore, the material payoffs of the game for player i are defined by: $\pi_i\left(a_i, a_j\right) = (1 - a_i) + \frac{\alpha}{2}\left(a_i + a_j\right)$. If additionally it is assumed that $1 < \alpha < 2$, then such game constitutes a prisoner's dilemma.

Players face a binary choice: spend all their endowment on the private good, i.e. *defect* (D), or contribute all their endowment to the provision of the public good, i.e. *cooperate* (C). Table 1 shows the material payoffs of the game.

Table 1: Material payoffs of a standard public good game

$_i/^j$	C	D
C	α ,α	$\frac{\alpha}{2}$,$\frac{\alpha}{2} + 1$
D	$\frac{\alpha}{2} + 1$, $\frac{\alpha}{2}$	1 ,1

From standard game theory we know that *(D,D)* is the Nash Equilibrium since there is no individual incentive to contribute to the provision of the public good even though it is socially desirable to do so, i.e. $\frac{\alpha}{2} < 1$.

Is *(D,D)* an *AS Equilibrium*?[24] Notice that $s_i(D,D) = 0$ because given i's beliefs that j does not sacrifice, by reciprocity he does not give up any material payoffs in order to produce a social benefit.[25] Then, by choosing to defect, player i does not contribute to the provision of the public good. If he deviates and chooses to cooperate, then $s_i(C,D) > 0$ because even though he believes j does not sacrifice, he gives up some material payoffs to produce a social gain.[26] Of course, this will not be a part of an *AS Equilibrium* because i is better off not sacrificing for that who does not reciprocate. Hence, *(D,D)* is an *AS Equilibrium* $\forall \alpha \in (1,2)$.[27] This means that player i has no incentive to sacrifice and produce a social gain if he believes that j does not sacrifice in return. So, given that the public good is not provided, both players in the game end up having lower payoffs in comparison to the case where both perform the altruistic-sacrifice.

Is *(C,C)* an *AS Equilibrium*? In this case $s_i(C,C) > 0$ since player i is willing to sacrifice material payoffs in order to create a social gain in reciprocity to his beliefs about j's altruistic-sacrifice.[28] If player i deviates from cooperation then $s_i(D,C) < 0$, reflecting the fact that he does not sacrifice whatsoever.[29] In

[24] I want to precise that I will use the notation in this section as follows. In a two-player case, the altruistic-sacrifice functions are properly defined as $s_i(a_i, b_{ji})$ and $\tilde{s}_j(b_{ji}, a_i)$. However, I will denote them as $s_i(a_i, b_{ji})$ and $\tilde{s}_j(a_i, b_{ji})$. For example, when analyzing the outcome *(C,D)*, I write $s_i(C,D)$ and $\tilde{s}_j(C,D)$ to express the altruistic-sacrifice of i and his beliefs about the altruistic-sacrifice of j, respectively, when player i chooses C and player j chooses D.

[25] This is because $\pi_i^{max}(D) = \pi_i(D,D)$. Notice as well that the material payoffs of player i and the payoffs of j are equivalent since both choose to defect, i.e. $\pi_i(D,D) = \pi_j(D,D)$. So, the numerator of $s_i(D,D)$ is equal to zero.

[26] So, $\pi_i^{max}(D) > \pi_i(C,D)$. Moreover, because player i gets "the sucker" payoffs while j defects, $\pi_i(C,D) < \pi_j(C,D)$.

[27] (1) in Appendix D shows the condition for (D,D) to be an *AS Equilibrium* for the N-player case.

[28] In this case $\pi_i^{max}(C) > \pi_i(C,C)$ and $\pi_i(C,C) = \pi_j(C,C)$.

[29] The altruistic-sacrifice function is negative because $\pi_i(D,C) > \pi_j(D,C)$ and $\pi_i^{max}(C) = \pi_i(D,C)$.

this case $s_i(C,C) = \frac{1-\frac{\alpha}{2}}{\frac{\alpha}{2}}$ and $\widetilde{s}_j(C,C) = \frac{1-\frac{\alpha}{2}}{\frac{\alpha}{2}}$. Thus, the higher the marginal return of the public good (α) is, the lower the altruistic-sacrifice player i makes and the lower is also i's perception about the altruistic-sacrifice of j. This is rather intuitive since a greater return to a player's contribution to the public good provision translate into a lower sacrifice, given that such return is part of his material payoffs.[30]

In consequence, player i finds fruitful to reciprocate his beliefs about the other j's strategy, i.e. *(C,C)* is an *AS Equilibrium*.[31] This is not such a realistic scenario, since it is documented that individuals fail to provide public goods. However, in the N-player case, (C,C) is not always an AS Equlibrium, providing a realistic feature of public goods provision. [32] In a *2*-player public good game, as long as i holds beliefs that j sacrifices, he will renounce to some material payoffs in order to produce a social gain. The public good is provided and all players in the game obtain the highest payoffs in the game.

Notice that the underlying tradeoff between material payoffs and a social gain derived from the provision of a public good has been represented by an altruistic-sacrifice function. Furthermore, in a prisoner's dilemma, the perception of the altruistic-sacrifice among players depends on the marginal return of the public good.

In the context of leadership, Singh and Krishnan [86] claim that self-sacrificial behaviour enhances: norms of reciprocity, contributions to the public good, in-group cooperation, and group belongingness. Thus, the use of the notion of altruistic-sacrifice to represent a motivation for environmental protection of the

[30] This is in line with Rabin's proposition that when the material stakes of the game increase, players will be driven by self-interest and the Nash Equilibrium will prevail.

[31] (2) in Appendix D shows the condition for *(C,C)* to be an *AS Equilibrium* for the N-player case.

[32] See Appendix A for the N-player case. In such case, (C,C) is only an AS Equilibrium for sufficiently high values of the marginal return of the public good. In Appendix C, an intuitive reason within the realm of public goods provision is provided to understand why a sufficiently high marginal return of the public good does not yield the full cooperative equilibrium.

players in the game is adequate because it represents their commitment to a social cause.

The next definition describes the outcome of the game in terms of the altruistic-sacrifice s_i made by each player. It will prove useful to determine which Nash Equilibria must necessarily be AS Equilibria.

Definition 4. $\forall i = 1, 2$ *an outcome is: "caring" if* $s_i > 0$*; "indifferent" if* $s_i = 0$*; "egoistic" if* $s_i < 0$*; "mixed" if* $\prod_{i=1}^{2} s_i \leq 0$.

Proposition 1. *If the tuple of strategies* $(a_1, a_2) \in (A_1, A_2)$ *is a Nash Equilibrium and an egoistic outcome, then it is an AS Equilibrium.*

Proof. See Appendix G. ‖

According to this statement, if players choose a contribution level that is a Nash Equilibrium then they are maximizing their material payoffs. Moreover, if the outcome is egoistic, then they do not increase the social gain by renouncing to some material payoffs. Thus, to maximize their overall utility, players reciprocate the egoistic outcome by pursuing their self-interest. In other words, proposition 1 states that "bad equilibria" must necessarily be *AS equilibria* in which players only care about themselves. As seen before, the same cannot be guaranteed about "good equilibria".

3.3 Monetary incentives

Advocates of the rational paradigm have proposed the use of incentive-based mechanisms such as monetary payments to promote cooperation in social dilem-

mas. The idea is to increase the return from contributing to the public good and make its provision more attractive in relation to private good consumption. So, suppose that players' contributions to the public good are subsidized and that receiving such benefit entails non-negative transaction costs (k) absorbed by the players in the game.

The material payoffs for player i are given now by $\pi_i(a_i, a_j; k) = (1 - a_i) + (a_i - k) + \frac{\alpha}{2}(a_i + a_j)$. It is assumed that if $a_i = 0 \Rightarrow k = 0$. Additionally, to make the incentive mechanism effective it is assumed that such transaction costs are non-negative and strictly lower than the marginal return per capita of the public good. In terms of the public good game: $0 \leq k < \frac{\alpha}{2}$. Table 2 shows the material payoffs of this game.

Table 2: Material payoffs of a standard public good game with subsidy

$_i/^j$	C	D
C	$\alpha + 1 - k$,$\alpha + 1 - k$	$\frac{\alpha}{2} + 1 - k$,$\frac{\alpha}{2} + 1$
D	$\frac{\alpha}{2} + 1$,$\frac{\alpha}{2} + 1 - k$	1 ,1

In this subsidy game the Nash Equilibrium is *(C,C)*. With respect to the *2*-player public good game, the subsidy scheme attains cooperation as the Nash Equilibrium of the game. However, the example of section 2 suggested that when players' beliefs matter, monetary incentives might not produce the desired result if they change the beliefs about the altruistic-sacrifice of the individuals who receive it as a retribution to their contribution. So, the natural question becomes: what does the *AS* model predict?

Let us start by checking *(D,D)*. When player i chooses to defect, he is actually giving up some material payoffs because given his beliefs that j chooses to defect, he would be better-off choosing to cooperate, i.e. $\pi_i^{max}(D) > \pi_i(D, D)$.

Moreover, $\pi_i(D,D) = \pi_j(D,D)$ implies $s_i(D,D) > 0$, and equivalently $\widetilde{s}_j(D,D) > 0$; i's perception about the altruistic-sacrifice made by j has been distorted because of the monetary payment. If player i deviates and chooses to cooperate, then $s_i(C,D) = \frac{k}{\frac{\alpha}{2}}$; so his action might be regarded as an altruistic-sacrifice if there are strictly positive transaction costs from receiving the subsidy. The monetary payment has altered i's altruistic-sacrifice. As in the game without monetary incentives, *(D,D)* is an *AS Equilibrium* $\forall \alpha \in (1,2)$, and this time $\forall k \in [0, \frac{\alpha}{2})$.[33]

To formalize the idea that a monetary payment affects the beliefs of players about the altruistic-sacrifice of others, I provide a precise definition of the policy intervention.

Definition 5. A policy is "material-effective" if the Nash Equilibrium attained after its implementation is a Pareto-improvement over the previous Nash Equilibrium.

Proposition 2. *Material-effective policy interventions change the beliefs among players about the altruistic-sacrifice of the other.*

Proof. See Appendix G. ‖

In the *2*-player public good game, when both players are willing to cooperate $s_i(C,C) > 0$ because given i's beliefs that j sacrifices, he chooses to reciprocate since he is better off than deviating. However, in the subsidy game, choosing to cooperate when there is a monetary incentive to do so eliminates the altruistic-sacrifice made by both players since they are not giving up any material payoffs

[33] (5) in Appendix D shows the condition for *(D,D)* to be an *AS Equilibrium* for the N-player case.

to produce a social gain. Hence, $s_i(C,C) = \widetilde{s}_j(C,C) = 0$.[34] If player i deviates and chooses to defect, his altruistic-sacrifice is given by $s_i\,(D,C) = \frac{\frac{\alpha}{2}-2k}{\frac{\alpha}{2}}$. Then, whether i sacrifices or not depends on the size of the transaction costs.[35] Finally, i's beliefs about j's altruistic-sacrifice depend again on the transaction costs, because $\widetilde{s}_j(D,C) = \frac{2k}{\alpha}$. As it turns out, the fact that *(C,C)* is an *AS Equilibrium* or not depends on the size of the transaction costs. For $0 \leq k < \frac{\alpha}{2}$, *(C,C,)* is an *AS Equilibrium* iff $k \leq k^*$.[36]

It is clear now that there is an asymmetry in the equilibria conditions of the game because no matter what the value of the transaction costs is, *(D,D)* is always an *AS Equilibrium*, whereas attaining *(C,C)* as an equilibrium depends precisely on such value.

If individuals are solely motivated by selfishness, the introduction of the monetary payment succeeds in eliciting cooperative behaviour from the individuals. But if they are motivated by reciprocity and altruistic-sacrifice and if they believe the other does not sacrifice, the scheme will not produce the full cooperative outcome. Additionally, there is a perception of no altruistic-sacrifice among both players even when they are motivated to provide the public good and choose to cooperate.

A monetary payment scheme does not attain full cooperation when the transaction costs of acquiring the payment are high enough. Yet, provided transactions costs are low enough, individuals will contribute to the provision of the public good even though it is clear they choose the strategy with the highest material payoffs and they do not believe the other player sacrifices. Thus, the public good is provided not because of a cooperative motivation produced through social interaction, but because of the material benefits delivered by the

[34] In this case $\pi_i^{max}(C) = \pi_i(C,C)$ and $\pi_i(C,C) = \pi_j(C,C)\ \forall i = 1,2$.

[35] Player i sacrifices if $k < \frac{\alpha}{4}$.

[36] (6) in Appendix D shows the condition for which *(C,C)* is an *AS Equilibrium* for the N-player case, and (7) is the value of the transaction costs k^* for which such condition holds.

monetary reward.

These results indicate that the monetary payment established by the subsidy scheme crowds-out the motivation of individuals to provide a public good. Hence, when the reward is present in the game, individuals care about the magnitude of such reward, and only if it is high enough (and therefore transaction costs are low) they are willing to cooperate to provide the public good.

While proposition 2 claimed that material-effective policy interventions decrease the altruistic-sacrifice of individuals by providing them with incentives to maximize their material payoffs, it did not precise if such intervention would ultimately change the outcome of the game. This idea is formalized in the following proposition.

Proposition 3. *If a material-effective policy intervention changes the outcome of a game from "caring" to "indifferent" or to "egoistic", then a motivation crowding-out takes place.*

Proof. See Appendix G. ‖

3.4 Limited monetary incentives

The subsidy game previously analyzed considered both players in the game were allowed to participate in the PES programme and received the monetary payment in return for their contributions to the public good. However, some PES are not privately established and instead the government becomes an intermediary between sellers and buyers of environmental services that channels the payment between parties through earmarked taxes (Muñoz-Piña et al [73]).

The scope of PES might then become limited because it depends on the government's budget and political agenda.[37] Other issues that limit the participation of potential environmental services sellers are the technical complexity of the application procedure and the applicants' income constraints which impede them to obtain technical assistance for the preparation of their conservation project. To represent such constraints consider a modified subsidy game in which j receives the monetary payment and i does not.

Table 3 shows the material payoffs of this game.

Table 3: Material payoffs of a standard public good game with limited monetary incentives

t/s	C	D
C	α ,$\alpha+1-k$	$\frac{\alpha}{2}$,$\frac{\alpha}{2}+1$
D	$\frac{\alpha}{2}+1$,$\frac{\alpha}{2}+1-k$	1 ,1

In this modified subsidy game the Nash Equilibrium is *(D,C)* because cooperation is only attractive for those individuals receiving the monetary payment, i.e. for the s members. With respect to the original subsidy game the Nash Equilibrium is then altered. Is cooperation still possible in this modified subsidy game if altruistic-sacrifice motives are considered?

Let us start by checking defection first, i.e. *(D,D)*. When i chooses to defect, he does not give up material payoffs because given his beliefs that j chooses to defect, he would be better-off not cooperating, i.e. $\pi_i^{max}(D) = \pi_i(D,D)$. Moreover, $\pi_i(D,D) = \pi_j(D,D)$; thus $s_i(D,D) = 0$. However, since j is subject to participate in the subsidy scheme, the perception of i is that he renounces to

[37] If the government gives priority to the programme's efficiency it will only fund those applications with the highest probability of not delivering the environmental service without the payment (additionality criterion). However, the PES might also be targeted to aid poor landowners, in which case, more applications will be funded.

some material payoffs by choosing to defect (and eventually not participating into the subsidy scheme) and $\widetilde{s}_j(D,D) > 0$.[38] If i deviates and chooses to cooperate, he would give up material payoffs by selecting the strategy that does not maximize his material payoffs, and additionally: $\pi_i(C,D) < \pi_j(C,D)$. Hence, $s_i(C,D) > 0$. Finally, $\widetilde{s}_j(C,D) < 0$ because although j renounces to some material payoffs by choosing not to receive the subsidy, $\pi_i(C,D) < \pi_j(C,D)$.[39] As in the game without monetary incentives and the original subsidy game, *(D,D)* is an *AS Equilibrium* $\forall \alpha \in (1,2)$ and $\forall k \in [0, \frac{\alpha}{2})$.[40]

Let us turn now to *(C,C)*. By choosing to cooperate, i willingly trades additional monetary benefits for a social gain. Thus, his altruistic-sacrifice is positive: $s_i(C,C) > 0$.[41] In contrast, since j receives a monetary payment for his contribution, i's perception of his altruistic-sacrifice is distorted inasmuch as he is not giving up any material payoffs to produce a social gain. Hence, the beliefs of i about the altruistic-sacrifice of j are such that $\widetilde{s}_j(C,C) < 0$.[42] If i deviates and chooses to defect, then he would not sacrifice because he chooses the strategy that maximizes his material payoffs. In fact, $s_i(D,C) \leq 0$.[43] Finally, i's beliefs regarding the altruistic-sacrifice of j might change, depending on the size of the transaction costs faced by him when receiving the subsidy. In particular, he might believe he sacrifices or that he does not: $\widetilde{s}_j(D,C) = \frac{2k}{\alpha}$. The condition for *(C,C)* to be an *AS Equilibrium* is the following:

$$\alpha + \left(\frac{k-1}{\frac{\alpha}{2}}\right) \cdot \left(1 + \frac{1-\frac{\alpha}{2}}{\frac{\alpha}{2}}\right) > \frac{\alpha}{2} + 1 + \left(\frac{k}{\frac{\alpha}{2}}\right) \cdot \left(1 - \frac{k}{\frac{\alpha}{2}}\right)$$

[38] This is because $\pi_j^{max}(D) > \pi_j(D,D)$.

[39] In other words, given that i cooperates, the maximum payoffs that j can get are higher than the actual payoffs that i ends up receiving, i.e. $\mid \pi_j^{max}(C) - \pi_j(C,D) \mid < \mid \pi_i(C,D) - \pi_j(C,D) \mid$.

[40] (8) in Appendix D shows the condition for *(D,D)* to be an *AS Equilibrium* for the N-player case.

[41] So, $\pi_i^{max}(C) > \pi_i(C,C)$ and $\pi_i(C,C) < \pi_j(C,C)$.

[42] This is because $\pi_j^{max}(C) = \pi_j(C,C)$ and $\pi_j(C,C) > \pi_i(C,C)$.

[43] Specifically $s_i(D,C) = -\frac{k}{\frac{\alpha}{2}}$.

It can be checked that such condition cannot be satisfied and that *(C,C)* is not an *AS Equilibrium*. Hence, the full cooperative equilibrium is not attained when one player does not receive the monetary payment. The defector does not reciprocate the cooperator precisely because the former believe the latter does not sacrifice and he is better-off not contributing to the public good. The player receiving the subsidy might cooperate because of the monetary incentive, and not because of an altruistic-sacrifice of material payoffs to attain a social gain.

The modified subsidy game shows that the motivation crowding-out effect produced by a monetary incentive may have a wider scope than originally planned, since it not only affects the motivation of the individual who receives the reward, but also of the individual who socially interacts with that who receives it.[44] The following proposition formalizes this point.

Proposition 4. *Material-effective policy interventions affect the beliefs of the unregulated individual about the altruistic-sacrifice of the regulated individual.*

Proof. See Appendix G. ‖

3.5 Non-monetary incentives

The last couple of subsections have shown that monetary incentives have potential adverse consequences for public goods provision. In some cases they negatively affect the beliefs of individuals regarding the altruistic-sacrifice of the other, while in others they can even change such perception and produce

[44] If the incentive-based mechanism has an impact beyond the system of beliefs of regulated individuals then the policy produces a *spillover effect* (Frey and Stutzer [41]).

a motivation crowding-out. So far, only incentives that damage the beliefs of individuals about the altruistic-sacrifice of the other have been analyzed. This subsection explores non-monetary incentives which produce a positive change in such beliefs.

A potential non-monetary incentive consists in the empowerment of the participants of a public good provision process to increase their decision-making abilities, improve their access to information and resources, and increase their ability to gain skills in general. In that way, individuals learn how to overcome typical obstacles of collective decision-making.

There is empirical evidence about the positive effects of empowerment and public goods provision. Zimmerman and Rappaport [100] found that the level of participation in different community volunteer activities and psychological empowerment were positively correlated. Kelly and Breinlinger [62] showed that expectations about the results of participation were determinant for cooperation. Finally, Ando [2] found that empowering individuals of environmental groups produces a sense of solidarity from participation among them.

Thomas and Velthouse [91] define psychological empowerment as the increase in the intrinsic task motivation. Since the motivation for the provision of the public good in the present model is given by the altruistic-sacrifice of the players, then empowerment should have a positive impact on the altruistic-sacrifice function. In other words, empowerment will positively affect the beliefs of individuals regarding the altruistic-sacrifice of the other, provided they do make an altruistic-sacrifice.

The following definitions are a plausible generalization of the altruistic-sacrifice of player i and his beliefs about the altruistic-sacrifice of player j while allowing for the effects of empowerment.

Definition 6. Player i's generalized altruistic-sacrifice is given by:

$$s_i^e(a_i, b_{ji}) \equiv \frac{\pi_i^{max}(b_{ji}) - \pi_i(a_i, b_{ji}) + \pi_j(b_{ji}, a_i) - \pi_i(a_i, b_{ji}) + \pi_i^e(a_i, b_{ji})}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

where

$$\pi_i^e(a_i, b_{ji}) \equiv e(a_i + a_i(b_{ji})),$$

and $e \in [0, 1]$

Definition 7. Player i's beliefs about the generalized altruistic-sacrifice made by j is given by:

$\tilde{s^e}_j(b_{ji}, c_{ij}) \equiv$

$$\frac{\pi_j^{max}(c_{ij}) - \pi_j(b_{ji}, c_{ij}) + \pi_i(c_{ij}, b_{ji}) - \pi_j(b_{ji}, c_{ij}) + \pi_j^e(b_{ji}, c_{ij})}{\pi_j^{max}(b_{ji}) - \pi_j^{min}(b_{ji})}$$

where

$$\pi_j^e \equiv e(b_{ji} + c_{ij}(b_{ji})),$$

and $e[0, 1]$

Notice that both generalized altruistic-sacrifice functions are equivalent to the ones established in definitions 1 and 2 if individuals are not empowered, i.e. if $e = 0 \Rightarrow s_i(a_i, b_{ji}) = s_i^e(a_i, b_{ji})$ and $\tilde{s}_j(b_{ji}, c_{ij}) = \tilde{s}_j^e(b_{ji}, c_{ij})$. This is also true if the individuals do not make strictly positive contributions to the public good.[45]

As it may be expected, introducing empowerment changes some results about public goods provision. Let us revisit the standard *2*-player public good game. Empowering an individual who is a defector does not produce any change in his beliefs about the altruistic-sacrifice made by the other. Hence, $\tilde{s}_j^e(D, D) = \tilde{s}_j(D, D)$ and $s_i^e(D, D) = s_i(D, D)$. However, empowering a co-operator will produce positive benefits related to solidarity and trust which

[45] So, if $a_i = 0 \Rightarrow s_i(a_i, b_{ji}) = s_i^e(a_i, b_{ji})$ and if $b_{ji} = 0 \Rightarrow \tilde{s}_j(b_{ji}, c_{ij}) = \tilde{s}_j^e(b_{ji}, c_{ij})$.

increases his motivation to provide the public good, i.e. it increases his beliefs about the altruistic-sacrifice made by the other. Thus, empowerment has a crowding-in effect: $\tilde{s}_j^e(D,C) > \tilde{s}_j(D,C)$ and $s_i^e(C,D) > s_i(C,D)$.[46]

Because empowering individuals only changes their beliefs about the altruistic-sacrifice of the other when they contribute to the provision of the public good, *(D,D)* is still an *AS Equilibrium* $\forall \alpha \in (1,2)$ and $\forall e \in [0,1]$.[47] Yet, empowering individuals will always attain the provision of the public good, provided they believe the other makes an altruistic-sacrifice.[48]

3.6 Provision under a dual incentive

The preferences of the individuals in the present framework depend on two different types of payoffs: material and psychological. When deciding to contribute to provide a public good, both individuals have to take into account the tradeoff between those two types of payoffs. In this section, the provision results are revisited when two different incentives are simultaneously offered to the individuals: a monetary payment and empowerment.

Consider first the subsidy game. *(D,D)* and *(C,C)* were always an *AS Equilibrium*.[49] Not surprisingly, allowing for empowerment changes the scenario. Despite the beliefs about the altruistic-sacrifice of the defector are not changed, i.e. $\tilde{s}_j^e(D,D) = \tilde{s}_j(D,D)$ and $s_i^e(D,D) = s_i(D,D)$, the incentive to deviate and contribute to the provision of the public good is higher in both material

[46] Just as with monetary incentives, empowerment produces a distortion in the beliefs of the individuals regarding the altruistic-sacrifice of the other. However, in this case such distortion is positive because, provided individuals already believe the other makes an altruistic-sacrifice, their perception is increased when they gain control over the decision making process.

[47] (9) in Appendix D shows the condition for *(D,D)* to be an *AS Equilibrium* for the N-player case.

[48] (10) in Appendix D shows the condition for *(C,C)* to be an *AS Equilibrium* for the N-player case.

[49] Remember this is not true for the N-player case though. In such case, the transaction costs need to be low enough for *(C,C)* to be an *AS Equilibrium*.

and psychological terms because of the benefits originated by the monetary payment and empowerment. Yet, this depends on how small e is. Hence, *(D,D)* is only an *AS Equilibrium* if $e < e^*$.[50] If the individuals are empowered enough, then it is a dominant strategy to contribute to the public good and receive the monetary reward with it.

If the individuals instead cooperate, *(C,C)* is an *AS Equilibrium* $\forall \alpha \in (1,2)$, $\forall k \in [0, \frac{\alpha}{2})$, and if $e > e^{\mp}$.[51] It can be further checked that for full provision of the public good to take place, even in the presence of high transaction costs, only little empowerment must be exerted.

Now consider the limited budget case where the monetary incentive is only available to j. Remember that the introduction of the monetary payment creates a distortion in the beliefs of i about the altruistic-sacrifice made by j. Moreover, if the former believes the latter decides not to contribute and receives the monetary payment, then there are no additional benefits originated by empowerment. Thus, it is a dominant strategy for i not to contribute to the public good as well and *(D,D)* is an *AS Equilibrium* $\forall \alpha \in (1,2)$, $\forall k \in [0, \frac{\alpha}{2})$ and $\forall e \in [0,1]$.[52] Introducing empowerment is not enough to avoid the underprovision of the public good if a monetary incentive is received only by one participant.

Without empowerment, *(C,C)* was not an *AS Equilibrium*. Hence, the full cooperative equilibrium could not be attained if one player did not receive the monetary payment. However, the introduction of empowerment has a positive effect on the beliefs of i regarding the altruistic-sacrifice of j. In particular it makes salient that it might be a best response to cooperate because the loss in material payoffs can be more than compensated by a gain in psychological

[50] (11) in Appendix D shows the condition for *(D,D)* to be an *AS Equilibrium* for the N-player case and (12) shows the level of empowerment e^* for which such condition holds.
[51] (13) in Appendix D shows the condition for *(C,C)* to be an *AS Equilibrium* for the N-player case and (14) shows the level of empowerment $e^{\mp}$ for which such condition holds.
[52] (15) in Appendix D shows the condition for which *(D,D)* is an *AS Equilibrium* for the N-player case.

payoffs. Therefore, if $e > e^{\oplus}$ *(C,C)* is an *AS Equilibrium* $\forall\alpha \in (1,2)$and $\forall k \in [0, \frac{\alpha}{2})$.[53]

Let us summarize the results of the model.[54] Introducing the notion that the individuals hold a motivation for public goods provision through an altruistic-sacrifice does not discard the defective equilibrium of the standard theoretical prediction, and because of their reciprocal behaviour it accommodates the case in which a cooperative equilibrium is possible.[55]

If there is an external intervention in the game to promote cooperation, then on the one hand, there is underprovision of the public good if it is made through a monetary payment in which the transaction costs of receiving the reward are sufficiently high or in which the monetary reward is not available to both players. On the other hand, the public good is still completely provided if the transaction costs of receiving the subsidy are sufficiently low, and the subsidy is available to both players in the game. In both cases however, the altruistic-sacrifice perception among players becomes distorted.

Things are different when a non-monetary external intervention is used to promote cooperation. While it does not work if both players do not contribute to the public good, it will produce a motivation crowding-in that will facilitate the full cooperative equilibrium.

If a dual incentive is used, i.e. both non-monetary and monetary incentives are used simultaneously, then little empowerment is required to attain a full cooperative equilibrium as the only *AS Equilibrium* of the game despite transaction costs of receiving the monetary payment are high. However, if the dual

[53] In Appendix D, (16) shows the condition for which *(C,C)* is an *AS Equilibrium* for the N-player case and (17) is the empowerment level $e^{\oplus}$ for which such condition holds.

[54] Table 4 in the Appendix F contains a comparative summary of the pure strategy equilibria of different games for the N-player case.

[55] Moreover, the implications of such motivation on the cooperative behaviour among individuals, as well as the potential outcomes it produces on a public good game should be of relevance to the analysis of economic interactions insofar as they are based on sound empirical evidence.

incentive has a limited monetary component and the payment is only available to one player, then a no provision scenario is once again possible. The empowerment that must be exerted to attain a full cooperative equilibrium when the payment is available to both players is substantially smaller than the one required when such payment is limited to only one of them.[56]

4. Policy Implications

While it is true that if individuals perform an altruistic-sacrifice they can escape the tragic fate of their social dilemma, cooperation failure is still possible. Then, the relevant question for the policymaker is: how to avoid the destruction of the perception of altruistic-sacrifice among players and promote the creation of a motivation for environmental protection?

A PES produces a distortion of the beliefs of individuals regarding the altruistic-sacrifice made by others. So, a pure monetary payment scheme can become a disease if it crowds-out the environmental protection motivation of its participants.

Nevertheless, it is not true this crowding-out will always result in underprovision of the environmental service. Provided the transaction costs of PES are low enough, full provision of the environmental service can be reached. Thus, the presence of a monetary incentive for cooperation substitutes the individuals' altruistic-sacrifice, for a market-type relationship where their actions are not the result of a culturally-rooted arrangement anymore, but just another commodity.[57] In this case, the PES represents a temporary cure which will hold as long

[56] This means that $e^{\oplus} > e^{\mp}$.

[57] Heyman and Ariely [55] investigated the relationship between effort and payment in two different markets: monetary and social. Their experiments showed that when payments were

as the payment keeps flowing.

For the provision of the environmental service to take place, either all players should be voluntarily willing to make an altruistic-sacrifice, or they should be motivated by a sufficiently high payment to be willing to be part of a market-type relationship. Then, since the main objective of the PES designer is the provision of the environmental service, he ought to follow the advice of Gneezy and Rustichini [46]: "pay enough, or don't pay at all".

This point is supported by evidence from Central America where water users' fees are so small that it hardly creates an incentive for saving water, and where PES compensations to upstream providers hardly cover opportunity costs (Kosoy et al [66]). But even if payments are high enough to cover opportunity costs, in some Latin American countries the buyers and sellers of environmental services do not make transactions within a market. Rather, the payments are obtained from earmarked taxes and channelized to the sellers by the government (e.g. Mexico's PSAH).

When the monetary payment is not a product of supply and demand for environmental services, but of the political agenda of a government at office, a limited budget might impede to include all potential participants. The subsidy game showed that in such case there is no room for full provision of the environmental service. This could be attributed to a negative distortion of the non-participants perception of the altruistic-sacrifice of the others. Yet, another possible interpretation is that non-participants will not voluntarily undertake environmental protective measures if they believe others receive a monetary reward for doing something they do for free. So, even if no transaction costs are originated by participating in the PES, the monetary reward becomes a

not mentioned or given in the form of gifts, effort was originated by altruistic motives and it was insensitive to the size of the gift. Yet, reciprocity and the magnitude of the payment were relevant when such payment was monetary. More importantly, particularly in the context of this subsidy game, they found that the driver of cooperation in mixed-markets resembled more that of monetary markets.

disease because it does not transform the individuals' altruistic-sacrifice into a market-type relationship, but it totally erodes it.

The erosion of socially produced environmental protection motivation produced by PES programmes with limited participation must be seriously considered by policymakers. Southgate and Wunder [87] claim that the object of PES-like schemes such as Mexico's PSAH is to provide temporary incentives for environmental protection, and that once the contract with the environmental services suppliers is over, it is expected they will make the transition towards sustainable forestry management or a full market PES scheme. However, such transition is likely to fail: if the players' altruistic-sacrifice becomes eroded, and if the monetary reward stops flowing to the participants, it is very unlikely that environmental protection will take place, and in turn, trigger more environmental depletion than the one which originally prevailed.[58]

Empowerment as a policy remains a possibility. However, it cannot guarantee by itself that the provision of environmental services will always take place. Instead, a policy mix with pecuniary and non-pecuniary components will attain better results in terms of environmental services provision by increasing the perception of the motivation of environmental protection among individuals while allowing them to obtain higher material payoffs.[59]

Finally, the use of PES in indigenous communities in developing countries should be closely monitored. Not only because these groups are governed by different traditions and values to those inherent to PES, but also because they

[58] Janssen and Mendys-Kamphorst [58] consider that withdrawing a financial incentive does not restore a social norm to contribute to a public good and might even reduce the level of contributions further.

[59] A PES programme in this spirit is the *Scolel Té* project in Chiapas and Oaxaca, Mexico. Its main objective is the creation of long-term carbon, livelihood and ecosystem benefits. Through participatory, bottom-up planning, and community-led design, such scheme builds local capacity by introducing agroforestry systems. In that way, landowners improve soil quality, increase their productivity and receive a payment in return for the environmental services they provide according to the land use project. Van Hecken and Bastiaensen [95] also argue that this type of PES programme has been successful in Nicaragua.

differ from modern economies in: altruistic-preferences, organizational capacity, access to financial resources and technical advice, and vulnerability to environmental changes.[60] Thus, although environmental and economic targets might be reached by choosing a suitable combination of instruments, a disruption with greater social consequences might originate from the introduction of a market-type system.[61]

5. Discussion

The main contribution of this paper is to illustrate the mechanism through which individuals produce a motivation to forego personal gains in order to attain the provision of an environmental service, and show how such motivation is deteriorated by a PES. However, as shown in Appendix E, the destruction of such motivation is not exclusive to monetary incentives. In accordance to the "impaired self-determination" process (Frey and Jegen [38]), any external measure established as an imposition to the individuals' social interaction will have a negative impact on their motivation to provide the environmental service through a distortion of their perception of the altruistic-sacrifice of others.

[60] As Kosoy and Corbera [65] stress: "When ecosystem services are commodified, they become the basis for new socio-economic hierarchies, characterised by the re-positioning of existing social actors, the emergence of others and, very likely, the reproduction of unequal power relations in access to wealth and environmental resources." p. 1234.

[61] Since some readers might consider that the present discussion maintains a romantic view about the traditional knowledge of indigenous communities regarding natural resources management, a clarification statement must be made. My claim is not that such communities always succeed in attaining a sustainable management of natural resources and thus, intervention should be always avoided. Indeed, last section pointed out that if individuals believe others do not hold a motivation for environmental protection then intervention with low costs of participation and available to most owners of natural resources might bring about a cooperative equilibrium where the environmental service is provided. Yet, the policymakers must realize that a monetary scheme will "commodify" the beliefs of individuals affected by the policy. Hence, the consequences of a PES will spread beyond the environmental services provision sphere and transform the social dynamics of those participant communities.

However, whereas in the case of a monetary payment the individuals' altruistic-sacrifice is reduced to a commodity that can be sold within a market, a non-monetary and externally imposed policy erodes it.

The AS model has clear differences with respect to other motivation crowding-out models.[62] As opposed to the AS model, Frey and Oberholzer-Gee [40] do not formalize the mechanism through which the intrinsic motivation of individuals (i.e. their civic duty) is deterred by the external compensation. Rather, they just show how the optimal level of support for an unwanted siting facility at their community might decline if there is motivation crowding-out. So, they do not explicitly model the costs of the external compensation.

In contrast to Brekke et al [10] where individuals have a preference for thinking of themselves as socially responsible, the present model does not assume individuals have that *self-image* as environmentally responsible. The motivation crowding-out in their model is originated by a dissonance produced within the personal (or internalized) norms realm, while in the AS model it is originated by a change in the subjective beliefs of individuals, i.e. it is produced by a distortion in the social norms realm. Finally, their model considers that the scenario of underprovision of the public good always prevails, while the AS model accommodates the case of full provision even where a monetary incentive is offered.

With respect to Bénabou and Tirole [6], differences are starker. In their model, the extrinsic reward, offered by a principal with vested interests in the consecution of a task, crowds-out the agent's intrinsic motivation because such reward signals the agent that the principal does not trust him. Hence, the agent's self-confidence is undermined by the extrinsic reward. In the AS model,

[62] Broadly, the AS model does not assume a change in the individuals' preferences or a change in the individuals' self-perception. Instead, the monetary incentive transforms the individuals' perception about the altruistic-sacrifice made by others, which changes the task environment and the nature of the task itself.

the motivation crowding-out originated by the monetary payment is not related to self-efficacy as in Bénabou and Tirole's model. Moreover, whereas they consider that rewards are positive reinforcers in the short run, the AS model predicts that under certain conditions (high transaction costs and limited budget that excludes potential participants from the PES) this would not be the case.

A closer and more recent analysis to the present approach is carried out by Dufwenberg et al [23]. Despite their use of Psychological Games as their theoretical framework, and their use of the public good game as their workhorse, there are subtle differences worth noticing. In Dufwenberg et al [23], the change in motivation to contribute to the public good comes from "valence" and "label" framing effects under a "take frame" and a "give frame". Yet, they do not explore the motivation crowding-out effects of monetary rewards as the AS model does.

As suggested by the example from Section 2, self-interest cannot accommodate the idea that individuals are able to produce a social motivation to provide a public good and that it might become undermined by monetary payments. However, other influential models that depart from self-interest and that explain a wide array of empirical evidence on cooperation in different games cannot explain such crowding-out either. Such is the case of the social preferences model of Fehr and Schmidt [31], and more specifically, the reciprocity models of Rabin [82] and Falk and Fischbacher [28] (FF).[63]

Take for instance the standard public good game. Rabin's framework predicts that the public good can be provided or not when individuals are willing to reciprocate both kindness and unkindness, respectively. Fehr and Schdmit's model also predicts that the public good can be provided or not. The former

[63] A stark difference between these three models is that while Fehr and Schmidt's model is concerned with outcomes, Rabin's idea of fairness comes from the intention of players. In turn, Falk and Fischbacher's is concerned with both outcomes and intentions.

is true when the sum of the marginal return of investing in the public good and the nonpecuniary benefits of reducing inequality is higher than the amount contributed to the public good, and if the number of individuals for which this is true is sufficiently high. The latter is attained if the reverse is true. If the monetary payment is introduced to incentive contributions to the public good, Rabin's and Fehr and Schmidt's predictions are not altered.[64] This should come as no surprise because the presence of a monetary payment does not change the perception of kindness (and unkindness) or the inequity aversion among individuals. So, the monetary payment cannot crowd-out the motivation of individuals to produce a social gain in either case.

With respect to FF there are two similarities, but four key differences with respect to the AS framework. The former refer to the fact that both frameworks rely on outcome-dependency and intention-driven behaviour, i.e. in both models individuals determine the kindness (or altruistic-sacrifice) of another given the outcome of the game or the intention of the other when selecting an action. The latter refer to the following cases. First, the standard to judge whtat is fair and what not is different. For FF it is the equitative payoffs, whereas for the AS model it is both the willingness of individuals to sacrifice personal gains for the social good and the intensity of such sacrifice. Second, in FF when a player cannot behave more opportunistically, then the other cannot make a judgement about his kindness, but this is not true for the AS; even when an individual is forced to behave in a specific way (command and control policies), like in Appendix E, the other individual can judge his altruistic-sacrifice. Finally, for FF it is not reasonable for an individual to demand that another behaves fairly when it implies for such individual to put himself in a disadvantageous position;

[64] However, as Nyborg and Rege [75] point out with respect to Fehr and Schmidt's model, if the society is already in an equilibrium in which inequity averse individuals contribute to the public good, then a subsidy will increase the number of contributors and hence, produce a motivation crowding-in.

this again is not true in the *AS* model, where an individual not being benefit by the PES would not consider as an altruistic-sacrifice the fact that another receives a payment for something he does for free.

The altruistic-sacrifice of individuals can be considered indeed as a generalization of particular environmental motivations. One example is the concept of "sense of place", which describes the meanings attached to a spatial setting by an individual that reflects his level of commitment to a place expressed by social involvement and subjective feelings (Jorgensen and Stedman [59]). Through such motivation, individuals position themselves in relation to others to advocate particular standpoints regarding natural resources management. Moreover, individuals with a "sense of place" are more willing to make personal sacrifices that promote environmental protection (Brandenburg and Carroll [8]). The destruction of the individuals' "sense of place" is more common in situations where individuals are not empowered and have no control over the disruptive process; precisely, the same scenarios where the individuals' perception of the altruistic-sacrifice of other individuals is distorted. Hence, the introduction of a monetary scheme such as PES can erode the "sense of place" of individuals.

Finally, an interesting interpretation can be made regarding the monetization of the individuals' contributions to the public good, especially in the realm of environmental services provision. Kosoy and Corbera [65] claim PES schemes have a negative impact on the individuals' motivation to provide the environmental services because they simplify the complexity of natural ecosystems, prioritise a single exchange-value, and mask the social relations embedded in the process of "producing" and "selling" ecosystem services. They denominate this process as *commodity fetishism*. In the *AS* model, a *commodity fetishism* takes place once the payment for the environmental service provision is received. The PES then becomes counterproductive for conservation because it transforms the

logic of resource use and conservation from multiple non-monetary to monetary values (Martinez-Allier [70]).

Conclusion

The social production of an environmental protection motivation and its erosion originated by monetary incentives cannot be represented by behavioural models based on self-interest, kindness or inequity aversion. Instead, it is best described by the altruistic-sacrifice of individuals which leads them to exchange personal material gains for a social benefit. Without external intervention, such social benefit is delivered by the provision of an environmental service, if and only if individuals believe their altruistic-sacrifice is reciprocated. However, no formation of such motivation is possible for those individuals who believe otherwise.

External intervention in the form of a monetary incentive produces a distortion in the beliefs held by individuals regarding others' altruistic-sacrifice, and despite their willingness to contribute their endowment to the provision of the public good, such altruistic-sacrifice is deemed as inexistent. In other words, their environmental protection motivation is deterred by PES programmes, i.e. they become a disease. Yet, the provision of the public good is viable as long as the transaction costs from participation in such incentive-based scheme are low enough and if the monetary payment is available to all individuals. Then PES become a temporary cure.

In general, not only monetary payments distort the perception of individuals about the others' altruistic-sacrifice. Any external imposition that overlooks the individuals' beliefs and which changes their social interaction will produce such

distortion. In that respect, it is appealing to experiment with inclusive measures such as grassroots participation schemes, and explore alternative designs of PES programmes which might include a non-monetary component that reinforces the perception of sacrifice of all participants and operate as a long-lasting cure.

The notion of the altruistic-sacrifice in the public goods provision decision-making of individuals generalizes the cognitive processes between individuals and their physical surroundings. An individual's "sense of place" can be constructed through the sacrifice of personal gains in benefit of others, and the identification and attachment that he has with respect to a specific place might be lost or reduced to a commodity by intrusive environmental policies. So, any pro-environmental motivation like "sense of place" is generalized by the present framework.

This chapter is only the first part of a body of research on natural resources management which tries to elucidate the motives for cooperation among individuals in order to provide environmental services and explain the mechanism through which such motivation can be destroyed or altered by environmental policy. Therefore, future research should be conducted along the following line.

Empirical evidence about the validity of the present model's predictions is pending to show the actual effects of incentive-based policies in developing countries, particularly of PES programmes in vulnerable communities which are endowed with key natural resources and whose management is governed by socially produced environmental protection motivations. Two potential candidates for such assessment are Mexico's PSAH and the *Scolel Té* project. The former is the largest PES in Mexico and consists in a pure monetary scheme (direct cash transfer to the landowners), while the latter resembles a dual incentive PES that increases the participation of individuals in the environmental services provision

decision-making process and delivers a payment in recognition of such service. Hence, the empirical research will consist in a frame field experiment that will test some of the propositions produced by this theoretical chapter. In particular, it will test differences between the motivation crowding-out produced by pure monetary incentives and the one produced by a policy mix. Furthermore, it will test what happens to the motivation of individuals who do not receive a monetary compensation for their efforts to provide environmental services while others do.

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Appendix

A. The *N*-player case

Consider a N-player, normal-form game with strategy sets $A_1, ..., A_n$ for players $1, ..., n$. Let π_i:A_1x...x$A_n \rightarrow \mathbb{R}$ be player i's *material payoffs*. Following Rabin [82]: $a_i \in A_i$ is the action chosen by player i, where $i = 1, ..., n$; $b_{ji} \in A_i$ represent player i's beliefs about what strategy player j chooses, where $i = 1, ..., n$, $j = 1, ..., n$, and $j \neq i$; $c_{ij} \in A_i$ stand for player i's beliefs about what player j believes player i's strategy is, where $i = 1, ..., n$, $j = 1, ..., n$, and $j \neq i$.

The *N*-player altruistic-sacrifice function

Player i's altruistic-sacrifice is given by:

$$s_i\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\pi_i^{max}(b_{1i},...,b_{ni}) - \pi_i(a_i,b_{1i},...,b_{ni}) + \pi_{-i}^{S}(b_{1i},...,b_{ni},a_i) - \pi_i(a_i,b_{1i},...,b_{ni})}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

$$where\ \pi_{-i}^{S}\left(b_{1i}, ..., b_{ni}, a_i\right) \equiv \frac{\sum_{j \neq i} \pi_j(b_{1i},...,b_{ni},a_i)}{N-1}$$

The scaled payoffs of all players except i are defined as the average payoffs of the rest of the group and they are used to make an interpersonal comparison between player i and the average player of the group excluding i.

Let the function $\tilde{s}_{-i}(b_{1i},...,b_{ni},c_{i1},...,c_{in})$ denote player i's beliefs about the (average) altruistic-sacrifice made by the rest of the players:

Player i's beliefs about the (average) altruistic-sacrifice made by the rest of players are:

$$\tilde{s}_{-i}(b_{1i},...,b_{ni},c_{i1},...,c_{in}) \equiv$$

$$\frac{\pi_{-i}^{maxS}(c_{i1},...,c_{in})-\pi_{-i}^{S}(b_{1i},...,b_{ni},c_{i1},...,c_{in})+\pi_i(c_{i1},...,c_{in},b_{1i},...,b_{ni})-\pi_{-i}^{S}(b_{1i},...,b_{ni},c_{i1},...,c_{in})}{\pi_{-i}^{maxS}(b_{1i},...,b_{ni})-\pi_{-i}^{minS}(b_{1i},...,b_{ni})}$$

$$where\ \pi_{-i}^{S}(b_{1i},...,b_{ni},c_{i1},...,c_{in}) \equiv \frac{\sum_{j\neq i}\pi_j(b_{1i},...,b_{ni},c_{i1},...,c_{in})}{N-1},$$

$$\pi_{-i}^{maxS}(c_{i1},...,c_{in}) \equiv \frac{\sum_{j\neq i}\pi_j^{max}(c_{i1},...,c_{in})}{N-1},$$

$$\pi_{-i}^{maxS}(b_{1i},...,b_{ni}) \equiv \frac{\sum_{j\neq i}\pi_j^{max}(b_{1i},...,b_{ni})}{N-1},$$

$$and\ \pi_{-i}^{minS}(b_{1i},...,b_{ni}) \equiv \frac{\sum_{j\neq i}\pi_j^{min}(b_{1i},...,b_{ni})}{N-1}$$

Equilibrium

With these altruistic-sacrifice functions, the players' preferences can be completely specified. Thus, player i chooses a_i to maximize his expected utility $U_i(a_i,b_{1i},...,b_{ni},c_{i1},...,c_{in})$ which incorporates the traditional material payoffs of the game and players' altruistic-sacrifice:

$$U_i(a_i,b_{1i},...,b_{ni},c_{i1},...,c_{in}) =$$
$$\pi_i(a_i,b_{1i},...,b_{ni}) + \theta_i\widetilde{s}_{-i}(b_{1i},...,b_{ni},c_{i1},...,c_{in})\cdot(1+s_i(a_i,b_{1i},...,b_{ni}))$$

The tuple of strategies $(a_1,...,a_n)\in(A_1,...,A_n)$ is an *AS Equilibrium* if, for $i=1,...,n,\ j=1,...,n,\ j\neq i$:

1. $a_i \in \text{argmax}_{a \in A_i} U_i\left(a_i, b_{ji}, c_{ij}\right)$

2. $c_{ij} = b_{ji} = a_i$

Baseline provision setting

The material payoffs of the game for player i are defined by: $\pi_i\left(a_i, a_{-i}\right) = (1 - a_i) + \frac{\alpha}{N}\left(a_i + \sum_{j \neq i} a_j\right)$. It is additionally assumed that $1 < \alpha < N$.

Consider further that players are separated into two groups; one group is conformed by player i and the other by the rest of players in the game (-i).

Table 4: Scaled material payoffs of a standard public good game

$i / -i$ *scaled*	C	D
C	α ,α	$\frac{\alpha}{N}$, $\frac{\alpha}{N} + 1$
D	$\frac{\alpha}{N}(N-1) + 1$, $\frac{\alpha}{N}(N-1)$	1 ,1

The analysis is similar to the *2*-player case in that *(D,D)* is an *AS Equilibrium* $\forall \alpha \in (1, N)$, i.e. for all the possible values of the marginal return of the public good. However, in the N-player case $s_i(C,C) = \frac{1-\frac{\alpha}{N}}{\alpha\left(1-\frac{1}{N}\right)}$ and $\widetilde{s}_{-i}(C,C) = \frac{1-\alpha\left(1-\frac{1}{N}\right)}{\frac{\alpha}{N}}$. Thus, the higher the marginal return of the public good (α) is, the lower the altruistic-sacrifice player i makes and the lower is also i's perception about the altruistic-sacrifice of the rest of the players in the game. This is rather intuitive since a greater return to a player's contribution to the public good provision translate into a lower sacrifice, given that such return is part of his material payoffs. In consequence, *(C,C)* is an *AS Equilibrium* iff $\alpha \leq \alpha^*$.

Monetary incentives

The material payoffs for player i are given now by $\pi_i(a_i, a_{-i}; k) = (1 - a_i) + (a_i - k) + \frac{\alpha}{N}\left(a_i + \sum_{j \neq i} a_j\right)$. It is assumed that if $a_i = 0 \Rightarrow k = 0$. Additionally, it is assumed that $0 \leq k < \frac{\alpha}{N}$.

Table 5: Scaled material payoffs of a standard public good game with subsidy

$_i/^{-i\,scaled}$	C	D
C	$\alpha + 1 - k$,$\alpha + 1 - k$	$\frac{\alpha}{N} + 1 - k$,$\frac{\alpha}{N} + 1$
D	$\frac{\alpha}{N}(N-1) + 1$,$\frac{\alpha}{N}(N-1) + 1 - k$	1 ,1

The fact that *(C,C)* is an *AS Equilibrium* or not depends on the size of the transaction costs. For $0 \leq k < \frac{\alpha}{N}$, *(C,C,)* is an *AS Equilibrium* iff $k \leq k^*$.

(D,D) is always an *AS Equilibrium*.

Limited monetary incentives

Consider a modified subsidy game in which a number of s individuals receive the monetary payment, and a number of t individuals do not.[65]

Table 6: Scaled material payoffs of a standard public good game with limited monetary incentives

$_t/^s$	C	D
C	α ,$\alpha + s - k$	$\frac{\alpha t}{N}$,$\frac{\alpha t}{N} + s$
D	$\frac{\alpha s}{N} + t$,$\frac{\alpha s}{N} + s - k$	t ,s

[65] It is assumed that $s + t = N$ and $s = t$. The latter is only used for its computational simplicity because it eliminates the necessity to scale the payoffs in the interpersonal comparison across members of both groups.

As in the game without monetary incentives and the original subsidy game, *(D,D)* is an *AS Equilibrium* $\forall \alpha \in (1, N)$, $\forall k \in [0, \frac{\alpha}{N})$, and $\forall s, t : s \geq 2, t \geq 2$ and $s + t = N$.

The condition for *(C,C)* to be an *AS Equilibrium* is the following:

$$\alpha + \left(\frac{k-s}{\alpha - \frac{\alpha s}{N}}\right) \cdot \left(1 + \frac{\frac{\alpha s}{N} + N - \alpha - k}{\alpha - \frac{\alpha t}{N}}\right) > \frac{\alpha s}{N} + t + \left(\frac{k}{\frac{\alpha t}{N}}\right) \cdot \left(1 - \frac{k}{\frac{\alpha s}{N}}\right)$$

It can be checked that such condition cannot be satisfied and that *(C,C)* is not an *AS Equilibrium* regardless of the number of players in either group. Hence, the full cooperative equilibrium is not attained when at least one player does not receive the monetary payment.

Non-monetary incentives

Player i's generalized altruistic-sacrifice is given by:

$$s_i^e\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\pi_i^{max}(b_{1i},...,b_{ni}) - \pi_i(a_i,b_{1i},...,b_{ni}) + \pi_{-i}^{S}(b_{1i},...,b_{ni},a_i) - \pi_i(a_i,b_{1i},...,b_{ni}) + \pi_i^e(a_i,b_{1i},...,b_{ni})}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

$$where\ \pi_{-i}^{S}\left(b_{1i}, ..., b_{ni}, a_i\right) \equiv \frac{\sum_{j \neq i} \pi_j(b_{1i},...,b_{ni},a_i)}{N-1},$$

$$\pi_i^e\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv e\left(a_i + a_i\left(\sum_{j \neq i} b_{ji}\right)\right),$$

$$and\ e \in [0, 1]$$

Player i's beliefs about the generalized (average) altruistic-sacrifice made by the rest of players are given by:

$$\tilde{s^e}_{-i}\left(b_{1i},...,b_{ni},c_{i1},...,c_{in}\right)\equiv$$

$$\frac{\pi_{-i}^{maxS}(c_{i1},...,c_{in})-\pi_{-i}^{S}(b_{1i},...,b_{ni},c_{i1},...,c_{in})+\pi_{i}(c_{i1},...,c_{in},b_{1i},...,b_{ni})-\pi_{-i}^{S}(b_{1i},...,b_{ni},c_{i1},...,c_{in})+\pi_{-i}^{e}(b_{1i},...,b_{ni},c_{i1},...,c_{in})}{\pi_{-i}^{maxS}(b_{1i},...,b_{ni})-\pi_{-i}^{minS}(b_{1i},...,b_{ni})}$$

$$where\ \pi_{-i}^{S}\left(b_{1i},...,b_{ni},c_{i1},...,c_{in}\right)\equiv\frac{\sum_{j\neq i}\pi_{j}(b_{1i},...,b_{ni},c_{i1},...,c_{in})}{N-1},$$

$$\pi_{-i}^{maxS}\left(c_{i1},...,c_{in}\right)\equiv\frac{\sum_{j\neq i}\pi_{j}^{max}(c_{i1},...,c_{in})}{N-1},$$

$$\pi_{-i}^{maxS}\left(b_{1i},...,b_{ni}\right)\equiv\frac{\sum_{j\neq i}\pi_{j}^{max}(b_{1i},...,b_{ni})}{N-1},$$

$$\pi_{-i}^{minS}\left(b_{1i},...,b_{ni}\right)\equiv\frac{\sum_{j\neq i}\pi_{j}^{min}(b_{1i},...,b_{ni})}{N-1},$$

$$\pi_{-i}^{e}\equiv e\left(\frac{\sum_{j\neq i}b_{ji}}{N-1}+c_{-ii}\left(\sum_{j\neq i}b_{ji}\right)\right),$$

$$and\ \ e\left[0,1\right]$$

Because empowering individuals only changes their beliefs about the altruistic-sacrifice of others when they contribute to the provision of the public good, *(D,D)* is still an *AS Equilibrium* $\forall\alpha\in(1,N)$ and $\forall e\in[0,1]$. Yet, empowering individuals will always attain the provision of the public good, provided they believe others make an altruistic-sacrifice and regardless of the marginal return of the public good, i.e. *(C,C)* is an *AS Equilibrium* $\forall\alpha\in(1,N)$ and $\forall e\in[0,1]$.

Provision under a dual incentive

(D,D) is only an *AS Equilibrium* if $e<e^{*}$.

If individuals instead cooperate, *(C,C)* is an *AS Equilibrium* $\forall\alpha\in(1,N)$, $\forall k\in[0,\frac{\alpha}{N})$, and if $e>e^{\mp}$.

Now consider the limited budget case where the monetary incentive is only available to a subset of the individuals in the game (s). *(D,D)* is an *AS Equilibrium* $\forall\alpha\in(1,N)$, $\forall k\in[0,\frac{\alpha}{N})$, $\forall s,t\ :s+t=N$, and $\forall e\in[0,1]$.

If $e > e^{\oplus}$ *(C,C)* is an *AS Equilibrium* $\forall \alpha \in (1, N)$, $\forall k \in [0, \frac{\alpha}{N})$, and $\forall s, t$: $s + t = N$.

B. Specification of the utility function

The choice of a particular functional form to represent the players' utility depends on the underlying behavioural feature to be represented and the correspondent realism. The main behavioural component of the utility function used throughout the chapter is the reciprocity of the players' strategies. So, a player is better-off if he chooses to perform an altruistic-sacrifice given he holds beliefs that the rest of players also renounce to material payoffs. But equivalently, if he believes they do not make and altruistic-sacrifice, he would be better-off reciprocating this "bad" behaviour.

This reciprocity feature can be represented as well by the next utility function:

$$V_i\left(a_i, b_{1i}, ..., b_{ni}, c_{i1}, ..., c_{in}\right) =$$
$$\pi_i\left(a_i, b_{1i}, ..., b_{ni}\right) + s_i\left(a_i, b_{ji}\right) \cdot \widetilde{s}_{-i}\left(b_{1i}, ..., b_{ni}, c_{i1}, ..., c_{in}\right)$$

This functional form is also mentioned by Rabin [82]. The difference between V_i and U_i is that the latter prescribes that any individual will be better-off reciprocating "good" behaviour than "bad" behaviour. Thus, with V_i, the individuals might end up as well-off after a hostile interaction, than after a "friendly" interaction where all are willing to cooperate. It seems reasonable to expect that this is not the case, and that individuals who undergo "friendly" interactions will end up happier than when they deal with hostile situations.

A feature that is present in both U_i and V_i, provided the altruistic-sacrifice function is bounded, is that issues regarding environmental protection become less important as the size of the material payoffs increases (just as fairness in

Rabin [82]). This is a suitable property since it is expected that to some extent, particularly in modern societies, the tangible (and even more so the intangible) benefits to individuals of environmental protection become obscured by material aspects.

In terms of the equilibrium outcomes of the different analyzed games presented throughout the chapter, V_i does not yield exactly the same results as U_i. In the standard public good game, *(C,C)* is an *AS Equilibrium* $\forall \alpha \in (1, N)$, so it cannot include the impossibility of attaining the full cooperative equilibrium when the value of the marginal return of the public good is sufficiently high. In Appendix C, it is briefly discussed why this result is intuitive. For the subsidy game, V_i prescribes that *(C,C)* is always an *AS Equilibrium* regardless of the size of the transaction costs of receiving the subsidy, so it cannot accommodate the crowding-out of the motivation for public good provision originated by the monetary payment.

The specification of the utility function does matter to obtain the most important result of the model. Yet, this should come as no surprise. As previously mentioned, V_i cannot distinguish the individuals' well being when they face a hostile situation from a "friendly" one, and in the subsidy game, the perception of altruistic-sacrifice depends on the size of the transaction costs. Therefore, that all players cooperate to the provision of the public good because of a monetary payment (rather than because of a social interaction) is not regarded as an altruistic-sacrifice and in turn, it is considered as hostile. Due to V_i's inability to capture the utility differential which prevails between a hostile and a friendly situation, *(C,C)* is an *AS Equilibrium* regardless of the size of the transaction costs involved in the subsidy scheme.

C. A family of sacrifice functions

I present here other specific functional forms that intuitively represent a personal sacrifice, but that cannot account for the behaviour described in the Introduction of all experimental evidence about reciprocity and motivation crowding-out, and in consequence, deliver different results when used to analyze the games presented in the chapter, i.e. the standard N-player public good game, the subsidy game and its modified version, and even a degenerate public good game which can be found in Appendix E.

The first alternative sacrifice function I revise captures the traditional concept of self-sacrifice, where an individual is willing to incur a loss. Therefore, a sacrifice function that captures this idea is:

$$ss_i\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\pi_i^{max}(b_{1i},...,b_{ni}) - \pi_i(a_i,b_{1i},...,b_{ni})}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

This sacrifice function is similar to the one used throughout the chapter, but it lacks the altruistic component, i.e. it does not include the recipient of the sacrifice's benefits. There are three major drawbacks with this sacrifice function. The first of them is that it cannot represent the intensity of the sacrifice, i.e. $ss_i(C,D) = ss_i(C,C)$ and $ss_i(D,D) = ss_i(D,C)$. The second drawback is that *(C,C)* might not be an *AS Equilibrium* in the public good game since the following condition is not fulfilled for any α and for any $N \geq 2$: $\alpha + \left(\frac{N-1-\alpha+\frac{\alpha}{N}}{\frac{\alpha}{N}}\right) \cdot \left(1 + \frac{1-\frac{\alpha}{N}}{\alpha-\frac{\alpha}{N}}\right) > \frac{\alpha}{N}(N-1) + 1 + \left(\frac{N-1-\alpha+\frac{\alpha}{N}}{\frac{\alpha}{N}}\right)$. While the altruistic-sacrifice function used throughout the chapter also considers the possibility of no full cooperative equilibrium in the public good game, in such case it stems from high values of the marginal return of the public good that originate from considering also a high number of players in the game (if the marginal return per capita is held constant), a result that is intuitive insofar as

a fully cooperative equilibrium might be complicated to achieve when dealing with a high number of contributors (e.g. it might be that assessing the altruistic-sacrifice of other players becomes complicated when the number of assessments becomes very high). However, with this self-sacrifice function, even in the two-player case, *(C,C)* is not an equilibrium for any α, which is rather dissapointing. Finally, the third drawback is that *(C,C)* is always an *AS Equilibrium* of the subsidy game because the following condition is always fulfilled $\forall \alpha \in (1, N)$ and $\forall k \in [0, \frac{\alpha}{N})$: $\alpha + 1 - k > \frac{\alpha}{N}(N-1) + 1$. Hence, this sacrifice function cannot account for the possibility of motivation crowding-out originated by the introduction of a monetary payment to promote cooperation in a public good game.

The second alternative sacrifice function I revisit includes the altruistic component that the first one lacked, and that it is used throughout the chapter. However, the definition of such altruistic component is different.

$$as_i\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\pi_i^{max}(b_{1i},...,b_{ni}) - \pi_i(a_i,b_{1i},...,b_{ni}) + \pi_{-i}^{S}(b_{1i},...,b_{ni},a_i) - \pi_{-i}^{S}(a_i^*)}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

$$\text{where } a_i^* \in \text{argmax}_{a \in A_i} \pi_i\left(b_{1i}, ..., b_{ni}\right)$$

There are three major drawbacks with this sacrifice function. The first is that it cannot represent (consistently) the intensity of the sacrifice, i.e. $as_i(D,D) = as_i(D,C)$ in the public good game, but that is not the case in the subsidy game. Additionally, $as_i(C,C) = as_i(C,D)$ in the subsidy game, but the same is not true in the public good game. Actually, for such game, we have that $as_i(C,C) > as_i(C,D)$ for $N > 2$, a result which is not intuitive, since it is expected that someone would be sacrificing more when the rest of players do not reciprocate his sacrifice. The second drawback is that once the monetary payment is introduced into the public good game, it is expected that the perception of sacrifice of players becomes distorted by it. In particular, the fact that $as_i(C,C) = 0$ is

acceptable because player i does not renounce to any material payoffs. Yet, if he deviates and selects the strategy that does not maximize his material payoffs, $as_i(D,C) = -\frac{k}{\alpha - \frac{\alpha}{N}}$, which means that when i defects, he does not sacrifice regardless the size of the transaction costs despite having renounced to non-negative material payoffs. Finally, the last drawback is that *(C,C)* is always an *AS Equilibrium* in the subsidy game because the following condition is always fulfilled $\forall \alpha \in (1,N)$ and $\forall k \in [0, \frac{\alpha}{N})$: $\alpha + 1 - k > \frac{\alpha}{N}(N-1) + 1$. Hence, as with the past sacrifice function, this one does not contemplate the possibility of motivation crowding-out originated by the subsidy introduced in the public good game. If the first two terms of the numerator are ommited and the sacrifice function just denotes the altruistic component of player i's sacrifice, i.e. if it is transformed to: $as_i\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\pi^S_{-i}(b_{1i},...,b_{ni},a_i) - \pi^S_{-i}(a_i^*)}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$, then such sacrifice function also has the same three drawbacks just mentioned.

The third alternative sacrifice function also considers the altruistic component of player i's sacrifice. However, the definition of the recipient of the benefits produced by such sacrifice is different. So, the sacrifice function becomes:

$$\overline{as}_i\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\pi_i^{max}(b_{1i},...,b_{ni}) - \pi_i(a_i,b_{1i},...,b_{ni}) + \sum_{i=1}^{n} \pi_i(a_i,b_{1i},...,b_{ni}) - \sum_{i=1}^{n} \pi_i(a_i^*)}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

$$\text{where } a_i^* \in \text{argmax}_{a \in A_i} \pi_i\left(b_{1i}, ..., b_{ni}\right)$$

This sacrifice function has two major drawbacks. Firstly, it cannot represent the intensity of the sacrifice, i.e. $\overline{as}_i(C,D) = \overline{as}_i(C,C)$ and $\overline{as}_i(D,D) = \overline{as}_i(D,C)$. Secondly, *(C,C)* is always an *AS Equilibrium* in the subsidy game because the following condition is always fulfilled $\forall \alpha \in (1,N)$ and $\forall k \in [0, \frac{\alpha}{N})$: $\alpha + 1 - k > \frac{\alpha}{N}(N-1) + 1$. Hence, as with the last two sacrifice functions, this one does not include the possibility of motivation crowding-out originated by the subsidy introduced in the public good game. If the first two terms of

the numerator are ommited and the sacrifice function just denotes the altruistic component of i's sacrifice, i.e. if it is transformed to: $\overline{as}_i\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\sum_{i=1}^{n} \pi_i(a_i, b_{1i}, ..., b_{ni}) - \sum_{i=1}^{n} \pi_i(a_i^*)}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$, the new sacrifice function also has the same two drawbacks.

The last alternative sacrifice function is composed by the last two terms of the function used throughout the chapter. Thus, it considers the altruistic component of the sacrifice as an interpersonal comparison of payoffs among the player who makes the sacrifice and the recipient of the benefits. The sacrifice function becomes:

$$\overline{s}_i\left(a_i, b_{1i}, ..., b_{ni}\right) \equiv \frac{\pi_{-i}^{S}(b_{1i}, ..., b_{ni}, a_i) - \pi_i(a_i, b_{1i}, ..., b_{ni})}{\pi_i^{max}(a_i) - \pi_i^{min}(a_i)}$$

This sacrifice function has two major drawbacks. The first is that the perception of sacrifice in the public good game is counterintuitive. Even if the player is renouncing to material payoffs, the function reports that he does not sacrifice, i.e. $\overline{s}_i(C, C) = 0$. Lastly, *(D,D)* is not a an *AS Equilibrium* in the subsidy game when there are no transaction costs because the following condition is not true: $0 < \frac{\alpha}{N}$.

Thus, there are many intuitive forms to represent the (self or altruistic) sacrifice that a player makes. However, only one (the one used throughout the chapter) produces the desired results in the different analyzed games and in accordance with the behavioural regularities presented in the Introduction about reciprocity, self-sacrifice and motivation crowding-out.

D. Conditions for *AS Equilibria*

1. $1 > \frac{\alpha}{N} + \left(-\frac{1}{\frac{\alpha}{N}}\right) \cdot \left(1 + \frac{2-\frac{\alpha}{N}}{\alpha\left(1-\frac{1}{N}\right)}\right)$
2. $\alpha + \left(\frac{1-\alpha\left(1-\frac{1}{N}\right)}{\frac{\alpha}{N}}\right) \cdot \left(1 + \frac{1-\frac{\alpha}{N}}{\alpha\left(1-\frac{1}{N}\right)}\right) > 1 + \frac{\alpha}{N}(N-1) + \left(\frac{2-\alpha\left(1-\frac{1}{N}\right)}{\frac{\alpha}{N}}\right) \cdot \left(1 - \frac{1}{\alpha\left(1-\frac{1}{N}\right)}\right)$
3. $\alpha^* \equiv \frac{N}{6}\left(\frac{\rho}{N-1} + \frac{2(3N-2)}{\rho}\right)$

   $\rho = \left(\left(-324 + 12\sqrt{-\frac{324N^3-648N^2-297N+633}{N-1}}\right)(N-1)^2\right)^{\frac{1}{3}}$

4. $\alpha < \frac{\alpha}{N}(N-1) + 1 + \frac{1}{\frac{\alpha}{N}}$
5. $1+\left(\frac{\alpha\left(1-\frac{1}{N}\right)-k}{\frac{\alpha}{N}}\right)\cdot\left(1 + \frac{\frac{\alpha}{N}-k}{\alpha\left(1-\frac{1}{N}\right)}\right) > \frac{\alpha}{N}+1-k+\left(\frac{\alpha\left(1-\frac{1}{N}\right)-2k}{\frac{\alpha}{N}}\right)\cdot\left(1 + \frac{k}{\alpha\left(1-\frac{1}{N}\right)}\right)$
6. $\alpha + 1 - k > \frac{\alpha}{N}(N-1) + 1 + \left(\frac{k}{\frac{\alpha}{N}}\right) \cdot \left(1 + \frac{\frac{\alpha}{N}-2k}{\alpha\left(1-\frac{1}{N}\right)}\right)$
7. $k^* \equiv \frac{\alpha}{4}\frac{\alpha(N-1)+N^2+\sqrt{\alpha^2(N^2-2N+1)+\alpha(2N^3-10N^2+8N)+N^4}}{N^2}$
8. $t + \left(\frac{\frac{\alpha s}{N}-k}{\frac{\alpha t}{N}}\right) > \frac{\alpha t}{N} + \left(\frac{\alpha-\frac{\alpha t}{N}-k-s}{\frac{\alpha t}{N}}\right) \cdot \left(1 + \frac{N-\frac{\alpha t}{N}}{\alpha-\frac{\alpha t}{N}}\right)$
9. $1 > \frac{\alpha}{N} + \left(-\frac{1}{\frac{\alpha}{N}}\right) \cdot \left(1 + \frac{2-\frac{\alpha}{N}+e}{\alpha-\frac{\alpha}{N}}\right)$
10. $\alpha+\left(\frac{1-\alpha\left(1-\frac{1}{N}\right)+Ne}{\frac{\alpha}{N}}\right)\cdot\left(1 + \frac{1-\frac{\alpha}{N}+Ne}{\alpha\left(1-\frac{1}{N}\right)}\right) > 1+\frac{\alpha}{N}(N-1)+\left(\frac{2-\alpha\left(1-\frac{1}{N}\right)+e}{\frac{\alpha}{N}}\right)\cdot\left(1 - \frac{1}{\alpha\left(1-\frac{1}{N}\right)}\right)$
11. $1+\left(\frac{\alpha\left(1-\frac{1}{N}\right)-k}{\frac{\alpha}{N}}\right)\cdot\left(1 + \frac{\frac{\alpha}{N}-k}{\alpha\left(1-\frac{1}{N}\right)}\right) > \frac{\alpha}{N}+1-k+\left(\frac{\alpha\left(1-\frac{1}{N}\right)-2k}{\frac{\alpha}{N}}\right)\cdot\left(1 + \frac{k+e}{\alpha\left(1-\frac{1}{N}\right)}\right)$
12. $e^* \equiv -\frac{\alpha k N^3-\alpha^2N^2-3k^2N^3+\alpha^3N-\alpha^3-\alpha^2kN^2+\alpha^2kN+\alpha^2N}{N^2(\alpha N-\alpha-2kN)}$
13. $\alpha+1-k+\left(\frac{Ne}{\frac{\alpha}{N}}\right)\cdot\left(1 + \frac{Ne}{\alpha\left(1-\frac{1}{N}\right)}\right) > \frac{\alpha}{N}(N-1)+1+\left(\frac{k+e}{\frac{\alpha}{N}}\right)\cdot\left(1 + \frac{\frac{\alpha}{N}-2k}{\alpha\left(1-\frac{1}{N}\right)}\right)$

14. $e^{\mp} \equiv \frac{1}{2}\frac{1}{N^3}\left(-\alpha N^2 - 2kN + 2\alpha N + \triangle\right)$

$$\triangle = \sqrt{4\alpha^2 k N^2 \left(\frac{N^2}{4k} + \frac{N}{\alpha} - N + \frac{k}{\alpha} - \frac{2}{\alpha} + \frac{1}{k} - \frac{\alpha}{k} + N - 1 + \frac{\alpha}{kN} + \frac{N^2}{\alpha} - \frac{2kN^2}{\alpha^2}\right)}$$

15. $t + \left(\frac{\frac{\alpha s}{N} + t - s - k}{\frac{\alpha t}{N}}\right) \cdot \left(1 + \frac{s-t}{\frac{\alpha s}{N}}\right) > \frac{\alpha t}{N} + \left(\frac{\alpha - \frac{\alpha t}{N} - k - s}{\frac{\alpha t}{N}}\right) \cdot \left(1 + \frac{N - \frac{\alpha t}{N} + te}{\frac{\alpha s}{N}}\right)$

16. $\alpha + \left(\frac{k - s + Ne}{\frac{\alpha t}{N}}\right) \cdot \left(1 + \frac{\frac{\alpha s}{N} + N - \alpha - k + Ne}{\frac{\alpha s}{N}}\right) > \frac{\alpha s}{N} + t + \left(\frac{t - s + k + se}{\frac{\alpha t}{N}}\right) \cdot \left(1 + \frac{s - t - k}{\frac{\alpha s}{N}}\right)$

17. $e^{\oplus} \equiv \frac{1}{2}\frac{1}{sN^3}\left(\Theta + \sqrt{\varphi + \Lambda + \Phi + \sigma + \Upsilon}\right)$

$$\Theta = sN\left(t\left(\alpha + k + t - s - N - \frac{\alpha s}{N}\right) + N\left(2s - k - N\right)\right)$$

$$\varphi = s^2N^4\left(4 + 2\alpha t - 8kt + N^2 - 4sN\right) + ts^2N^3\left(6\alpha s - 6\alpha t - 4kt - 2k^2 + 6ks - \frac{4\alpha s^2}{N}\right)$$

$$\Lambda = s^2t^2N^2\left(\alpha^2\left(1 + \frac{2t}{\alpha} - \frac{2s}{N}\right) + 2k\left(\frac{k}{2} + t - s\right)\right) + 2stN\left(\alpha s^3\left(t + \frac{t^2}{s} + 2\alpha^2\right) + 4kN^3\left(t - N\right)\right)$$

$$\Phi = 4s^3N^3\left(\frac{tNk^2}{s^2} + \frac{t\alpha^3}{s} - \frac{2t\alpha^3}{N} - \alpha k + \frac{tN\alpha^2}{s} - \frac{t^2\alpha^2}{s} - t\alpha^2 + \frac{t^2\alpha^2}{N} + \frac{\alpha kN}{s}\right) +$$
$$s^2N^5\left(10t + 6k\right)$$

$$\sigma = s^2N^4\left(t^2\left(\frac{2s}{t} - 9 - \frac{2t}{N} + \frac{6s}{N} - \frac{4s^2}{tN} + \frac{t^2}{N^2} - \frac{2st}{N^2} + \frac{s^2}{N^2} + \alpha^2s^2\right) + 5k^2 - 8sk - 4\alpha^3 + \frac{8s\alpha^3}{N}\right)$$

$$\Upsilon = 4s^3N^4\left(\frac{\alpha s}{N} - \alpha - \frac{s\alpha^3}{N^2} - \frac{t^2N}{s^2} + \frac{t^3}{s^2} - \frac{Nk^2}{s^2}\right) + 2\alpha ks^2N^2\left(st - \frac{N}{\alpha} + t^2 - \frac{st^2}{N}\right)$$

E. A command and control policy

Command and control used to be the most common regulatory means to achieve environmental objectives. Goverments simply impose a requirement on the conduct of individual actors, e.g. restricting access to and regulating the use of ecosystem services. To represent such type of policy in a voluntary contribution setting, consider the situation where all players but i are forced to contribute all their endowment to the provision of the public good, e.g. it might be that the government is implementing a Zoning policy and somehow it does

not apply to i. In terms of the game, the introduction of the policy derives in a degenerate version of the original social dilemma.

In this case, standard game theory predicts that only those forced to contribute to the provision of the public good will cooperate. Therefore, the Nash Equilibrium is *(D,C)*. What does the AS model predict? Notice that since all players but i are forced to cooperate, i does not believe that they are performing an altruistic-sacrifice; they are just doing something they are obliged to do. Hence, in reciprocity and by definition of the altruistic-sacrifice function, i does not sacrifice. In other words we have that $s_i(C,C) = \widetilde{s}_{-i}(C,C) = 0$. As it turns out, if player i deviates then $s_i(D,C) = 0$ by definition as well, because the maximum payoffs he gets by cooperating are equivalent to his minimum payoffs. Therefore, no matter what i's beliefs regarding the rest of players' actions are, he will not sacrifice, which resumes in *(C,C)* not being an equilibrium. The *AS Equilibrium* in this game is *(D,C)* and coincides with the standard prediction (see condition 4 in Appendix D).

Although the outcome under the two models is the same, the logical process behind them is quite different. Standard theory explains that *(D,C)* is the Nash equilibrium because no player has the incentive to deviate from that strategy. More precisely, all players but i cannot even deviate because they are forced to cooperate whereas i takes advantage of this in pursue of his self-interest by reaping a greater benefit. The AS model establishes that *(D,C)* is the equilibrium because i believes the rest of players' actions do not constitute an altruistic-sacrifice and they are rather forced to cooperate; in return he will not sacrifice either. Then, as mentioned in the Discussion, when cooperation is not voluntary, individuals will not develop a social motivation simply because it does not arise from an altruistic-sacrifice and it rather stems as an imposition.

F. Comparison of models

Table 4: Equilibria comparison in all the games

$_{Game}\backslash^{Equilibrium}$	Nash	Kindness	Inequity aversion	Altruistic-sacrifice
Public Good Game	(D,D)	(D,D) (C,C)	(D,D) $(C,D)/(D,C)$ (C,C)	(D,D) $(C,C)^{*}$
Degenerate Public Good Game	(D,C)	(D,C)	(D,C) (C,C)	(D,C)
Subsidy game	(C,C)	(D,D) (C,C)	(D,D) $(C,D)/(D,C)$ (C,C)	(D,D) $(C,C)^{\star}$
Modified subsidy game	(D,C)	(D,D) (C,C)	(D,C)	$(D,C)/(D,D)^{\ddagger}$

* *AS Equilibrium* iff $\alpha \leq \alpha^{*}$.

$\star$*AS Equilibrium* iff $k < k^{*}$.

$\ddagger$*(D,C)* is *AS Equilibrium* if $s \leq t$.

G. Proofs

Proof of *Proposition 1.*

The tuple of strategies $(a_1, ..., a_n) \in (A_1, ..., A_n)$ is a Nash Equilibrium if $\pi_i^{max}(a_1, ..., a_i, ..., a_n) \geq \pi_i\left(a_1, ..., a_i^{\dagger}, ..., a_n\right)$ $\forall a_i \in A_i$ and $\forall i = 1, ..., n$. Moreover, if $s_i < 0$ $\forall i = 1, ..., n$ then $\pi_i^{max}(b_{1i}, ..., b_{ni}) - \pi_i(a_i, b_{1i}, ..., b_{ni}) + \pi_{-i}^{S}(b_{1i}, ..., b_{ni}, a_i) - \pi_i(a_i, b_{1i}, ..., b_{ni}) < 0$ and $\sum_{j \neq i} \pi_j^{max}(c_{i1}, ..., c_{in}) - \sum_{j \neq i} \pi_j(b_{1i}, ..., b_{ni}, c_{i1}, ..., c_{in}) + \pi_i(c_{i1}, ..., c_{in}, b_{1i}, ..., b_{ni}) - \pi_{-i}^{S}(b_{1i}, ..., b_{ni}, c_{i1}, ..., c_{in}) < 0$. Since $U_i(a_i, b_{1i}, ..., b_{ni}, c_{i1}, ..., c_{in}) = \pi_i(a_i, b_{1i}, ..., b_{ni}) + \tilde{s}_{-i}(b_{1i}, ..., b_{ni}, c_{i1}, ..., c_{in}) \cdot (1 + s_i(a_i, b_{1i}, ..., b_{ni}))$, then $(a_1, ..., a_n) \in$

$(A_1, ..., A_n)$ is such that $a_i \in \text{argmax}_{a \in A_i} U_i(a_i, b_{ji}, c_{ij})$ and $c_{ij} = b_{ji} = a_i$ $\forall i = 1, ..., n$, $\forall j = 1, ..., n$, and $j \neq i$.■

Proof of *Proposition 2.*

Suppose the tuple of strategies $(a_1, ..., a_n) \in (A_1, ..., A_n)$ is a Nash Equilibrium. A policy intervention Γ is material-effective if $\pi_i(a_1, ..., a_n) \leq \pi_i\left(a_1^\dagger, ..., a_n^\dagger\right)$ $\forall i = 1, ..., n$ and $\pi_i(a_1, ..., a_n) < \pi_i\left(a_1^\dagger, ..., a_n^\dagger\right)$ for at least one player, where $\left(a_1^\dagger, ..., a_n^\dagger\right)$ is the Nash Equilibrium attained by Γ. Suppose that for j $\pi_j(a_1, ..., a_n) < \pi_j\left(a_1^\dagger, ..., a_n^\dagger\right)$ and $j \neq i$. Then, by definition of the altruistic-sacrifice function $\tilde{s}_j$ is decreasing in π_j. Therefore $\tilde{s}_j > \tilde{s}_j(\Gamma)$, and the statement follows.■

Proof of *Proposition 3.*

By definition, a caring outcome is such that $s_i > 0$ $\forall i = 1, ..., n$. Thus, i makes an altruistic-sacrifice and his beliefs are such that $\tilde{s}_{-i} > 0$. To maximize utility, it must be that each i chooses a_i so as to sacrifice material payoffs and has no incentive to deviate. Once a material-effective policy Γ is implemented such that $s_i = 0$ and $\tilde{s}_{-i} = 0$ or $s_i < 0$ and $\tilde{s}_{-i} < 0$, then to maximize his utility i must choose $a_i^\ddagger$ to maximize his material payoffs, i.e. $\pi_i\left(a_1^\ddagger, ..., a_n^\ddagger\right)$. Therefore, the motivation to choose a particular a_i has been transformed because of Γ, i.e. it has crowded-out i's altruistic-sacrifice.■

Proof of *Proposition 4.*

Suppose player i is not regulated by a material-effective policy Γ, which regulates -i players. Then, by definition of Γ, $\pi_j(a_1, ..., a_n) \leq \pi_j\left(a_1^\dagger, ..., a_n^\dagger\right)$

$\forall j = 1, ..., n-i$, $\pi_j(a_1, ..., a_n) < \pi_j\left(a_1^\dagger, ..., a_n^\dagger\right)$ for at least one player, and $\pi_i(a_1, ..., a_n) = \pi_i\left(a_1^\dagger, ..., a_n^\dagger\right)$, where $(a_1, ..., a_n)$ was the Nash Equilibrium before the introduction of Γ and $\left(a_1^\dagger, ..., a_n^\dagger\right)$ is the Nash Equilibrium attained by Γ. By construction of the altruistic-sacrifice function, $\tilde{s}_i$ is decreasing in π_{-i}^S. So, it is also decreasing in π_{-i}. Thus, the claim follows.■

Chapter 2: This land is your land, this land is my land: The environmental behaviour of native-born and immigrants

Luis Serra-Barragán*

Abstract

Should governments be concerned about immigrants on environmental grounds? On the one hand, immigrants are typically considered as a burden in most aspects by the host country. On the other hand, the New Environmental Paradigm hypothesis claims that environmental attitudes are a worldwide phenomenon. Hence, individuals across the world would display similar environmental behaviour and such concern should not prevail. This chapter analyzes a sample of the World Values Survey dataset to show that, despite there are substantial behavioural differences between immigrants and native-born regarding pro-environmental action, the perception of immigrants as an environmental burden is misplaced. In particular, while neither native-born nor immigrants are more willing to sacrifice money to save the environment, immigrants actually engage more on activities like choosing products that are better for the environment, recycling, and reducing water consumption. The engagement in pro-environmental behaviour of immigrants is region-specific and depends on their source region. Moreover, such relatively higher actual engagement in environmentally friendly behaviours can be explained by their high socio-economic status and their high education level, i.e. "selective immigration". When the behaviour of immigrants by their length of residence in the host country is analyzed, no differences in pro-environmental attitudes or pro-environmental behaviour are found, a result which suggests they do not develop a "sense of belongingness" to the host country. Finally, in line with the standard finding in the literature of acculturation in environmental behaviour, this chapter finds that immigrants conform through time to some of the pro-environmental actions of native-born.

JEL Nos.: C13, C23, F22, J15, Q57, Q58, Y10.

KEYWORDS: pro-environmental behaviour; environmental attitudes; recycling; environmental policy; sense of place; selective immigration; immigration policy.

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Introduction

Immigrants and problems are words commonly (and unfairly) used in the same sentence by governments, particularly those of developed countries.[1] They are seen as a burden which puts pressure on the job market through wage inequalities and higher unemployment rates. However, with respect to the former, most studies coincide that the impact of immigration on the wage of native workers appears to cluster around zero, and some even find a positive impact (Friedberg and Hunt [34]; and Borjas [13]).[2] In regard to the latter, evidence seems to indicate as well that immigrants are not to blame for higher unemployment rates in the host countries.[3] Immigrants are also feared to have a detrimental effect on the fiscal sustainability of the welfare state. Yet, no consensus is found in the literature, and some studies even claim that the fiscal impact of immigration is positive.[4] Finally, immigrants are also thought to in-

[1] Despite the general aversion to immigration, at least four types of potential gains to the host country are acknowledged (Nannestad [62]): 1) the "immigration surplus", i.e. immigrants could make a society richer; 2) the positive effect on the age distribution of the host society; 3) a "smoothing effect" on the labour market; and 4) the increase in the aggregate demand for domestic goods and services. Borjas [12] also considers that benefits of immigration to native-born result from production complementarities between immigrant workers and other factors of production. Further potential benefits are discussed in Ratha et al [74].

[2] Despite Borjas et al [15] estimated that immigrants accounted for 30%-55% of the relative wage decline experienced by high school dropouts and other low-wage workers in the U.S., they acknowledged the overall effect on wages was small. Other studies in the same line are Brücker et al [**?**] and Hanson et al [38]. Indeed, Card and Shleifer [21] found that immigrants accounted only for a 5% share of the increase in the U.S. wage inequality between 1980 and 2000. Lerman [52] showed that if the rapid wage gains for immigrants are incorporated and comparable populations are used, the wage inequalities in the U.S. disappear. A meta-analysis carried out by Longhi et al [54] suggests the effect of immigrants on local wages is very small, but when native workers and immigrants are close substitutes the effect becomes larger. Poot and Cochrane [70] conclude wage inequalities are encountered in the short run or in closed labour markets.

[3] Poot [69] rejected the hypothesis that immigration caused unemployment in New Zealand. Borjas [11] determined there was no sufficient evidence to support an adverse impact of immigration on native employment opportunities in the U.S. In fact, Chapman and Cobb-Clark [23] found that the employment probabilities of unemployed Australian native-born increased in the short-run. Gross [36] showed that immigrants increase the unemployment rate in France in the short run but decrease it in the long run.

[4] Auerbach and Oreopoulis [4] [5] argue that the impact of immigration on fiscal balance is so small, that it should not be considered as neither a cause nor a solution to budget deficits. In that sense, Rowthorn [76] estimated that in most countries, the (positive or negative) net fiscal impact is less than 1% of GDP. Lee and Miller [51] found that the marginal net fiscal

crease crime rates and have a negative impact on the social cohesion of the host country.[5]

More recently, the environment has become a matter of national concern, and immigrants have also been blamed for contributing to the environmental degradation of the host country.[6] Muradian [61] considers such belief is promoted in the U.S. by "Malthusians", who advocate immigration restrictive policies based on limited carrying capacity arguments, and "Environmental Nativists", who reject immigration on racist grounds.[7]

Despite there is solid evidence of the opposite, immigration is singled out as the source of a wide array of problems in the host country because of its political and national identification implications.[8] A strong case for this is the

benefit of an immigrant is negative in his first years at the host country, but then turns positive within a 25 year-span and keeps on increasing. Gustafsson and Österberg [37] showed that immigrants in Sweden generated a net burden on the public sector budget upon arrival, but also that it was eventually reversed. Razin and Sadka [75] showed that in an infinite-horizon overlapping generations economy, the net fiscal burden could change to net gain for the native-born population. Finally, Nannestad [62] and Pekkala Kerr and Kerr [67] provide surveys with mixed results with respect to the fiscal effect of immigration.

[5]With respect to crime, a study regarding the incidence of crime amongst immigrants in the U.S. is provided by Martinez and Lee [57]. A brief review from Australia can be found in Mukherjee [60]. Poot and Cochrane [70] hint that immigration is likely associated with lower crime rates through its effect on a lower unemployment rate. Research on social cohesion is provided by Smith and Edmonston [79] and Borjas [14] for the U.S., and Glover et al [35] for the UK. Karagedikli et al [48] suggest that immigration has a negative impact on the social cohesion of metropolitan cities in New Zealand.

[6]A brief review of evidence about negative environmental impacts of immigration can be found in Hugo [43]. Price and Feldmeyer [72] discuss literature on the negative environmental impacts produced by the social disorganization of local communities and the inhibition of its residents' abilities to organize to combat sources of environmental degradation. Yet, they also provide references on the "Latino Paradox" and the "Immigrant Revitalization" perspectives, which state that immigration may actually have the reverse effect by stabilizing communities and reinforcing their social institutions and social networks.

[7]According to "Malthusians", immigrants directly contribute to local environmental degradation by means of: generation of urban sprawl; congestion and pollution; waste generation; water consumption; land conversion; depletion of natural resources; and biodiversity loss. Examples of "Malthusians" research are Beck [6], Daly [25], DinAlt [28], and Chapman [24]. "Environmental Nativists" critiques to immigration are based on racist arguments. They argue that immigrants will alter the racial composition of the U.S., leading then to the social decadence and the collapse of Western values. Research along this line is provided by Hardin [39], Abernethy [1] and [2], and Macdonald [56].

[8]Price and Feldemeyer [72] state that other motives to oppose immigration because of its negative environmental impacts include the highly geographical concentration of their settlements in the host country, higher fertility rates than native-born, and support to the development of industrial and manufacturing sectors that tend to contribute to pollution problems (e.g. meat processing and textile industries).

debate led by the Sierra Club (the most influential grassroots environmental organization in the U.S.) about the environmental impact that immigrants posed in the U.S. and global ecosystems (Harris [40]). The stance of immigration restriction supporters was that immigrants engage in negative environmental behaviours just like Americans, therefore assuming no immigrant/native-born environmental behaviour differences. If such argument is true, then immigration should be restricted in the U.S. but promoted in countries where native-born display a strong pro-environmental behaviour. But, do immigrants really have the same environmental behaviour than native-born? Research on the topic has provided mixed results and it is limited in scope because it has focused on the environmental behaviour of native-born and immigrants at state and national levels only.

DinAlt [28] claims that immigrants in the U.S. are a burden because they "adopt the consumption and pollution patterns of the world's most environmentally destructive lifestyle". However, Ratha [73] deems such claim is incorrect because immigrants are still commited to their families in their countries of origin, and send up large sums of money as remittances each year. Moreover, some studies suggest that immigrants usually have a smaller "ecological footprint" and create less pollution than U.S. native-born (Bohon et al [10]; Neumayer [63]; and White [86]).

Lynch [55] was the first to analyze the influence of culture on the individuals' environmental attitudes. In particular, she focused on differences in the environmental views between Anglos and Latinos regarding ideal landscapes and the relationship of the environment to ethnic identity. Work in the same line is that of Schultz et al [77]. They examined the environmental attitudes among foreign-born Latino American students. But the first one to properly compare the environmental behaviour of immigrants and native-born is Sierra [78]. He

focused on how immigrants differ from native-born in behaviour which is destructive for the environment in tropical rainforests in Ecuador, but found no significant differences in recent deforestation associated with each group based on their ethnic background.

Hunter [44] found that immigrants in the U.S. had similar environmental attitudes than native-born regarding prominence of economic progress over environmental quality, human responsibility for environmental damage, willingness to sacrifice for environmental quality, and environmental activism. However, she also found that immigrants of short residence in the country expressed higher environmental concern and higher engagement in environmentally friendly behaviours compared to native-born.[9]

Pfeffer and Mayone Stycos [68] analyzed New York's immigrant/native-born differences on the propensity to engage in constraining personal consumption, green consumerism, and environmentally related political behaviour.[10] They found that immigrants were as likely as native-born to engage in most consumption behaviours protective of the environment. Yet, while immigrants were more likely to save water than native-born, the latter were more likely to engage in environmentally related political behaviour than the former.[11]

Another study which analyzes differences in immigrant/native-born environmental attitudes is Buijs et al [17]. They found that immigrants manifested a

[9] Using data from the 1993 General Social Survey, she defined 5 factors and 19 variables reflecting the individuals' environmental attitudes, environmental concern, environmental behaviours, and environmental activism. While she found no behavioural differences between immigrants and native-born in general, she did find a higher level of concern of immigrants with respect to the impacts of pesticides, chemicals, pollution, and the greenhouse effect. Additionally, immigrants were more likely to adopt behaviours like buying organic products, recycling, and driving a car less.

[10] They collected data in New York City from five boroughs in 1996 through 1500 random telephone interviews. To assess the behavioural differences they controlled for different factors that may contribute to environmentally friendly behaviours like environmental orientation, environmental knowledge, acculturation, race, community attachment and economic status.

[11] The odds that an immigrant saved water were 20% greater than for a native-born. The odds for an immigrant to sign a petition were 24% lower, while they were 17% lower to talk or write to an official than for a native-born.

more anthropocentric view of the human-nature relationship which involved a preference for a high level of management of nature.[12] In turn, Squalli [80] found that U.S. states with a larger share of immigrants are associated with lower NO_2 and SO_2 emmisions; in other words, immigrants exert less pressure on the environment than their native-born counterparts.[13] A related work is that of Price and Feldmeyer [72]. They also found evidence that immigrants do not contribute directly or indirectly to increase air pollution in the U.S.

The results of these behavioural studies can be accomodated by two competing hypotheses regarding the individuals' environmental attitudes: the New Environmental Paradigm (NEP) proposed by Dunlap and Van Liere [29], and the Post-materialistic hypothesis (PMH). The former asserts that the pro-environmental attitudes of individuals are a global phenomenon. Thus, individuals would hold the same environmental attitudes regardless of their culture, income and education. The latter affirms that individuals develop pro-environmental attitudes once they achieve a standard of living such that they can shift their attention from economic security concerns to quality-of-life issues.

Is the behaviour of immigrants a real threat to the host country's environment? Should immigration policies therefore remain restrictive? Should environmental awareness programmes and environmental policy in general be group-targeted? If there are environmental behavioural differences between native-born and immigrants, what is the source of such discrepancy? Does the length of residence of immigrants in the host country affect their environmental behaviour? In order to tackle such questions, this chapter analyzes worldwide behavioural differences between immigrants and native-born by looking at the

[12] Their study was based on 618 questionnaires to obtain preferences for landscape management and nature images on immigrants from Islamic countries and native-born in the Netherlands.

[13] He used U.S. state-level data for CO, NO_2, SO_2, and PM_{10} emmisions in 2000, and a Stochastic Impacts by Regression on Population, Affluence, and Technology model (STIRPAT) to determine whether there are immigrant/native-born environmental behaviour differences.

probability of engagement of both groups of individuals across a wide range of pro-environmental behaviours. Moreover, it is the aim of this chapter to determine the possible origin of any behavioural discrepancy encountered. If the NEP holds, immigrants and native-born will show no environmental behavioural differences because environmental concern is a global phenomenon (Yearly [90]; Breching and Kempton [16]; and Dunlap and Van Liere [29]). But if the PMH holds, two possible scenarios can be observed: a) native-born hold stronger environmental attitudes than immigrants insofar as the latter are traditionally a vulnerable and poorer group which come from less developed countries (Inglehart [46]; and Lapham et al [50]); b) immigrants hold stronger environmental attitudes than native-born, thus indicating the presence of "selective immigration" of individuals with relatively high socio-economic status and education levels as well (Kidd and Lee [49]; and Abrahamson [3]), and who have embraced post-materialistic views even prior to their migration.

The PMH, though, is not the only reason why environmental behavioural differences between immigrants and native-born may arise. As Pffefer and Mayone Stycos [68] point out, an alternative explanation to immigrants holding stronger environmental attitudes than native-born might be that environmental problems in their country of origin sensitized them and motivated them to engage in pro-environmental action (Martinez-Alier and Hershberg [58]). Thus, immigrants would display stronger environmental concern than native-born. Likewise, an alternative explanation to immigrants holding weaker environmental attitudes than native-born is that immigrants lack a "sense of belongingness" or a "sense of place" that would make them feel attached and identified to their physical surroundings in the host country.[14] Without that close relationship between

[14]The first to conceptualize the "sense of place" of individuals was Tuan [83]. He regarded the place as the centre of meaning or field of care which emphasizes human emotions and relationships. The individuals' "sense of place" is the perspective from which individuals position themselves in relation to others to advocate particular standpoints regarding natural resources management (Cantrill and Senecah [19]).

immigrants and their place of residence, the need to take pro-environmental actions when required could be absent.

The Sierra Club's assumption of immigrants having the same environmental behaviour as U.S. native-born is closely related to another central theme in the discussion: the effect on such behaviour of their length of residence in the country. This process, denominated as "environmental acculturation" by Padilla [65], helps the immigrants to learn the ways of the dominant culture. Thus, the more time an immigrant spends on the host country, the more likely he is to adhere to the behavioural rules of the native-born. In this sense, Hunter [44] found evidence of such process and showed there are no behavioural differences between long-term immigrants and native-born. Mukherji [59] found that the level of acculturation of Hispanics in Texas did influence their environmental attitudes and behaviours.[15] Most acculturated individuals had lowest scores on environmental attitudes and engaged less in recycling activities. Finally, Pffefer and Mayone Stycos [68] found that differences in acculturation between immigrants and native-born masked the prevailing behavioural divergence related to eating less meat and saving water, but it also reduced behavioural differences among both groups regarding green consumption behaviour.

Since acculturation seems to drive the environmental behaviour of immigrants by their length of residence, this chapter incorporates such feature into the analysis. Furthermore, since it has been suggested that environmental behavioural differences among immigrants and native-born might arise because of the presence (or lack) of a "sense of place", the analysis will use an instrument to avoid comparing individuals with heterogenous attachment and identification to their place of residence: the immigrants' offspring. Hence, by comparing the behaviour of native-born to that of "second generation immigrants", it is

[15]She used survey data from 262 residents of a mid-size city on the U.S. side of the Mexico-US border. The proxy for acculturation used was the language mostly spoken at home.

assured that no variation in "sense of place" due to immigrant status will exist, while allowing to isolate the effect of length of residence on their environmental behaviour.

This chapter makes three novel contributions to the native-born/immigrant environmental behaviour literature. First, it is the only worldwide exploration of native-born/immigrant environmental behavioural differences. This should provide more robust findings than state or country level studies which use a smaller dataset and consider a lower cultural variation. Second, unlike most papers in the literature, it disentangles environmental attitudes from behaviours by analyzing the willingness to perform and actual engagement in environmentally friendly behaviours of individuals. This offers a clear separation between intention and action with strong consequences for the design of environmental policy programmes. Finally, in order to assess if immigrants experience an acculturation process, it incorporates a control (second generation immigrants) in the econometric analysis in the same vein of the epidemiological approach (Fernández [33]) to address the heterogeneity of the individuals' "sense of belongingness".

The plan for the rest of the chapter is the following: Section 2 describes the data and methods used to evaluate the immigrant/native-born differences in environmental behaviour. It offers a description of the variables used in the analysis and a brief literature review of the main findings regarding their impact on environmental behaviour. Section 3 presents the results of the empirical analysis. In section 4, a discussion of the findings and its policy implications are offered. Finally, concluding remarks are provided and further research is suggested.

2. Data and Methods

The data used in the present study are taken from the World Values Survey (WVS). The WVS is a worldwide investigation of political and socio-cultural change based on representative samples from over 80 countries in the world, carried out in five waves and covering over 25 years. It is carried out by the World Values Survey Association (WVSA), which is a non-profit association based in Stockholm, Sweden. In order to provide information about the beliefs, values and motivations of people all over the world, the WVS carries out representative national surveys of people's values and beliefs. Thus, the WVS is a cross-sectional study with individual-level data. Since the WVSA aims to cover a wide variety of countries, it designates a Principal Investigator who is in charge of conducting the survey in his/her country. Such investigator is also responsible to analyze, interpret, and disseminate the data resulting from the surveys. The interviews are conducted face to face by a local field organization and are supervised by academic researchers. Finally, the core questionnaire is translated into the local language.

This chapter analyzes the differences in environmental behaviour of native-born and immigrants regarding three general environmental issues: a) Money and the Environment; b) Specific pro-environmental actions; and c) Environmental politically related behaviour.

The Money and the Environment issues are investigated through three dependent variables measured in a four-item *likert* scale.[16] These variables measure the willingness to sacrifice money in order to save the environment of immigrants and native-born. The variables are:

[16]The scale is: 1=*strongly agree*; 2=*agree*; 3=*disagree*; and 4=*strongly disagree*. More importantly, the items in the Money and the Environment category do not measure in fact behaviour, rather attitudes.

- Willingness to pay higher taxes to prevent environmental pollution.
- Willingness to give part of own income for the environment.
- Willingness to buy things at a 20% higher price if it helped to protect the environment.

The specific pro-environmental actions are investigated through four dichotomous (1=*yes*/0=*no*) responses to questions indicating whether or not the respondent had engaged in specific environmentally friendly behaviours. The variables are:

- Choose products that are better for the environment.
- Recycle.
- Reduce water consumption.
- Contribute to an environmental organization.

The Environmental politically related behaviour issues are investigated using two dichotomous (1=*yes*/0=*no*) responses to questions indicating whether or not the respondent has engaged in politically related behaviour in favour of the environment. The variables are:

- Attend meetings or sign petitions.
- Join boycotts.

Table 1 in the Appendix shows the proportion of individuals by environmental behaviour and by region of the world. It can be appreciated that the nine environmental behaviours analyzed cover on average survey responses of 101,677 individuals from 58 different countries. Table 1 also shows that 36 in 100 respondents were surveyed in Europe; 20 in 100 in Asia; 18 in 100 in Latin America; 10 in 100 in Africa; 5 in 100 in Oceania; 4 in 100 in the Nordic countries; 3 in 100 in North America; and about 3 in 100 in the Middle East. Table 2 in the Appendix shows the proportion of individuals by environmental behaviour and by the level of income of the surveyed country.[17] About 4 in every 10 countries surveyed are upper middle income countries; slightly more than 3 in every 10 are high income countries; 2 in 10 are lower middle income countries; and slightly less than 1 in every 10 are low income countries. Table 1 and 2 then establish that the environmental behaviour to be analyzed corresponds to individuals living mostly in Europe, Asia and Latin America, in upper middle and high income countries. Since the United States is included in the sample, it can be said that the dataset contains those countries which are typically recipients of high immigration flows.

While the indicators of environmental behaviour selected are quite comprehensive, there is, as Pffefer and Mayone Stycos [68] point out, a limitation regarding the use of dichotomous variables. In particular, the exact strength of the environmental behaviour cannot be determined since those variables do not quantify the frequency with which the individual has engaged in the specific behaviour. Thus, an individual who has recycled once is treated equally as one who has recycled more than once. The results obtained by the analysis will then overestimate the engagement in environmentally friendly behaviours.

[17] The income level of the country was determined by the average gross national income per capita of the country during the period of the WVS survey and the classification made by the World Bank. Low income countries have a GNI per capita of $1,025 or less; lower middle income countries, $1,026-$4,035; upper middle income countries, $4,036-$12,475; and high income countries, $12,476 or more.

Another problem is that those individuals who have an interest in the environment are more likely to have completed the survey. Additionally, poorly integrated immigrants who have not mastered the language of the host country are less likely to have completed it. Thus, the survey captures the views of a certain immigrant profile. This can bias the results towards an overestimation of the immigrants' pro-environmental attitudes and pro-environmental behaviour.

Given that, to my knowledge, there is no study which analyzes the environmental behaviour of native-born and immigrants from all over the world, it is complicated to determine the extent of these problems as there is no basis for comparison. Nevertheless, section 4 will present a comparison of the results obtained by other researchers with the results provided by the present chapter.

The key predictor variable in the analysis is *immigrant status*. Using the WVS, a dichotomous variable is constructed to determine whether the individual was born in the country of his residence or not. Those born in the country (i.e. native-born) are coded 0, while those who did not (i.e. immigrants) are coded 1.[18]

To analyze environmental behaviour differences between immigrants and native-born, a baseline model is defined to predict the probability that the individual engages in a specific environmental behaviour considering only his immigrant status. The issues regarding Money and the Environment (i.e. willingness to sacrifice money in order to save the environment) are estimated through an ordered probit model, while Specific pro-environmental actions and Environmental politically related behaviour (i.e. actual engagement in environmentally friendly behaviour) issues are estimated with a probit model. Given that the Money and the Environment variables use a *likert* scale, an ordered logit model could have been used. However, as it is shown by Tables 9-11 in the Appendix,

[18]The original variable in the WVS dataset is *Born in this country: birth country*. Possible answers are: Yes, Latin America, USA/Canada, Asia, Europe, Africa, other, and Oceania. Table 1 in the Appendix shows the distribution of immigrants in the sample.

the data do not meet the "proportional odds assumption" that is required in order to estimate them with an ordered logit model.[19]

According to Table 3 in the Appendix, immigrants represent 5.89% of those who responded to the question *Born in this country: birth country* in the WVS dataset throughout the 1989-2007 period.[20] This is higher to the 2.9%-3.1% of the total world population reported during the 1990-2010 period by the United Nations International Migrant Stock.[21]

Table 4 in the Appendix shows the region of the world from which individuals migrate (source region) and the region of the world they migrate to (host region). It stands out that the greatest flows take place: within Europe; from Asia to Europe; and from the Nordic countries or the Middle East to Europe. Table 5 shows the percentage of immigrants that migrate to countries by their level of income. Slightly more than half of immigrants in the dataset migrate to a high income country; almost 3 out of 10 immigrants migrate to an upper middle income country; almost 2 out of 10 immigrants migrate to a lower middle income country; and no immigrants migrate to a low income country. Table 6 shows the regions of the world from which individuals migrate by the level of income of their source country. Almost half of immigrants come from Europe, of which most come from upper middle and high income countries. One in every four immigrants come from Asia, of which most come lower middle income countries. Finally, almost 1 in every 10 come from Latin America, of which most come from upper middle income countries. In consequence, Tables 4-6 suggest

[19] Thus, the coefficients that describe the relationship between the lowest (i.e. *strongly agree* to an increase in taxes to prevent environmental pollution) versus all higher categories of the response variable (i.e. *agree*, *disagree*, and *strongly disagree*) are not the same as those that describe the relationship between the next lowest category (i.e. *agree* to an increase in taxes...) and all higher categories (i.e. *disagree* and *strongly disagree*). For the Specific pro-environmental actions and Environmental politically related behaviour variables a probit model is used just to be consistent in terms of the interpretation of the coefficients and its marginal effects.

[20] Not surprisingly, Oceania, North America and Europe are the regions of the world with the highest proportion of immigrants in their total population.

[21] www.esa.un.org/migration/

that while the vast majority of immigration flows in the dataset take place from developed countries to developed countries (Europe to Europe, Nordic countries to Europe, and Europe to Oceania), the size of flows from less developed countries to developed countries is not negligible (Asia to Europe, Oceania and North America, Latin America to Europe and North America). Additionally, the amount of migration flow between some less developed countries is noteworthy (Latin America to Latin America). This structure of the dataset is actually useful to test the hypotheses about the environmental behaviour of individuals by immigrant status previously discussed (i.e. the PMH and NEP).

An issue of concern when analyzing environmental behaviour differences of individuals between immigrant status is that those differences might depend on whether the scope of the environmental problem is local or global. For example, it might be the case that an immigrant does not care about a local environmental problem because he is not well adapted to the host country, but at the same time he cares about global environmental problems. Table 8 in the Appendix shows the perceptions of individuals by immigrant status about local and global environmental problems. It shows that regardless of this possibility, the individuals' environmental behaviour is similar in all cases. Thus, it is not true that the immigrants' attitudes to environmental problems differ depending on whether they are local or global problems, i.e. the immigrant status of the individual does not produce such environmental myopia. For that reason, this feature will not be incorporated into the analysis.

Table 12 in the Appendix presents the descriptive statistics of environmentally friendly behaviour of immigrants and native-born. It would be a mistake to conclude that behavioural differences are only a product of the individuals' immigrant status. It is well-known that several factors other than being a native-born or immigrant affect the individuals' environmental behaviour. For that

reason, the following variables are included as controls in independent estimations: education, income, age, gender, community attachment, environmental orientation, social capital, national identification, empowerment, and pro-social traits. Tables 13 and 34 in the Appendix present the descriptive statistics of these variables, while Table 14 in the Appendix shows the correlation between these explanatory variables. I explain now why and how each control is included in the analysis.

2.1 Variables of interest

Education

Higher levels of education lead to stronger preferences for environmental protection because more educated individuals are supposed to possess "better" information to make a decision regarding environmental issues (Danielson et al [26]; Blomquist and Whitehead [3]; Engel and Pötschke [32]; Witzke and Urfei [89]; Israel and Levinson [47]; and Veistein et al [84]). Traditionally, immigrants are a vulnerable group which might be expected to have lower levels of education than native-born. If the individuals' environmental behaviour is influenced by their education, controlling for it would reduce the difference in native-born and immigrants' environmental behaviour.

The variable from the WVS dataset used as a proxy for the education of native-born and immigrants is *highest educational level attained*. The variable uses a scale from 1 to 8 where 1 is the lowest educational level and 8 is the highest.[22]

[22]From 1 to 8, the educational levels are: incomplete elementary school, complete elementary school, incomplete secondary school, complete secondary school, incomplete tertiary education, complete tertiary education, incomplete university, and university with degree.

Income

People from a higher social class are also supossed to be more pro-environmentally oriented insofar as they have already satisfied basic needs, and consequently, can focus on satisfying other less urgent preferences (Whitehead [88]; Stevens et al [81]; Blomquist and Whitehead [9]; Popp [71]; Witzke and Urfei [89]; Bulte et al [18]; Dupont [30]; Israel and Levinson [47]; Veisten et al [84]; and Hidano et al [41]). Furthermore, it can be argued that engaging in pro-environmental behaviour is costly, and since people in higher social classes do not face the same budget constraints as people in lower social classes, they are more likely to adhere to such behaviour. Given that immigrants usually leave their country of origin to seek better economic opportunities, they might be expected to have lower levels of income than native-born. If the individuals' environmental behaviour is influenced by their income level, controlling for it would reduce the difference in native-born and immigrants' environmental behaviour.

The variable from the WVS dataset used as a proxy for income of native-born and immigrants is *scale of incomes*. The variable uses a scale from 1 to 10 where 1 is the lowest income decile and 10 is the highest. This variable is country-specific, e.g. the 4^{th} decile of Mexico is not the same as the 4^{th} decile of Venezuela or Germany. Notwithstanding this fact, region effects will be included in the estimation so that these variables can somehow capture income differences between regions.

Age

Younger people should possess stronger environmental preferences than older people because they are more likely to live long enough to perceive the negative effects of any potential environmental damage. Alternatively, older people will not live to enjoy the benefits of resource preservation (Whitehead [88]; Howell

and Laska [42]; and Carlsson and Johansson-Stenman [22]).[23] If the individuals' age affects their environmental behaviour, controlling for such factor would reduce the difference in native-born and immigrants' environmental behaviour.

The variable from the WVS dataset used for the analysis is *age*. Age^2 is also incorporated to consider non-linear effects on the individuals' environmental behaviour.

Gender

Hunter et al [45] provide an overview of the increased likelihood to perform behaviours directed at environment preservation due to the role of women's work at home. Moreover, Zelezny et al [91] provide evidence that women display more environmental concern than men. Yet, their meta-analysis also found that regarding actual pro-environmental behaviour, there is an inconsistent relationship between such variable and gender, with a number of studies finding men being more active in pro-environmental behavior. Despite these mixed results, the control is included in a series of estimations.

The variable from the WVS dataset used for the analysis is *sex*. It is a dichotomous variable coded 0 for *men* and 1 for *women*.

Community attachment

Individuals with a higher commitment to their local community should be more actively concerned about its environmental problems. Some even claim that environmental behaviours are essentially local, and that the boom of grassroots environmentalism provides evidence about the relevance of community interests as a driving force (Szasz 1994). Pfeffer and Mayone Stycos [68] found

[23] Torgler and García-Valiñas [82] discuss that there is also a "cohort effect" which encompasses the difference of attitudes between different age-cohorts due to generational differences in socialization, life experiences and economic conditions. Instead of a negative relationship between age and environmental concern, this effect describes a positive one (Nord et al [64]; and Vlosky and Vlosky [85]).

evidence that controlling for community attachment reduced the differences between the native-born and immigrants' environmental attitudes in New York, particularly regarding green consumerism environmental behaviours. Not surprisingly, the community attachment of native-born should be higher than that of immigrants. In consequence, I expect to find the same effect as in Pffefer and Mayone Stycos [68].

Ideally, the variable from the WVS dataset that would be used as a proxy for community attachment is *I see myself as a member of my local community.* However, there are no observations for 6 out of the 9 environmental behaviours to be included in the analysis. Therefore, the selected variable to be used as a proxy for community attachment is *Geographical group that I belong to first.* The variable is coded in the following way: 1=*locality*; 2=*region*; 3=*country*; 4=*continent*; and 5=*the world.* In order to clearly represent community attachment, the variable is recoded as a dichotomous variable where 0 represents *not attached to the community* and 1 describes *attached to the community.*[24]

Environmental orientation

I adopt here the concept of environmental orientation of Pfeffer and Mayone Stycos [68]. Environmental orientation is the logic with which individuals understand their relationship with nature. Some individuals possess an environmental orientation which dictates human domination over nature, while others possess one that prescribes a harmonic relationship between humans and nature. Having a particular environmental orientation might be closely related to the individuals' income and education level. For that matter, controlling for this factor would reduce the difference in native-born and immigrants' environmental behaviour.

[24]Individuals who claim to belong to a region, country, continent or the world are coded as not being attached to their community. Individuals who claim to belong to a locality are coded as being attached to their community.

Two proxies from the WVS dataset are used to describe the individuals' environmental orientation. The first one is the individuals' preferences regarding *Protecting the Environment vs Economic Growth*. The variable is coded in the following way: 1=*protect the environment*; 2=*economic growth*; 3=*other answer*. The variable was recoded as a dichotomous one where 0 represents *preference for economic growth* and 1 represents *preference for protecting the environment*.[25] The other proxy describes the individuals' stance regarding *Human and Nature*. The variable is coded in the following way: 1=*humans should master nature*; 2=*humans should coexist with nature*; and 3=*other answer*. The variable was recoded as a dichotomous one where 0 stands for *humans should master nature* and 1 represents *humans should coexist with nature*.[26] In the estimations, the variables are denominated *Orientation 1* and *Orientation 2*, respectively.

Social Capital

The social capital of individuals might have a positive effect on their pro-environmental behaviour. If people trust others, they are more likely to think that if they behave in a pro-environmental fashion, others will do it as well, thus increasing their motivation to engage in environmentally friendly behaviours. Evidence of this claim is provided by Torgler and García-Valiñas [82]. They found that trusting others leads to higher preferences for environmental protection.[27]

As it is standard in the literature, the selected proxy for social capital is the individuals' *trust* in other members of the society. The variable in the WVS

[25] Those with score 3 (*other answer*) were coded as missing observations because they do not prefer something relevant in terms of environmental orientation.

[26] Those with score 3 (*other answer*) were coded as missing observations because they do not prefer something relevant in terms of environmental orientation.

[27] In fact, they showed that the probability that the willingness of those who trust others changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 3.1% to 3.6% higher than that of those who do not trust others.

dataset is coded: 1=*most people can be trusted*; and 2=*can't be too careful*. It is then recoded as: 0=*do not trust others*; and 1=*trust others*.

National identification

An individual who is more identified with his nationality might develop greater interest in preserving the natural resources of his country. Torgler and García-Valiñas [82] found inconclusive support for the hypothesis that national pride is correlated with higher preferences towards environmental protection.[28] However, they did not investigate the relationship of those variables in a native-born/immigrant context, where national pride might play an important role in defining the individuals' environmental behaviour. For that reason, the individuals' national identification is included as a control in the analysis of native-born and immigrants' environmental behaviour differences.

The variable used as a proxy for national identification from the WVS dataset is *How proud you are of your nationality*. The original variable is coded in a 4-item *likert* scale where: 1=*very proud*; 2=*quite proud*; 3=*not very proud*; and 4=*not at all proud*. The variable is recoded as a dichotomous one where 0=*not proud about own nationality* and 1=*proud about own nationality*.

Empowerment

Empowerment is the liberty and control that individuals have on decision-making processes that affect their life. Those individuals who feel more empowered, i.e. who feel they have more freedom of choice and control over their life, are more likely to display stronger pro-environmental preferences. Blake [7] found that, at least at the individual level, the effect of empowerment on environ-

[28] Of ten different estimations they carried out, the coefficient of national pride lost its significance in three of them. Yet, they point out that this might have been driven by a low number of observations with respect to the estimations where it did have significance.

mental attitudes was as strong as that of environmental awareness. Paloniemi and Vainio [66] found that empowerment predicted forest owners' willingness to promote nature conservation in Finland. It is reasonable to consider that immigrants would feel less empowered than native-born because they hold a different citizen status in the country they live in. If the individuals' environmental behaviour is influenced by their empowerment, controlling for such factor would reduce the difference in native-born and immigrants' environmental behaviour.

The variable used as a proxy for empowerment from the WVS dataset is *How much freedom of choice and action do you have*. The original variable is coded in a 1 to 10 scale where 1 is *none at all* and 10 is *a great deal*. The variable is recoded as a dichotomous one where 0=*disempowered* and 1=*empowered*.

Pro-social traits

Pro-social behaviour shapes the individuals' environmental preferences because it is "voluntary intentional behaviour that results in benefits for another" (Eisenberg and Miller [31]). Thus, those individuals that are more pro-social oriented are expected to display stronger environmental preferences. Pro-social behaviour as a catalyst of norm activation has been useful as predictor of willingness to pay for environmental protection, recycling and general pro-environmental behaviour (De Groot and Steg [27]). Since pro-social traits are likely to influence environmental behaviour, they might obscure differences in the immigrants and native-born environmental behaviour. For that matter, pro-social traits are included as a control in the analysis.

The variable used as a proxy for pro-social traits from the WVS dataset is *Income equality preferences*. The original variable is coded 1 to 10 where 1 is *incomes should be make more equal* and 10 is *we need larger income differences*. The variable is recoded as a dichotomous one where 0=*not pro-social* and 1=*pro-*

social.[29]

2.2 Method

First, environmental behaviour differences between immigrants and native-born are investigated. For that matter, a series of ordered probit estimations are carried out for the Money and the Environment issues, whereas probit estimations are carried out for the Specific pro-environmental behaviour and Environmental politically related issues. The equation to be estimated is:

$$Y_{it} = \alpha + \varphi is_{it} + \beta X_{it} + \theta R_{it} + \lambda RO_i + \delta T_t + u_{it} \quad (1)$$

Where the dependent variable, Y_{it}, is the willingness or actual engagement to perform a particular environmental behaviour of individual i at time t. The predictor variables are: is_{it}, a dummy variable which indicates the *immigrant status* of individual i at time t; X_{it}, which is a vector of control variables (previously defined) of individual i at time t; R_{it}, which is a vector of dummy variables that indicate region-specific effects (e.g. differences in culture, policy or climate) that might affect the environmental behaviour of individual i at time t; RO_i, which is a vector of dummy variables that will provide information of the effect of immigration on the environmental behaviour of an individual from a particular region relative to that of individuals from other regions; T_t, which is a vector of dummy variables that indicate time-specific effects which might affect all individuals equally but which change over time;α is a constant; and u is the error term. The obtained parameters would give information about which group holds stronger environmental attitudes, but they will not give information about how much stronger they are. Thus, marginal effects are computed to provide a

[29] From the original variable, individuals with score 1 to 5 were grouped into *pro-social* and individuals with score 6 to 10 were grouped into *not pro-social*.

measure of differences between immigrants and native-born in the probability of engaging in each of the nine environmental behaviours previously described.

It is reasonable to expect immigrant/native-born differences when key characteristics that could shape their environmental behaviour are considered. Yet, immigrants who have lived for many years in the host country might learn the ways of the dominant culture (probably as a means to fit in) and display a similar behaviour to that of native-born, than immigrants who have just arrived in the country. Thus, there should be a variation in the environmental behaviour of immigrants by their length of residence in the country. For that reason, a new series of ordered probit and probit estimations is made with a variable of *length of residence* as main predictor.[30] The equation to be estimated is:

$$Y_{it} = \alpha + \varphi lengthresidence_{it} + \beta X_{it} + \theta R_{it} + \lambda RO_i + \delta T_t + u_{it} \qquad (2)$$

Which is the same as equation (1), only this time the main predictor variable is changed so as to be able to analyze environmental behaviour differences between immigrants by their length of residence in the host country. Once more, marginal effects are also computed.

While there might be more similarities between immigrants of longer residence and native-born as opposed to immigrants of recent arrival in the country, they are still immigrants who (to some extent) bring along their traditions and habits to their new country of residence. Moreover, immigrants are expected to lack a "sense of belongingness" to their new place of residence or at least display less attachment to such place if compared to native-born. This variation

[30]The variable *When came to country* from the WVS dataset is used for this matter. The original variable has five possible answers, but it was recoded for the analysis in the following way: 1=*less than 10 years*; 2=*11-15 years*; 3=*more than 15 years*.

in "sense of place" might obscure the effect of acculturation on the immigrants' environmental behaviour. Therefore, a group which might be interesting to analyze is the second generation immigrants, i.e. those who are born in the country of residence with at least one immigrant parent and who share the same institutional structure as native-born to develop a "sense of place". A series of ordered probit and probit estimations are then carried out to analyze the differences in environmental behaviour between native-born, second generation immigrants and immigrants by their length of residence. The equation to be estimated is:

$$Y_{it} = \alpha + \varphi allgroups_{it} + \beta X_{it} + \theta R_{it} + \lambda RO_i + \delta T_t + u_{it} \tag{3}$$

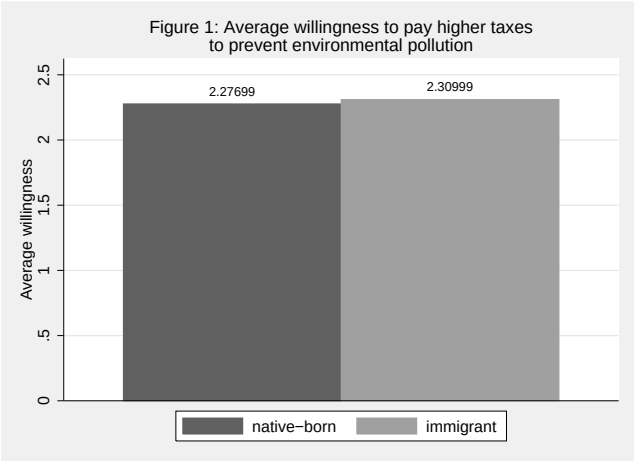
Which is the same as equations (1) and (2), only this time the main predictor variable is a modified immigrant status variable denominated *allgroups*.[31] Once more, marginal effects are also computed for this set of estimations.

3. Results

3.1 Immigrants and native-born

Table 12 in the Appendix shows the descriptive statistics for each environmentally friendly behaviour by immigrant status. If the issues regarding Money and the Environment are considered first, Figures 1, 2 and 3 show the average willingness of individuals to pay higher taxes to prevent environmental pollu-

[31] To create such variable, four different variables from the WVS dataset were used: *Born in this country: birth country*, *When came to country*, *Father immigrant*, and *Mother immigrant*. It has been explained how the first two variables are coded. The last two are dichotomous variables with a 0=*no* and 1=*yes* code.



tion, give part of their own income for the environment, and buy things at a 20% higher price if it helped to protect the environment by their immigrant status. It is clear that the average willingness of native-born to sacrifice money in order to save the environment is higher than that of immigrants.[32] The biggest difference in environmental behaviour between the two groups is regarding giving part of their own income for the environment.

Figures 4-9 show the average engagement of individuals in the following environmentally friendly behaviours by their immigrant status: choose better products for the environment, recycle, reduce water consumption, contribute to an environmental organization, attend meetings or sign petitions and join boycotts. The graphs show that immigrants have engaged more (on average) than native-born in such environmentally friendly behaviours except in attending meetings or signing petitions. As it can also be appreciated in Table 6 in

[32] Remember that the *likert scale* code of the variable implies that a lower score is associated with higher willingness to perform the environmental behaviour.

Figure 2: Average willingness to
give part of own income for the environment

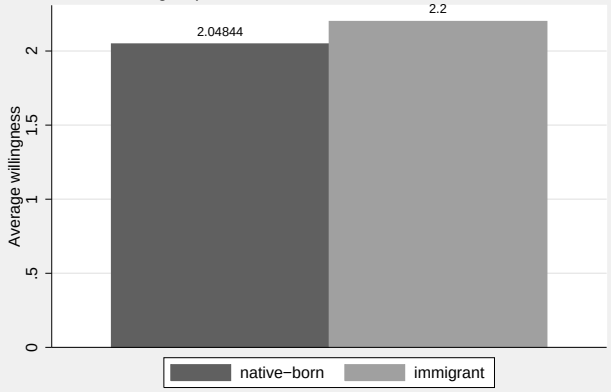
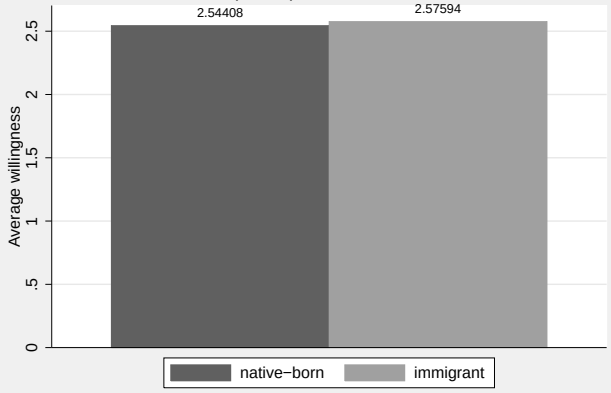
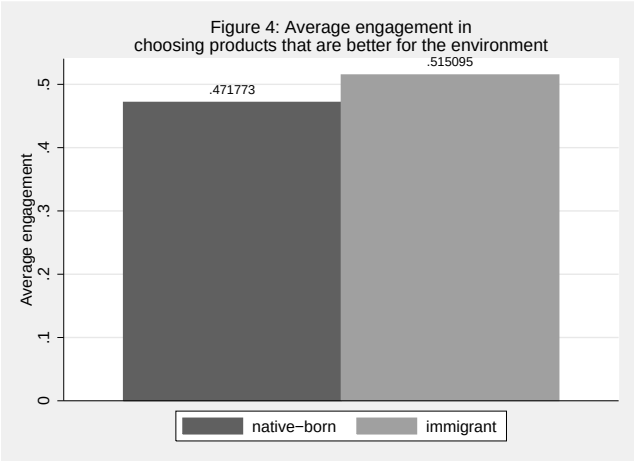
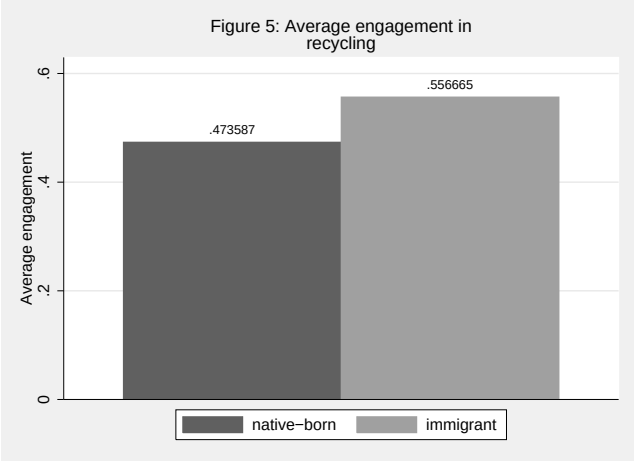


Figure 3: Average willingness to buy things at a 20% higher price
if it helped to protect the environment







the Appendix, the starkest differences in environmental behaviour between the groups are regarding recycling and water consumption reduction.

With the information provided by figures 1-9 and that of Tables 3, 12 and 13 in the Appendix, five main observations can be drawn: 1) immigrants are slightly overrepresented in the WVS sample if the data is compared to that of the United Nations International Migrant Stock; 2) native-born seem to be more "willing" to sacrifice money in order to save the environment than immigrants, but the latter seem to "have engaged" more on environmentally friendly actions than the

Figure 6: Average engagement in reducing water consumption

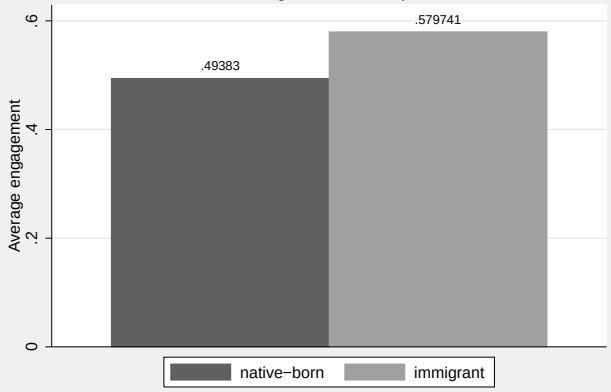


Figure 7: Average engagement in contributing to an environmental organization

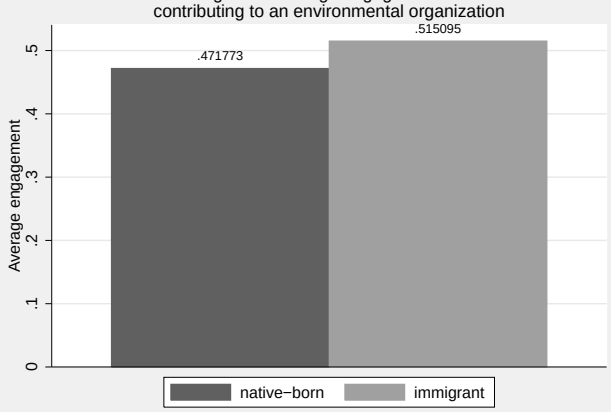
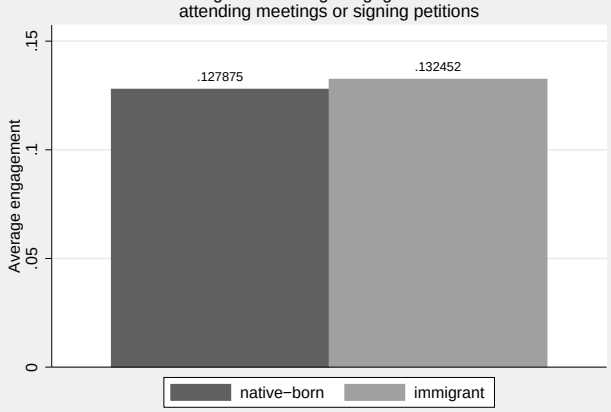
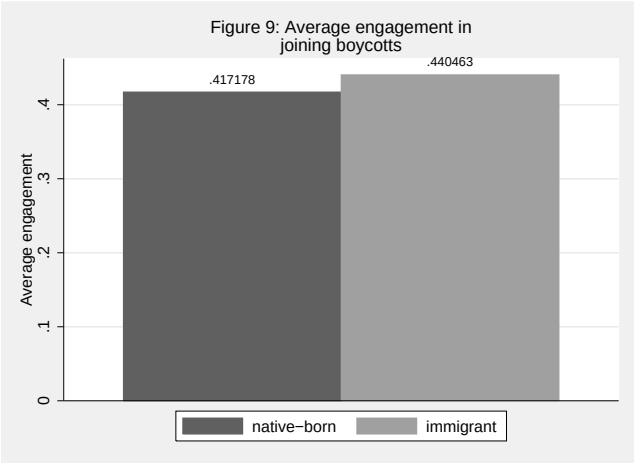


Figure 8: Average engagement in attending meetings or signing petitions





former; 3) there seems to be "selective immigration" in the WVS sample, i.e. immigrants are more educated and have higher income than native-born;[33] 4) native-born appear to hold a stronger "sense of place" than immigrants;[34] and 5) no group is substantially more environmentally concerned than the other.

While these observations provide support to the PMH, the statistical significance of these behavioural differences between native-born and immigrants must be assessed first. In order to do that, a series of ordered probit models are estimated for those environmentally friendly behaviours presented in Figures 1-3, while probit models are used to evaluate differences in the environmentally friendly behaviours depicted in Figures 4-9.

Table 15 in the Appendix presents the coefficients and standard errors for the

[33] Some characteristics of the sample explain this seemingly counterintuitive observation. First, most immigrants in the sample come from Europe and Asia (*circa* 7 out of 10 immigrants). Only 1 out every 10 immigrants in the survey comes from Africa or Latin America. Second, there is no information regarding the source country of immigrants. So, the exact proportion of immigrants coming from Western European countries, U.S., Canada, Japan or Australia, versus the proportion coming from Eastern European countries or China or India is unknown. Third, the sample contains immigrant data from 48 countries. Approximately 30 of those countries are middle income or lower income countries. There is no data for high income countries like France, Italy, UK, Austria, Belgium, Denmark, Iceland, Ireland, South Korea, Israel, Luxembourg, Netherlands and Singapore.

[34] The components of "sense of place" used to make this claim are (community) attachment and (national) identification. On average, immigrants scored lower in both items, suggesting they do not have such "sense of belongingness".

immigrant status regressor, as well as the number of observations of each model corresponding to the Money and the Environment issues. It can be observed that once the relevant controls that might affect the environmental behaviour of individuals, there are no statistically significant differences between immigrants and native-born with respect to Money and the Environment issues. In other words, there is no evidence that there are behavioural differences between immigrants and native-born with respect to their willingness to pay higher taxes to prevent environmental pollution, or their willingness to give part of their own income to the environment, or their willingness to buy things at a 20% higher price if it helped to protect the environment.

Table 16 in the Appendix presents the coefficients and standard errors for the *immigrant status* regressor, as well as the number of observations of each model corresponding to the Specific pro-environmental actions. With the exception of contributing to an environmental organization, there is statistically significant evidence that immigrants actually engage more than native-born on behaviours such as: choosing products that are better for the environment, recycling, and reducing water consumption.

Table 17 in the Appendix presents the coefficients and standard errors for the *immigrant status* regressor, as well as the number of observations of each model analyzing the Environmental politically related issues. There is no statistically significant evidence that there behavioural differences between immigrants and native-born with respect to Environmental politically related issues. Thus, there are no differences between both groups with respect to attending meetings or signing petitions, and joining boycotts.

What about the effect of the (control) variables that could affect the environmental behaviour of individuals other than their immigrant status? Some of the expected relationships with pro-environmental attitudes and pro-environmental

behaviour were confirmed.

Education is found to be an enhancer of pro-environmental attitudes and pro-environmental behaviour. So, more educated individuals will be more willing to sacrifice money in order to save the environment, as well as engage in specific pro-environmental behaviour and environmental politically related behaviour. Income is also found to have a positive relationship with pro-environmental attitudes and pro-environmental behaviour, with two exceptions: willingness to give part of own income for the environment and actual engagement in reducing water consumption.

Age is found to have a different effect on pro-environmental attitudes than on pro-environmental behaviour. On the one hand, younger individuals are more willing to sacrifice money in order to save the environment. On the other hand, it is older individuals who actually engage more on specific pro-environmental behaviour and on environmental politically-related behaviour.[35]

With respect to gender, results remain somewhat mixed. In general, women seem to possess stronger pro-environmental attitudes and pro-environmental behaviour than men. But, there are no statistically significant differences in their actual engagement on attending meetings or signing petitions, and men seem to be more inclined than women to contribute to environmental organizations and join boycotts.

Social capital is found to have a positive relationship with pro-environmental attitudes and pro-environmental behaviour; the only exception is in regard to actual engagement in reducing water consumption, where such relationship is negative.

Empowerment also shows a positive relationship with pro-environmental attitudes and pro-environmental behaviour, but there is no statistically significant

[35] In both cases, however, there is a quadratic effect of age on the individuals' environmental behaviour.

effect of empowerment on the willingness of individuals to give part of their own income to the environment.

Finally, there seems to be a positive relationship between environmental orientation and pro-environmental attitudes and pro-environmental behaviour: a) with respect to "Economic Growth vs Protect the Environment preferences", individuals who prefer to protect the environment display stronger pro-environmental attitudes and pro-environmental behaviour; b) with respect to "Human vs Nature stance", those who believe individuals should have an harmonic relationship with nature show stronger pro-environmental attitudes and pro-environmental behaviour with two exceptions: such relationship is reversed for willingness to buy things at a 20% higher price if it helped to protect the environment, and for actual engagement in contributing to an environmental organization and attending meetings or signing petitions; and there is no statistically significant effect on the individuals' beliefs about their relationship with nature and their willingness to give part of their own income to the environment.

Some other control variables show a counterintuitive relationship with pro-environmental attitudes and pro-environmental behaviour. There is no clear relationship between the pro-social traits of individuals and their pro-environmental attitudes and pro-environmental behaviour: there is a negative relationship between the immigrants and native-born pro-social traits and their willingness to pay higher taxes to prevent pollution and to buy things at a 20% higher price if it helped to protect the environment, as well as with their actual engagement in reducing water consumption; there is a positive relationship between the individuals' pro-social traits and their actual engagement in choosing products that are better for the environment, as well as their engagement in attending meetings or signing petitions and joining boycotts; finally, there is no statistically significant effect of pro-social traits on the individuals' willingness to give part

of their own income to the environment, and actual engagement in recycling and contributing to an environmental organization. With respect to community attachment, results are contrary to what was expected: there is a negative relationship between community attachment and the individuals' willingness to pay higher taxes to prevent environmental pollution and to buy things at a 20% higher price if it helped to protect the environment, as well as with their actual engagement in reducing water consumption, attending meetings or signing petitions and joining boycotts; and there is no statistically significant effect of the individuals' community attachment on their willingness to give part of their own income to the environment, as well as their actual engagement in choosing products that are better for the environment, recycling, reducing water consumption and contributing to an environmental organization. There is no clear relationship between national identification and pro-environmental attitudes and pro-environmental behaviour: a positive relationship is found with respect to individuals' willingness to pay higher taxes to prevent environmental pollution and to buy things at a 20% higher price if it helped to protect the environment, as well as with actual engagement in reducing water consumption; a negative relationship is found with respect to actual engagement in recycling, attending meetings or signing petitions, and joining boycotts; and no statistically significant effect is found with respect to willingness to give part of own income to the environment and actual engagement in choosing products that are better for the environment and contributing to an environmental organization.

Region-specific effects are reported with respect to the reference group: North America. With few exceptions, it can be established that there is statistically significant evidence that individuals in regions of the world other than North America show higher willlingness to sacrifice money in order to save the environment, but at the same time actually engage less in specific pro-

environmental behaviours and environmental politically related behaviours. The two most important exceptions are individuals from Africa, whose willingness to pay higher taxes to prevent environmental pollution is not statistically significant different from that of individuals in North America; and individuals from Oceania, who engage more than individuals from any other region in choosing products that are better for the environment, recycle, reduce water consumption, contribute to environmental organizations, attend meetings or sign petitions, and join boycotts.

To understand differences in pro-environmental attitudes and pro-environmental behaviour due to the region of origin of immigrants, we look at the coefficients of the relevant dummy variables. The reference group is North America as well. There are no statistically significant differences in the pro-environmental attitudes of immigrants regardless of their source region. Thus, Asians do not have different willingness to pay higher taxes to prevent environmental pollution than Latin Americans, just as Africans do not have different willingness to buy things at a 20% higher price if it helped to protect the environment than Europeans. The same claim cannot be made about pro-environmental behaviour, and there is no clear pattern: a) immigrants from Europe, Asia, Africa, Nordic countries, and Middle East engage less in choosing products that are better for the environment than immigrants from North America, Latin America, and Oceania; b) immigrants from Europe, Asia, Latin America, Nordic countries, and Middle East engage less in recycling than immigrants from North America, Africa, and Oceania; c) immigrants from Latin America and Oceania engage less in reducing water consumption than immigrants from North America, Europe, Asia, Africa, Nordic countries, and Middle East; d) immigrants from Asia and Latin America engage less in contributing to an environmental organization than immigrants from Europe, Africa, North America, Oceania, Nordic countries, and Middle

East; e) there is no statistically significant differences among immigrants of all regions regarding their engagement in attending meetings or signing petitions; and f) immigrants from Asia engage less in joining boycotts than immigrants from the rest of the world.

Now, remember the aim of this section is to establish whether there are statistically significant differences in pro-evironmental attitudes and pro-environmental behaviour between immigrants and native-born. Results showed there are differences regarding three specific pro-environmental behaviours. What is the magnitude of that difference? Tables 24-26 in the Appendix present the marginal effects for the ordered probit and probit models. The interpretation for each type of model is quite different. On the one hand, the marginal effects of the ordered probit models indicate (*ceteris paribus*) the percentual change in the probability that the willingness of immigrants changes from *agree* to *strongly agree* to perform the environmentally friendly behaviour in consideration.[36] On the other hand, the marginal effects of the probit models indicate the probability that the individual performs the environmentally friendly behaviour in consideration when his status changes from being native-born to immigrant or viceversa.

Let us analyze first the marginal effects of the *immigrant status* variable. The probability that an immigrant chooses products that are better for the environment is 13.21% higher than that of a native-born. The probability that an immigrant recycles is 15.83% higher than that of a native-born. And the probability that an immigrant reduces his water consumption is 12.42% higher than that of a native-born.

If the source region of the immigrant is considered, the results are: a) im-

[36]The reported marginal effects of the ordered probit models are MEM's, i.e. marginal effects at means. In general, there is no strong reason why one would suspect it would be best to compute the average marginal effect, i.e. why AME's would be best. However, although not reported here, AME's were also computed and there was no substantial difference.

migrants from Europe, Asia, Africa, Nordic countries and Middle East have a 20.25%, 24.49%, 23.04%, 11.83%, and 11.83% lower probability, respectively, to choose products that are better for the environment than immigrants from Latin America and North America; b) immigrants from Europe, Asia, Latin America, Nordic countries and Middle East have a 26.32%, 23.98%, 18.13%, 21.21%, and 21.21% lower probability, respectively, to recycle than immigrants from Africa, Oceania, and North America; and c) immigrants from Latin America and Oceania have a 14.87% and 31.22% lower probability, respectively, to reduce water consumption than immigrants from the rest of the world.

What control variables have the greatest impact on pro-environmental attitudes and pro-environmental behaviour? The probability that the willingness of an individual with preferences oriented towards "protecting the nature" (environmental orientation 1) changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 11.1% higher than that of individuals with preferences oriented towards "economic growth". The same probability is 4.83% and 7.31% higher for the willingness to give part of their own income to the environment and to buy things at a 20% higher price if it helped to protect the environment, respectively. The probability that an individual with preferences oriented towards "protecting the nature" (environmental orientation 1) chooses products that are better for the environment, recycles, reduces water consumption, contributes to an environmental organization, and attends meetings or signs petitions is 10.18%, 9.65%, 7.65%, 3.84%, and 4.2% higher, respectively, than that of an individual with preferences oriented towards "economic growth". Finally, the probability that an individual with social capital joins a boycott is 9.14% higher than that of an individual who does not trust others.

What about differences in pro-environmental attitudes and pro-environmental behaviour driven by the region of residence of individuals? Tables 24-26 in the

Appendix suggest the following: a) the probability that the willingness of individuals in Europe, Asia, Latin America, Nordic countries, Middle East, and Oceania changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 7.71%, 11.91%, 8.99%, 8.55%, 19.03%, and 2.93% higher, respectively, than that of individuals in Africa and North America; b) the probability that the willingness of individuals in Europe, Asia, Africa, Latin America, Nordic countries, Middle East, and Oceania changes from *agree* to *strongly agree* to buy things at a 20% higher price if it helped to protect the environment is 6.98%, 8.46%, 2.98%, 8.44%, 2.33%, 16.94%, and 2.98% higher, respectively, than that of individuals in North America; c) the probability that individuals in Europe, Asia, Africa, and Latin America choose products that are better for the environment is 3.21%, 2.8%, 2.4%, and 2% lower, respectively, than that of individuals in North America and Nordic countries. Individuals in Oceania have a 9.5% higher probability to choose products that are better for the environment than individuals in North America; d) the probability that individuals in Europe, Asia, Africa, Latin America, and Nordic countries recycle is 5.82%, 5.02%, 5.05%, 4.92%, and 7.62% lower, respectively, than that of individuals in North America. Individuals in Oceania have a 2.31% higher probability to recycle than individuals in North America; e) the probability that individuals in Europe, Africa, and Nordic countries reduce water consumption is 7.02%, 5.9%, and 21.41% lower, respectively, than that of individuals in Asia, Latin America, and North America. Individuals in Oceania have a 15.49% higher probability to reduce water consumption than individuals in North America; f) the probability that individuals in Europe, Asia, Latin America, and Middle East contribute to an environmental organization is 12.48%, 4.69%, 5.36%, and 4.94% lower, respectively, than that of individuals in Nordic countries and North America. Individuals in Africa and Oceania have a 5.39% and 2.25% higher probability to

contribute to an environmental organization than individuals in North America; g) the probability that individuals in Europe and Asia attend meetings or sign petitions is 7.57% and 4.44% lower, respectively, than that of individuals in Africa, Latin America, Nordic countries, Middle East, and North America. Individuals in Oceania have a 9.78% higher probability to attend meetings or sign petitions thant that of individuals in North America; and h) the probability that individuals in Europe, Asia, Africa, Latin America, and Middle East join boycotts is 27.38%, 10.64%, 17.71%, 34.96%, and 28.38% lower, respectively, than that of individuals in North America. Individuals in Nordic countries and Oceania have a 12.69% and 5.14% higher probability, respectively, to join boycotts than that of North America.

Because there are statistically significant differences in some of the pro-environmental behaviours, the NEP cannot be supported. Individuals do not hold the same environmental preferences despite variation in personal characteristics such as education, income, age, etc.

Now that the variation in the environmental behaviour of immigrants and native-born across issues like Money and the Environment, Specific pro-environmental actions, and Environmental politically related behaviour has been established, the topic of the length of residence of immigrants becomes relevant. Are immigrants that have lived for longer time in the host country more pro-environmentally inclined than those immigrants of recent arrival? It has been assessed that immigrants have a stronger engagement on environmentally friendly behaviours than native-born, but do they do it as a means of strategic adaptation into their new culture, thus making lighter the negative burden that their presence in the host country already implies? Or is it simply because they are more educated and face a less restrictive budget constraint than native-born? Do immigrants engage more on environmentally friendly behaviours because previous exposure

to environmental problems sensitized them, i.e. increased their environmental awareness? Or do immigrants develop a "sense of place" that compels them to behave in a more pro-environmental fashion? The next section investigates these issues.

3.2 Immigrants and the length of residence

The difference in environmental behaviour between native-born and immigrants might reflect the fact that the degree of incorporation of immigrants to their new society is not profound. The longer their residence in the host country is, the more likely they will adopt features of the dominant culture, including certain environmental behaviours. Since there is variation in the time that immigrants have resided in the host country, a proxy is created from the dataset to deal with such issue. The variables *Born in this country: birth country* and *When came to country* are used for that matter. The constructed variable *length of residence* has three items: 1=*10 years or less*; 2=*11-15 years*; and 3=*more than 15 years*. Descriptive statistics for immigrants by their length of residence can be found in Tables 33 and 34 in the Appendix.[37]

Figures 10-12 show that the immigrants' willingness to give part of their income for the environment and buy things at a 20% higher price if it helped to protect the environment is lower when the immigrants have lived more years in the country. With respect to the immigrants' willingness to pay higher taxes to prevent environmental pollution, such relation is not that clear. However, it can be observed that the group of immigrants that display lower willingness is the one with more than 15 years of residence in the country.

[37] Immigrants who have lived in the host country for 10 years or less, 11 to 15 years, and more than 15 years represent 23.57%, 21.79% and 54.64% of the total immigrant population, respectively.

Figure 10: Average willingness to pay higher taxes
to prevent environmental pollution

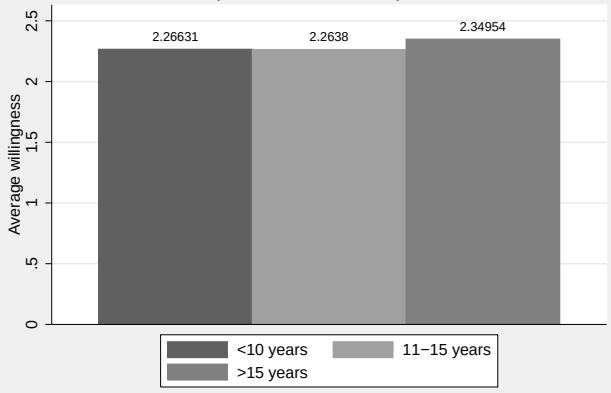


Figure 11: Average willingness to
give part of own income for the environment

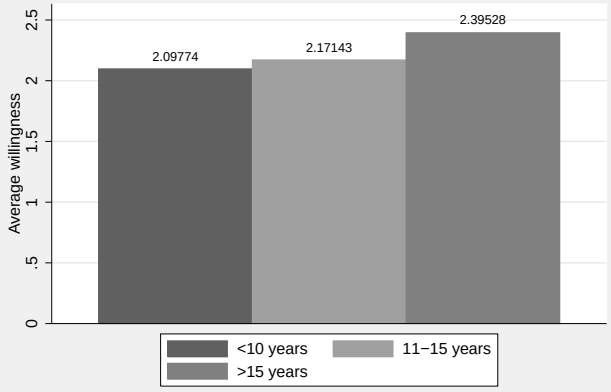
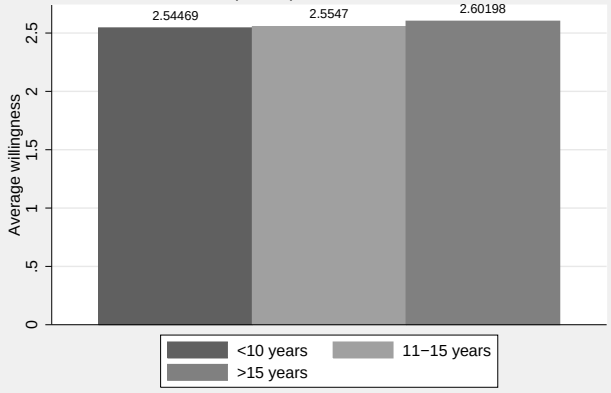
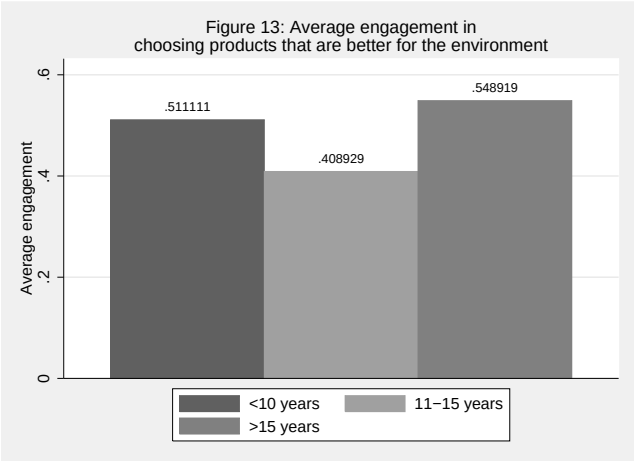


Figure 12: Average willingness to buy things at a 20% higher price
if it helped to protect the environment





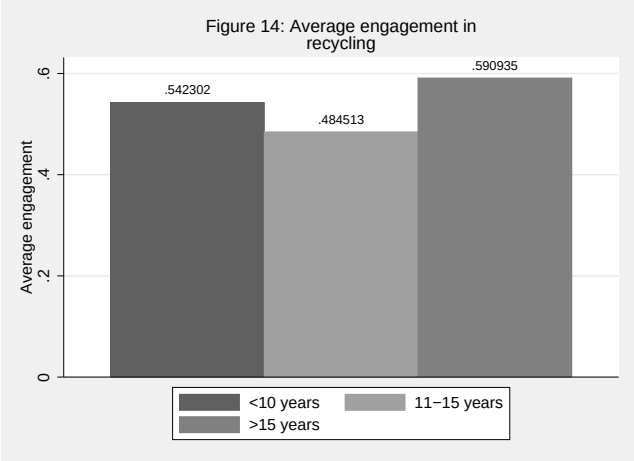


Figure 13-18 shows that, in contrast to what prevailed in Figures 10-12, immigrants display more engagement on environmentally friendly behaviours when their time of residence in the country is more than 15 years. Yet, a positive relationship between engagement and time of residence cannot be established; immigrants that have lived in the country 10 years or less show higher engagement in environmentally friendly behaviours than those immigrants with 11 to 15 years of residence.

It becomes clear then, that there are behavioural differences within immigrants when their time of residence in the host country is considered. In order to

Figure 15: Average engagement in reducing water consumption

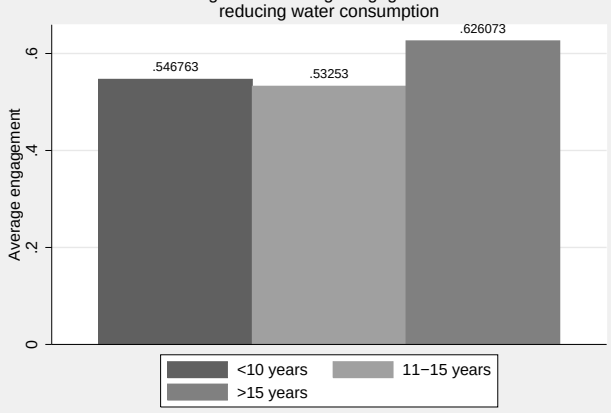


Figure 16: Average engagement in contributing to an environmental organization

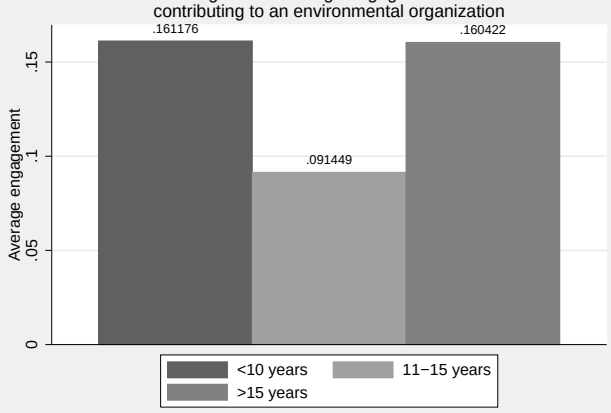
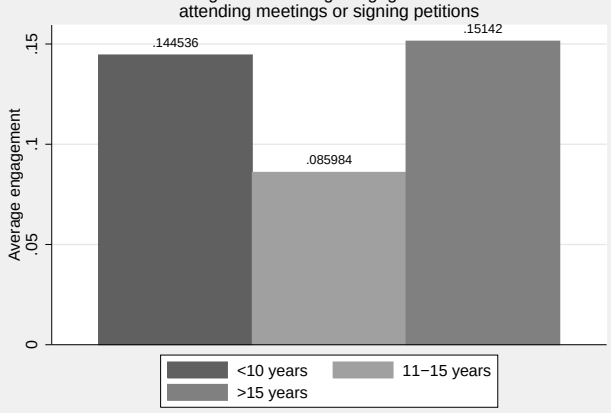
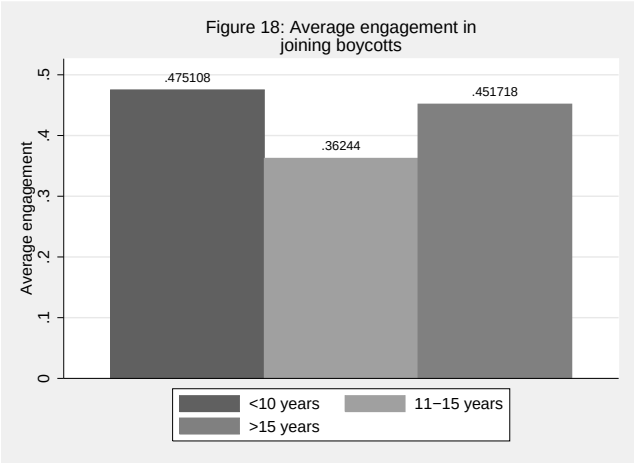


Figure 17: Average engagement in attending meetings or signing petitions





assess the statistical significance of these differences, a series of ordered probit models are estimated for those environmentally friendly behaviours presented in Figures 10-12, while probit models are used to evaluate differences in the environmentally friendly behaviours depicted in Figures 13-18.

Table 18 in the Appendix shows the coefficients and standard errors for the *length of residence* regressor, and the number of observations in each model corresponding to the Money and the Environment issues. The reference group in the estimations is the group of immigrants with 10 years or less of residence in the host country. It can be observed that, in general, there is no evidence that there are behavioural differences between immigrants of various lengths of residence in the host country with respect to their willingness to sacrifice money in order to save the enviroment, albeit there is one exception: immigrants of 11-15 years of residence show stronger willingness to give part of their own income to the environment than immigrants of less than 10 years of residence or those of more than 15 years of residence in the host country.

Tables 19 and 20 in the Appendix presents the coefficients and standard errors for the *length of residence* regressor, as well as the number of observations of each model corresponding to Specific pro-environmental behaviour and Envi-

ronmental politically related issues. Once all relevant controls that might affect the environmental behaviour of immigrants, there is no evidence that there are behavioural differences between immigrants of different lengths of residence in the host country.

What about the effect of those (control) variables that could affect the environmental behaviour of individuals other than their length of residence? Once again, some of the expected relationships with pro-environmental attitudes and pro-environmental behaviour were confirmed and some others were not.

While education was found to be an enhancer of pro-environmental attitudes and pro-environmental behaviour when considering immigrants and native-born, the same cannot be claimed, in general, when comparing immigrants by their length of residence. There are three exceptions though: more educated immigrants are more willing to pay higher taxes to prevent environmental pollution and to buy things at a 20% higher price if it helped to protect the environment, as well as they engage more on contributing to environmental organizations.

Income was found to have no effect with respect to pro-environmental attitudes, but it does have an effect with respect to four pro-environmental behaviours; immigrants of higher level of income engage more on choosing products that are better for the environment, recycling, contributing to an environmental organization, and joining boycotts.

Age is found to have no effect on the immigrants' pro-environmental attitudes. However, older immigrants engage more on choosing products that are better for the environment, recycling, reducing water consumption and attending meetings or signing petitions.[38]

With respect to gender, immigrant women show stronger pro-environmental attitudes than immigrant men, as well as more engagement on choosing prod-

[38] A quadratic effect of age is found to be significant with respect to engagement in choosing products that are better for the environment, reducing water consumption and attending meetings or signing petitions.

ucts that are better for the environment. However, no statistically significant difference is found among immigrant men and women regarding recycling, reducing water consumption, contributing to an environmental organization and attending meetings or signing petitions. Finally, immigrant men engage more in joining boycotts than immigrant women.

Immigrants with higher social capital display stronger pro-environmental attitudes, but with the exception of contributing to environmental organizations and joining boycotts, the social capital of immigrants has no effect on their engagement in choosing products that are better for the environment, recycling, reducing water consumption, and attending meetings or signing petitions.

The empowerment of immigrants by their length of residence has no effect on their pro-environmental attitudes and pro-environmental behaviour, with the exception that empowered immigrants do show higher willingness to buy things at a 20% higher price if it helped to protect the environment, as well as more engagement in choosing products that are better for the environment.

With two exceptions, pro-social traits do not have an influence on immigrants' pro-environmental attitudes and pro-environmental behaviour. Contrary to what was expected, immigrants with pro-social inclination show lower willingness to buy things at a 20% higher price if it helped to protect the environment; yet, immigrants with pro-social traits engage more in joining boycotts.

Once more, there is no clear relationship between national identification and immigrants' pro-environmental attitudes and pro-environmental behaviour: there is a positive relationship with respect to immigrants' willingness to pay higher taxes to prevent environmental pollution and buy things at a 20% higher price if it helped to protect the environment; there is no relationship with respect to immigrants' willingness to give part of their own income to the environment, as well as with their engagement in choosing products that are better for the

environment, recycling, reducing water consumption, contributing to an environmental organization, and attending meetings or signing petitions; finally, there is a negative relationship with respect to immigrants' engagement in joining boycotts.

The community attachment of immigrants by their length of residence does not have any statistically significant impact on their pro-environmental attitudes and their pro-environmental behaviour.

Finally, there is a positive relationship between environmental orientation and pro-environmental attitudes and pro-environmental behaviour: a) with respect to "Economic Growth vs Protect the Environment preferences" (orientation 1), immigrants who prefer to protect the environment display stronger pro-environmental attitudes and pro-environmental behaviour; b) with respect to "Human vs Nature stance", those immigrants who believe men should have an harmonic relationship with nature show higher willingness to buy things at a 20% higher price if it helped to protect the environment, as well as higher engagement in choosing products that are better for the environment, and recycling. However, those same immigrants show less engagement in contributing to an environmental organization. The "Human vs Nature stance" of immigrants has no statistically significant influence in their willingness to pay higher taxes to prevent environmental pollution and to give part of their own income to the environment, as well as with their engagement in reducing water consumption, attending meetings or signing petitions, and joining boycotts.

Region-specific effects are reported with respect the same reference group: North America. Now that the model specification excludes native-born inviduals and disaggregates immigrants by their length of residence in the host country, there is evidence that immigrants in regions of the world other than North America show higher willingness to sacrifice money in order to save the environment.

The two exceptions are immigrants living in Africa and Oceania who display the same willingness as immigrants in North America to pay higher taxes to prevent environmental pollution, as well as immigrants in Africa, Nordic countries and Oceania who display the same willingness as immigrants in North America to buy things at a 20% higher price if it helped to protect the environment. With respect to pro-environmental behaviour, results are somewhat similar to those found when comparing immigrants and native-born. Immigrants in Oceania engage more in choosing products that are better for the environment, recycling, reducing water consumption, and attending meetings or signing petitions. With respect to contributing to an environmental organization, immigrants in Europe engage less than immigrants who reside in any other region of the world. Finally, with respect to joining boycotts, immigrants in Nordic countries and Oceania show higher engagement than immigrants who reside in any other region of the world.

Differences in pro-environmental attitudes and pro-environmental behaviour due to the region of origin of immigrants are reported with the relevant interaction dummies. Results are quite similar to those found when comparing immigrants and native-born. With the exception of willingness to give part of own income to the environment,[39] there is no statistically significant evidence that pro-environmental attitudes of immigrants differ because of their region of origin. With respect to pro-environmental behaviour, with the exception of engagement in choosing products that are better for the environment, recycling and contributing to an environmental organization,[40] there is no statistically

[39] In this case, immigrants from Europe, Africa, Nordic countries and Middle East show lower willingness to give part of their income to the environment than immigrants from the rest of the world.

[40] With respect to choosing products that are better for the environment, immigrants from Europe, Africa, and Oceania show lower engagement than immigrants from any other region of the world. With respect to recycling, immigrants from Europe, Nordic countries, Middle East, and Latin America show lower engagement than immigrants from any other region of the world. Finally, with respect to contributing to an environmental organization, immigrants from Asia and Latin America show lower engagement than immigrants from any other region

significant evidence that the engagement of immigrants in pro-environmental differs because of their region of origin.

Let us look at the magnitude of the differences found in pro-environmental attitudes and pro-environmental behaviour of immigrants by their length of residence. Tables 27-29 in the Appendix present the marginal effects for the ordered probit and probit models.

Let us analyze first the marginal effects of the *length of residence* variable. The percentual change in the probability that the willingness of an immigrant of 11-15 years of residence in the host country changes from *agree* to *strongly agree* to give part of his own income to the environment is 19.41% greater than that of an immigrant of less than 10 years and that of an immigrant of more than 15 years of residence in the host country.

If the source region of the immigrants is considered, the results are: a) the percentual change in the probability that the willingness of immigrants from Europe, Africa, Nordic countries and Middle East change from *agree* to *strongly agree* to give part of their income to the environment is 14.2%, 21.09%, 18.52%, and 18.52% lower, respectively, than that of immigrants from Asia, Latin America, Oceania, and North America; b) the probability that immigrants from Europe, Africa and Oceania engage in choosing products that are better for the environment is 12.97%, 20.64%, and 25.71% lower, respectively, than that of immigrants from Asia, Latin America, Nordic countries, Middle East, and North America; c) the probability that immigrants from Europe, Latin America, Nordic countries and Middle East in recycling is 22.73%, 27.72%, 17.71%, and 17.71% lower, respectively, than that of immigrants from Asia, Africa, and North America; and d) the probability that immigrants from Asia and Latin America engage in contributing to an environmental organization is 13.16% and 13.21% lower, respectively, than that of immigrants from Europe,

of the world.

Africa, Nordic countries, Middle East, Oceania, and North America.

What control variables have the greatest impact on pro-environmental attitudes and pro-environmental behaviour? The probability that the willingness of an immigrant with preferences oriented towards "protecting the nature" (environmental orientation 1) changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 11.32% higher than that of immigrants with preferences oriented towards "economic growth". The same probability is 7.87% and 6.57%, higher for the willingness to give part of own income to the environment and to buy things at a 20% higher price if it helped to protect the environment, respectively. The probability that an immigrant with preferences oriented towards "protecting the nature" (environmental orientation 1), or an immigrant who is empowered, chooses products that are better for the environment is 14.67% and 13.12% higher, respectively, than that of an immigrant whose preferences are oriented towards "economic growth" or a disempowered immigrant. The probability that an immigrant with preferences oriented towards "protecting the nature" (environmental orientation 1), or an immigrant with a notion that "humans should have an harmonic relationship with nature" (environmental orientation 2), recycles is 17.31% and 11.79% higher, respectively, than that of an immigrant whose preferences are oriented towards "economic growth" or who deems that "humans should master nature". The probability that an immigrant with preferences oriented towards "protecting the nature" (environmental orientation 1) reduces his water consumption is 8.94% higher than that of an immigrant whose preferences are oriented towards "economic growth". The probability that an immigrant with preferences oriented towards "protecting the nature" (environmental orientation 1), or an immigrant with social capital, contributes to an environmental organization is 5.11% and 4.75% higher, respectively, than that of an immigrant whose preferences are

oriented towards "economic growth" and that of an immigrant without social capital. The probability that an immigrant with preferences oriented towards "protecting the nature" (environmental orientation 1) attends meetings or signs petitions is 4.16% higher than that of an immigrant whose preferences are oriented towards "economic growth". Finally, the probability that an immigrant who is a man, or has preferences oriented towards "protecting the nature", or has social capital, join boycotts is 9.4%, 8.58% and 8.97% higher than that of a woman immigrant, or an immigrant with preferences oriented towards "economic growth", or an immigrant without social capital.

What about differences in pro-environmental attitudes and pro-environmental behaviour driven by the region of residence of immigrants? Tables 27-29 in the Appendix suggest the following: a) the percentual change in the probability that the willingness of immigrants who reside in Europe, Asia, Latin America, Nordic countries, Middle East, and Oceania changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 14.89%, 26.88%, 16.09%, 16.83%, 21.52%, and 6.12% higher, respectively, than that of immigrants who reside in Africa and North America; b) the percentual change in the probability that the willingness of immigrants who reside in Europe, Asia, Latin America, and Middle East changes from *agree* to *strongly agree* to give part of their own income to the environment is 8%, 14.79%, 10.8%, and 11.36% higher, respectively, than that of immigrants who reside in Africa, Nordic countries, Oceania, and North America; c) the probability that immigrants who reside in Europe and Oceania choose products that are better for the environment is 29.31% lower and 19.03% higher, respectively, than that of immigrants who reside in Asia, Africa, Latin America, Nordic countries, and North America; d) the probability that immigrants who reside in Europe, Africa, Latin America, and Oceania recycle is 52.13%, 35.42% and 32.98% lower, and 17.95% higher, respectively, than

that of immigrants who reside in Asia, Nordic countries, and North America; e) the probability that an immigrant who resides in Oceania reduces his water consumption is 20.16% higher than that of an immigrant who resides in any other part of the world; f) the probability that immigrants who reside in Europe contribute to an environmental organization is 11.58% lower than that of immigrants who reside in any other part of the world; g) the probability that an immigrant who resides in Oceania attends meetings or signs petitions is 10.95% higher than that of an immigrant who resides in any other part of the world; h) the probability that immigrants who reside in Europe, Latin America, and Middle East join boycotts is 19.05%, 18.83%, and 20.55% lower, respectively, than that of immigrants who reside in Asia, Africa, and North America; and i) the probability that immigrants who reside in Nordic countries and Oceania join boycotts is 23.27% and 13.28% higher, respectively, than that of immigrants who reside in North America, Asia, and Africa.

Now that individuals with more similiarites where compared, behavioural differences driven by the length of residence of immigrants in the host country were minimal. Although not yet a definite statement, this indicates that immigrants do not develop a sense of belongingness to the host country with time. The pro-environmental attitudes and pro-environmental behaviour of immigrants are rather affected by three things: a) variables that could affect pro-environmental attitudes and pro-environmental behaviour that are not specific to immigrant status (e.g. social capital, empowerment, and environmental orientation); b) the region of origin of the immigrant (region-specific characteristics such as the institutional framework or climate); c) and the region where immigrants reside (region-specific characteristics such as the institutional framework or climate).

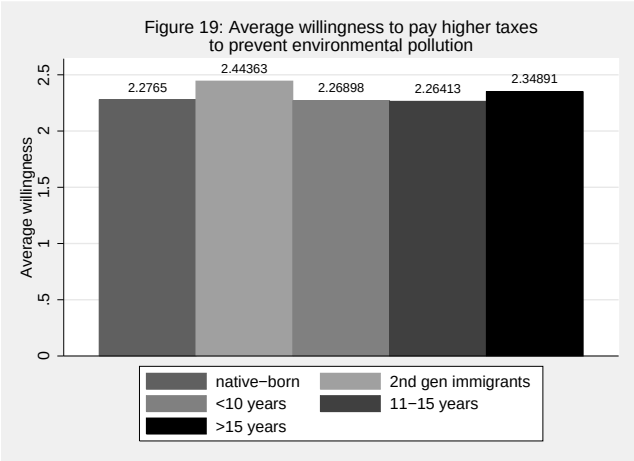
The next part digs deeper into the immigrants' adaptation to their new

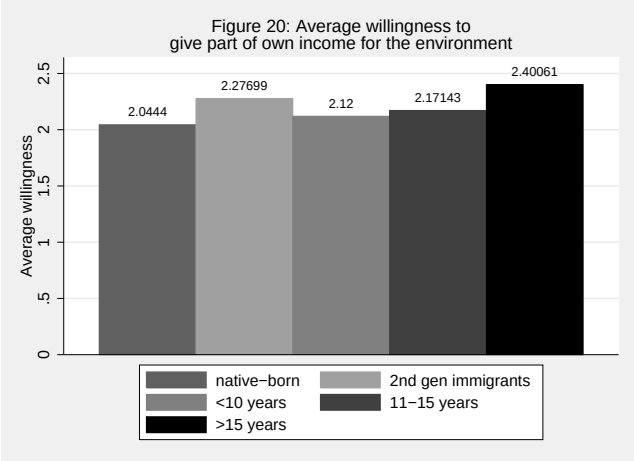
culture and its effect on their environmental behavior controlling for variations in the individuals' "sense of belongingness" or "sense of place" to the host country due to their immigrant status. In particular, do immigrants accomodate to the environmental behaviour of native-born? Do immigrants' offspring still behave like immigrants in the environmental arena, or do they definitely blend in with native-born?

3.3 Acculturation and second generation immigrants

The acculturation process could have been studied by comparing the environmental behaviour of native-born to that of immigrants by length of residence. However, the inherent variation in the individuals' "sense of belongingness" could provide inaccurate results. A more suitable approach would require the introduction of a control group with the same cultural characteristics of immigrants, but also that at the same time develops a "sense of belongingness" to the host country under the same institutional framework of native-born. Such group is conformed by *second generation immigrants*. They are those native-born whose fathers were born abroad (Card et al [20]). To determine such status, a dichotomous variable (0=*no*, 1=*second generation immigrant*) was created using the WVS variables: *Born in this country: birth country*, *Mother Immigrant*, and *Father Immigrant*.

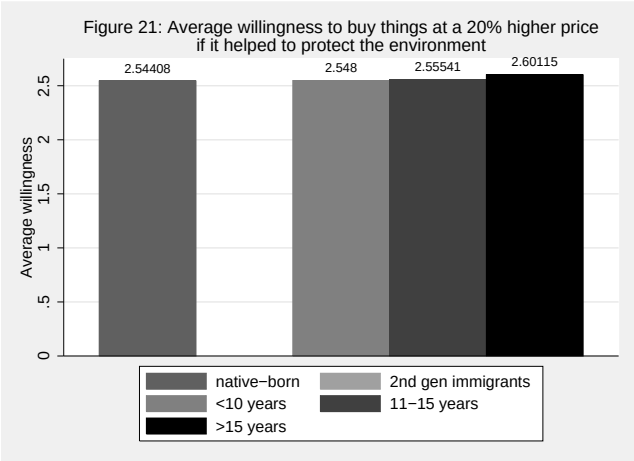
To capture the differences in environmental behaviour produced by the adaptation of individuals to a new culture through time, a series of ordered probit and probit models are carried out introducing a status variable, denominated *allgroups*, which identifies the individual as native-born, immigrant by length of residence, or second generation immigrant. If second generation immigrants' behaviour closely resembles that of native-born, then it can be ascertained that acculturation does take place completely, because despite (probably) being raised





under a set of foreign traditions and values, the immigrants' offspring has now learned the ways of the dominant culture. But if their behaviour is more similar to that of immigrants, specially those of short residence, then it can be supported that despite exposure to a new culture, the environmental behaviour of immigrants is inherited to younger generations.

Figures 19-21 show that immigrants of short residence and native-born are



(on average) more willing to pay higher taxes to prevent environmental pollution than immigrants of long residence and second generation immigrants. This is not true for their willingness to give part of their income for the environment. In such case native-born clearly show stronger willingness, followed by immigrants of short residence and second generation immigrants. Immigrants of long residence display the lowest willingness to give part of their income for the environment. Finally, with respect to the willingness to buy things at a 20% higher price if it helped to protect the environment, the average levels are very similar for native-born and immigrants of short residence. Immigrants of long residence display the lowest willingness, while that of second generation immigrants cannot be assessed because of missing data. So far, it seems that native-born and short residence immigrants are more willing to sacrifice money to save the environment than second generation and long residence immigrants, suggesting that acculturation might not take place at least regarding pro-environmental attitudes.

Figure 22: Average engagement in
choosing products that are better for the environment

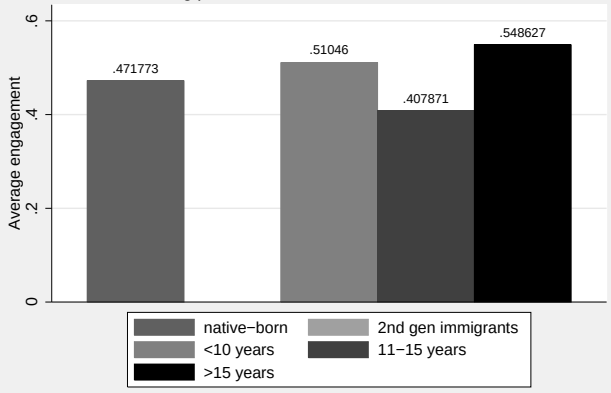


Figure 23: Average engagement in
recycling

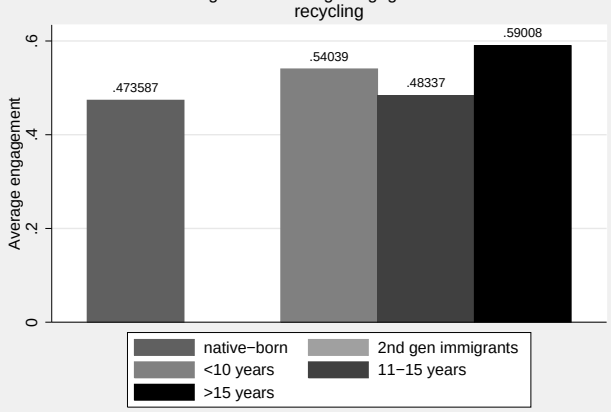
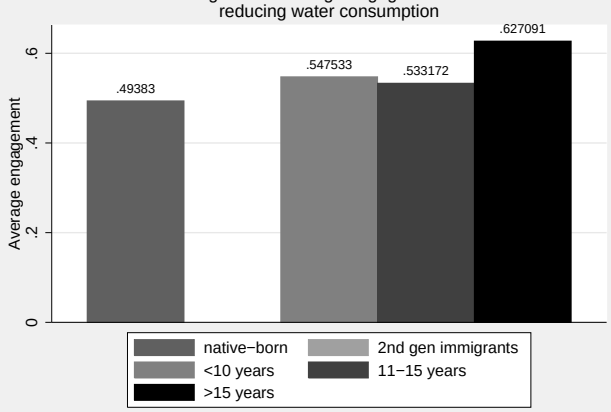
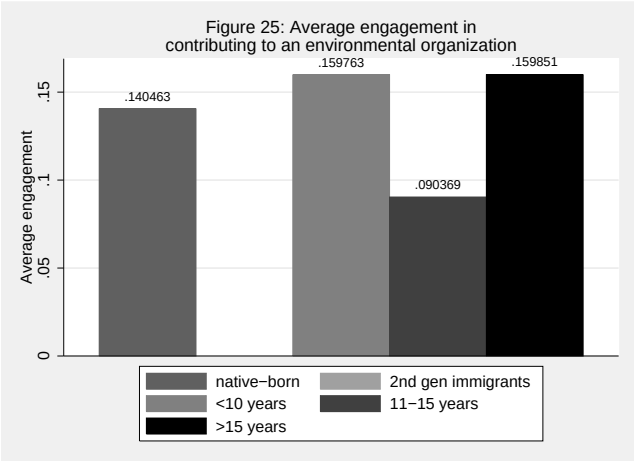
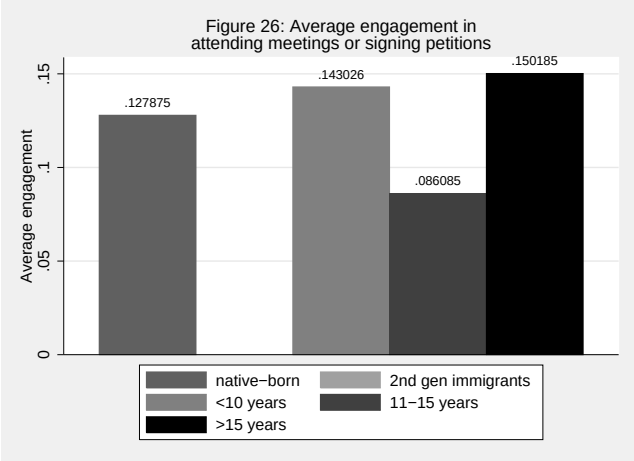


Figure 24: Average engagement in
reducing water consumption

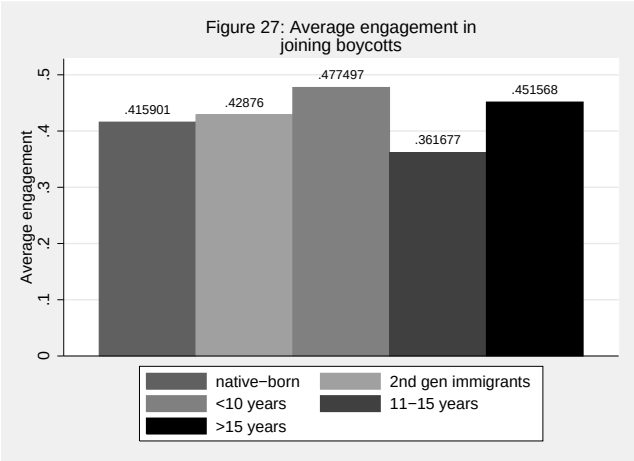






Once again, Figures 22-27 show that when we consider pro-environmental behaviour as opposed to pro-environmental attitudes, matters change.[41] Immigrants of long residence are the group that has engaged more on environmentally

[41] Unfortunately, with respect to pro-environmental behaviour, the WVS dataset only contains information of second generation immigrants for the joining boycotts variable.



friendly behaviours like choosing products that are better for the environment, recycling, and reducing water consumption. They are followed by immigrants of short residence and native-born. There are no clear behavioural differences regarding the contribution to environmental organizations and meetings attendance or petitions signing. However, in terms of joining boycotts, immigrants of short residence show the highest engagement, followed by immigrants of long residence, native-born and second generation immigrants.

To establish the statistical significance of these environmental behavioural differences, a series of ordered probit models are estimated for the pro-environmental attitudes, while probit models are used for pro-environmental behaviours.

Tables 21-23 in the Appendix show the coefficients and standard errors for the *allgroups* regressor, and the number of observations in each model corresponding to the Money and the Environment issues, Specific pro-environmental behaviour, and Environmental politically related behaviour. The reference group in the estimations is the native-born individuals. It can be observed that, despite there are some exceptions, there are substantial differences in the pro-environmental attitudes and pro-environmental behaviour of individuals. With respect to pro-environmental attitudes, there is statistically significant evidence

that immigrants of 11-15 years of residence in the host country have more willingness to pay higher taxes to prevent environmental pollution and to give part of their own income to the environment. With respect to pro-environmental behaviour: a) immigrants of less than 10 years and more than 15 years of residence in the host country show higher engagement in choosing products that are better for the environment and in reducing water consumption; b) immigrants of more than 15 years of residence in the host country show higher engagement in recycling; and c) immigrants of less than 10 years of residence in the host country show higher engagement in contributing to an environmental organization. For the case of willingness to buy things at a 20% higher price if it helped to protect the environment, engagment in attending meetings or signing petitions and engagement in joining boycotts, there is no statistical evidence which suggests that there are differences between immigrants by their length of residence and native-born.

What about the effect of those (control) variables that could affect the environmental attitudes and behaviour of individuals other than their immigrant status and (if immigrant) length of residence in the host country? As it should be expected from the past sections, some relationships were confirmed and some others were not.

Education was found to be an universal enhancer of pro-environmental attitudes and pro-environmental behaviour. Thus, more educated individuals are more willing to sacrifice money in order to save the environment and engage more in both specific pro-environmental behaviour and environmental politically related behaviour, regardless of their immigrant status and (if immigrant) length of residence in the host country.

Income was also found to be an enhancer, with the exception of willingness to give part of own income to the environment and reducing water consumption;

in such cases, income lacks impact.

Age was found to have a negative effect on pro-environmental attitudes and a positive effect on pro-environmental behaviour, with the exception of engagement in reducing water consumption; in such case, age has no effect. Thus, younger individuals show stronger pro-environmental attitudes, while older individuals show stronger pro-environmental behaviour.

Gender provides mixed results: while it has no impact on the individuals' engagement in attending meetings or signing petitions, men do show higher engagement in contributing to an environmental organization and joining boycotts, whereas women show stronger pro-environmental attitudes and more engagement in choosing products that are better for the environment, recycling and reducing water consumption.

Individuals with social capital show stronger pro-environmental attitudes and pro-environmental behaviour, with the exception of reducing water consumption, where the impact of social capital is indeed negative.

Empowered individuals also show stronger pro-environmental attitudes and pro-environmental behaviour, with the exception of willingness to give part of own income to the environment, for which empowerment has no influence.

In general, environmental orientation has a positive effect on the individuals' pro-environmental attitudes and pro-environmental behaviour: a) With respect to "economic growth vs protecting nature" preferences (environmental orientation 1), there is a universal positive relationship with pro-environmental attitudes and pro-environmental behaviour; b) with respect to "human vs nature stance", there is also a positive relationship with pro-environmental attitudes and pro-environmental behaviour with three exceptions: such relationship is negative for the case of engagement in contributing to an environmental organization and attending meetings or signing petitions, and there is no influence

with respect to the willingness of individuals to give part of their own income to the environment.

With respect to pro-social traits, community attachment and national identification, results are opposite to what was expected. For the case of pro-social traits: a) there is a negative relationship with willingness to pay higher taxes to prevent environmental pollution and to buy things at a 20% higher price if it helped to protect the environment; b) there is a positive relationship with engagement in attending meetings or signing petitions and joining boycotts; and c) there is no influence of pro-social traits of the individuals on their willingness to give part of their own income to the environment and their engagement in recycling and contributing to an environmental organization. For the case of community attachment: a) there is a negative relationship with the individuals' willingness to pay higher taxes to prevent environmental pollution and to buy things at a 20% higher price if it helped to protect the environment, as well as with their engagement in reducing water consumption, attending meetings or signing petitions and joining boycotts; and b) there is no influence of the individuals' community attachment on their willingness to give part of their own income to the environment and their engagement in choosing products that are better for the environment, recycling and contributing to an environmental organization. Finally, for the case of national identification: a) there is a positive relationship with the individuals' willingness to pay higher taxes to prevent environmental pollution and to buy things at a 20% higher price if it helped to protect the environment, as well as with the individuals' engagement in reducing water consumption; b) there is a negative relationship with the individuals' engagement in recycling, attending meetings or signing petitions and joining boycotts; and c) the individuals' national identification has no effect on their willingness to give part of their own income to the environment and

their engagement in choosing products that are better for the environment and contributing to an environmental organization.

Region specific effects are reported with respect the same reference group: North America. Individuals in Europe, Asia, Latin America, Nordic countries, Middle East, and Oceania have higher willingness to pay higher taxes to prevent environmental pollution than individuals in North America and Africa. Individuals in Europe, Asia, Africa, Latin America, Nordic countries, Middle East, and Oceania have higher willingness to buy things at a 20% higher price if it helped to protect the environment. Individuals in Europe, Asia, Africa, and Latin America engage less in choosing products that are better for the environment than individuals in Nordic countries and North America; yet, individuals in Oceania engage the most in such behaviour. Individuals in Europe, Asia, Africa, Latin America, and Nordic countries engage less in recycling than individuals in North America and Oceania. Individuals in Europe, Africa, and Nordic countries engage less in reducing water consumption than individuals in Asia and North America; yet, individuals in Oceania engage the most in such behaviour. Individuals in Europe, Asia, Latin America, and Middle East engage less in contributing to an environmental organization than individuals in North America and Nordic countries; yet, individuals in Africa and Oceania engage the most in such behaviour. Individuals in Europe and Asia engage less in attending meetings or signing petitions than individuals in Africa, Latin America, Nordic countries, Middle East, and North America; yet, individuals in Oceania engage the most in such behaviour. Finally, individuals in Europe, Asia, Africa, Latin America, and Middle East engage less in joining boycotts than individuals in North America; yet, individuals in Nordic countries and Oceania engage more in such behaviour.

Once more, differences in pro-environmental attitudes and pro-environmental

behaviour due to the region of origin of individuals (both immigrants and native-born) are reported with the relevant interaction dummies. There are no differences in the pro-environmental attitudes of individuals and in regard to their engagement in attending meetings or signing petitions. Individuals coming from Europe, Asia, Africa, Nordic countries, Middle East, and Oceania engage less in choosing products that are better for the environment than individuals coming from North America and Latin America. Individuals coming from Europe, Asia, Latin America, Nordic countries, and Middle East engage less in recycling than individuals coming from Africa and North America. Individuals coming from Latin America and Oceania engage less in reducing water consumption than individuals coming from any other region of the world. Individuals coming from Asia and Latin America engage less in contributing to an environmental organization than individuals coming from Europe, Africa, Nordic countries, Middle East, Oceania and North America. Individuals coming from Asia engage less in joining boycotts than individuals coming from any other part of the world.

What about the magnitude of the differences found in pro-environmental attitudes and pro-environmental behaviour of individuals? Tables 30-32 in the Appendix present the marginal effects for the ordered and probit models.

Let us analyze first the marginal effects of the *allgroups* variable. The percentual change in the probability that the willingness of an immigrant of 11-15 years of residence in the host country changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 7.07% higher than that of a native-born or that of immigrants of less than 10 years and more than 15 years of residence in the host country. Likewise, the percentual change in the probability that the willingness of an immigrant of 11-15 years of residence in the host country changes from *agree* to *strongly agree* to give part of their own income to the environment is 34.62% higher than that of a native-born or that of

immigrants of less than 10 years and more than 15 years of residence in the host country. The probability that an immigrant of less than 10 years of residence and an immigrant of more than 15 years of residence in the host country chooses products that are better for the environment is 10.83% and 14.7% higher, respectively, than that of native-born or immigrants of 11-15 years of residence in the host country. The probability that an immigrant of more than 15 years of residence in the host country engages in recycling is 18.36% higher than that of a native-born or that of immigrants of less than 15 years of residence in the host country. The probability that immigrants of less than 10 years and more than 15 years of residence in the host country engage in reducing water consumption is 10.81% and 13.47%, respectively, than that of native-born and immigrants of 11-15 years of residence in the host country. Lastly, the probability that immigrants of less than 10 years of residence in the host country engage in contributing to an environmental organization is 7.86% higher than that of native-born or immigrants of more than 10 years of residence in the host country.

If the source region of the immigrants is considered, the results are: a) the probability that immigrants from Europe, Asia, Africa, Nordic countries, Middle East, and Oceania choose products that are better for the environment is 22.14%, 22.08%, 21.84%, 11.84%, 11.84%, and 28.81% lower, respectively, than that of immigrants from North America and Latin America; b) the probability that immigrants from Europe, Asia, Latin America, Nordic countries, and Middle East recycle is 28.76%, 20.83%, 21.5%, 20.92%, and 20.92% lower, respectively, than that of immigrants from Africa and North America; c) the probability that immigrants from Latin America and Oceania reduce their water consumption is 13.33% and 25.27% lower, respectively, than that of immigrants from any other region of the world; d) the probability that immigrants from

Asia and Latin America contribute to an environmental organization is 10.24% and 12.88% lower, respectively, than that of immigrants from any other region of the world; and e) the probability that immigrants from Asia join boycotts is 13.63% lower than that of immigrants from any other region of the world.

What control variables have the greatest impact on pro-environmental attitudes and pro-environmental behaviour? The percentual change in the probability that the willingness of an individual with preferences oriented towards "protecting the nature" (environmental orientation 1) changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 11.13% higher than that of individuals with preferences oriented towards "economic growth". The same probability is 4.8% and 7.3% higher for the willingness to give part of own income to the environment and to buy things at a 20% higher price if it helped to protect the environment, respectively. The probability that an individual with preferences oriented towards "protecting the nature" (environmental orientation 1) chooses products that are better for the environment, recycles, reduces water consumption, contributes to an environmental organization, attends meetings or signs petitions and join boycotts is 10.15%, 9.67%, 7.67%, 3.87%, 4.16%, and 1.81% higher, respectively, than that of individuals with preferences oriented towards "economic growth".[42]

With respect to differences in pro-environmental attitudes and pro-environmental behaviour driven by the region of residence of the individuals, results suggest the following: a) the percentual change in the probability that the willingness of an individual who resides in Europe, Asia, Latin America, Nordic countries, Middle East and Oceania changes from *agree* to *strongly agree* to pay higher taxes to prevent environmental pollution is 7.75%, 11.92%, 9.05%, 8.58%, 19.07%, and

[42] Trust and gender have a greater marginal effect for the join boycotts variable. A man has a 9.32% higher probability to join a boycott than a woman, whereas an individual with social capital has 9.17% higher probability to join a boycott than an individual who does not trust others.

2.97% higher, respectively, than that of an individual who resides in Africa or North America; b) the percentual change in the probability that the willingness of an individual who resides in Europe, Asia, Africa, Latin America, Nordic countries, Middle East, and Oceania changes from *agree* to *strongly agree* to buy things at a 20% higher price if it helped to protect the environment is 7.03%, 8.47%, 3%, 8.49%, 2.36%, 16.96%, and 3.01% higher, respectively, than that of an individual who resides in North America; c) the probability that an individual who resides in Europe, Asia, Africa, Latin America, and Oceania chooses products that are better for the environment is 32.06%, 28.01%, 23.93%, 19.97%, and 9.63% lower, respectively, than that of an individual who resides in Nordic countries or North America; d) the probability that an individual who resides in Europe, Asia, Africa, Latin America, and Nordic countries recycles is 58.35%, 50.31%, 50.63%, 49.42%, and 7.72% lower, respectively, than that of an individual who resides in Oceania or North America; e) the probability that an individual who resides in Europe, Africa, and Nordic countries reduces his water consumption is 6.86%, 5.79%, and 21.37% lower, respectively, than that of an individual who resides in Asia and North America, but it is 2.89% and 15.46% higher, respectively, if the individual resides in Latin America or Oceania; f) the probability that an individual who resides in Europe, Asia, Latin America, and Middle East contributes to an environmental organization is 12.44%, 4.59%, 5.32%, and 4.89% lower, respectively, than that of an individual who resides in Nordic countries or North America, but it is 5.48% and 2.25% higher, respectively, if the individual resides in Africa or Oceania; g) the probability that an individual who resides in Europe and Asia attends a meetings or signs a petition is 7.54% and 4.39% lower, respectively, than that of an individual who resides in Africa, Latin America, Nordic countries, Middle East and North America, but it is 9.81% higher if the individual resides in Oceania; and h)

the probability that an individual who resides in Europe, Asia, Africa, Latin America, and Middle East joins a boycott is 27.42%, 10.75%, 17.74%, 34.99%, and 28.4% lower, respectively, than that of an individual who resides in North America, but it is 12.68% and 5.04% higher if the individual resides in Nordic countries or Oceania, respectively.

There is statistically significant evidence that there is no acculturation process regarding pro-environmental attitudes. The exception to this claim is the individuals' willingness to give part of their own income to the environment, but the relatively low number of observations might influence such result.[43] With respect to pro-environmental behaviour a general claim cannot be made. There is statistically significant evidence that there is an acculturation process regarding the individuals' engagement in reducing water consumption, attending meetings or signing petitions, and join boycotts. However, there is no such evidence for the individuals' engagement in choosing products that are better for the environment, recycling, and contributing to an environmental organization. The next section discusses the findings of the chapter and elaborates on its policy implications.

4. Discussion

This study is the first worldwide exploration of immigrant/native-born environmental behaviour differences. The objective is multiple. First, it seeks to shed light on the debate about whether governments of recipient countries should be threatened by immigration on environmental grounds. Second, it

[43] The number of observations is 448. The other two variables of pro-environmental attitudes have 36681 and 36640 observations.

provides quantitative measures about environmental behaviour differences between immigrants and native-born and between immigrants by their length of residence. Third, it studies whether the environmental behaviour of immigrants converges through time to that of native-born because of an environmental acculturation process. And finally, it discusses whether the origin of the behavioural discrepancies accomodates to well known hypothesis in the literature. Using data from the WVS dataset, variations across willingness to perform and actual engagement on environmentally friendly behaviours are analyzed.

In general, there are no immigrant/native-born differences regarding pro-environmental attitudes, but there are differences regarding pro-environmental behaviour. Immigrants engage more in choosing products that are better for the environment, recycling, and reducing water consumption. In turn, native-born do not have a single stronger pro-environmental attitude or pro-environmental behaviour. If differences between immigrants by their length of residence are considered, then there are differences between immigrants regarding pro-environmental attitudes: immigrants of 11-15 years of residence in the host country show stronger pro-environmental attitudes than immigrants with less and more years of residence. Of those immigrants who engage more than native-born on choosing products that are better for the environment and recycling, it is immigrants of less than 10 years and more than 15 years of residence in the host country who engage more on the former, and it is immigrants of more than 15 years of residence who engage more on the latter.

If region specific effects are taken into account, individuals who reside outside North America show stronger pro-environmental attitudes, but weaker pro-environmental behaviour. Yet, individuals who reside in Oceania display the strongest pro-environmental behaviour of any region of the world. This claim is valid for both native-born and immigrants, even accounting for differences in

length of residence in the host country.

If the source region of immigrants is considered, no differences in pro-environmental attitudes are recorded. Of those three pro-environmental actions for which immigrants show more engagement than native-born, i.e. a) choosing products that are better for the environment; b) recycling; and c) reducing water consumption: European immigrants engage less in a) and b) than immigrants from any other region of the world; and immigrants from Latin America and Oceania engage less in reducing water consumption than immigrants from any other region of the world.

In terms of the magnitude of probability divergence in immigrant/native-born environmental behaviour, the differentials are of similar magnitude: 12.42%, 13.21%, and 15.83% for reducing water consumption, choosing products that are better for the environment, and recycling. The magnitude of probability divergence between immigrants by their length of residence in the host country is starker: 19.41% for choosing products that are better for the environment. Finally, when all the groups are considered, the magnitudes increase: 18.36% for immigrants of more than 15 years of residence in the host country with respect to recycling, and up to 34.62% for immigrants of 11-15 years of residence in the host country with respect to paying higher taxes to prevent environmental pollution.

Because of these persistent environmental behavioural differences between immigrants and native-born and within immigrants by their length of residence, the results of this study discredit the NEP. Individuals have the same attitudes and behaviour regarding their willingness to give part of their own income to the environment, and regarding their engagement in contributing to an environmental organization and joining boycotts. When only immigrants and native-born are considered, the results suggest the validity of the PMH through "selective im-

migration" (as in Pffefer and Mayone Stycos [68]) for those engagement-related environmentally friendly behaviours. On average, immigrants have higher income and are more educated than native-born, and given that environmental behaviours such as recycling and choosing products that are better for the environment could entail costs for the individuals, it seems reasonable that those who can afford and are more aware of the benefits of carrying out such behaviours end up engaging more in them.

While it is true that immigrants are more educated and have a higher income level than native-born, and there is statistically significant evidence that education and income have a positive influence on pro-environmental attitudes and pro-environmental behaviour, the PMH can be supported only partially. The reason is that not only education and income differences explain the environmental behaviour discrepancies between native-born and immigrants. Other variables like environmental orientation, empowerment, social capital, gender, and age influence both native-born and immigrants' environmental attitudes and behaviour. An alternative explanation that cannot be tested with the data provided by the WVS is that the environmental behaviour of immigrants obeys to a strategy that seeks to increase their level of integration into the native-born society. This would explain why immigrants of very short residence (i.e. less than 10 years) in the host country show high engagement in choosing products that are better for the environment and in contributing to an environmental organization.

The hypothesis that immigrants might display strong environmental behaviour due to previous exposure to environmental problems that sensitized and increased their environmental concern could not be tested. Data for the environmental awareness of individuals (local and global environmental problems) were only available for 3 out of the 9 environmentally friendly behaviours

analyzed. The variable was dropped out, not only because there was virtually no difference in the environmental awareness of individuals regarding local and global environmental problems, but also because including it in the models produced no observations. Furthermore, there is no information about such variable before and after immigration took place. However, if it is considered that only 1 out of 10 immigrants in the sample come from Latin America and Africa (places where exposure to environmental problems might be more common, e.g. water shortage that might sensitize an individual to reduce his water consumption), it seems safe to rule out such hypothesis as the origin of immigrant/native-born environmental behaviour differences.

It becomes clear that by rejecting the NEP in one pro-environmental attitude and two pro-environmental behaviours, there is room for environmental policy to promote an attitudinal and behavioural change of both native-born and immigrants for such actions. In particular, given that there are behavioural discrepancies, environmental policies should be grouped-targeted and behaviour-specific as opposed to being implemented with a general design. Moreover, an interesting challenge for policymakers is to transform the high willingness of immigrants of 11-15 years of residence in the host country to sacrifice money in order to save the environment into actual engagement ("value-action gap").[44]

More importantly, the results indicate that the negative connotation attached to immigrants, at least on environmental grounds, is not well-founded. Immigrants of different length of residence in the host country engage more in pro-environmental behaviour than native-born, even when variations in "sense of place" solely due to immigrant status are controlled for. While it is true that immigrants do not engage more than native-born in environmental politically related behaviour, they engage as much as the latter in such behaviour, they overpass native-born in engagement of certain pro-environmental actions, and

[44] For more on the "value-action gap" see Blake [8].

they tend to be at least as willing as native-born to sacrifice money in order to save the environment. Hence, no waste generation, pollution and excessive water consumption as predicted by "Malthusians" is to be expected from immigrants, at least not in excess to that generated by native-born. In that respect, there is no valid environmental protection argument to maintain immigration restrictive policies.

What happened with the relationship between the variables used as controls and the individuals' environmental behaviour? The ordered probit and probit models confirmed: a) more educated individuals display stronger pro-environmental attitudes and pro-environmental behaviour. But when only immigrants by their length of residence are considered, education has little effect on their pro-environmental behaviour; b) with some exceptions, individuals with higher income display stronger pro-environmental attitudes and pro-environmental behaviour; in particular, it seems that the level of income of native-born and immigrants does not influence their willingness to give part of own income to the environment and their engagement in reducing water consumption; c) younger individuals are more willing to sacrifice money in order to save the environment, but older individuals show stronger pro-environmental behaviour; d) in general, women seem to have stronger pro-environmental attitudes and pro-environmental behaviour. However, no gender shows more engagement in attending meetings or signing petitions, and men show more engagement in contributing to an environmental organization and joining boycotts; e) individuals with social capital display stronger pro-environmental attitudes and pro-environmental behaviour, with the exception of reducing water consumption where trusting others has no influence. Furthermore, social capital has less influence on the environmental attitudes and behaviour of immigrants; f) more empowered individuals show stronger pro-environmental at-

titudes and pro-environmental behaviour. But the impact is not extended to immigrants by their length of residence; g) more environmentally oriented individuals have stronger pro-environmental attitudes and pro-environmental behaviour. In particular, the effect is stronger if their preferences are closer to "protecting the nature" than to "economic growth"; h) individuals with more pro-social traits do not necessarily have stronger pro-environmental attitudes and pro-environmental behaviour; i) individuals who identify more with their nationality do not necessarily have stronger pro-environmental attitudes and pro-environmental behaviour; and j) individuals with more attachment to their community display weaker pro-environmental attitudes and pro-environmental behaviour than those who do not possess such attachment.

While the results of national identification and community attachment seem counterintuitive, a potential explanation can be found in Lima and Castro [53]. They sustain that individuals might try to protect their identity by denying environmental problems in their community because "what is ours is best". So, individuals might try to negate such problems as a defence mechanism and avoid to engage in pro-environmental behaviours.

The control variable with stronger influence on the pro-environmental attitudes and pro-environmental behaviour of both native-born and immigrants of any length of residence is their environmental orientation. Specifically, the fact that their preferences are oriented towards "protecting the nature" as opposed to "economic growth" increase the probability of engagement in pro-environmental behaviour from 1.81% (in the case of join boycotts), to 17.31% (in the case of recycling).

How do the results of the present chapter compare to those of previous research? The result that immigrants engage more on pro-environmental behaviour than native-born is in line with Hunter [44] and Pffefer and Mayone

Stycos [68], particularly with respect to recycling and reduction of water consumption, respectively. However, the results do not support Pfeffer and Mayone Stycos' [68] finding that native-born engage more than immigrants on environmental politically related behaviours; there is no statistically significant evidence that there are differences in the native-born and immigrants' engagement in attending meetings or signing petitions and joining boycotts. With respect to the impact of acculturation, the results support the verdict of Hunter [44] that long residence immigrants behave as native-born regarding environmental politically related behaviours like attending meetings or petitions signing, and also support the conclusion of Mukherji [59] that there are behavioural discrepancies between immigrants with different levels of acculturation regarding recycling activities. The results do not support the acculturation argument with respect to pro-environmental attitudes. But with respect to pro-environmental behaviour, there is an acculturation process regarding the immigrants' engagement in reducing water consumption, attending meetings or signing petitions, and join boycotts. Thus, the acculturation hypothesis is partially supported.

Finally, it has been acknowledged that the use of dichotomous variables for engagement in pro-environmental behaviour might overestimate such engagement for both native-born and immigrants. It was also acknowledged that the profile of immigrants surveyed by the WVS could have biased the results, also overestimating the engagement of immigrants in pro-environmental behaviour. Yet, there is no other dataset which can be used as an alternative to analyze the questions addressed by this chapter. So, the results provided and the policy recomendations should be considered as a first approach on the subject, and as a recommendation for the WVS survey methodology so as to consider in future waves a wider spectrum of individuals.

Conclusion

Immigrants have been traditionally regarded as a burden to the host country in a wide variety of issues. Yet, such negative connotation seems to be politically charged insofar as there is strong evidence that their flow into host countries do not necessarily entail negative impacts. That is also true with respect to environmental degradation issues.

This chapter analyzed a sample of the World Values Survey dataset and showed the New Environmental Paradigm predictions do not hold inasmuch as there are robust differences in immigrant/native-born environmental behaviour. In that respect, claims that maintain immigration into an environmentally unfriendly society such as the U.S. would increase environmental degradation are not supported by the empirical results. Since immigrants display higher engagement in environmentally friendly behaviours such as choosing better products for the environment, recycling, and reducing water consumption, a greater flow of immigrants into the host country might actually have a positive impact on the protection of the environment. In fact, while residents in North America do have weaker pro-environmental attitudes if compared to residents from any other region of the world, North American native-born and resident immigrants engage more in pro-environmental action.

Although it cannot be fully discarded, the results do not suggest that immigrants display stronger engagement in pro-environmental behaviour than native-born because of higher environmental awareness produced by previous exposure to environmental problems in their source countries. They do not suggest either that the individuals' community attachment and national identification (i.e. their "sense of belongingness" or "sense of place") explain differences in environmental behaviour. Rather, they suggest that a "modified" Post-Materialistic

Hypothesis holds. A certain profile of immigrant engages more than native-born in pro-environmental behaviour: educated and of relatively high income, mostly not from Europe, Latin America or Oceania, with preferences oriented towards "protecting nature" as opposed to "economic growth", who are also relatively old and women, empowered and with social capital.

The policy implications are straightforward: restrictive immigration policies should not be based on threats of negative environmental impacts for the host country; and national environmental policy should be group-targeted, given that native-born and short and long residence immigrants do not have the same probability to actually engage or display willingness to perform an environmentally friendly behaviour. However, there biggest challenge for the policymaker is to transform the native-born and immigrants' willingness to sacrifice money in order to save the environment into actual engagement.

There is ample room for further research in the topic. First, the results of this chapter are driven by a dataset which considers highly educated and high income immigrants. Thus, further research with a dataset which includes more information about low-skilled immigrants could be conducted. Second, although the present work controls the influence that the region source of the immigrant has on his pro-environmental attitudes and pro-environmental behaviour, an extension to this chapter might try to establish if the results would hold controlling for the source country of immigrants. Is there an influence on the immigrant's environmental behaviour driven by specific cultural traits? If so, immigration policy based on environmental impacts would likely become country-selective. Third, the analysis of the individuals' development of a "sense of belongingness" or "sense of place" for the host country will provide a better understanding of why an "environmental acculturation process" does not take place. Finally, the environmental behaviour of second generation immigrants deserves attention.

Unfortunately, the WVS dataset does not contain enough information to carry it out at the moment. But their apparent weak environmental behaviour raises some questions: is it related to the fact they simultaneously do not identify either with their immigrant parents' culture or the host country's culture? A careful analysis of such topic is determinant to assess the long-run effects of immigration on the host country's environment.

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Appendix

I.

Table 1: Proportion of individuals by Environmental Behaviour and by Region of the World.

Environmental Behaviour	countries	individuals	Africa	Asia	Europe	Latin America
Willingness to pay higher taxes	79	189379	14.21%	22.15%	30.11%	18.63%
Willingness to give part of own income	67	118467	18.84%	25.04%	23.53%	17.63%
Willingness to buy things at a 20% higher price	51	66395	6.93%	18.23%	42.22%	16.98%
Choose better products for the environment	46	58600	7.92%	20.53%	39.94%	17.19%
Recycle	46	60189	7.83%	20.53%	38.43%	18.97%
Reduce water consumption	49	65749	7.19%	18.93%	43.3%	17.47%
Contribute to environmental organization	51	69392	6.77%	17.8%	41.44%	18.97%
Attend meetings or sign petitions	50	69554	6.78%	17.74%	41.5%	18.94%
Join boycotts	83	217367	17.41%	19.04%	27.78%	19.41%
Average	58	101677	10.43%	19.98%	36.47%	18.24%

Environmental Behaviour	countries	individuals	Middle East	Nordic countries	Oceania	North America
Willingness to pay higher taxes	79	189379	4.19%	3.73%	2.82%	4.15%
Willingness to give part of own income	67	118467	4.32%	3.39%	1.87%	5.38%
Willingness to buy things at a 20% higher price	51	66395	2.77%	4.61%	6.04%	2.22%
Choose better products for the environment	46	58600	0%	5.19%	6.69%	2.53%
Recycle	46	60189	0%	5.13%	6.74%	2.54%
Reduce water consumption	49	65749	0%	4.67%	6.12%	2.31%
Contribute to environmental organization	51	69392	2.71%	4.41%	5.73%	2.17%
Attend meetings or sign petitions	50	69554	2.70%	4.42%	5.74%	2.18%
Join boycotts	83	217367	6.14%	3.67%	2.96%	3.6%
Average	58	101677	2.54%	4.36%	4.97%	3.01%

Table 2: Proportion of individuals by Environmental Behaviour and by Level of Income of Country.

Environmental Behaviour	countries	individuals	Level of Income			
			1	2	3	4
Willingness to pay higher taxes	79	189379	7.45%	22.62%	37.89%	32.05%
Willingness to give part of own income	67	118467	10.75%	24.26%	33.27%	31.71%
Willingness to buy things at a 20% higher price	51	66395	2.07%	21.31%	40.89%	35.73%
Choose better products for the environment	46	58600	2.27%	16.68%	42.87%	38.18%
Recycle	46	60189	2.25%	18.47%	41.3%	38%
Reduce water consumption	49	65749	2.19%	22.47%	40.35%	34.99%
Contribute to environmental organization	51	69392	2%	19.48%	45.38%	33.15%
Attend meetings or sign petitions	50	69554	2%	19.49%	45.36%	33.15%
Join boycotts	83	217367	6.54%	23.24%	40.2%	30.01%
Average	58	101677	4.17%	20.89%	40.83%	34.11%

The income level of the country corresponds to the World Bank classification.

Table 3: Distribution and origin of native-born and immigrants. WVS dataset years 1989-2007.

Born in this country: birth country			
	Frequency	% of total	% within immigrants
Yes	77130	94.11%	-
Immigrants	4830	5.89%	-

Born in this country: birth country			
Latin America	415	0.51%	8.59%
USA/Canada	195	0.24%	4.04%
Asian	1159	1.41%	24%
Europe	2114	2.58%	43.77%
African	110	0.13%	2.28%
Other	750	0.92%	1.8%
Oceania	87	0.11%	15.53%
Total	81960	100%	100%

Table 4: Source and Host Region of immigrants (Frequencies).

	Source Region						
Host Region	Latin America	North America	Asia	Europe	Africa	Oceania	Other
Latin America	144	94	17	85	0	34	11
North America	94	29	124	185	28	5	18
Asia	47	8	24	231	0	1	8
Europe	64	8	846	1119	6	0	409
Africa	20	11	6	55	42	1	11
Oceania	5	30	116	308	22	44	286
Other	41	15	26	131	12	2	7

Table 5: Where do indivdiduals migrate? Number and Percentage of Immigrants to Countries by Level of Income.

Level of income of host country	# of immigrants	% of immigrants	# of countries	% of countries
1	0	0%	0	0%
2	830	17.18%	9	18.75%
3	1413	29.25%	20	41.67%
4	2587	53.56%	19	39.58%
Total	4830	100%	48	100%

The income level of the country corresponds to the World Bank classification.

Table 6: Where do individuals come from? Number and Percentage of Immigrants to Countries by Level of Income.

Level of income of source country	Latin America	North America	Asia	Europe	Africa	Oceania	Other
1	0	0	0	0	0	0	0
2	0	0	5	3	1	0	0
3	8	0	1	9	1	0	1
4	1	2	2	9	0	2	3
Total	9	2	8	21	2	2	4
% of immigrants by region	8.59%	4.04%	24%	43.77%	2.28%	1.8%	1.53%

The income level of the country corresponds to the World Bank classification.

Table 7: Environmental Behaviour by Region of the World.

Environmental Behaviour		Region of the world						
		Latin America	North America	Asia	Europe	Africa	Oceania	Other
Willingness to	strongly agree	17.08%	22.34%	15.16%	16.49%	21.57%	17.33%	15.51%
pay	agree	44.9%	56.38%	47.46%	44.51%	40.2%	37.33%	47.78%
higher taxes	disagree	24.79%	16.49%	29.28%	29.11%	29.41%	36%	23.96%
	strongly disagree	13.22%	4.79%	8.1%	9.89%	8.82%	9.33%	12.74%
		Latin America	North America	Asia	Europe	Africa	Oceania	Other
Willingness to	strongly agree	25%	33.33%	17.02%	14.23%	25.71%	13.64%	18.57%
give part of	agree	51.04%	41.67%	63.12%	50.21%	48.57%	31.82%	48.93%
own income	disagree	16.67%	16.67%	17.73%	25.94%	22.86%	36.36%	21.43%
	strongly disagree	7.29%	8.33%	2.13%	9.62%	2.86%	18.18%	11.07%
		Latin America	North America	Asia	Europe	Africa	Oceania	Other
Willingness to	strongly agree	10.42%	13.33%	9.09%	9.02%	11.69%	8.57%	8.62%
buy things at	agree	38.33%	47.33%	34.31%	35.2%	35.06%	35.71%	41.38%
a 20% higher price	disagree	33.33%	28.67%	45.89%	43.35%	35.06%	38.57%	36.64%
	strongly disagree	17.92%	10.67%	10.71%	12.44%	18.18%	17.14%	13.36%
Choose better		Latin America	North America	Asia	Europe	Africa	Oceania	Other
products for	have not	45.99%	28.48%	60.48%	50.48%	41.67%	30.99%	33.96%
the environment	have engaged	54.01%	71.52%	39.52%	49.52%	58.33%	69.01%	66.04%
		Latin America	North America	Asia	Europe	Africa	Oceania	Other
Recycle	have not	41.98%	28.39%	55.01%	47.29%	36.36%	28.77%	28.48%
	have engaged	58.02%	71.61%	44.99%	52.71%	63.64%	71.23%	71.52%
Reduce		Latin America	North America	Asia	Europe	Africa	Oceania	Other
water	have not	47.33%	33.12%	43.69%	43.51%	29.87%	43.66%	34.44%
consumption	have engaged	52.67%	66.88%	56.31%	56.49%	70.13%	56.34%	65.56%
Contribute to		Latin America	North America	Asia	Europe	Africa	Oceania	Other
an environmental	have not	87.8%	71.34%	92.3%	86.66%	72.73%	77.27%	78.49%
organization	have engaged	12.2%	28.66%	7.7%	13.34%	27.27%	22.73%	21.51%
Attend meetings		Latin America	North America	Asia	Europe	Africa	Oceania	Other
or	have not	84.9%	77.56%	92.02%	88.18%	77.03%	76.39%	76.55%
sign petitions	have engaged	15.1%	22.44%	7.98%	11.82%	22.97%	23.61%	23.45%
		Latin America	North America	Asia	Europe	Africa	Oceania	Other
Join boycotts	have not	60.17%	47.28%	63.64%	58.05%	41.58%	57.14%	40.23%
	have engaged	39.83%	52.72%	36.36%	41.95%	58.42%	42.86%	59.77%

Table 8: Immigrant and Native-born perceptions about Local Environmental Problems.

Local Environmental Problems					Global Environmental Problems				
Poor water quality					Global warming and GHE				
	N-B	I	N-B	I		N-B	I	N-B	I
	#		%			#		%	
Very serious	715	162	25.98%	26.73%	Very serious	1680	381	61.86%	63.5%
Somewhat serious	470	90	17.08%	14.85%	Somewhat serious	842	167	31%	27.83%
Not very serious	615	159	22.35%	26.24%	Not very serious	169	40	6.22%	6.67%
Not at all serious	952	195	34.59%	32.18%	Not at all serious	25	12	0.92%	2%
Total	2752	606			Total	2716	600		
Poor air quality					Plant and animal loss				
	N-B	I	N-B	I		N-B	I	N-B	I
	#		%			#		%	
Very serious	700	180	25.34%	29.51%	Very serious	1534	355	56.11%	58.29%
Somewhat serious	640	144	23.17%	23.61%	Somewhat serious	975	204	35.66%	33.5%
Not very serious	727	165	26.32%	27.05%	Not very serious	207	43	7.57%	7.06%
Not at all serious	695	121	25.16%	19.84%	Not at all serious	18	7	0.66%	1.15%
Total	2762	610			Total	2734	609		
Poor sewage and sanitation					Pollution of rivers, lakes, and oceans				
	N-B	I	N-B	I		N-B	I	N-B	I
	#		%			#		%	
Very serious	584	133	21.49%	22.89%	Very serious	2046	471	74.13%	76.96%
Somewhat serious	460	95	16.92%	16.35%	Somewhat serious	650	122	23.55%	19.93%
Not very serious	662	143	24.36%	24.61%	Not very serious	59	16	2.14%	2.61%
Not at all serious	1012	210	37.23%	36.14%	Not at all serious	5	3	0.18%	0.49%
Total	2718	581			Total	2760	612		

II.

An ordered logit model could have been used to estimate the three 4-item *likert* scale dependent variables: *willingness to pay higher taxes to prevent environmental pollution*; *willingness to give part of own income to the environment*; and *willingness to buy things at a 20% higher price if it helped to protect the environment*. However, to establish that the ordered logit estimation is appropiate, the "proportional odds assumption" must hold. Thereby, a Brant test was performed in STATA. The results are:

Table 9: Brant test (Willingness to pay higher taxes).

Estimated coefficients from j-1 binary regressions			
	y>1	y>2	y>3
immigrant status	.14917714	.0352456	.03651484
constant	1.4751824	-.54536426	-2.2401387
Brant test parallel regression assumption			
Variable	chi 2	p>chi 2	df
All	7.25	0.027	2
immigrant status	7.25	0.027	2

Table 10: Brant test (Willingness to give part of own income).

Estimated coefficients from j-1 binary regressions			
	y>1	y>2	y>3
immigrant status	.51868439	.23050007	.18878759
constant	.95055123	-1.0666184	-2.568848
Brant test of parallel regression assumption			
Variable	chi 2	p>chi 2	df
All	8.99	0.011	2
immigrant status	8.99	0.011	2

Table 11: BRANT TEST (Willingness to buy things at a 20% higher price).

Estimated coefficients from j-1 binary regressions			
	y>1	y>2	y>3
immigrant status	.21050834	.05937442	-.02017714
constant	2.0677841	.11204785	-1.9154548
Brant test of parallel regression assumption			
Variable	chi 2	p>chi 2	df
All	10.62	0.005	2
immigrant status	10.62	0.005	2

A significant test statistic provides evidence that the parallel regression assumption has been violated. Thus, since $p<0.05$ in all three cases, the "proportional odds assumption" is not met and the ordered probit estimation is then appropiate.

III.

Table 12: ENVIRONMENTALLY FRIENDLY BEHAVIOURS. WVS dataset years 1989-2007, Dependent Variables used in the regressions.

Environmental Behaviour	Status	Mean	Std. Dev.	Min.	Max.	N
Willingness to pay higher taxes	I	2.30	.861	1	4	4526
	N-B	2.27	.874	1	4	71671
Willingness to give part of own income	I	2.20	.839	1	4	850
	N-B	2.04	.863	1	4	14388
Willingness to buy things at a 20% higher price	I	2.57	.826	1	4	3766
	N-B	2.54	.854	1	4	56392
Choose better products for the environment	I	.51	.499	0	1	50554
	N-B	.47	.499	0	1	3213
Recycle	I	.55	.496	0	1	3106
	N-B	.47	.499	0	1	50979
Reduce water consumption	I	.57	.493	0	1	3781
	N-B	.49	.499	0	1	55590
Contribute to environmental organization	I	.13	.345	0	1	3846
	N-B	.14	.347	0	1	57467
Attend meetings or sign petitions	I	.13	.339	0	1	3858
	N-B	.12	.333	0	1	57603
Join boycotts	I	.44	.496	0	1	4493
	N-B	.41	.493	0	1	66643

- The scale for the "willingness" items is 1-4 where 1 is *strongly agree*, i.e. stronger pro-environmental behaviour and 4 is *strongly disagree*, i.e. weaker pro-environmental behaviour.
- The scale for the "actual engagement" items is 0-1 where 0 is *no en-*

gagement in pro-environmental behaviour and 1 is *engagement* in pro-environmental behaviour.

- Immigrant status: I=immigrant, N-B=native-born.

Table 13: VARIABLES THAT AFFECT ENVIRONMENTAL BEHAVIOUR. WVS dataset years 1989-2007, Controls used in the regressions.

Control	Status	Mean	Std. Dev.	Min.	Max.	N
Education	N-B	4.60	2.23	1	8	68264
	I	5.20	2.20	1	8	4668
Income	N-B	4.41	2.54	1	10	67070
	I	4.96	2.71	1	10	4239
Age	N-B	40.78	15.96	15	95	76968
	I	46.55	16.43	15	92	4802
Gender	N-B	.51	.49	0	1	77058
	I	.53	.49	0	1	4820
C. Attachment	N-B	.38	.48	0	1	72446
	I	.32	.46	0	1	4058
Orientation 1	N-B	.55	.49	0	1	53477
	I	.57	.49	0	1	3926
Orientation 2	N-B	.83	.37	0	1	58167

Control	Status	Mean	Std. Dev.	Min.	Max.	N
Trust	I	.87	.32	0	1	3795
	N-B	.27	.44	0	1	73801
Nat Identification	I	.31	.46	0	1	4656
	N-B	.86	.34	0	1	74827
Empowerment	I	.78	.41	0	1	3611
	N-B	.66	.47	0	1	72877
Pro-social traits	I	.64	.47	0	1	4638
	N-B	.46	.49	0	1	74405
	I	.44	.49	0	1	4680

- Immigrant status: I=immigrant, N-B=native-born.
- On average, immigrants: have attained a higher level of education than native-born; enjoy higher income than native-born; are approximately six years older than native-born; have a slightly higher women-to-men ratio than native-born; are less attached to their community than native-born; have a slightly stronger preference to protect the environment over economic growth than native-born; agree that humans should coexist with nature more than native-born; believe they can trust in other people more than native-born; are less proud about their nationality than native-born; are slightly less empowered than native-born; and are less pro-social than native-born.

Table 14: Correlation matrix of all Explanatory Variables.

	Education	Income	Age	Gender	C. Attachment	Orientation 1	Orientation 2	Trust	Nat Identification	Empowerment	Pro-social traits
Education	1.000										
Income	0.311	1.000									
Age	-0.204	-0.068	1.000								
Gender	-0.030	-0.047	-0.012	1.000							
C. Attachment	-0.053	-0.026	0.035	0.024	1.000						
Orientation 1	0.092	0.057	-0.026	0.016	-0.024	1.000					
Orientation 2	0.058	0.047	0.036	0.028	-0.014	0.072	1.000				
Trust	0.069	0.106	0.036	-0.003	0.012	0.064	-0.011	1.000			
Nat Identification	-0.063	-0.045	0.020	0.004	-0.025	0.014	-0.029	-0.002	1.000		
Empowerment	0.100	0.128	-0.033	-0.030	-0.028	0.053	0.051	0.058	0.071	1.000	
Pro-social traits	-0.127	-0.086	0.048	0.024	0.034	-0.035	-0.010	0.025	-0.007	-0.087	1.000

V.

Table 15: MONEY AND THE ENVIRONMENT. Ordered Probit estimations for *immigrant status*. Dependent variable is WILLINGNESS to perform an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
	Pay higher taxes		Give part of own income		Buy things 20% higher price	
immigrant status	-.1884	.1179	-1.0142	.7926	-.1287	.1169
education	-.0304***	.0028	-.1144***	.0436	-.0168***	.0028
income	-.0118***	.0023	-.0119	.0219	-.0134***	.0023
age	.0107***	.0019	.0367*	.0220	.0060***	.0019
age2	-.0001***	.0000	-.0004*	.0002	-.0000**	.0000
gender	-.0560***	.0113	-.3378***	.1085	-.0576***	.0113
c attachment	.0292**	.0118	.1373	.1292	.0426***	.0118
orientation 1	-.4122***	.0116	-.5728***	.1201	-.3794***	.0116
orientation 2	-.0375**	.0157	-.0256	.2217	-0.4641***	.0157
trust	-.0794***	.0133	-.1818*	.1108	-.0738***	.0133
nat identification	-.1575***	.0170	.1996	.3604	-.1392***	.0171
empowerment	-.0641***	.0126	.1222	.1925	-.0917***	.0126
pro social	.0775***	.0115	-.1589	.1075	.0672***	.0115
Europe	-.2863***	.0351	0	(omitted)	-.3623***	.0353
Asia	-.4422***	.0408	0	(omitted)	-.4390***	.0409
Africa	-.0266	.0394	0	(omitted)	-.1546***	.0396
Latin America	-.3340***	.0366	0	(omitted)	-.4384***	.0368
Nordic Country	-.3174***	.0403	0	(omitted)	-.1212***	.0404

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Middle East	-.7063***	.0447	0	(omitted)	-.8793***	.0447
Oceania	-.1090***	.0409	0	(omitted)	-.1551***	.0411
Europe imm	.1900	.1235	.7819	.8079	.1796	.1226
Asia imm	.1805	.1277	.6356	.8483	.1642	.1269
Africa imm	.2789	.2007	1.0624	.9157	.2166	.1977
Latin imm	.1483	.1613	0	(omitted)	.0230	.1598
Other imm	.1931	.1356	1.4698	.9314	.0329	.1346
Oceania imm	.1388	.2231	.8762	.9618	.0644	.2247
Wave 2	0	(ommitted)	0	(omitted)	0	(omitted)
Wave 3	-.3392***	.0553	0	(omitted)	-.2741***	.0559
Wave 4	0	(ommited)	0	(omitted)	0	(omitted)
Wave 5	0	(ommited)	0	(omitted)	0	(omitted)
	# obs	Lr chi2(27)	# obs	Lr chi2(18)	# obs	Lr chi2(27)
	36381	2680.04	448	65.09	36509	2490.09
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.0294	0.0000	0.0630	0.0000	0.0275

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for immigrant status variable is native-born.
- The r.g. for region specific effects is North America.

- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 16: Specific pro-environmental Behaviour. Probit estimations for *immigrant status*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
	Consume better products		Recycle		Reduce water consumption		Contribute to environmental org	
immigrant status	.3350**	.1523	.4060***	.1556	.3181**	.1457	.1708	.1476
education	.0286***	.0036	.0318***	.0037	.0250***	.0034	.0544***	.0041
income	.0594***	.0030	.0415***	.0031	.0017	.0028	.0384***	.0034
age	.0282***	.0025	.0168***	.0026	.0216***	.0023	.0109***	.0029
age2	-.0002***	.0000	-.0001***	.0000	-.0001***	.0000	-.0001***	.0000
gender	.1956***	.0146	.1235***	.0149	.1169***	.0135	-.0388**	.0166
c attachment	-.0219	.0152	.0172	.0155	-.0710***	.0141	.0011	.0174
orientation 1	.2554***	.0148	.2419***	.0151	.1920***	.0138	.1796***	.0172
orientation 2	.1658***	.0202	.1819***	.0204	.0654***	.0186	-.1407***	.0227
trust	.1376***	.0170	.0966***	.0175	-.0366**	.0158	.1273***	.0191
nat identification	-.0286	.0223	-.0560**	.0227	.0849***	.0202	.0097	.0261
empowerment	.2018***	.0164	.1912***	.0166	.0506***	.0151	.1250***	.0193
pro social	.0488***	.0149	.0099	.0152	-0565***	.0138	.0073	.0170
Europe	-.8061***	.0458	-1.460***	.0545	-.1762***	.0413	-.5832***	.0462
Asia	-.7026***	.0521	-1.259***	.0597	.0340	.0481	-.2191***	.0541

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Africa	-.6022***	.0504	-1.266***	.0583	-.1481***	.0463	.2521***	.0507
Latin America	-.5030***	.0473	-1.235***	.0557	.0691	.0431	-.2505***	.0481
Nordic Country	.0156	.0525	-.1911***	.0618	-.5373***	.0477	-.0171	.0519
Middle East	0	(omitted)	0	(omitted)	0	(omitted)	-.2311***	.0611
Oceania	.2384***	.0547	.0580	.0649	.3888***	.0491	.1054**	.0523
Europe imm	-.5080***	.1606	-.6598***	.1647	-.2088	.1521	-.0735	.1569
Asia imm	-.6143***	.1674	-.6011***	.1707	-.1670	.1565	-.5017***	.1712
Africa imm	-.5779**	.2486	-.3435	.2652	.1405	.2451	-.1705	.2440
Latin imm	-.1756	.2045	-.4546**	.2054	-.3730*	.1952	-.4504**	.2242
Other imm	-.2969*	.1776	-.5317***	.1832	-.2331	.1678	-.1447	.1733
Oceania imm	-.1543	.2763	-.0783	.2937	-.7834***	.2625	-.3345	.3189
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.2900***	.0756	.0686	.0918	.3961***	.0660	.4330***	.0739
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
_cons	-1.358***	.1125	-.1943	.1277	-1.232***	.1012	-1.967***	.1180
	# obs	Lr chi2(26)	# obs	Lr chi2(26)	# obs	Lr chi2(26)	# obs	Lr chi2(27)
	32522	4578.74	32573	6522.09	35559	1625.31	37087	2444.04
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.1017	0.0000	0.1446	0.0000	0.0330	0.0000	0.0780

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Hu-

man vs Nature stance.

- The r.g. for immigrant status variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 17: Environmental Politically Related Behaviour. Probit estimations for *immigrant status*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error
	Attend meetings/sign petitions		Join boycotts	
immigrant status	-.1188	.1616	.1732	.1475
education	.0690***	.0043	.0491***	.0035
income	.0276***	.0035	.0281***	.0029
age	.0185***	.0031	.0207***	.0025
age2	-.0002***	.0000	-.0003***	.0000
gender	-.0003	.0171	-.2384***	.0142
c attachment	-.0494***	.0180	-.0703***	.0149
orientation 1	.2127***	.0177	.0471***	.0145
orientation 2	-.0830***	.0241	.0727***	.0199
trust	.1407***	.0196	.2353***	.0166
nat identification	-.1325***	.0256	-.2205***	.0209
empowerment	.0358*	.0196	.0613***	.0158

Predictor	Coef.	Std. Error	Coef.	Std. Error
pro social	.0352**	.0174	.0609***	.0145
Europe	-.3835***	.0492	-.7052***	.0436
Asia	-.2248***	.0584	-.2742***	.0565
Africa	-.0438	.0553	-.4562***	.0484
Latin America	.0406	.0508	-.9004***	.0455
Nordic Country	-.0635	.0560	.3269***	.0507
Middle East	-.0473	.0638	-.7308***	.0549
Oceania	.4951***	.0545	.1325***	.0510
Europe imm	.0451	.1713	-.2100	.1543
Asia imm	-.1929	.1819	-.3959**	.1599
Africa imm	.0464	.2626	-.3224	.2430
Latin imm	.1169	.2258	-.2435	.2002
Other imm	.2074	.1841	-.0079	.1700
Oceania imm	.0486	.3131	-.0988	.2839
Wave 2	0	(omitted)	0	(omitted)
Wave 3	.3401***	.0697	-.2588***	.0766
Wave 4	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)
_cons	-2.160***	.1184	.0916	.1107
	# obs	Lr chi2(27)	# obs	Lr chi2(27)
	37150	1993.30	35143	5159.79
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.0686	0.0000	0.1083

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for immigrant status variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 18: MONEY AND THE ENVIRONMENT. Ordered Probit estimations for *length of residence*. Dependent variable is WILLINGNESS to perform an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
	Pay higher taxes		Give part of own income		Buy things 20% higher price	
length of residence						
11-15 years	-.0764	.0825	-1.171*	.6591	-.0439	.0830
>15 years	-.0343	.0728	-.1990	.4395	-.0479	.0731
education	-.0264*	.0139	-.0445	.1362	-.0225*	.0138
income	-.0161	.0108	-.1119	.0755	-.0025	.0108
age	.0090	.0095	.1057	.0888	-.0109	.0096
age2	-.0000	.0000	-.0011	.0008	.0001	.0001
gender	-.1019*	.0532	-.7404**	.3425	-.1458***	.0533

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
c attachment	.0459	.0578	.2189	.5136	.0808	.0580
orientation 1	-.4612*	.0545	-.8728**	.3913	-.4374***	.0546
orientation 2	.0442	.0756	.1751	.6278	-.1387	.0764
trust	-.2345***	.0583	-.6912**	.3427	-.1677***	.0585
nat identification	-.2513***	.0690	.9063	1.075	-.2230***	.0695
empowerment	-.0495	.0604	.7896	.5762	-.1096*	.0604
pro social	-.0085	.0549	-.5141	.3184	.0998*	.0551
Europe	-.6063***	.1518	0	(omitted)	-.5322***	.1519
Asia	-1.094***	.2731	0	(omitted)	-.9843***	.2734
Africa	-.0487	.2001	0	(omitted)	-.0412	.2000
Latin America	-.6553***	.1820	0	(omitted)	-.7183***	.1822
Nordic Country	-.6854***	.1967	0	(omitted)	-.0507	.1953
Middle East	-.8762***	.2457	0	(omitted)	-.7561***	.2436
Oceania	-.2492	.1529	0	(omitted)	-.2101	.1531
Europe imm	.1893	.1464	1.574**	.7229	.15799	.1458
Asia imm	-.2063	.1520	1.000	.7855	.1868	.1519
Africa imm	.1733	.2187	2.338**	.9619	.0395	.2173
Latin imm	.1387	.1765	0	(omitted)	.0283	.1756
Other imm	.1433	.1568	2.053**	.8100	-.0105	.1566
Oceania imm	.0148	.2917	1.190	.9059	.1542	.2986
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	-.3010***	.1450	0	(omitted)	-.2645*	.1468
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	Lr chi2(28)	# obs	Lr chi2(19)	# obs	Lr chi2(28)

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
	1750	179.82	72	30.96	1733	181.54
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.0425	0.0408	0.1797	0.0000	0.0436

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for length of residence variable is <10 years.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 19: Specific pro-environmental Behaviour. Probit estimations for *length of residence*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
	Consume better products		Recycle		Reduce water consumption		Contribute to environmental org	

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
length of residence								
11-15 years	-.0582	.1193	-.0232	.1276	-.0588	.0976	-.1781	.1240
>15 years	.0239	.0994	.0965	.1062	.0511	.0871	-.0983	.1035
education	-.0033	.0190	-.0190	.0198	.0056	.0164	.0116	.0211
income	.0661***	.0149	.0641***	.0161	.0096	.0128	.0486***	.0157
age	.0414***	.0133	.0279	.0140	.0312***	.0114	.0151	.0145
age2	-.0004***	.0001	-.0002	.0001	-.0002**	.0001	-.0002	.0001
gender	.2247***	.0740	.0883	.0782	.0837	.0635	-.0105	.0777
c attachment	-.0091	.0807	.1039	.0838	-.0425	.0684	-.0603	.0867
orientation 1	.3684***	.0740	.4386***	.0791	.2326***	.0641	.2402***	.0803
orientation 2	.2154**	.1034	.2987***	.1084	-.0323	.0894	-.2845***	.1088
trust	.0837	.0796	-.0562	.0867	.0706	.0689	.2232***	.0823
nat identification	.0181	.0972	.1461	.1027	.0826	.0801	.0313	.1100
empowerment	.3294***	.0832	.1335	.0871	.0774	.0713	.0412	.0926
pro social	.0601	.0755	-.0491	.0804	-.0853	.0658	.0203	.0802
Europe	-.7357***	.1883	-1.320***	.2036	.0654	.1758	-.5438***	.1993
Asia	.5953	.3922	.0003	.3585	.4826	.3308	-.6849	.5089
Africa	-.1970	.2453	-.8975***	.2550	.1162	.2348	-.1762	.2602
Latin America	-.1735	.2245	-.8356***	.2398	.2797	.2111	-.2361	.2454
Nordic Country	.2293	.2494	.2754	.2805	-.1810	.2267	-.0590	.2530
Middle East	0	(omitted)	0	(omitted)	0	(omitted)	-.3036	.3389
Oceania	.4778**	.1927	.4548**	.2138	.5242***	.1800	.1484	.1938
Europe imm	-.3257*	.1954	-.5759***	.2173	-.1009	.1748	-.1725	.1886
Asia imm	-.3189	.2034	-.3294	.2247	-.0469	.1812	-.6180***	.2032
Africa imm	-.5182*	.2769	-.2540	.3079	.2446	.2629	-.1584	.2704
Latin imm	-.2020	.2268	-.7023***	.2347	-.2578	.2106	-.6202**	.2564

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Other imm	-.1232	.2098	-.4489*	.2331	-.0938	.1886	-.2959	.2030
Oceania imm	-.6455*	.3804	0	(omitted)	-.4919	.3363	-.2621	.3864
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.2168	.2027	-.0056	.2553	.4525***	.1741	.3094*	.1857
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
_cons	-1.668***	.4834	-.5361	.5290	-1.439***	.4218	-1.116**	.4952
	# obs	Lr chi2(27)	# obs	Lr chi2(26)	# obs	Lr chi2(27)	# obs	Lr chi2(28)
	1504	447.65	1492	635.11	1745	101.91	1785	193.13
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.2148	0.0000	0.3077	0.0000	0.0434	0.0000	0.1222

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for length of residence variable is <10 years.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 20: Environmental Politically Related Behaviour. Probit estimations for *length of residence*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error
	Attend meetings/sign petitions		Join boycotts	
length of residence				
11-15 years	-.0165	.1289	-.0012	.1022
>15 years	.0902	.1076	.1183	.0907
education	.0460**	.0216	.0174	.0171
income	.0154	.0160	.0473***	.0132
age	.0416***	.0156	.0043	.0119
age2	-.0004***	.0001	-.0001	.0001
gender	-.1112	.0795	-.2372***	.0654
c attachment	-.0955	.0892	-.0977	.0720
orientation 1	.2078**	.0820	.2164***	.0665
orientation 2	-.0735	.1187	-.0956	.0923
trust	.1065	.0845	.2263***	.0716
nat identification	.0334	.1129	-.2322***	.0837
empowerment	-.0176	.0949	.0855	.0741
pro social	.0132	.0824	.1286*	.0685
Europe	-.2110	.2161	-.4805***	.1838
Asia	-.6736	.5239	-.3017	.3453
Africa	-.1153	.2860	-.3553	.2401
Latin America	.0361	.2577	-.4751**	.2218

Predictor	Coef.	Std. Error	Coef.	Std. Error
Nordic Country	.3574	.2663	.5871**	.2451
Middle East	.1072	.3589	-.5183*	.2991
Oceania	.5462***	.2105	.3350*	.1882
Europe imm	-.1263	.1983	-.1433	.1858
Asia imm	-.2933	.2110	-.2476	.1931
Africa imm	-.0392	.2864	-.1498	.2693
Latin imm	.0703	.2512	-.1778	.2203
Other imm	.0863	.2106	.0737	.1987
Oceania imm	.2145	.3829	-.0724	.3786
Wave 2	0	(omitted)	0	(omitted)
Wave 3	.2671	.1868	-.1645	.1989
Wave 4	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)
_cons	-2.453***	.5217	.2526	.4452
	# obs	Lr chi2(28)	# obs	Lr chi2(28)
	1780	175.64	1734	340.50
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.1178	0.0000	0.1424

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.

- The r.g. for length of residence variable is <10 years.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 21: MONEY AND THE ENVIRONMENT. Ordered Probit estimations for *all groups*. Dependent variable is WILLINGNESS to perform an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
	Pay higher taxes		Give part of own income		Buy things at 20% higher price	
all groups						
2nd gen	.3524	.4323	-.3011	.4877	-	-
<10 years	-.1645	.1269	-.9431	.8838	-.0747	.1262
11-15 years	-.2395*	.1321	-1.604*	.9847	-.1422	.1313
>15 years	-.1906	.1200	-1.026	.7929	-.1493	.1189
education	-.0303***	.0028	-.1129	.0436***	-.0169***	.0028
income	-.0117***	.0023	-.0141	.0220	-.0135***	.0023
age	.0106***	.0019	.0382	.0220*	.0061***	.0019
age2	-.0001***	.0000	-.0004	.0002*	-.0000*	.0000
gender	-.0566***	.0113	-.3415	.1086***	-.0573***	.0113
c attachment	.0285**	.0118	.1345	.1295	.0427***	.0118
orientation 1	-.4130***	.0116	-.5727	.1202***	-.3789***	.0116
orientation 2	-.0373**	.0157	.0385	.2221	-.0452***	.0158

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
trust	-.0792***	.0133	-.1890	.1111*	-.0741***	.0134
nat identification	-.1549***	.0171	.2261	.3608	-.1375***	.0172
empowerment	-.0663***	.0126	.1300	.1929	-.0924***	.0126
pro social	.0768***	.0115	-.1552	.1076	.0672***	.0115
Europe	-.2879***	.0352	0	(omitted)	-.3645***	.0354
Asia	-.4425***	.0409	0	(omitted)	-.4394***	.0410
Africa	-.0278	.0394	0	(omitted)	-.1559***	.0396
Latin America	-.3358***	.0367	0	(omitted)	-.4406***	.0368
Nordic Country	-.3183***	.0403	0	(omitted)	-.1226***	.0404
Middle East	-.7077***	.0448	0	(omitted)	-.8798***	.0447
Oceania	-.1103***	.0410	0	(omitted)	-.1562***	.0411
Europe imm	.1883	.1242	.8278	.8120	.1757	.1232
Asia imm	.2080	.1313	.5908	.8819	.1885	.1305
Africa imm	.2806	.2012	1.215	.9861	.2047	.1982
Latin imm	.0822	.1685	0	(omitted)	-.0267	.1667
Other imm	.1880	.1357	1.477	.9317	.0353	.1347
Oceania imm	.0757	.2871	.8825	.9622	.1785	.2929
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	-.3386***	.05539	0	(omitted)	-.2726***	.0559
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	Lr chi2(29)	# obs	Lr chi2(20)	# obs	Lr chi2(29)
	36681	2677.52	448	66.38	36360	2481.70
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.0295	0.0000	0.0643	0.0000	0.0275

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for all groups variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 22: Specific pro-environmental Behaviour. Probit estimations for *all groups*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
	Consume better products		Recycle		Reduce water consumption		Contribute to environmental org	
all groups								
2nd gen	-	-	-	-	-	-	-	-
<10 years	.2734*	.1656	.2679	.1704	.2756*	.1565	.3140*	.1619
11-15 years	.2279	.1756	.2790	.1811	.2461	.1621	.0753	.1758
>15 years	.3741**	.1551	.4754***	.1579	.3462**	.1478	.1183	.1517
education	.0288***	.0036	.0318***	.0037	.0249***	.0034	.0541***	.0041

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
income	.0596***	.0030	.0419***	.0031	.0018	.0028	.0386***	.0034
age	.0283***	.0025	.0168***	.0026	.0215***	.0023	.0109***	.0029
age2	-.0002***	.0000	-.0001***	.0000	-.0001***	.0000	-.0001***	.0000
gender	.1959***	.0146	.1245***	.1495	.1170***	.0135	-.0384**	.0166
c attachment	-.0217	.0152	.0181	.0155	-.0717***	.0141	-.0002	.0175
orientation 1	.2547***	.0149	.2424***	.0152	.1924***	.0138	.1806***	.0172
orientation 2	.1654***	.0202	.1806***	.0204	.0636***	.0186	-.1400***	.0228
trust	.1393***	.0171	.0968***	.0176	-.0341**	.0158	.1266***	.0191
nat identification	-.0278	.0224	-.0530**	.0228	.0852***	.0203	.0107	.0262
empowerment	.2033***	.0164	.1895***	.0166	.0516***	.0151	.1256***	.0190
pro social	.0501***	.0149	.0106	.0152	-.0548***	.0139	.0061	.0170
Europe	-.8041***	.0458	-1.462***	.0546	-.1722***	.0414	-.5802***	.0463
Asia	-.7027***	.0521	-1.261***	.0598	.0365	.0481	-.2142***	.0542
Africa	-.6002***	.0504	-1.269***	.0584	-.1454***	.0463	.2559***	.0507
Latin America	-.5010***	.0473	-1.238***	.0558	.0725*	.0431	-.2482***	.0482
Nordic Country	.0163	.0525	-.1935	.0618	-.5361***	.0477	-.0146	.0520
Middle East	0	(omitted)	0	(omitted)	0	(omitted)	-.2284***	.0612
Oceania	.2415***	.0547	.0526	.0650	.3879***	.0492	.1052**	.0523
Europe imm	-.5554***	.1616	-.7211***	.1654	-.1873	.1530	-.0304	.1583
Asia imm	-.5538***	.1719	-.5223***	.1752	-.1406	.1610	-.4776***	.1777
Africa imm	-.5479**	.2495	-.2840	.2660	.1654	.2458	-.1997	.2467
Latin imm	-.1003	.2145	-.5389***	.2140	-.3346	.2036	-.6007**	.2461
Other imm	-.2971*	.1779	-.5245***	.1835	-.2228	.1680	-.1276	.1738
Oceania imm	-.7227*	.3734	0	(omitted)	-.6341*	.3331	-.1348	.3834
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.2884***	.0757	.0679	.0919	.3984***	.0661	.4360***	.0740

Predictor	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
_cons	-1.364***	.1127	-.1931	.1280	-1.238***	.1014	-1.976***	.1181
	# obs	Lr chi2(28)	# obs	Lr chi2(27)	# obs	Lr chi2(28)	# obs	Lr chi2(29)
	32421	4585.40	32452	6513.19	35409	1624.06	36933	2434.83
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.1021	0.0000	0.1449	0.0000	0.0331	0.0000	0.0780

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for all groups variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 23: Environmental Politically Related Behaviour. Probit estimations for *all groups*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	Coef.	Std. Error	Coef.	Std. Error
	Attend meetings//sign petitions		Join boycotts	
all groups				
2nd gen	-	-	.7238	.5416
<10 years	-.1372	.1768	.1105	.1577
11-15 years	-.1879	.1887	.1048	.1654
>15 years	-.1019	.1648	.2117	.1497
education	.0690***	.0043	.0490***	.0036
income	0.2765***	.0035	.0281***	.0029
age	.0184***	.0031	.0208***	.0025
age2	-.0002***	.0000	-.0003***	.0000
gender	-.0046	.0171	-.2401***	.0142
c attachment	-.0515***	.01812	-.0712***	.0149
orientation 1	.2107***	.0178	.0467***	.0145
orientation 2	-.0826***	.0241	.0744***	.0200
trust	.1404***	.01967	.2326***	.0167
nat identification	-.1326***	.0257	-.2231***	.0210
empowerment	.0354*	.0197	.0596***	.0158
pro social	.03516**	.0175	.0608***	.0145
Europe	-.3816***	.0493	-.7060***	.0436
Asia	-.2220***	.0585	-.2769***	.0565
Africa	-0.4196	12	-.4569***	.0484
Latin America	.0479	.0509	-.9008***	.0456
Nordic Country	-.0611	.0561	.3264***	.0508
Middle East	-.0449	.0638	-.7313***	.0550
Oceania	.4961***	.05462	.1299**	.0511

Predictor	Coef.	Std. Error	Coef.	Std. Error
Europe imm	.0378	.1725	-.2229	.1549
Asia imm	-.2205	.05853	-.3509**	.1643
Africa imm	-.0419	.05539	-.2935	.2440
Latin imm	.0427	.5092	-.2629	.2084
Other imm	.1991	.1845	-.0116	.1697
Oceania imm	.2955	.3792	-.1216	.3789
Wave 2	0	(omitted)	0	(omitted)
Wave 3	.3420***	.0698	-.2610***	.07670
Wave 4	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)
_cons	-2.159***	.1185	.0975	.1109
	# obs	Lr chi2(29)	# obs	Lr chi2(29)
	36997	1981.89	34994	5152.79
	Prob>chi2	Pseudo R2	Prob>chi2	Pseudo R2
	0.0000	0.0684	0.0000	0.1086

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for all groups variable is native-born.
- The r.g. for region specific effects is North America.

- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.

Table 24: MARGINAL EFFECTS BY MONEY AND THE ENVIRONMENT. Ordered Probit estimations for *immigrant status*. Dependent variable is WILLINGNESS to perform an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
	Pay higher taxes		Give part of own income		Buy things at 20% higher price	
immigrant status	.0544	.0363	.1554	.1858	.02655	.0257
education	.0081***	.0007	.0096**	.0039	.0032***	.0005
income	.0031***	.0006	.0010	.0018	.0025***	.0004
age	-.0028***	.0005	-.0031	.0019	-.0011***	.0003
age2	.0000***	.0000	.0000*	.0000	.0000**	.0000
gender	.0151***	.0030	.0285***	.0102	.0111***	.0021
c attachment	-.0078**	.0031	-.0115	.0110	-.0082***	.0022
orientation 1	.1110***	.0031	.0483***	.0126	.0731***	.0023
orientation 2	.0101**	.0042	.0021	.0187	.0089***	.0030
trust	.0214***	.0036	.0153	.0096	.0142***	.0025
nat identification	.0424***	.0046	-.0168	.0305	.0268***	.0033
empowerment	.0172***	.0034	-.0103	.0163	.0176***	.0024
pro social	-.0208***	.0031	.0134	.0093	-.0129***	.0022
Europe	.0771***	.0094	0	(omitted)	.0698***	.0068
Asia	.1191***	.0110	0	(omitted)	.0846***	.0079
Africa	.0071	.0094	0	(omitted)	.0298***	.0076

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
Latin America	.0899***	.0098	0	(omitted)	.0844***	.0071
Nordic Country	.0855***	.0108	0	(omitted)	.0233***	.0077
Middle East	.1903***	.0120	0	(omitted)	.1694***	.0087
Oceania	.0293***	.0110	0	(omitted)	.0298***	.0079
Europe imm	-.0512	.0332	-.0660	.0689	-.0346	.0236
Asia imm	-.0486	.0344	-.0536	.0720	-.0316	.0244
Africa imm	-.0751	.0540	-.0897	.0785	-.0417	.0380
Latin imm	-.0399	.0434	0	(omitted)	-.0044	.0308
Other imm	-.0502	.0365	-.1241	.0809	-.0063	.0259
Oceania imm	-.0374	.0601	-.0739	.0821	-.0124	.0433
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.0913***	.0149	0	(omitted)	.0528***	.0107
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	36831	# obs	448	# obs	36509

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for immigrant status variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.

- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 25: Marginal effects by Specific pro-environmental Behaviour. Ordered Probit estimations for *immigrant status*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
	Consume better products		Recycle		Reduce water consumption		Contribute to environmental org	
immigrant status	.1321**	.0584	.1583***	.0578	.1242**	.0549	.0397	.0370
education	.0114***	.0014	.0127***	.0014	.0099***	.0013	.0116***	.0008
income	.0236***	.0012	.0165***	.0012	.0007	.0011	.0082***	.0007
age	.0112***	.0010	.0067***	.0010	.0086***	.0009	.0023***	.0006
age2	-.0001***	.0000	-.0000***	.0000	-.0000***	.0000	-.0000***	.0000
gender	.0780***	.0058	.0492***	.0059	.0465***	.0054	-.0083**	.0035
c attachment	-.0087	.0060	.0068	.0061	-.0283***	.0056	.0002	.0037
orientation 1	.1018***	.0059	.0965***	.0060	.0765***	.0055	.0384***	.0036
orientation 2	.0661***	.0080	.0725***	.0081	.0260***	.0074	-.0301***	.0048
trust	.0548***	.0068	.0385***	.0070	-.0146**	.0062	.0272***	.0041
nat identification	-.0114	.0089	-.0223**	.0090	.0338***	.0080	.0020	.0055
empowerment	.0804***	.0065	.0762***	.0066	.0201***	.0060	.0267***	.0041
pro social	.0194***	.0059	.0039	.0060	-.0225***	.0055	.0015	.0036
Europe	-.3214***	.0182	-.5825***	.0217	-.0702***	.0164	-.1248***	.0098
Asia	-.2801***	.0207	-.5022***	.0238	.0135	.0191	-.0469***	.0115
Africa	-.2401***	.0201	-.5053***	.0232	-.0590***	.0184	.0539***	.0108

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
Latin America	-.2005***	.0188	-.4929***	.0222	.0275	.0172	-.0536***	.0103
Nordic Country	.0062	.0209	-.0762***	.0246	-.2141***	.0190	-.0036	.0111
Middle East	0	(omitted)	0	(omitted)	0	(omitted)	-.0494***	.0130
Oceania	.0950***	.0218	.0231	.0259	.1549***	.0195	.0225**	.0111
Europe imm	-.2025***	.0640	-.2632***	.0657	-.0832	.0606	-.0157	.0336
Asia imm	-.2449***	.0667	-.2398***	.0681	-.0665	.0624	-.1073***	.0366
Africa imm	-.2304**	.0991	-.1370	.1058	.0560	.0977	-.0365	.0522
Latin imm	-.0700	.0815	-.1813**	.0819	-.1487*	.0778	-.0964**	.0480
Other imm	-.1183*	.0708	-.2121***	.0731	-.0923	.0668	-.0309	.0371
Oceania imm	-.0615	.1101	-.0312	.1171	-.3122***	.1046	-.0716	.0682
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.1156***	.0301	.0274	.0366	.1578***	.0263	.0927***	.0158
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	32522	# obs	32573	# obs	35559	# obs	37087

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for immigrant status variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.

- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 26: MARGINAL EFFECTS BY ENVIRONMENTAL POLITICALLY RELATED BEHAVIOUR. Ordered Probit estimations for *immigrant status*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error
	Attend meetings/sign petitions		Join boycotts	
immigrant status	-.0220	.0279	.0682	.0586
education	.0136***	.0008	.0190***	.0013
income	.0054***	.0006	.0109***	.0011
age	.0036***	.0006	.0080***	.0009
age2	-.0000***	.0000	-.0001***	.0000
gender	-.0000	.0033	-.0926***	.0055
c attachment	-.0097***	.0035	-.0273***	.0057
orientation 1	.0420***	.0035	.0183***	.0056
orientation 2	-.0164***	.0047	.0282***	.0077
trust	.0277***	.0038	.0914***	.0064
nat identification	-.0261***	.0050	-.0856***	.0081
empowerment	.0070*	.0038	.0238***	.0061
pro social	.0069**	.0034	.0236***	.0056
Europe	-.0757***	.0097	-.2738***	.0169
Asia	-.0444***	.0115	-.1064***	.0219
Africa	-.0086	.0109	-.1771***	.0188

Predictor	dy/dx	Std. Error	dy/dx	Std. Error
Latin America	.0080	.0100	-.3496***	.0177
Nordic Country	-.0125	.0110	.1269***	.0197
Middle East	-.0093	.0126	-.2838***	.0213
Oceania	.0978***	.0107	.0514***	.0198
Europe imm	.0089	.0338	-.0815	.0599
Asia imm	-.0381	.0359	-.1537***	.0621
Africa imm	.0091	.0518	-.1252	.0943
Latin imm	.0231	.0446	-.0945	.0777
Other imm	.0409	.0363	-.0030	.0660
Oceania imm	.0006	.0618	-.0383	.1102
Wave 2	0	(omitted)	0	(omitted)
Wave 3	.0671***	.0137	-.1005***	.0297
Wave 4	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)
	# obs	37150	# obs	35143

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for immigrant status variable is native-born.
- The r.g. for region specific effects is North America.

- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 27: MARGINAL EFFECTS BY MONEY AND THE ENVIRONMENT. Ordered Probit estimations for *length of residence*. Dependent variable is WILLINGNESS to perform an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
	Pay higher taxes		Give part of own income		Buy things at 20% higher price	
length of residence						
11-15 years	.0188	.0203	.1941	.1722	.0064	.0122
>15 years	.0082	.0174	.0145	.0303	.0070	.0106
education	.0064*	.0034	.0040	.0124	.0033	.0020
income	.0039	.0026	.0101	.0076	.0003	.0016
age	-.0022	.0023	-.0095	.0088	.0016	.0014
age2	.0000	.0000	.0001	.0000	-.0000	.0000
gender	.0250	.0131	.0668*	.0397	.0219***	.0080
c attachment	-.0112	.0142	-.0197	.0471	-.0121	.0087
orientation 1	.1132***	.0136	.0787*	.0452	.0657***	.0087
orientation 2	-.0108	.0185	-.0158	.0568	.0208*	.0115
trust	.0576***	.0143	.0623	.0381	.0252***	.0088
nat identification	.0617***	.0170	-.0817	.1001	.0335***	.0105
empowerment	.0121	.0148	-.0712	.0583	.0164*	.0091

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
pro social	.0021	.0134	.0463	.0338	-.0150*	.0083
Europe	.1489***	.0374	0	(omitted)	.0800***	.0231
Asia	.2688***	.0673	0	(omitted)	.1479***	.0416
Africa	.0119	.0491	0	(omitted)	.0062	.0300
Latin America	.1609***	.0448	0	(omitted)	.1080***	.0278
Nordic Country	.1683***	.0484	0	(omitted)	.0076	.0293
Middle East	.2152***	.0605	0	(omitted)	.1136***	.0369
Oceania	.0612	.0375	0	(omitted)	.0315	.0230
Europe imm	-.0465	.0359	-.1420*	.0817	-.0237	.0219
Asia imm	-.0506	.0373	-.0903	.0769	-.0280	.0228
Africa imm	-.0425	.0537	-.2109*	.1136	-.0059	.0326
Latin imm	-.0340	.0433	0	(omitted)	-.0042	.0264
Other imm	-.0352	.0385	-.1852*	.0984	.0015	.0235
Oceania imm	-.0036	.0716	-.1074	.0912	-.0231	.0449
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.0739**	.0356	0	(omitted)	.0397***	.02216
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	1750	# obs	72	# obs	1733

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.

- The r.g. for length of residence variable is <10 years.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 28: MARGINAL EFFECTS BY SPECIFIC PRO-ENVIRONMENTAL BEHAVIOUR. Ordered Probit estimations for *length of residence*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
	Consume better products		Recycle		Reduce water consumption		Contribute to environmental org	
length of residence								
11-15 years	-.0232	.0475	-.0092	.0507	-.0228	.0379	-.0382	.0265
>15 years	.0095	.0396	.0381	.0420	.0196	.0335	-.0220	.0236
education	-.0013	.0076	-.0075	.0078	.0021	.0063	.0024	.0045
income	.0263***	.0059	.0253***	.0063	.0037	.0049	.0103***	.0033
age	.0165***	.0053	.0110**	.0055	.0120***	.0044	.0032	.0030
age2	-.0001***	.0000	-.0000	.0000	-.0000**	.0000	-.0000	.0000
gender	.0895***	.0294	.0348	.0308	.0322	.0244	-.0022	.0165
c attachment	-.0036	.0321	.0410	.0331	-.0163	.0263	-.0128	.0184
orientation 1	.1467***	.0294	.1731***	.0312	.0894***	.0246	.0511***	.0171
orientation 2	.0858**	.0412	.1179***	.0428	-.0124	.0343	-.0606***	.0231
trust	.0333	.0317	-.0221	.0342	.0271	.0265	.0475***	.0175

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
nat identification	.0072	.0387	.0576	.0405	.0317	.0308	.0066	.0234
empowerment	.1312***	.0331	.0527	.0343	.0297	.0274	.0087	.0197
pro social	.0239	.0301	-.0194	.0317	-.0328	.0253	.0043	.0170
Europe	-.2931***	.0750	-.5213***	.0803	.0251	.0676	-.1158***	.0423
Asia	.2371	.1562	.0001	.1415	.1856	.1272	-.1459	.1081
Africa	-.0784	.0977	-.3542***	.1006	.0447	.0903	-.0375	.0554
Latin America	-.0691	.0894	-.3298***	.0946	.1075	.0812	-.0503	.0522
Nordic Country	.0913	.0993	.1087	.1107	-.0696	.0872	-.0125	.0539
Middle East	0	(omitted)	0	(omitted)	0	(omitted)	-.0646	.0721
Oceania	.1903**	.0767	.1795**	.0843	.2016***	.0692	.0316	.0413
Europe imm	-.129*	.0778	-.2273***	.0857	-.0388	.0672	-.0367	.0402
Asia imm	-.1270	.0810	-.1300	.0886	-.0180	.0697	-.1316***	.0431
Africa imm	-.2064*	.1103	-.1002	.1215	.0941	.1011	-.0337	.0576
Latin imm	-.0805	.0903	-.2772***	.0925	-.0991	.0810	-.1321**	.0546
Other imm	-.4911	.0835	-.1771	.0919	-.0361	.0725	-.0630	.0433
Oceania imm	-.2571*	.1515	0	(omitted)	-.1892	.1293	-.0558	.0823
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.0863	.0807	-.0022	.1008	.1740***	.0669	.0695*	.0395
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	1504	# obs	1492	# obs	1745	# obs	1785

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for length of residence variable is <10 years.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 29: MARGINAL EFFECTS BY ENVIRONMENTAL POLITICALLY RELATED BEHAVIOUR. Ordered Probit estimations for *length of residence*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error
	Attend meetings/sign petitions		Join boycotts	
immigrant status				
11-15 years	-.0031	.0242	-.0005	.0401
>15 years	.0180	.0211	.0468	.0357
education	.0092**	.0043	.0069	.0068
income	.0031	.0032	.0187***	.0052
age	.0083***	.0031	.0017	.0047
age2	-.0001***	.0000	-.0000	.0000
gender	-.0223	.01592	-.0940***	.0259
c attachment	-.0191	.0178	-.0387	.0285

Predictor	dy/dx	Std. Error	dy/dx	Std. Error
orientation 1	.0416**	.0164	.0858***	.0263
orientation 2	-.0147	.0238	-.0379	.0366
trust	.0213	.0169	.0897***	.0283
nat identification	.0067	.0226	-.0920***	.0331
empowerment	-.0035	.0190	.0339	.0294
pro social	.0026	.0165	.0509*	.0271
Europe	-.0423	.0433	-.1905***	.0728
Asia	-.1351	.1048	-.1196	.1369
Africa	-.0231	.05738	-.1408	.0951
Latin America	.0072	.0517	-.1883**	.0879
Nordic Country	.0717	.0534	.2327**	.0972
Middle East	.0215	.0720	-.2055*	.1185
Oceania	.1095***	.0423	.1328*	.0746
Europe imm	-.0253	.0398	-.0568	.0736
Asia imm	-.0588	.0423	-.0981	.0765
Africa imm	-.0078	.0574	-.0594	.1067
Latin imm	.0141	.0503	-.0705	.0873
Other imm	.0173	.0422	.0292	.0787
Oceania imm	.0430	.0768	-.0287	.1500
Wave 2	0	(omitted)	0	(omitted)
Wave 3	.0535	.0375	-.0652	.0788
Wave 4	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)
	# obs	1780	# obs	1734

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for length of residence variable is <10 years.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 30: Marginal effects by Money and the Environment. Ordered Probit estimations for *all groups*. Dependent variable is WILLINGNESS to perform an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
	Pay higher taxes		Give part of own income		Buy things at 20% higher price	
all groups						
2nd gen	-.0801	.0803	.0328	.0664	-	-
<10 years	.0471	.0385	.1355	.1962	.0149	.0262
11-15 years	.0707*	.0422	.3462	.3400	.0296	.0293
>15 years	.0552	.0371	.1568	.1863	.0312	.0267
education	.0081***	.0007	.0094**	.0039	.0032***	.0005

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
income	.0031***	.0006	.0011	.0018	.0026***	.0004
age	-.0028***	.0005	-.0032*	.0019	-.0011***	.0003
age2	.0000***	.0000	.0000*	.0000	.0000**	.0000
gender	.0152***	.0030	.0286***	.0101	.0110***	.0021
c attachment	-.0076**	.0031	-.0112	.0109	-.0082***	.0022
orientation 1	.1113***	.0031	.0480***	.1264	.0730***	.0023
orientation 2	.0100**	.0042	.0032	.0186	.0087***	.0030
trust	.0213***	.0036	.0158	.0096	.0142***	.0025
nat identification	.0417***	.0046	-.0189	.0303	.0265***	.0033
empowerment	.0178***	.0034	-.0109	.0162	.0178***	.0024
pro social	-.0207***	.0031	.0130	.0092	-.0129***	.0022
Europe	.0775***	.0094	0	(omitted)	.0703***	.0068
Asia	.1192***	.0110	0	(omitted)	.0847***	.0079
Africa	.0075	.0106	0	(omitted)	.0300***	.0076
Latin America	.0905***	.0098	0	(omitted)	.0849***	.0071
Nordic Country	.0858***	.0108	0	(omitted)	.0236***	.0078
Middle East	.1907***	.0121	0	(omitted)	.1696***	.0087
Oceania	.0297***	.0110	0	(omitted)	.0301***	.0079
Europe imm	-.0507	.0334	-.0694	.0689	-.0338	.0237
Asia imm	-.0560	.0354	-.0495	.0743	-.0363	.0251
Africa imm	-.0756	.0542	-.1019	.0841	-.0394	.0382
Latin imm	-.0221	.0454	0	(omitted)	.0051	.0321
Other imm	-.0506	.0365	-.1239	.0805	-.0068	.0259
Oceania imm	-.0204	.0774	-.0740	.0816	-.0344	.0564
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.0912***	.0149	0	(omitted)	.0525***	.0108

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	36681	# obs	448	# obs	36360

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for all groups variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 31: Marginal effects by Specific pro-environmental Behaviour. Ordered Probit estimations for *all groups*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
	Consume better products		Recycle		Reduce water consumption		Contribute to environmental org	
all groups								
2nd gen	-	-	-	-	-	-	-	-
<10 years	.1083*	.0645	.1058	.0660	.1081*	.0597	.0786*	.0461
11-15 years	.0905	.0691	.1102	.0699	.0968	.0624	.0167	.0404
>15 years	.1470**	.0588	.1836***	.0571	.1347**	.0552	.0268	.0364
education	.0114***	.0014	.0127***	.0014	.0099***	.0013	.0116***	.0008
income	.0237***	.0012	.0167***	.0012	.0007	.0011	.0082***	.0007
age	.0113***	.0010	.0067***	.0010	.0086***	.0009	.0023***	.0006
age2	-.0001***	.0000	-.0000***	.0000	-.0000***	.0000	-.0000***	.0000
gender	.0781***	.0058	.0497***	.0059	.0466***	.0054	-.0082**	.0035
c attachment	-.0086	.0060	.0072	.0062	-.0285***	.0056	-.0000	.0037
orientation 1	.1015***	.0059	.0967***	.0060	.0767***	.0055	.0387***	.0037
orientation 2	.0659***	.0080	.0720***	.0081	.0253***	.0074	-.0300***	.0048
trust	.0555***	.0068	.0386***	.0070	-.0136**	.0063	.0271***	.0041
nat identification	-.0110	.0089	-.0211**	.0091	.0339***	.0080	.0023	.0056
empowerment	.0810***	.0065	.0756***	.0066	.0205***	.0060	.0269***	.0041
pro social	.0200***	.0059	.0042	.0060	-.0218***	.0055	.0013	.0036
Europe	-.3206***	.0182	-.5835***	.0217	-.0686***	.0165	-.1244***	.0099
Asia	-.2801***	.0207	-.5031***	.0238	.0145	.0191	-.0459***	.0116
Africa	-.2393***	.0201	-.5063***	.0233	-.0579***	.0184	.0548***	.0108
Latin America	-.1997***	.0188	-.4942***	.0222	.0289*	.0172	-.0532***	.0103
Nordic Country	.0065	.0209	-.0772***	.0246	-.2137***	.0190	-.0031	.0111
Middle East	0	(omitted)	0	(omitted)	0	(omitted)	-.0489***	.0131
Oceania	.0963***	.0218	.0210	.0259	.1546***	.0196	.0225**	.0112

Predictor	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error	dy/dx	Std. Error
Europe imm	-.2214***	.0644	-.2876***	.0660	-.0746	.0609	-.0065	.0339
Asia imm	-.2208***	.0685	-.2083***	.0699	-.0560	.0641	-.1024***	.0381
Africa imm	-.2184**	.0995	-.1133	.1061	.0659	.0979	-.0428	.0529
Latin imm	-.0400	.0855	-.2150**	.0853	-.1333*	.0811	-.1288**	.0527
Other imm	-.1184*	.0709	-.2092***	.0732	-.0888	.0669	-.0273	.0372
Oceania imm	-.2881*	.1489	0	(omitted)	-.2527*	.1327	-.0289	.0822
Wave 2	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 3	.1150***	.0301	.0271	.0366	.1588***	.0263	.0935***	.0158
Wave 4	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)	0	(omitted)	0	(omitted)
	# obs	32421	# obs	32452	# obs	35409	# obs	36933

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for all groups variable is native-born.
- The r.g. for region specific effects is North America.
- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 32: Marginal effects by Environmental politically related Behaviour. Ordered Probit estimations for *all groups*. Dependent variable is ACTUAL ENGAGEMENT in an environmentally friendly behaviour.

Predictor	dy/dx	Std. Error	dy/dx	Std. Error
	Attend meetings/sign petitions		Join boycotts	
all groups				
2nd gen	-	-	.2803	.1917
<10 years	-.0251	.0298	.0433	.0623
11-15 years	-.0333	.0298	.0410	.0653
>15 years	-.0191	.0291	.0835	.0596
education	.0136***	.0008	.0190***	.0013
income	.0054***	.0007	.0109***	.0011
age	.0036***	.0006	.0081***	.0009
age2	-.0000***	.0000	-.0001***	.0000
gender	-.0000	.0033	-.0932***	.0055
c attachment	-.0101***	.0035	-.0276***	.0058
orientation 1	.0416***	.0035	.0181***	.0056
orientation 2	-.0163***	.0047	.0289***	.0077
trust	.0277***	.0038	.0917***	.0064
nat identification	-.0262***	.0050	-.0866***	.0081
empowerment	.0070*	.0039	.0231***	.0061
pro social	.0069**	.0034	.0236***	.0056
Europe	-.0754***	.0097	-.2742***	.0169
Asia	-.0439***	.0115	-.1075***	.0219

Predictor	dy/dx	Std. Error	dy/dx	Std. Error
Africa	-.0082	.0109	-.1774***	.0188
Latin America	.0084	.0100	-.3499***	.0177
Nordic Country	-.0120	.0110	.1268***	.0197
Middle East	-.0088	.0126	-.2840***	.0213
Oceania	.0981***	.0108	.0504**	.0198
Europe imm	.0074	.0341	-.0865	.0601
Asia imm	-.0333	.0371	-.1363**	.0638
Africa imm	.0123	.0521	-.1140	.0947
Latin imm	.0127	.0474	-.1021	.0809
Other imm	.0393	.0364	-.0045	.0659
Oceania imm	.0584	.0749	-.0472	.1471
Wave 2	0	(omitted)	0	(omitted)
Wave 3	.0676***	.0138	-.1014***	.0297
Wave 4	0	(omitted)	0	(omitted)
Wave 5	0	(omitted)	0	(omitted)
	# obs	36997	# obs	34994

* p<0.1, ** p<0.05, *** p<0.01

- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.
- The r.g. for all groups variable is native-born.
- The r.g. for region specific effects is North America.

- The r.g. for immigrant region of origin is North America.
- The r.g. for time effects is Wave 1.
- dy/dx for factor levels is the discrete change from the base level.

Table 33: ENVIRONMENTALLY FRIENDLY BEHAVIOURS BY LENGTH OF RESIDENCE . WVS dataset years 1989-2007, Dependent Variables used in the regressions.

Environmental Behaviour	Status	Mean	Std. Dev.	Min.	Max.	N
Willingness to pay higher taxes	N-B	2.27	.875	1	4	71294
	2nd gen	2.44	.897	1	4	3805
	<10 years	2.26	.872	1	4	922
	11-15 years	2.26	.840	1	4	814
	>15 years	2.34	.880	1	4	2161
Willingness to give part of own income	N-B	2.04	.865	1	4	14008
	2nd gen	2.27	.860	1	4	3816
	<10 years	2.12	.885	1	4	125
	11-15 years	2.17	.954	1	4	35
	>15 years	2.40	.893	1	4	327
Willingness to buy things at a 20% higher price	N-B	2.54	.854	1	4	56392
	2nd gen	-	-	-	-	0
	<10 years	2.54	.844	1	4	823
	11-15 years	2.55	.815	1	4	776
	>15 years	2.60	.823	1	4	1908
Choose better products for the environment	N-B	.47	.499	0	1	50554

Environmental Behaviour	Status	Mean	Std. Dev.	Min.	Max.	N
	2nd gen	-	-	-	-	0
	<10 years	.51	.500	0	1	717
	11-15 years	.40	.491	0	1	559
	>15 years	.54	.497	0	1	1748
	N-B	.47	.499	0	1	50979
	2nd gen	-	-	-	-	0
Recycle	<10 years	.54	.498	0	1	718
	11-15 years	.48	.500	0	1	451
	>15 years	.59	.491	0	1	1754
	N-B	.49	.499	0	1	55590
	2nd gen	-	-	-	-	0
Reduce water consumption	<10 years	.54	.498	0	1	831
	11-15 years	.53	.499	0	1	829
	>15 years	.62	.483	0	1	1853
	N-B	.14	.347	0	1	57467
	2nd gen	-	-	-	-	0
Contribute to environmental organization	<10 years	.15	.366	0	1	845
	11-15 years	.09	.286	0	1	841
	>15 years	.15	.366	0	1	1883
	N-B	.12	.333	0	1	57603
	2nd gen	-	-	-	-	0
Attend meetings or sign petitions	<10 years	.14	.350	0	1	846
	11-15 years	.08	.280	0	1	848
	>15 years	.15	.357	0	1	1891
	N-B	.41	.492	0	1	66273
Join boycotts						

Environmental Behaviour	Status	Mean	Std. Dev.	Min.	Max.	N
	2nd gen	.42	.494	0	1	3797
	<10 years	.47	.499	0	1	911
	11-15 years	.36	.480	0	1	835
	>15 years	.45	.497	0	1	2137

- The scale for the "willingness" items is 1-4 where 1 is *strongly agree*, i.e. stronger pro-environmental behaviour and 4 is *strongly disagree*, i.e. weaker pro-environmental behaviour.
- The scale for the "actual engagement" items is 0-1 where 0 is *no engagement* in pro-environmental behaviour and 1 is *engagement* in pro-environmental behaviour.
- Immigrant status: N-B=native-born, 2nd gen=second generation immigrant, <10 years=immigrant with 10 or less years of residence, 11-15=immigrant with 11 to 15 years of residence, and >15 years=immigrant with more than 15 years of residence.

Table 34: VARIABLES THAT AFFECT ENVIRONMENTAL BEHAVIOUR BY LENGTH OF RESIDENCE. WVS dataset years 1989-2007, Controls used in the regressions.

Control	Status	Mean	Std. Dev.	Min.	Max.	N
	N-B	4.60	2.23	1	8	68264
	2nd gen	4.50	2.35	1	8	3944
Education						

Control	Status	Mean	Std. Dev.	Min.	Max.	N
	<10 years	5.52	2.12	1	8	931
	11-15 years	5.37	2.09	1	8	896
	>15 years	4.97	2.25	1	8	2194
	N-B	4.41	2.54	1	10	66746
	2nd gen	5.12	2.38	1	10	3295
Income	<10 years	5.04	2.74	1	10	867
	11-15 years	5.02	2.71	1	10	821
	>15 years	4.85	2.66	1	10	1980
	N-B	40.78	15.96	15	95	76968
	2nd gen	43.50	17.60	16	94	3954
Age	<10 years	36.35	13.30	15	84	978
	11-15 years	44.45	15.27	15	84	904
	>15 years	51.66	15.42	18	88	2257
	N-B	.51	.49	0	1	77058
	2nd gen	.52	.49	0	1	3969
Gender	<10 years	.51	.50	0	1	979
	11-15 years	.55	.49	0	1	906
	>15 years	.53	.49	0	1	2264
	N-B	.38	.48	0	1	72446
	2nd gen	.5	.52	0	1	10
C. Attachment	<10 years	.29	.45	0	1	893
	11-15 years	.35	.47	0	1	865
	>15 years	.31	.46	0	1	2004
	N-B	.55	.49	0	1	53477
	2nd gen	.60	.48	0	1	3558
Orientation 1						

Control	Status	Mean	Std. Dev.	Min.	Max.	N
	<10 years	.57	.49	0	1	757
	11-15 years	.58	.49	0	1	747
	>15 years	.53	.49	0	1	1876
	N-B	.83	.37	0	1	58167
	2nd gen	-	-	-	-	0
Orientation 2	<10 years	.85	.35	0	1	825
	11-15 years	.87	.32	0	1	835
	>15 years	.88	.31	0	1	1863
	N-B	.27	.44	0	1	73801
	2nd gen	.27	.44	0	1	3826
Trust	<10 years	.30	.46	0	1	931
	11-15 years	.29	.45	0	1	862
	>15 years	.31	.46	0	1	2213
	N-B	.86	.34	0	1	74827
	2nd gen	.91	.27	0	1	3759
Nat Identification	<10 years	.72	.44	0	1	677
	11-15 years	.60	.48	0	1	648
	>15 years	.84	.36	0	1	1693
	N-B	.66	.47	0	1	72877
	2nd gen	.80	.39	0	1	3895
Empowerment	<10 years	.62	.48	0	1	946
	11-15 years	.52	.49	0	1	861
	>15 years	.68	.46	0	1	2187
	N-B	.46	.49	0	1	74405
	2nd gen	.42	.49	0	1	3855
Pro-social traits						

Control	Status	Mean	Std. Dev.	Min.	Max.	N
	<10 years	.47	.49	0	1	945
	11-15 years	.37	.48	0	1	879
	>15 years	.47	.49	0	1	2213

- Immigrant status: N-B=native-born, 2nd gen=second generation immigrant, <10 years=immigrant with 10 or less years of residence, 11-15=immigrant with 11 to 15 years of residence, and >15 years=immigrant with more than 15 years of residence.
- Orientation 1=Environment vs Economic Growth stance; Orientation 2=Human vs Nature stance.

Chapter 3: Identity selection and the activation of pro-environmental behaviour

Luis Serra-Barragán*

Abstract

Pro-environmental behaviour can be the result of two different processes: a process of norm internalisation carried out by individuals through which they become aware of the consequences of their actions on other individuals and ascribe responsibility from those actions, i.e. *direct norm activation*; and a process of adhesion to social norms influenced by justice, commitment, fairness, reciprocity, and framing effects, i.e. *indirect norm activation*. There is empirical evidence that policy in the form of informational campaigns can disrupt the direct norm activation process by imposing an excessive burden of responsibility on the individuals. Yet it has been neglected that other popular instruments supported by economists could also have an indirect negative effect on norm activation by introducing a situational cue that fosters a change of identity among individuals with potential negative consequences on their pro-environmental behaviour. This chapter investigates this issue with a two-period identity selection model based on self-verification theory. In each period there are two types of selves an individual can take: selfish and pro-environmental. The process of identity selection is driven by the desire of individuals to be consistent across the two periods in order to avoid social disapproval due to self-change. Results show that the monetary component of an environmental policy introduces an asymmetry in the identity selection process that produces a failure of norm activation: while selfish agents preserve their selfish identity after the policy is implemented, pro-environmental agents might change their identity despite they experience social disapproval due to a reduction in the cognitive benefits of keeping such identity. Implications for environmental policy design are discussed.

"When people obey norms, they often have a particular outcome in mind: they want to avoid the disapproval -ranging from raised eyebrows to social ostracism - of other people" J. Elster, 1989.

JEL Nos.: D03, H23, H41, Q57, Q58.

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KEYWORDS: identity; self-verification; norm activation; framing effects; pro-environmental behaviour; environmental policy; payments for environmental services; sense of place.

Introduction

Psychologists, sociologists and a growing number of economists have now recognized that worldwide environmental degradation is not merely a by-product of industrial and technological evolution, but behavioural and attitudinal as well. Cooperation (or defection) among individuals lies at the heart of the problem of environmental services underprovision given their public good nature. Despite tragic predictions influenced by a somewhat extreme version of the rational paradigm (Hardin [23]), a vast body of theoretical and empirical research has made progress in elucidating the conditions under which individuals are in fact willing to cooperate in social dilemmas.[1]

A certain environmentally friendly behaviour might be followed by those individuals who are attached to a specific set of norms. Norms are shared beliefs about how the individuals should act, and they are enforced by the threat of sanctions or the promise of rewards (Schwartz and Howard [40]). Norms can be divided into two groups according to their level of internalisation: *personal* and *social* (Thøgersen [51]).

A personal norm is a self-expectation of specific action in a particular context, commonly experienced as a feeling of moral obligation (Schwartz [39]). Inasmuch as norms are a behavioural guide for individuals, their violation leads to sanctions. When a sanction is executed by the same individual it is said that the norm has been internalised. According to Schwartz [39], and Schwartz

[1] The Introduction of Chapter 1 provides references on the literature of cooperation mechanisms in social dilemmas.

and Howard [41], internalised norms are personal norms. Thus, personal norms are followed because of internalised values and conceptions of what is right and wrong.

On the other hand, a social norm is based on a group-expectation where the rewards and punishment are externally enforced. Hence, individuals follow a social norm on account of (real or imagined) social pressure (Ajzen [1]). Biel and Thøgersen [8] consider that social norms are a reason for departure from rational choice insofar as they prescribe the manifestation of a particular behaviour and the proscription of other in a given context. In that sense, Fehr and Fischbacher [18] explain that, despite little is known about the formation process of social norms, they are greatly driven by non-selfish motives and largely enforced by sanctions.

Norm adhesion is of great relevance to the analysis of pro-environmental behaviour. Bamberg and Schmidt [5], Bratt [9], Harland et al [24] and Thøgersen [48] and [52] have documented an important correlation between environmentally responsible behaviour and social and personal norms. While there is research which demonstrates that personal norms often have stronger and more reliable behavioural implications than social norms (Thøgersen [53]), other studies have shown there are cases where this need not be true (Bamberg and Schmidt [5] and Hunecke et al [25]),[2] at least in an indirect way.

It is possible for individuals to display pro-environmental behaviour if norms related to such behaviour are somehow activated. In social dilemmas, norm activation depends on personal and situational factors (Biel and Thøgersen [8]). Personal factors are associated to an obligation that lies within the individuals

[2]Bicchieri [6] also argues that social norms are determinant for cooperative behaviour between individuals. Yet, she points out that people must know the norm, and also be aware that it applies to the situation under consideration. More importantly, she regards that the individual must believe that a sufficient number of others will conform to the social norm, and that a sufficient number of others expect the individual to conform. Such requirement is similar to the belief-dependent framework presented in Chapter 1.

to protect a particular natural resource. The norms activated by these factors are considered to be moral norms that individuals internalise and that have a direct effect on the environment. They determine the environmental responsibility held by individuals through the establishment of environmental values. Conversely, situational factors are associated with norms related to cooperation, or in Kerr's taxonomy (Kerr [27]): "general interaction norms that are elicited by the behaviour of others and which have an indirect effect both on other individuals' welfare and on the environment". Situational factors that affect the activation of norms indirectly encompass the salience of need and actions, benefits and costs, framing effects (e.g. market vs non-market frames), behaviour of others, and communication. These situational factors alter the individuals' perception of fairness and justice, reciprocity and commitment in social dilemmas with consequences on cooperation.

The left hand side of the diagram above, i.e. personal factors, refers to the environmental responsibility that arises in individuals from the activation of personal norms. One influential model representing this activation mechanism is Schwartz's Norm Activation Theory (Schwartz [39]). Under such model, a norm is activated when: a) the individual recognizes his private actions have a public good aspect, or in other words, become aware of the consequences of his actions; and b) the individual ascribes personal responsibility for the issue at hand.

Although Schwartz's theory seems to enjoy empirical validation (Van Liere and Dunlap [55], and Stern et al [42]),[3] a group of researchers claim that some environmental policies might actually disrupt such process of norm activation. Bruvoll and Nyborg [11] show that even though authorities may succeed in increasing consumers' voluntary contributions to a public good through infor-

[3]See Bratt [9] for a survey-based study on recycling behaviour that does not support Schwartz's theory.

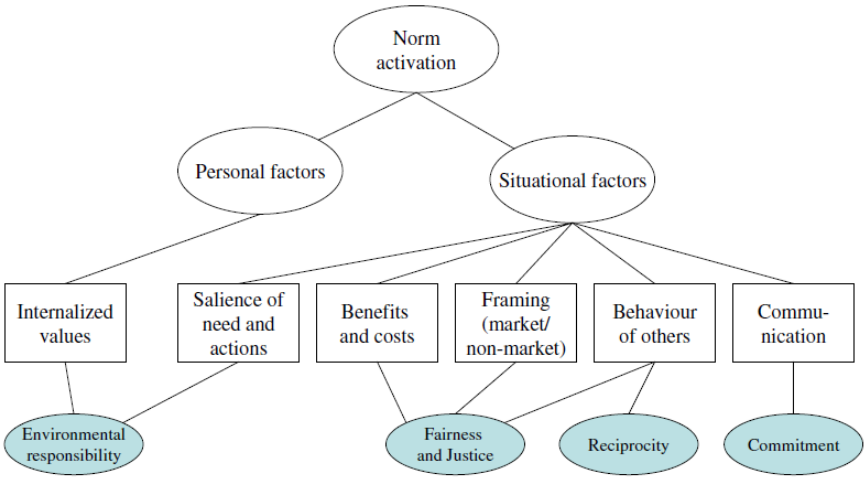
mation campaigns that appeal to consumer responsibility, this will generally come at a social cost which may or may not be outweighed by the policy benefits such as improved environmental quality and increased *warm glow*. Hence, when consumers ascribe responsibility for a certain contribution level to a public good, they may experience a *warm glow* of giving and a *cold shiver of not giving enough*. By tightening the norm and thus requiring higher contributions from the individuals, environmental policy will usually increase the *cold shiver*.

Brekke et al [10] explain that responsibility may represent a burden, and so duty-oriented individuals (i.e. those who prefer to think of themselves as a responsible person) may consciously or unconsciously avoid settings in which they suspect a heavy burden of responsibility will be lay upon them, especially when they possess uncertain information about others' behaviour.[4]

A theoretical model in the same spirit is the one found in Nyborg [28]. She considers that individuals with preferences for keeping moral obligations may not like learning that voluntary contributions are socially valuable. This information can then trigger irksome feelings of cognitive dissonance. So, information campaigns which promote environmental responsibility can present individuals with information they would rather not have, imposing on them an excessive feeling of moral responsibility.

Fig 1. Factors influencing the activation of norms in social dilemmas. Source: Biel and Thøgersen [8].

[4]To test their model, Brekke et al [10] collected survey data on glass recycling in Norwegian households since such activity stands as an example of voluntary contributions to a public good. The policy implication of their model is that when responsibility ascription is endogenous, economic incentives for voluntary contributions could be counterproductive.



The right hand side of Figure 1 depicts the situational factors that affect norm activation. The type of norms activated through this mechanism are norms related to cooperation or social norms. The benefits of communication for cooperation[5] have been studied in Isaac and Walker [26] and Ostrom and Walker [32]. Orbell et al [30] reported a strong correlation between commitment and cooperation rates. Moreover, communication gives rise to a commitment norm (Kerr [27]) that produces on other individuals an expectation about future consistent behaviour (Cialdini [12]).

Fairness acts as a norm in a social dilemma that if bolstered it promotes higher contributions to the public good from individuals, but if the situation is perceived to be unfair, it will activate their defective behaviour (Biel et al [7]). A sequential model of justice is provided by Schroeder et al [37]. They highlight that when resources are perceived to be distributed in an unjust fashion, then some individuals might try to change the rules of allocation. Those who defect, should compensate those harmed by their actions, restoring the just distribution.

Reciprocity is a widely studied norm (Rabin [34], Ostrom [31], Dufwenberg

[5]See Balliet [4] for a Meta-Analytic review of studies devoted to the analysis of the effects of communication on cooperation in social dilemmas.

and Kirchsteiger [14], and Falk and Fishbacher [17]) which prescribes conditional cooperation among individuals, i.e. an individual should be kind to those that are kind to him, but be unkind to those who are unkind.

The reference point in a decision situation affects the choice of individuals. Fleishman [20] provides experimental evidence on the matter in a social dilemma. Framing effects on cooperation in public good games are studied by Andreoni [3]. He shows there is a behavioural asymmetry because individuals are more willing to cooperate under positive framing than under a negative one. Other studies are Pillutla and Chen [33] and Tenbrunsel and Messick [46]. They show that individuals adjust their competitive behaviour depending on the frame. Economic-oriented contexts elicited a more competitive-behaviour.

Most research focused on failure of social norms activation due to a change in the prevailing situational factors is related to the analysis of framing effects. In particular, interest has been drawn to analyze the effects of monetary incentives on the behaviour of individuals in laboratory experiments (Frey and Jegen [21] and Reeson and Tisdell [35]).

While Figure 1 is an extensive depiction of the different mechanisms of norm activation, it does not acknowledge that the identity of individuals can also trigger a specific norm of environmental behaviour given that identities describe social roles.

An identity is a set of meanings related to the self that functions as a reference that guides behaviour in different contexts (Stets and Biga [43]). An environmental identity prescribes a course of action that is compatible with individuals' sense of who they are (Clayton and Opotow [13]). Weber et al [56] stress that the identity of the decision maker is a significant factor for cooperation in social interaction scenarios.[6] Moreover, Stets and Biga [43] claim that

[6]The other two significant factors for cooperation according to their framework are: classification of the situation, and identification of rules and heuristics that could guide behavioural choice.

while traditional environmental sociology linked attitude processes to the determination of environmentally responsible behaviour, it is the identity process which influences such type of behaviour.[7]

The identity of the individual is also relevant for policy design. An individual's sense of self is linked to his social environment (Akerlof and Kranton [2]), and so it is reasonable to suspect that by changing situational factors, environmental policy might in turn affect the individuals' sense of who they are. Hence, understanding which identities are salient is important to evaluate how individuals react to a particular threat or distribution of rewards (Clayton and Opotow [13]).

This chapter outlines an identity selection model and inquires about how identity selection can activate a particular environmentally friendly norm. More importantly, it shows how environmental policy (a situational factor) might produce unwanted outcomes by affecting the process of identity selection. It is worth to notice though, that the issue at hand (i.e. social norms activation failure due to situational factors) should not be confounded with motivation crowding-out. Whilst both can represent cooperation failure in a public good provision setting, and so both can explain why individuals might not display pro-environmental behaviours, motivation crowding-out theory does not seek to establish the origin of the environmentally friendly inclination of the individual, just the mechanism through which such preference is distorted. In turn, this chapter proposes that the literature has paid no attention to the study of the identity of individuals as a source of pro-environmental behaviour or to environmental policies as key determinants of such source.

The plan for the rest of the chapter is the following: Section 2 introduces

[7] Evidence that a pro-environmentally oriented identity is associated to engagement in environmentally friendly behaviour is provided by Fielding et al [19].

the set up of a two-period self-selection model. Section 3 presents the basic problem where individuals choose whether to keep or change their identity based on situational factors. In section 4, a monetary incentive scheme will be also analysed and its impact on the self-selection process will be compared to the case where there is no environmental policy. Section 5 discusses the results of the model and provides policy implications. Finally, concluding remarks are provided and empirical research is suggested.

2. The Model

2.1 Motivation example

Individuals have a sense-of-self which defines which type of person they are, e.g. selfish, pro-social, friendly, etc. For the sake of simplicity, assume that upon birth an individual is given an exogenous identity which is defined by a social norm which prescribes a course of action under a particular set of circumstances.[8] Whenever the individual has to make a choice, he must decide whether to take a course of action that is coherent with the social norm or not. In order to do that, he performs a cost-benefit analysis based on the situational factors (or situational cues) that might affect his decision. Should he change his identity he will face a punishment in the form of social disapproval. Thus, if he is "psychologically coherent" and decides to conform to the norm (and avoid the cost of social disapproval), he becomes accepted by others. Given that his sense-of-self originates from a social norm, he then revalidates who he is.

Matters are different if he decides not to conform to the social norm. If

[8]This might be too simplistic, but it is plausible to think that the individual creates a sense-of-self through the norms created by his family or community.

that is the case, he is considered not to be psychologically coherent because he takes a course of action not prescribed by the social group he belongs to, and in retaliation he faces social disapproval. Thus, a change in his sense-of-self takes place, or in other words, he changes his identity.

As it turns out, which course of action the individual takes depend on his proclivity to conform to the social norm, or in other words, on the likelihood that he is psychologically coherent. The more psychological coherence the individual has, the more likely he will conform to the social norm and take the course of action prescribed by the norm.

The next section formalizes this idea and shows that if an individual is sufficiently psychologically coherent, he will likely conform to the social norm and keep his identity. However, if he is not sufficiently psychologically coherent, he will not conform to the social norm and will change his identity. Moreover, the section also shows that a monetary payment might reduce the likelihood that certain individuals maintain their psychological coherence and end up changing their identity.

2.2 The model set up

This section draws extensively on Teraji's model of self-verification (Teraji [47]). Assume a two-period economy: $t = 0$ and $t = 1$. In each of these periods there are two types of selves (or identities) an individual can take: selfish (S) and pro-environmental (PE). Regardless of which self the individual adopts he receives material payoffs π. Those material payoffs are defined like in a standard linear public good game, i.e. the individual has to decide whether to put in effort e at a cost c in the production of a public good or put in effort $1 - e$ in the

production of a private good.[9] Assume $c > 0 \iff e > 0$, $\frac{\partial \pi}{\partial e} > 0$, $\frac{\partial^2 \pi}{\partial e^2} < 0$, $\frac{\partial c}{\partial e} > 0$ and $\frac{\partial^2 c}{\partial e^2} > 0$. The following are the payoffs of each self in period 0:

$$U_S^0 = \pi_S^0(e) - c(e)$$

$$U_{PE}^0 = \pi_{PE}^0(e) + \vartheta(e) - c(e)$$

Notice that besides material payoffs, the pro-environmental self also obtains cognitive payoffs related to the provision of the public good defined by ϑ. It can be perfectly interpreted that the pro-environmental self derives a *warm glow* from his contribution to the public good. However, he can only obtain such *warm glow* if he provides effort, i.e. $\vartheta > 0 \iff e > 0$. Furthermore, assume that: $\frac{\partial \vartheta}{\partial e} > 0$, and $\frac{\partial^2 \vartheta}{\partial e^2} < 0$.

In period 0 the individual cannot chose which identity to adopt, i.e. it is exogenous. Hence, given a determined self, he chooses the optimal level of effort provided to the production of the public good in order to maximize his utility. The problem he faces is: $\underset{e}{max} U_{self}^0$. The optimal level of effort which is solution to such problem is that which equates the marginal benefits of providing effort to its marginal costs. In other words we have the following (expressions in bold denote derivatives):

$$\boldsymbol{\pi_S^0(e^*) = c(e^*)}$$

$$\boldsymbol{\pi_{PE}^0(e^\dagger) + \vartheta(e^\dagger) = c(e^\dagger)}$$

As the expressions above suggest, the identity of each individual prescribes a different behaviour which means that a different optimal level of effort is

[9] For simplicity it is assumed that the cost of effort is the same for both selves, and the maximum amount of effort the individual can provide to the production of either good has been normalised to 1.

selected. The selfish individual selects to provide zero effort to the production of the public good because the benefits of provision do not compensate its costs, or in other words, the selfish individual maximizes his utility by devoting all his effort to the production of the private good. On the contrary, the pro-environmental individual selects to devote all his effort to the production of the public good because despite it is costly to do so, he receives a *warm glow* from helping others, which added to the material payoffs obtained from contributing to the public good, outweighs the benefits of devoting his effort to the production of the private good.

After period 0 and once payoffs for such period are materialized, the individual faces the decision whether to keep his identity for the next period. If he decides to do so, he is considered to be *consistent*.[10] These are his payoffs:

$$U^1_{S|S^0} = \pi^1_S(e) - c(e)$$

$$U^1_{PE|PE^0} = \pi^1_{PE}(e) + \vartheta(e) - c(e)$$

So, if the individual is consistent and selects the same self in the two periods he obtains in $t = 1$ the same utility he obtained in the previous period because his prescribed behaviour is the same, i.e. the level of effort he provides to the production of the public good does not change.

If for some reason the individual decided to change his identity in period 1, then he would face social disapproval that stems from the adoption of a different behaviour prescribed by a different identity to the one he held in the previous period.[11] This creates in the individual a discrepancy he might feel as guilt,

[10] This term does not imply that individuals are interested in consistency for its own sake. Rather, as Swann et al [45] explain, individuals strive for psychological coherence to strengthen own perceptions of prediction and control.

[11] It is assumed that the adhesion to the social norm of the individual is valuable to other individuals sharing the same identity.

anxiety or embarrasment (Elster [16] and [15]).[12] In this model such feature is represented by a cost d. If the individual changes his identity from period 0 to period 1 then he is considered to be *inconsistent*. In such case, these are his payoffs:

$$U^1_{PE|S^0} = \pi^1_{PE}(e) + \vartheta(e) - c(e) - d(e)$$

$$U^1_{S|PE^0} = \pi^1_{S}(e) - c(e) - d(e)$$

Where the cost of social disapproval depends on the level of effort provided by the individuals for a simple reason: the individuals' identity prescribes a particular behaviour, i.e. a selfish self is expected to provide zero effort to the production of the public good, while a pro-environmental self is expected to provide all his effort to such activity. It is assumed that the social disapproval will be higher if the level of effort provided at $t = 1$ differs more with respect to the expected level of effort of the identity held at the previous period.

The individual will decide to keep his identity and avoid social disapproval as long as the costs of self-change are higher than its benefits. The following *consistency conditions* reflect this for the selfish and pro-environmental selves, respectively:

$$d(e) > \pi^1_{PE}(e) + \vartheta(e) - \pi^1_{S}(e)$$

$$d(e) > \pi^1_{S}(e) - \pi^1_{PE}(e) - \vartheta(e)$$

[12] Despite social disapproval comes from other individuals sharing a common identity, it is unlikely they will complain to him for not following the social norm. Just the fact that the individual knows his current behaviour is not supported by his identity will make him feel not approved by others (Rege [36]).

3. Identity selection

In order to select an appropiate self under the current situation (no environmental policy), the individual assesses his expected utility. So, he compares the payoffs he would get by being *consistent* with the payoffs he would get by being *inconsistent*. Define θ as the subjective belief he holds about keeping the same self in the two periods, i.e. θ denotes the individual's "psychological coherence bias". So, with probability θ he is *consistent* (and has strong psychological coherence) and with probability $1-\theta$ he is *inconsistent* (and has low psychological coherence) and changes his identity.

Assume that in $t = 0$ the individual holds a selfish identity and he has to decide whether to keep it next period or change it and adopt a pro-environmental self. His expected utility at $t = 1$ is:

$$EU = x\theta\left(U^1_{S|S^0}\right) + (1-x)(1-\theta)\left(U^1_{PE|S^0}\right)$$

Where x is the probability that the same self of period 0 will be activated in period 1. Thus, x is the objective probability of *self-consistency*. If the individual is sufficiently psychologically coherent (i.e. θ is high enough) then the selfish self is activated in period 1. If the individual is not sufficiently psychologically coherent (i.e. θ is low enough) , the reverse is true. Substituting some terms we get that the expected utility then becomes:

$$EU = x\theta\left(\pi^1_S(e) - c(e)\right) + (1-x)(1-\theta)\left(\pi^1_{PE}(e) + \vartheta(e) - c(e) - d(e)\right)$$

The individual then maximizes his expected utility with respect to the objective probability of *self-consistency*, i.e.:$\underset{x}{max} EU$.

The FOC of such problem is:

$$\theta\left(\pi_S^1(e)-c(e)\right)-(1-\theta)\left(\pi_{PE}^1(e)+\vartheta(e)-c(e)-d(e)\right)=0$$

From here we arrive at the value of the subjective belief of the individual or *optimal psychological coherence* for which he is indifferent to keep or change his identity:

$$\theta^* \equiv \frac{\pi_{PE}^1(e)+\vartheta(e)-c(e)-d(e)}{\pi_S^1(e)-c(e)+\pi_{PE}^1(e)+\vartheta(e)-c(e)-d(e)}$$

If $\theta > \theta^* \Rightarrow x = 1$ and the individual is *consistent*. But if $\theta < \theta^* \Rightarrow x = 0$ and the individual suffers a self-change. This means that if the individual is sufficiently psychologically coherent (θ is high enough), he will keep his identity in all likelihood (the probability that he keeps his identity x, is equal to one), whereas if he is not sufficiently psychologically coherent, he will change his identity in all likelihood. If the latter case holds, a different norm becomes activated because the individual adopts a pro-environmental identity.

Keeping an identity or switching from a selfish to a pro-environmental self thus depends on the material payoffs that each self would receive in period 1, the cost of effort provision, the *warm glow* that a pro-environmental obtains from providing effort to the production of a public good, and the social disapproval that the individual experiences from being *inconsistent*.

From the individual's optimal belief of self-consistency expression the next comparative statics follow. Higher material payoffs for a pro-environmental self in period 1 increases the value of θ^*, i.e. $\frac{\partial \theta^*}{\partial \pi_{PE}^1} > 0$. As expected, higher material payoffs for a pro-environmental self increases the probability of switching a selfish identity in $t = 0$ for a pro-environmental one in $t = 1$. In turn, the

probability of identity switching decreases in period 1 if there are higher material payoffs for a selfish self, i.e. $\frac{\partial \theta^*}{\partial \pi_S^1} < 0$. A higher *warm glow* from the provision of the public good increases the probability of adopting a pro-environmental self in period 1 because it represents an increase in the total payoffs for an individual with such identity, i.e. $\frac{\partial \theta^*}{\partial \vartheta} > 0$. The cost of effort represents a burden on the individual for performing an action prescribed by a given identity. Thus, a higher cost of effort increases the probability of identity switching in period 1, i.e. $\frac{\partial \theta^*}{\partial c} > 0$. Finally, and as it was expected, higher social disapproval for being *inconsistent* deters the individual from self-changing, i.e. $\frac{\partial \theta^*}{\partial d} < 0$. The sign of all these derivatives (except the last two) would be reversed if the individual held a pro-environmental identity at $t = 0$ instead and he were to consider an identity change in $t = 1$ to a selfish self.

4. Identity selection under a monetary environmental policy

Now, it is the aim of this chapter to show that environmental policy can indirectly affect the activation of a particular social norm through a change in the identity of individuals. This self-change modifies the behavioural prescription of the individuals with the potential to ultimately affect their decision about the level of effort to be provided to the production of a public good. For this matter, this section focuses on economic incentives in the form of a monetary payment delivered to those individuals who provide effort in the production of the public good. In other words, the policy to be analyzed is a *Payment for*

Environmental Services (PES).

Under a PES, all individuals willing to provide effort to the production of a public good are rewarded with a monetary payment that increases their material payoffs. Notice that while a pro-environmental self already does it because it is his prescribed behaviour, a selfish self will also do it because his prescribed behaviour is to maximize his total payoffs. The monetary payment thus gives the selfish self the incentive to participate in the production of the public good by decreasing the relative cost of effort. Therefore, a PES increases the material payoffs of the individual regardless of which self he holds. However, the monetary payment has different effects for each self outside the material realm. Given that the behavioural prescription for a pro-environmental self is to provide effort to the production of the public good because it generates a *warm glow* for him, offering a reward for such behaviour with a monetary payment is understood as a cue that involves material aspects. In other words his "benevolence" has a price now. Thus, the monetary payment produces a cognitive distortion in the pro-environmental self that reduces his cognitive benefits from providing effort to the production of a good that will benefit other individuals.

Assume that a PES is enacted at $t = 1$. The total payoffs of individuals are modified in the following way:

$$U^1_{S_{PES}} = \pi^1_S(e) + \lambda_\pi(e) - c(e)$$

$$U^1_{PE_{PES}} = \pi^1_{PE}(e) + \lambda_\pi(e) + \vartheta(e) - \psi_\vartheta(e) - c(e)$$

Where λ_π represents the monetary payment offered by the PES and $\lambda_\pi > 0 \iff e > 0$. The negative effect on the *warm glow* that a pro-environmental self suffers from participating in the PES is denoted by ψ_ϑ, and $\psi_\vartheta > 0 \iff e > 0$. By assumption, the production of the public good increases when more effort

is provided, thus a higher monetary payment is received by such individual, i.e. $\frac{\partial \lambda_\pi}{\partial e} > 0$. Moreover, and precisely because higher effort entails a higher monetary payment, it also produces a higher negative cognitive effect for a pro-environmental self, i.e. $\frac{\partial \psi_\vartheta}{\partial e} > 0$.

Let us analyze what is the effect of a PES policy on the process of identity selection of the individual. Once more, the individual assesses his expected utility so as to select an adequate self under the current situation. Again he compares the payoffs he would get by being *consistent* with the payoffs he would get by being *inconsistent* under the PES scheme. Assume first that at $t = 0$ the individual holds a selfish identity. His expected utility is then:

$$EU_{PES} = x\theta \left(U^1_{S_{PES}|S^0} \right) + (1-x)(1-\theta) \left(U^1_{PE_{PES}|S^0} \right)$$

Making some substitutions the expression then becomes:

$$EU_{PES} = x\theta \left(\pi^1_S (e) + \lambda_\pi (e) - c(e) \right) +$$
$$(1-x)(1-\theta) \left(\pi^1_{PE} (e) + \lambda_\pi (e) + \vartheta (e) - \psi_\vartheta (e) - c(e) - d(e) \right)$$

The individual then maximizes his expected utility with respect to the objective probability of *self-consistency*, i.e.:$\underset{x}{max} EU_{PES}$.

The FOC of such problem is:

$$\theta \left(\pi^1_S (e) + \lambda_\pi (e) - c(e) \right) -$$
$$(1-\theta) \left(\pi^1_{PE} (e) + \lambda_\pi (e) + \vartheta (e) - \psi_\vartheta (e) - c(e) - d(e) \right) = 0$$

From here we arrive at the value of the individual's subjective belief for which he is indifferent to keep or change his identity under the PES policy:

$$\theta^*_{PES} \equiv \frac{\pi^1_{PE}(e)+\lambda_\pi(e)+\vartheta(e)-\psi_\vartheta(e)-c(e)-d(e)}{\pi^1_S(e)+\lambda_\pi(e)-c(e)+\pi^1_{PE}(e)+\lambda_\pi(e)+\vartheta(e)-\psi_\vartheta(e)-c(e)-d(e)}$$

Once more, if $\theta_{PES} > \theta^*_{PES} \Rightarrow x = 1$ and the individual is *consistent*. But if $\theta_{PES} < \theta^*_{PES} \Rightarrow x = 0$ and the individual suffers a self-change and becomes pro-environmental. Keeping and identity or switching from selfish to a pro-environmental self depends on the same parameters that were analyzed when no PES took place. Yet, there are two new terms in the expression shown above: the amount of the monetary payment delivered by the PES scheme λ_π and the negative effect on the *warm glow* ψ_ϑ produced by such payment.

With respect to the comparative statics, the next conditions still hold: $\frac{\partial\theta^*_{PES}}{\partial\pi^1_{PE}} > 0$, $\frac{\partial\theta^*_{PES}}{\partial\pi^1_S} < 0$, $\frac{\partial\theta^*_{PES}}{\partial\vartheta} > 0$, $\frac{\partial\theta^*_{PES}}{\partial c} > 0$, and $\frac{\partial\theta^*_{PES}}{\partial d} < 0$. But there are now two effects of interest: the material (λ_π) and cognitive (ψ_ϑ) impacts of the monetary payment from the PES on the probability of identity switching. The more effort is provided, the higher the monetary payment from PES will be because the production of the public good increases. An individual with a selfish identity does not care about such production and rather cares about maximizing the total payoffs he receives. But since higher effort provided means a higher monetary payment and thus higher total payoffs, he would be motivated by the PES to actually participate in the production of the public good. Then, $\frac{\partial\theta^*_{PES}}{\partial\lambda_\pi} < 0$, i.e. a higher monetary payment from PES increases the probability that a selfish identity will be maintained in $t = 1$. However, since more effort provided generates a higher monetary payment from PES, the cognitive negative effect is also higher, i.e. the *warm glow* obtained by helping others is somewhat decreased because the effort provided no longer represents and act of sheer benevolence, but rather an act motivated by the desire to increase own material payoffs. Then, $\frac{\partial\theta^*_{PES}}{\partial\psi_\vartheta} < 0$, i.e. the higher the cognitive negative effect from providing effort to the production of a public good for monetary reasons rather than *warm glow* alone, the higher the probability of *self-consistency* is.

Isolating the two effects from the monetary payment of the PES scheme, it can be observed that both work in the same direction. In other words, an individual with a selfish identity, *ceteris paribus*, will still be selfish in $t = 1$ when the PES scheme is in operation.

Now let us assume that at $t = 0$ the individual self is pro-environmental. His expected utility is then:

$$EU_{PES} = x\theta \left(U^1_{PE_{PES}|PE^0} \right) + (1-x)(1-\theta) \left(U^1_{S_{PES}|PE^0} \right)$$

Making some substitutions the expression then becomes:

$$\begin{aligned} EU_{PES} = x\theta \left(\pi^1_{PE}(e) + \lambda_\pi(e) + \vartheta(e) - \psi_\vartheta(e) - c(e) \right) + \\ (1-x)(1-\theta) \left(\pi^1_S(e) + \lambda_\pi(e) - c(e) - d(e) \right) \end{aligned}$$

The individual then maximizes his expected utility with respect to the objective probability of *self-consistency*, i.e.:$\underset{x}{max} EU_{PES}$.

The FOC of such problem is:

$$\begin{aligned} \theta \left(\pi^1_{PE}(e) + \lambda_\pi(e) + \vartheta(e) - \psi_\vartheta(e) - c(e) \right) - \\ (1-\theta) \left(\pi^1_S(e) + \lambda_\pi(e) - c(e) - d(e) \right) = 0 \end{aligned}$$

From here we arrive at the value of the individual's subjective belief for which he is indifferent to keep or change his identity under the PES policy:

$$\theta^*_{PES} \equiv \frac{\pi^1_S(e) + \lambda_\pi(e) - c(e) - d(e)}{\pi^1_{PE}(e) + \lambda_\pi(e) + \vartheta(e) - \psi_\vartheta(e) - c(e) + \pi^1_S(e) + \lambda_\pi(e) - c(e) - d(e)}$$

Once more, if $\theta_{PES} > \theta^*_{PES} \Rightarrow x = 1$ and the individual is *consistent*. But if $\theta_{PES} < \theta^*_{PES} \Rightarrow x = 0$ the social norm which prescribes environmentally friendly behaviour fails to be activated. Despite social disapproval, the individual suffers a self-change and adopts a selfish identity. Comparative statics now change slightly. We still have the same derivatives that prevailed when no PES took place: $\frac{\partial \theta^*_{PES}}{\partial \pi^1_S} > 0$, $\frac{\partial \theta^*_{PES}}{\partial \pi^1_{PE}} < 0$, $\frac{\partial \theta^*_{PES}}{\partial \vartheta} < 0$, $\frac{\partial \theta^*_{PES}}{\partial c} > 0$, and $\frac{\partial \theta^*_{PES}}{\partial d} < 0$. For the case of an individual with a selfish identity at $t = 0$ it was mentioned that the two effects of PES (the material (λ_π) and cognitive (ψ_ϑ) impacts of the monetary payment) on the probability of identity switching worked in the same direction and thus the individual kept his identity in $t = 1$. Regardless of the identity of the individual, more effort provided increases the production of the public good, and a higher monetary payment from PES is received. Since the pro-environmental self maximizes his total payoffs by increasing the production of the public good, he will receive a higher monetary payment from PES that will reinforce his motivation to produce the public good and further increase his total payoffs. This increases the probability that the individual remains *consistent* with respect to his identity selection at $t = 1$, i.e. $\frac{\partial \theta^*_{PES}}{\partial \lambda_\pi} < 0$. By nature of PES, more effort provided is rewarded with a higher monetary payment, which means the cognitive negative effect perceived by the individual is higher, or in other words, the *warm glow* obtained by helping others is somewhat decreased because such effort is associated to a monetary incentive. Then, $\frac{\partial \theta^*_{PES}}{\partial \psi_\vartheta} > 0$, i.e. the higher the cognitive negative effect from providing effort to the production of a public good for monetary reasons rather than *warm glow* alone, the higher the probability of self-change is. In this case, the two effects of the monetary payment of the PES scheme work in opposite direction. This means that an individual with a pro-environmental identity, *ceteris paribus*, will still be pro-environmental in $t = 1$ when the PES scheme is in operation

iff $\left|\frac{\partial\theta^*_{PES}}{\partial\lambda_\pi}\right| > \left|\frac{\partial\theta^*_{PES}}{\partial\psi_\vartheta}\right|$.[13] Yet, a PES will transform an individual's identity from pro-environmental to selfish *iff* $\left|\frac{\partial\theta^*_{PES}}{\partial\lambda_\pi}\right| < \left|\frac{\partial\theta^*_{PES}}{\partial\psi_\vartheta}\right| + \left|\frac{\partial\theta^*_{PES}}{\partial d}\right|$. In consequence, *ceteris paribus*, a PES scheme can produce a self-selection *inconsistency* only for those individuals whose identity's behavioural prescription is in conflict with the monetary payment from PES, i.e. for pro-environmental selves. The next section discusses when such scenario might happen and its consequences for environmental policy design.

5. Discussion

While the model presented in the last three sections is heavily influenced by Teraji's work (Teraji [47]), there are noticeable differences between them. For Teraji, the self-change experienced by the individuals is intentional. In fact, they need not remain the same because they possess optimistic self-views that improve their performance, thus developing different characteristics through time. In turn, the identity change represented here takes place because of situational factors (e.g. an environmental policy with a framing effect) that the individual does not control.[14]

In Teraji, there is a dual motivational drive for individual self-change: *self-enhacement* (the drive to convince ourselves that we are intrinsically worthwile) and *self-verification* (the drive to maintain a consistent and maybe negative view

[13] This expression already takes into account on the right hand side the effect of social disapproval. However it does not appear since the individual does not actually self-change. This means that $d=0$ and $\frac{\partial\theta^*_{PES}}{\partial d} = 0$.

[14] PES programmes are voluntary in nature. So, an individual can decide not to participate if it does not suit his interest, but he cannot determine the monetary component of the programme or the actual policy instrument to be used. In other words, he does not control the situational factors.

of ourselves).[15] The present model presumes that individuals would like to be *consistent* with their identity choice because adopting a new identity does not bring about self-enhancement (no identity is superior to another), but rather social disapproval. Thus, the motivational drive of individuals here is identity preservation and not quite self-verification as understood by Teraji because keeping the same identity in the model presented in the past three sections does not involve a negative or pessimistic self-perception of the individual.

Because of this negative connotation on self-verification, Teraji regards that those individuals unwilling to change (due to low self-confidence) may fail to reach optimal economic outcomes. In this model this is not entirely true. Without a PES, a selfish individual that remains selfish by period 1 diminishes the production of the public good and this might be considered not socially optimal, yet from his private standpoint it is. And if a pro-environmental individual keeps his identity, there will not be underprovision of the public good, which means that the outcome will not be suboptimal. Therefore, self-verification in the present model does not necessarily have a negative impact.

Finally, Teraji regards self-change as a positive outcome which can only bring about self-enhancement. The stance of this chapter is that self-change produced by environmental policy, apart from entailing social disapproval for the individual, might actually have negative behavioural, environmental, and social consequences.

Stets and Burke [44] argue that the self-verification process involves a comparison of the own perceptions of the identity in the current situation to the same perception held in the standard. If a discrepancy arises, then the process will resolve it by adapting behaviour to the standard or through a change of identity.

[15] Teraji's self-change mechanism relies on self-discrepancy theory because when faced to the decision of self-change, the individual compares his *actual* self to an *ideal* he would like to become.

The present model is in line with this idea. Once period 1 arrives, the individual undergoes a self-verification process in which he has to decide whether to keep the identity he held in period 0 or change it. It was shown that when the situational factors in the two periods remain unaltered (e.g. there is no policy intervention), it is likely that the individual will not experience any discrepancy by being consistent with his identity selection throughout the periods.

Yet, if an environmental policy is implemented and therefore the situational factors change, in this case by the introduction of a monetary payment (PES), those individuals who change their behaviour with respect to their identity's behavioural prescription because of the enforcement of the policy will experience social disapproval. In particular, selfish individuals remain selfish insofar as the payment does not interfere with their behavioural prescription, i.e. maximize total payoffs. On the contrary, the payment reinforces such prescription. Nevertheless, the payment symbolizes a different behavioural prescription for pro-environmental individuals. Thus, they could undergo a self-change process since they experience a discrepancy produced by the monetary payment. Because of this, they might find it worthwile to change their identity.

Notice that despite there is a possibility of self-change in $t = 1$ for those individuals who were pro-environmental at $t = 0$, there will not be a change in the level of effort that they provide to the production of the public good when the environmental policy (PES) takes place. In that respect thus, there is no crowding-out in this model. While this is good news from the policymaker standpoint, the induced identity change may still present adverse consequences in two different ways. First, if the PES no longer takes place in the future and the identity of the pro-environmental individual has switched to a selfish one, the level of effort devoted to the production of the public good will diminish because the social norm will no longer become activated (given that selfish selves

preserve their identity). Second, the identity change may have a spillover effect (Frey and Stutzer [22]) on other aspects related to cooperative and environmental behaviour, e.g. it is unlikely that selfish selves would engage in recycling activities or sacrifice money in order to save the environment by being willing to pay higher taxes to prevent an environmental damage.

It can be argued that the first of these consequences is not a real concern as long as the PES can be sustained. The problem is precisely that, particulary in developing countries. Instead of being established as a market, PES has appeared in such countries as a public policy where the government acts as the manager of the payment for environmental services, linking supply and demand for these services. In terms of enforcement this is a good strategy when it is both difficult to define the environmental service to be sold and identify the consumers for such service. However, in terms of sustainability it is not ideal since the enforcement of the PES relies on the political agenda of the government. Then, an identity change originated by the environmental policy might actually activate a different norm with unwanted consequences if the PES ceases to be enforced.

Even if the PES is established without government participation and becomes a full-fledged market, the identity change produced by it will have adverse consequences on the cooperative behaviour of the targeted individuals. This is specially true if there is a relatively strong correlation of environmental behaviour across different spheres, e.g. environmental services provision, recycling, water pollution, biodiversity protection, etc.[16] The identity change produced by the PES activates a set of selfish prescriptions such that if the individual was once willing to provide an environmental service for free out of

[16]There are studies that find a strong correlation across different environmental responsible behaviours and there are others which find no correlation at all. Thøgersen [50] discusses those studies and provides evidence that individuals have consistent behavioural patterns in the environmental field. While he claims that the spillover is more likely when personal norms are activated, he recognizes that social norms may also have influence on such process.

the *warm glow* he derived from helping others, he would sell it now for a monetary reward. Likewise, he would expect now a monetary reward for undertaking similar activities that involve a cooperative or pro-environmental behaviour like recycling, biodiversity protection, reduction of water use or green consumption.

A final caveat with respect to the effects of the PES on the individuals' self-selection process is the following. Suppose the PES was established as a market without government intervention such that it could be sustained through time. The policymaker could then argue that despite it introduces and identity switch, the environmental behaviour addressed by the PES would be continuously fostered because there is a sustainable monetary incentive. However, there is still a tradeoff present here: environmental protection at the price of a given identity. Some ancient cultures possess an identity which dictates a protection of their natural resources and their environment.[17] It is true that most population of such cultures lives in poverty conditions and that a monetary payment for environmental protection would represent a good source of income for them. But such payment would alter their behavioural prescriptions and ultimately transform their identity.[18] Therefore, the PES must be gradually implemented and adapted to their social schemes and traditions.

A PES certainly has the potential to bring about environmental protection,

[17]Some of these cultures are: Chinantecos in Northern Oaxaca, Mexico; Embera, Wainan, and Kuna in the *Darien* Biosphere Reserve, Panama; Cabecar, Bribi, Teribe and Guaymi in *La Amistad* Bioshpere Reserve, Costa Rica and Panama; Miskito, Paya and Garifunos in *Río Plátano* Biosphere Reserve, Honduras; Chenchu, Konda Savara, and Khond in Andhra Pradesh, India; and Thai, Hmong, and Kinh in Lai Chau and So La, Vietnam.

[18]Many of these cultures' identity is closely related to the physical characteristics of their habitats. Thus, they do not only have a positive emotional bond with the place they live in, they also possess a "sense of self" that stems from their surroundings. In other words, the individuals of such ancient cultures understand who they are because of their habitat. Such "sense of belongingness" is denominated as "sense of place" in the environmental psychology literature. The negative effects a situational cue such as a PES can pose on the individuals' identity can also produce a transformation of such "sense of place". This is because individuals with a "sense of place" most likely hold a pro-environmental identity rather than a selfish one, otherwise they would not be interested in contributing to the environmental protection of their habitat. Hence, a PES could bring about a self-change in those individuals and a detrimental effect on their contributions to the preservation of the physical characteristics of their habitat, consequently affecting their "sense of place".

but the results of this chapter give way to two important questions: Given its effects on identity selection, can the policymaker estimate the ultimate effect on social welfare of the PES? A relatively good proxy for the payment for environmental services provision is the opportunity cost of land use, what would be the payment a community should receive in order to transform their identity?

Conclusion

The study of social norms activation is crucial to analyze environmental degradation problems since social norms can trigger cooperation in social dilemmas. Self-selection processes as mechanisms for social norms activation have been neglected in the literature despite the fact it is acknowledged that a particular identity dictates a behavioural prescription for specific situational contexts.

The selection of a selfish or pro-environmental identity is influenced by situational factors such as the benefits and costs of performing a given behaviour, the *warm glow* of contributing to a public good, and the social disapproval from adopting a behaviour different to the one originally prescribed. Without any exogenous intervention, individuals are expected to undergo a self-verification process and keep their identity. However, if a monetary payment is offered as a reward to the provision of an environmental service, the probability of self-verification is reduced for those individuals who experience a discrepancy between their prescribed behaviour and their behaviour under the new situational factors. In fact, if the *warm glow* of those individuals is severely affected by the the perception of a monetary payment and despite suffering social disapproval, they will change their identity.

The policy implications of the model are straightforward. A monetary re-

ward increases the provision of environmental services regardless of the identity the targeted individuals hold. However, it might end up inducing a selfish transformation for those individuals with prior pro-environmental inclination. Hence, if the policy depends on the political agenda of the government at office and cannot be sustained or if the environmental behaviour of individuals is correlated across different spheres, selfish prescriptions will dictate their post-policy behaviour, thus creating a negative spillover effect.

The model presented in this chapter suggests a new research agenda for social norm activation. Future empirical work should analyze the effects of a PES programme on the identity selection process of individuals and its effects on environmental behaviour. A possible study consists in the natural experiment provided by the Chinanteco communities in Northern Oaxaca. Some of those communities are currently participating in a PES scheme administered by the Mexican government while others are not. However, those not participating can constitute a good control group which possess the exact same characteristics of those communities that are actually receiving the payment.

The spillover effect produced by the monetary payment could also be tested. The Chinantecos have a form of community service denominated *tequio*. Under this institution, all members of the community are obliged to provide labour for maintenance of roads, public buildings and communal pastures. The policy implications of the identity selection model would predict that those Chinantecos exposed to the payment for environmental services probably underwent a self-change. Hence, the amount of time they devote to *tequio* activities should be considerably lower to the time that Chinantecos not exposed to PES devote.

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Conclusion

The thesis consists of three self-contained studies. These are (i) Payments for Environmental Services and motivation crowding-out: A Psychological Games approach, (ii) This land is your land, this land is my land: The environmental behaviour of native-born and immigrants and (iii) Identity selection and the activation of pro-environmental behaviour. Here, conclusions and implications of each chapter and conclusions of the thesis are addressed.

In Chapter 1 it was argued that the social production of an environmental protection motivation and its erosion originated by monetary incentives could not be represented by behavioural models based on self-interest, kindness (reciprocity) or inequity aversion. Instead, it is best described by the altruistic-sacrifice of individuals which leads them to exchange personal material gains for a social benefit. Without external intervention, such social benefit is delivered by the provision of an environmental service, if and only if individuals believe their altruistic-sacrifice is reciprocated. However, no formation of such motivation is possible for those individuals who believe otherwise.

External intervention in the form of a PES produces a distortion in the beliefs held by individuals regarding others' altruistic-sacrifice, and despite their willingness to contribute their endowment to the provision of the environmental service, such altruistic-sacrifice is deemed as inexistent. In other words, their environmental protection motivation is deterred by PES programmes, i.e. they become a disease. Yet, the provision of the environmental service is viable as long as the transaction costs from participation in such incentive-based scheme

are low enough and if the monetary payment is available to all individuals. Then PES become a temporary cure.

In general, the perception of individuals about the others' altruistic-sacrifice is not distorted exclusively by PES. Any external imposition that overlooks the individuals' beliefs and which changes their social interaction will produce such distortion. In that respect, it is appealing to experiment with inclusive measures such as grassroots participation schemes, and explore alternative designs of PES programmes which might include a non-monetary component that reinforces the perception of sacrifice of all participants and operate as a long-lasting cure.

The notion of the altruistic-sacrifice in the environmental services provision decision-making of individuals generalizes the cognitive processes between individuals and their physical surroundings. An individual's "sense of place" can be constructed through the sacrifice of personal gains in benefit of others, and the identification and attachment that he has with respect to a specific place might be lost or reduced to a commodity by intrusive environmental policies. So, the modification (or even destruction) of a pro-environmental motivation like "sense of place" is generalized by the present framework.

Chapter 1 is only the first part of a more ambitious research agenda on natural resources management which tries to elucidate the motives for cooperation among individuals in order to provide environmental services and explain the mechanism through which such motivation can be destroyed or altered by environmental policy. Therefore, future research could be conducted along the following line.

Empirical evidence about the validity of the present model's predictions is pending to show the actual effects of incentive-based policies in developing countries, particularly of PES programmes in vulnerable communities which are endowed with key natural resources and whose management is governed by

socially produced environmental protection motivations. Two potential candidates for such assessment are Mexico's PSAH and the *Scolel Té* project. The former is the largest PES in Mexico and consists in a pure monetary scheme (direct cash transfer to the landowners), while the latter resembles a dual incentive PES that increases the participation of individuals in the environmental services provision decision-making process and delivers a payment in recognition for such service. Hence, the empirical research will consist in a frame field experiment that will test some of the propositions produced by Chapter 1. In particular, it will test differences between the motivation crowding-out produced by pure monetary incentives and the one produced by a policy mix. Furthermore, it will test what happens to the motivation of individuals who do not receive a monetary compensation for their efforts to provide environmental services while others do.

In Chapter 2, it was claimed that immigrants have been traditionally regarded as a burden by the host countries' governments in a wide variety of issues. Yet, such negative connotation seems to be politically charged insofar as there is strong evidence that their flow into host countries do not necessarily entail negative impacts. That is also true with respect to environmental degradation issues.

Chapter 2 analyzed a sample of the World Values Survey dataset to shed light on the debate about whether governments of recipient countries should be threatened by immigration on environmental grounds. In that respect, Chapter 2 showed the New Environmental Paradigm predictions do not hold inasmuch as there are robust differences in immigrant/native-born environmental behaviour. Therefore, claims that maintain immigration into an environmentally unfriendly society such as the U.S. would increase environmental degradation are not supported by the empirical results. Since immigrants display higher engagement

in environmentally friendly behaviours such as choosing better products for the environment, recycling, and reducing water consumption, a greater flow of immigrants into the host country might actually have a positive impact on the protection of the environment. In fact, while residents in North America do have weaker pro-environmental attitudes if compared to residents from any other region of the world, North American native-born and resident immigrants engage more in pro-environmental action.

Although it cannot be fully discarded, the results do not suggest that immigrants display stronger engagement in pro-environmental behaviour than native-born because of higher environmental awareness produced by previous exposure to environmental problems in their source countries. They do not suggest either that the individuals' community attachment and national identification (i.e. their "sense of belongingness" or "sense of place") explain differences in environmental behaviour. Rather, they suggest that a "modified" Post-Materialistic Hypothesis holds. A certain profile of immigrant engages more than native-born in pro-environmental behaviour: educated and of relatively high income, mostly not from Europe, Latin America or Oceania, with preferences oriented towards "protecting nature" as opposed to "economic growth", who are also relatively old and women, empowered and with social capital.

The policy implications are straightforward: restrictive immigration policies should not be based on threats of negative environmental impacts for the host country; and national environmental policy should be group-targeted, given that native-born and short and long residence immigrants do not have the same probability to actually engage or display willingness to perform an environmentally friendly behaviour. However, there biggest challenge for the policymaker is to transform the native-born and immigrants' willingness to sacrifice money in order to save the environment into actual engagement.

There is ample room for further research in the topic. First, the results of this chapter are driven by a dataset which considers highly educated and high income immigrants. Thus, further research with a dataset which includes more information about low-skilled immigrants could be conducted. Second, although the present work controls the influence that the region source of the immigrant has on his pro-environmental attitudes and pro-environmental behaviour, an extension to this chapter might try to establish if the results would hold controlling for the source country of immigrants. Is there an influence on the immigrant's environmental behaviour driven by specific cultural traits? If so, immigration policy based on environmental impacts would likely become country-selective. Third, the analysis of the individuals' development of a "sense of belongingness" or "sense of place" for the host country will provide a better understanding of why an "environmental acculturation process" does not take place. Finally, the environmental behaviour of second generation immigrants deserves attention. Unfortunately, the WVS dataset does not contain enough information to carry it out at the moment. But their apparent weak environmental behaviour raises some questions: is it related to the fact they simultaneously do not identify either with their immigrant parents' culture or the host country's culture? A careful analysis of such topic is determinant to assess the long-run effects of immigration on the host country's environment.

In Chapter 3, it was sustained that the study of social norms activation is crucial to analyze environmental degradation problems since social norms can trigger cooperation in social dilemmas. Self-selection processes as mechanisms for social norms activation have been neglected in the literature despite the fact it is acknowledged that a particular identity dictates a behavioural prescription for specific situational contexts.

The identity selection model presented in Chapter 3 is more suitable to ana-

lyze social norms activation failure than other self-verification models because of two reasons. First, the self-change experienced by the individuals is not intentional; it rather takes place because of situational factors (e.g. an environmental policy with a framing effect) that the individual does not control. Monetary environmental policies like PES programmes are voluntary in nature. So, an individual can decide not to participate if it does not suit his interest, but he cannot determine the monetary component of the programme or even the actual policy instrument. In other words, he does not control the situational factors. Second, the model presented in Chapter 3 does not impose a dual motivational drive for individual self-change: *self-enhacement* (the drive to convince ourselves that we are intrinsically worthwile) and *self-verification* (the drive to maintain a consistent and maybe negative view of ourselves). Rather, the model presumes that individuals would prefer to be consistent with their identity choice because adopting a new identity does not bring about self-enhancement (no identity is superior to another), but rather social disapproval and negative environmental consequences.

The selection of a selfish or pro-environmental identity is influenced by situational factors such as the benefits and costs of performing a given behaviour, the *warm glow* of contributing to a public good, and the social disapproval from adopting a behaviour different to the one originally prescribed. Without any exogenous intervention, individuals are expected to undergo a self-verification process and keep their identity. However, if a monetary payment is offered as a reward to the provision of an environmental service, an asymmetry is introduced in the self-selection process: selfish individuals remain selfish insofar as the payment does not interfere with their behavioural prescription, i.e. maximize total payoffs. On the contrary, the payment reinforces such prescription. But the probability of self-verification is reduced for pro-environmental selves who ex-

perience a discrepancy between their prescribed behaviour and their behaviour under the new situational factors. In fact, if the *warm glow* of those individuals is severely affected by the the perception of a monetary payment and despite suffering social disapproval, they will change their identity. Notice that even when there is a possibility of self-change in period 1 for those individuals who were pro-environmental at period 0, there will not be a change in the level of effort that they provide to the production of the public good when the environmental policy (PES) takes place. In that respect there is no crowding-out in this model.

The policy implications of the model are straightforward. A monetary reward increases the provision of environmental services regardless of the identity the targeted individuals hold. However, it might end up inducing a selfish transformation for those individuals with prior pro-environmental inclination. Hence, if the policy depends on the political agenda of the government at office and cannot be sustained or if the environmental behaviour of individuals is correlated across different spheres, selfish prescriptions will dictate their post-policy behaviour, thus creating a negative spillover effect. But even if a PES is established as a market without government intervention such that it could be sustained through time, there is still a tradeoff present here: environmental protection at the price of a given identity. Some ancient cultures possess an identity which dictates a protection of their natural resources and their environment and which is closely related to the physical characteristics of their habitats. The negative effects of a situational cue such as a PES extend thus to the transformation of their "sense of belongingness" or "sense of place".

The model presented in Chapter 3 suggests a new research agenda for social norm activation. Future empirical work should analyze the effects of a PES programme on the identity selection process of individuals and its effects on

environmental behaviour. A possible study consists in the natural experiment provided by the Chinanteco communities in Northern Oaxaca. Some of those communities are currently participating in a PES scheme administered by the Mexican government while others are not. However, those not participating can constitute a good control group which possess the exact same characteristics of those communities that are actually receiving the payment.

The spillover effect produced by the monetary payment could also be tested. The Chinantecos have a form of community service denominated *tequio*. Under this institution, all members of the community are obliged to provide labour for maintenance of roads, public buildings and communal pastures. The policy implications of the identity selection model would predict that those Chinantecos exposed to the payment for environmental services probably underwent a self-change. Hence, the amount of time they devote to *tequio* activities should be considerably lower to the time that Chinantecos not exposed to PES devote.

To conclude, the thesis has considered three important issues of interest to economists in the behavioural and environmental spheres. These are (i) motivation crowding-out, (ii) immigrant/native-born environmental behaviour differences, and (iii) pro-environmental behaviour activation failure. Additionally, a secondary objective of the thesis has been to include the study of the individuals' "sense of belongingness" or "sense of place" into the discussion of environmental problems within the Economics realm. It stands as a central element in the analysis of environmentally friendly behaviour that, so far, has only been seriously considered in other disciplines such as Environmental and Social Psychology, and Geography. These three issues (four with the inclusion of "sense of place") have strong implications for the current worldwide (and life-threatening) environmental degradation problematic. Leaving aside the U.S., bigger efforts to tackle environmental resources depletion and global warming have been car-

ried out by the international community under the United Nations Framework Convention on Climate Change through the Kyoto Protocol. Yet, a deeper understanding of the elements of environmental services provision involves more interest and research in: the mechanism through which pro-environmental behaviour becomes activated in the first place; the elements that determine the probability of engagement in environmentally friendly behaviour of individuals in a culturally-diversified society; the process through which environmental policy might destroy the individuals' willingness to protect the environment; and the process of creation, evolution and erosion of the individuals' "sense of belongingness" or "sense of place". Environmental policies which take such themes into account are more likely to be successful and avoid the imposition of additional social costs to the society.