

Economics and duty-motivated choices

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Abstract

We study the relationship between economics and duties, the latter considered as deep, intrinsic moral obligations that motivate individuals. We first define duty in a way that could be amenable to work within the tools of decision theory, distinguishing between perfect and imperfect duty-motivated choices. Finally, we apply standard decision theory to assess how duties relate to economics, particularly to rationality. Three main findings emerge. One, perfect duty-motivated choice is rational. Two, when imperfect duty is at play, rationality conditions can be violated. Third, by making use of the difference between two representations of the maximisation problem - the relational and the real valued utility function - we show that individuals motivated by duty can choose a maximal while optimising their preference rankings; instead, maximisation of utility may not be possible under duty-motivated choices that supervene the local non satiation assumption.

Keywords: duties, decision theory, rationality, maximisation, optimisation.

JEL codes: B49, D01, D60, D91

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1 Introduction

Human beings appear to undertake actions and make choices based on the sense of duty and not solely because of the benefits that can be derived from their outcome. There are examples of this in many areas and types of activities, for instance, in the way individuals opt for one action over another on the basis of professional integrity and duty towards the institution they belong to. Problems of conscience are important to people, if not as important as those associated with the full realisation of an outcome. Perhaps most famous is the duty to vote at political elections, even when the influence on the outcome is minuscule. We can also think of the decision to eat a vegetarian diet as being solely on the basis of the duty held towards the environment, despite the enjoyment one may have from eating meat. The nature of this kind of decision might not be straightforward but, on the contrary, complex, necessitating consideration of dilemmas, conflicting judgements and the use of conscious mental activity and reasoning.

Individuals and societies more widely face various issues that appear to have a cogent rationale for considering the relationship between duties and economics and, by doing so, enlarge the scope and utility of economics: climate change and the responsibility towards future generations is certainly one important example. The current Covid-19 health pandemic has also been strongly associated with duty-motivated choices in more than one way: whether watching or reading the news on the web or in newspapers, references to people's sense of duty and responsibility have been abundant. Most Governments of countries affected by the pandemic have continuously referred to and explicitly relied on people's sense of responsibility to stay at home, to their civic duty to stay alert and to help with the effort to save the national health service. Similarly, the sense of duty has also been used to explain and applaud the incredible effort of so-called key workers, whether in the hospitals, in cleaning streets and collecting garbage and in the delivery of essential items and food. Perhaps more surprisingly, an implicit reference to the sense of duty can be discerned in an answer from the newly appointed Governor of the Bank of England to a question from a BBC journalist: "anybody who says, I can make a load of money by shorting, which might not be frankly in the interest of the economy, the interest of the people, just *stop doing* what you're doing".¹

Duties are often considered alongside rights; indeed, in legal and judicial reasoning, rights and duties have a relationship as both opposites and correlatives (Hohfeld, 1913). In this respect, rights are thought as embracing whatever may be lawfully claimed, that which a man is entitled to have, or to do, or to receive from others within the limits prescribed by the law. Duty, or legal obligation, is that which one ought or ought not to do, as concretely established in law: for instance the duty to respect what is established in contract. This perhaps helps to understand why there has been a much closer relationship between economics and rights than between economics and duties: rights have long been considered in economics, as evident when thinking of the essential market mechanism of exchange. Key related economic concepts, such as contracts and endowments involve specific types of rights. Perhaps more profoundly, rights have been key components of

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very important theories of justice, such as in Rawls (2009), in Sen's capability approach and the related concept of substantive freedom (Sen, 2009), and of course in theorists influenced by libertarian views such as Hayek, Nozick, Friedman, Buchanan and Sugden, who have all greatly influenced welfare economics.²

What about duties? How do duties relate to economics? Do duties matter to people? Do they inform people's decision-making? And if so, what does that mean for economics? Would duty-motivated choices impinge on economics? If so, in what ways? Or can economics' typical flexibility incorporate and account for duty-based action? If so, in what ways? Would that be at the expense of major losses in terms of the ability to explain important phenomena, or gains in such an ability but losses in terms of formal tractability? Would standard assumptions be still valid when considering duty-motivated choices? In this paper, we attempt to answer these questions.

However, this attempt would be hampered from the outset if the "field of investigation" were kept so wide open. Indeed, it is essential to make an effort to clarify and specify more rigorously both sides of the research question: on one side, what do we mean by duty-motivated action?³ On the other side: what do we mean by relationship to economics, this being a tall tree with many branches?

Therefore, we will take some time to define duty-motivated choices: this requires a clear idea of what we mean by it, which will have to be informed by a solid understanding of the ways economists have potentially dealt with it or with similar concepts. A short historical journey to provide a profile of key approaches in economic thoughts is necessary, which is also linked to the other side of the question. In fact, even though economics is a tree with many branches, perhaps the main core trunk all of them share are assumptions on what motivates human decision-making. Decision theory, the reasoning underlying people's choices, will therefore be the main area of economics we will be looking at. This is strictly linked to the concept of rationality in economics.

Some of the earlier points in this introduction might have offered a glimpse into what we mean by duty-motivated choice. Before starting with the substantial effort of defining duty-motivated choice, at this point we want to clarify that our concern is not with legal duties, or with obligations that are commanded by an authority. We are concerned with duties as *moral* obligations to something or someone, imposed by our own conscience. We will explore how this is related to but is not the same as altruism, in the way the latter is generally considered in economics; we will also point to the binding nature of duty-motivated action,⁴ and its relationship to other concepts.

The aim of the next two sections is to first seek help from the history of economic thought, alongside some key ideas from philosophy (in Section 2) so to crystallize the key dimensions of a definition of duty (in Section 3). We then examine the definition of duty-motivated choice through the lens of rationality of decision making in economics (in Section 4). We then draw the main conclusions and discuss some of the most relevant issues we have encountered during

²Development economics has also strongly engaged with the idea of sustainable development, which is itself strongly informed by economic, social and political rights.

³We are using the terms action and choices interchangeably.

⁴Duty from Greek *deon*, meaning that which is binding..... ought to...

this assessment of the relationship between duties and economics, particularly those that we feel deserve more research (in Section 5).

We draw three main conclusions. One, we find that perfect duty-motivated choice is rational. Two, when imperfect duty is at play, rationality conditions can be violated. Third, we show that individuals, motivated by duty, can still be rational and choose a maximal while optimising their preference rankings, while maximisation of utility may not be possible under duty-motivated choices that supervene the local non satiation assumption. This latter result relies on the subtle but important difference between the two representations of the maximisation problem: the relational one and that based on the real valued utility function.

2 Economics, human motivation and sense of duty

2.1 Diverse human motivations

Although the approach that identifies self-interest as the only motivation behind individual decisions is predominant in economics, the history of economic thought shows, without any doubt, that economics has not fully rejected the fact that agents are moved by other and diverse motivations.⁵ Adam Smith's invisible hand, and the associated idea that individuals frequently promote the good of society when motivated by pursuing their own self-interest, has offered one of the foundation pillars of what *should* represent an economic efficient motivation, as exemplified in the fundamental theorems of welfare economics. But the author himself was very explicit on the role that moral sentiments *do* play in motivating people's behaviours. In the *Theory of Moral Sentiments*, Smith discusses prudence, sympathy, public spirit and generosity, the latter being characterised as self-sacrifice. He also points to the role of general rules in individual's behaviours, particularly when informing actions that are to be avoided (Smith, 2010).⁶ The first ever chair in Economics and near contemporary to Smith, Antonio Genovesi, with his conception of civil economy, underlined the importance of *fides*, "a cord which ties and joins, a bond that unites families fuelled by the principle of reciprocity and therefore by the market, an economic institution practicing reciprocal assistance" (Screpanti and Zamagni, 2005; Pabst, 2018). While Bentham's utilitarianism emphasised that happiness as a primary aim of existence produces egoistic men (Bentham, 1996), Spencer's exploration of individualistic moral philosophy recognised that the happiness of individuals are to be achieved in part by their pursuit of the general happiness (Spencer, 1892). John Stuart Mill's *Utilitarianism* is particularly relevant to our focus on duty-motivated action, in the way he proposed that the *right* action is the *best* available

⁵The aim of this section is not to provide a comprehensive discussion of how various schools of thought in economics have considered human motivation, but rather to offer a brief outline that touches on the most salient ones so to help us to define duty-based action.

⁶The idea that general welfare emerges from the pursuit of self-interest of individuals can be traced much earlier than Smith; it was also remarked by Anonimus Jamblichi in 450 B.C., in reference to the merchants' activity that caused Greek wealth and a general system of welfare; by the roman Seneca in *De Beneficiis* in reference to merchants producing good results without having it as a purpose; by the German Fronsberger in *The Praise of self-interest* in reference to farmers, merchants and artisans who, while busy in the pursuit of their self-interest, create public order and well being in the general interest (Sacco, 1996).

action and comes in degrees, depending on proximity to the best (Mill, 1895). The key authors of the marginal revolution were also keen on the possible underpinnings of individuals' decision making. For instance, Francis Edgeworth stated that the first principle of economics is that every agent is actuated only by self-interest, though he also acknowledged that it was not a very realistic principle.⁷

What Amartya Sen defines as the two origins of economics, one ethics-based and the other engineering-based (Sen, 1987), had both become fully cogent by the 1930. However, an important watershed was represented by the establishment of rational choice theory approaches that aimed to develop a theory of consumer demand "free from the vestigial traces of utility concept" (Samuelson, 1938). This approach, heavily linked to positive economics, has diminished, if not rejected, the remit of normative analysis.⁸ But normative approaches never fully disappeared, nor could they, given the nature of economics: in particular, welfare economics, including the new welfare economics, remained somewhat fertile grounds for normative analyses. Indeed, Kenneth Arrow, possibly the most prominent welfare economics scholar, placed great emphasis on the importance of obligations and responsibilities in his work on social choice, general equilibrium and, of course, moral hazard (Cato and Lutz, 2018). It is also illuminating to see that the title of one his most important books is "Social Choice and Individual *Values*" (italics mine), perhaps to distinguish it neatly from individual preferences, although a key contribution of the book was exactly associated with the problems of aggregating individual preferences into social choices (Arrow, 2012).

Three major, and more recent, arguments against the self-interest assumption of standard economics are those from Amartya Sen, Elinor Ostrom and behavioural economics. Sen attacks the meaning of rationality of the standard self-interested motivation by making use of the concept of commitment. Ostrom provides a strong rationale for the emergence of co-operative behaviours and behavioural economics provides substantial evidence that individuals behave altruistically or possess a sense of justice.

Sen introduced the concept of commitment in a 1977 seminal paper (Sen, 1977).⁹ It is worth spending some time on Sen's work on commitment as it captures various aspects that are similar to the concept of duty and, therefore, helps us to define duty-motivated choice for the purposes of this paper.¹⁰ Sen originally defines commitment while considering it against sympathy, this representing a case in which the concern for others directly affects one's own welfare, that is an externality. Commitment, instead, involves counter preferential choice; it involves "an action that yields a lower expected welfare than an alternative available action". Consequently, it drives a wedge between choice and welfare. Sen refined his work on commitment and the

⁷As Collard (1975) reminds us, Edgeworth, in his *Mathematical Psychics*, stated that "the concrete 19th century man is for the most part an impure egoist, a mixed utilitarian" (Edgeworth, 1881).

⁸This is not to say that major contributors to positive analyses, such as for instance Samuelson, argued that human beings are solely motivated by self-interest or that deviations from narrow self-interest are, as in Stigler (1981), "limited and confined to one's family and a close circle of friends".

⁹Although the concept was introduced in the 1977 paper, Sen's interest in the limits of individual rational choice in economics can be traced back to his 1973 paper in *Economica* (Sen, 1973).

¹⁰Sen states that "ethics is somehow mixed up with the idea of commitment" (Sen, 2005).

implications for rationality in other seminal papers later on, by introducing the distinction between self-centred welfare, self-welfare goal and self-goal choice. Commitment-based action is non egoistic; individuals are ready to act not because they personally feel worse-off (or better-off). For instance, while it does not respect self-centred welfare, altruistic behaviour is still selfish when considered against the other two dimensions. Behaviour based on commitment, instead, sets limits to self-goal choice, the action and choice being one whose goal is not to maximise own welfare.¹¹

An important line of research by [Ostrom \(1990\)](#) underlines the role of co-operative behaviour as a way to avoid or solve the tragedy of the commons, an antagonism between the *me* and *us*. As morality is often associated with a willingness to put *us* ahead of *me*, it can be thought of as a solution to the problem of cooperation and a way of averting the tragedy of the commons. The root of cooperative behaviours in Ostrom's analyses is not altruism or other-regarding considerations but solidarity, a recognition that individuals are part of a unity (a community, group etc.): we cooperate because it is beneficial to each one and not because we care about others.¹²

Research from behavioural economists has powerfully shown that people's behaviours in various decision making situations does not follow the predictions of standard economic models. The challenge to the rational choice model comes from various anomalies that have been demonstrated to underline human actions in many circumstances.¹³ Making use of four main types of experiments, researchers have shown that individuals are moved to act on the basis of other-regarding considerations, such as in the case of sympathy, altruism and fairness. For instance, this is particularly evident in prisoner's dilemma type of games, in which it is shown that altruism leads to a better outcome than non-altruistic behaviour, whereby players maximise their own utility while taking into direct account the utility of other players. Similarly, in public good games, where players decide how much of their own money to put into a public pot, the aggregate payoff is maximised with full cooperation even though free-riding would represent the dominant strategy.

2.2 Sense of duty and economics

The historical profile in the previous section has shown that economics, despite its strong reliance on a self-centred welfare motivation of human action, has not hidden away from the acceptance of wider motivations of people's actions. The most widely adopted form of acceptance has certainly been that of enlarging own welfare to include other-regarding considerations, but always within a framework that is aimed to maximise personal welfare, which simply becomes more sympathetic of others. This could be in the form of an externality, or in a utility function that includes other

¹¹Sen's work on commitment, introduced in 1977, was developed later on in other papers, which are part now of the collection of essays in both *Choice, Welfare and Measurement* ([Sen, 1997a](#)) and *Rationality and Freedom* ([Sen, 2004](#)). However, it is unfortunate that the concept received only limited consideration in economics, most of the debate having happened within philosophy. The concept has more recently received increased attention, as for instance in [Peacock \(2019\)](#) and [Osmani \(2019\)](#).

¹²Section 3 will explore this line of argument further, particularly from the perspective of the psychology and neuroscience of moral judgements.

¹³A summary of these can be found in [Thaler and Ganser \(2015\)](#); [Rabin \(1998, 2006\)](#); [DellaVigna \(2009\)](#)

individuals' welfare objectives, or social preferences, as in many behavioral experiments. What has received much less attention, instead, is consideration of ethical behaviour, such as that resulting in duty-motivated choices. In fact, it is important to emphasise that social preference models in economics are *inherently* consequentialist: agents evaluate potential actions according to their expected outcomes.¹⁴ How consideration of decisions based on the sense of duty differs from, and relates to, standard behavioural assumptions in economics and the deviations we have briefly looked at above, will depend on how we define duty-motivated action more specifically. We will do this in detail later on. However, one key implication that arises from considering duty-motivated choices is that they transcend welfare maximisation altogether and would potentially require modelling of counter-preferential choices. Sen's concept of commitment is the one that comes closer to it.

However, before proceeding with a discussion of the literature that more specifically focuses on ethical behaviours and moral obligations, it will help to make a brief incursion into philosophy. Duties have in fact been the subject of immense focus in moral philosophy, both in the West and East, detailed consideration of which is beyond the scope of this paper. However, we cannot proceed without considering the work of Kant, the philosopher whose work on morals has been linked to the concept of duties possibly more than any other. Particularly important here is his distinction between perfect and imperfect duties. Kant is perhaps best known for the categorical imperative, a rule used to judge plans of actions. Duties are based on the categorical imperative. There are three formulations of the categorical imperative: (i) the Respect for the Dignity of the Person: "act in such a way that you treat humanity always at the same time as an end and never simply as a means"; (ii) the Universal Law: "act according to the maxim whereby you can at the same time will that it should become a universal law"; (iii) the Legislation for a Moral Community: "act as if your maxims were to serve at the same time as a universal law". These derive from pure reasoning alone and must be followed, no matter the consequences: the consequences of actions for the person do not determine their moral status as duties. Kant distinguished between perfect and imperfect duties. The former *must* be followed and permits no exception in the interest of inclination while, in the case of imperfect duties, agents have some latitudes in executing; imperfect duties should be pursued when doing so would not lead to excessive hardship or sacrifice.¹⁵

Kant's ethics is an ideal platform to introduce the work of economists interested in the moral motivations underlying people's actions and the need for economics to recognise it.¹⁶ Amitai Etzioni is one of these scholars. Following Kant, he considered the person not as a unified bundle of desires but as having a divided self, one part standing over the other. This justifies a multiple utility conception and the need to distinguish interests which generate *pleasure utility* from ideal

¹⁴This is not to say that duty-motivated action is *inherently* non-consequentialist.

¹⁵"How far should one expend one's resources in practicing beneficence? Surely not to the extent that he himself would finally come to need the beneficence of others"(Kant, 1996)

¹⁶We abstract from the substantial discussion on the wider relationship between social sciences, capitalism, markets and morality, which would require a much more extensive analysis than it is possible here. We therefore focus on research that considered a more specific and narrow definition of morality, of a similar meaning to that of the sense of duty that we adopt here.

ends which generate *moral utility*, the two having no common standard of measurement (Etzioni, 1986, 1987, 2010). According to Etzioni, moral utility cannot be pursued at all costs: "once one breaks out of the straight jacket of one utility, and allows for other factors to drive behaviours, one sees that normal people do some things because they are right, whether or not they enjoy them" (Etzioni, 1986, p. 162).

Others have argued that individuals do not have two utilities, but may have multiple goals that can all be integrated into one coherent structure, which gives particular weights to each goal or into a grand, all-things-considered preference ordering (Broome, 1992; Hausman, 2005). A dual preference structure was also in Harsanyi's distinction between ethical and subjective preferences, the latter expressing moral judgments from an impersonal point of view. It therefore provides a framework for the individual decision maker to distinguish between what is good from the social point of view from what is good from the personal perspective (Harsanyi, 1955).

Within a single utility approach, interesting analyses are those in Frank (1987) and, more recently, the maximisation framework proposed by Roemer (2015, 2019). Frank (1987) defends the standard utility maximisation approach and suggests to pay more careful attention to the specification of the utility function. This should expand the model to incorporate conscience and other moral sentiments that play a powerful role in the choices people make. Roemer, instead, explains cooperation through Kantian optimization, a process whereby agents optimise in a different way from when they act competitively. They, similarly to Kant's categorical imperative, take those actions that would be universalized: each must think that he should take an action if and only if he would advocate that all others take a similar action - "all hang together or all hang separately" (Roemer, 2019). Contrary to the behavioural economics approach, whereby the deviation from standard neoclassical assumption relies on differences in preferences, Roemer's approach is characterised by the change to the optimising process, which is considered as a cooperative venture, while implying nothing about preferences. Roemer's approach is relevant to our analysis later on, as it directly points to the distinction between preferences and optimization. This will also be part of the analysis in Section 4, when we will discuss the relationship between duties and rationality.

In summary, in this section we have taken a quick journey through the history of economic thought to show that economics has admitted a wide range of motivations underlying people's actions, although standard neoclassical economics, exemplified by rational choice theory, has closed the door to these other important motivations. Altruism, cooperation and other types of social preferences have all been part of various approaches in economics. Two further points from this brief journey are helpful to the discussion and analysis in the next sections. Firstly, the distinctions between sense of duty and the various kinds of wider motivations we have referred to above, such as altruism, other-regarding social preferences and cooperation, need further clarification. In many respects, most of the analyses consider those wider motivations within the context of a utility maximisation framework, by enlarging the utility to include other-regarding

preferences and the consideration of social welfare. Secondly, this means that most of the strategies, typically employed in economics to formalise these concepts, are made by means of adaptations to utility and preferences, with the exception of Roemer's analysis that proposes a different, solidarity-based Kantian optimization process. But even Roemer's Kantian optimization says nothing about the nature of preferences and, therefore, cannot fully inform an assessment of duty-motivated choice that is counter-preferential. Counter-preferential actions and motivations, therefore, have not found much consideration in economics, one exception being Sen's concept of commitment, which has been more widely analysed in philosophy than in economics.

3 Defining duty-based choice

Directed by some of the insights from the previous section, here we aim to provide a definition of duty-motivated action that can be amenable to analysis through decision theory. In order to do so, we need to crystallize some of the key elements of the concept of duty-motivated choice we have in mind, building on the introductory points and the relevant evidence we reviewed in section 2. There, we have pointed out that our concerns is not with legal duties, or obligations commanded by a legal authority, but with moral obligations imposed by our own conscience. The notion of duty we have in mind is certainly related to rights, in the sense that rights, to be effective, needs the sense of duty, the respect for rules and moral principles, not because of self interest or respect for law but for the obligations imposed by own conscience. This could perhaps be identified more directly with a republican ideal, whereby duty is seen as a "principle that guides men towards their own improvement, teach them constancy and self-sacrifice, unite them with fellow men" (Mazzini, 1862). So duties are seen as freedoms, moral, interior freedoms; feeling a sense of duty means considering what is right or wrong to do or not to do. It is our conscience that considers an action to be right or wrong, not others, nor a legal authority. The sense of duty enables everyone to express oneself fully, therefore, to be really free and not a passive and docile subject.

All this suggests that we can identify two dimensions of the concept of duty-motivated action. According to one, duty-motivated choices simply result from restricting people's actions to certain specified options that are in line with what is dictated by conscience (which we call the restrictive dimension of duty-motivated choices); according to the other, duty-motivated choices allow the agents to assert their own identity and behave authentically (which we call the positive dimension).¹⁷

What is the origin of duties and where do they come from? Three possible sources can be thought of. The first can be linked back to the reference, in the previous paragraph, to the work of Mazzini: he saw the origin of duties in god, in religion. The second is linked to another reference in the previous section, to the work of Kant, who saw duties as deriving from the categorical imperative and, therefore, from pure, practical reasoning. The third is also linked to another reference, in

¹⁷We will come back to the important distinction between the restrictive and positive dimensions of the definition of duty later on, when we assess the relationship between duty and rationality in economics. To anticipate some of the points made later on, the restrictive dimension appears to be relatively easy to formalise with the tools of decision theory while, unfortunately, the positive one is not.

the previous section, to science, more specifically to psychology and the neuroscience of moral judgements. It is beyond the scope of this paper to discuss the relative merits of these perspectives on the origin of duties. However, we would like to focus on the insights that are emerging from neuroscience, not because we believe that they provide a more compelling narrative on the origin of duties than the other two sources, but because they shed light on some aspects that we find helpful to our aim of narrowing towards a workable definition of duty-motivated action.

A good starting point for this discussion is [Greene \(2013\)](#), who suggests that morality evolved as a solution to problems of cooperation, as a way of averting the tragedy of the commons, as in [Ostrom \(1990\)](#). Morality is a set of psychological adaptations that allow otherwise selfish individuals to reap the benefits of cooperation. Its essence is the willingness to promote and stabilise cooperative behaviour. His dual-process theory of moral judgment sustains that the brain has two types of settings: one automatic and one manual. The former is efficient but inflexible, while the latter is inefficient but flexible. He claims that “the moral brain’s automatic settings are the moral emotions . . . the gut-level instincts that enable cooperation within personal relationships and small groups. Manual mode, in contrast, is a general capacity for practical reasoning” ([Greene, 2013](#), p. 15). The automatic settings are the psychological traits or moral machinery that help to bridge the gap between me and us but can create the “Us versus Them” problems. The manual setting, instead, is flexible and helps to reflect and consider the long-term consequences of actions. For our purposes, conflicting moral philosophies are the predictable products of our dual process brains: according to [Greene \(2013\)](#), automatic settings are associated with rights and duties. He relates rights and duties to automatic, rather than manual settings and, therefore, associates them with "perfect rhetorical excuses where evidence becomes secondary and we excuse ourselves from hard, deliberative work", requiring intuitive emotional responses rather than controlled cognitive responses and deliberation. This appears at odds with the concept of duty we have exposed so far, which is instead associated with the deliberative, conscious and controlled use of reasoning.¹⁸ [Greene \(2013\)](#) attempts to support this claim with evidence from neuro imaging studies of moral decision-making, which suggest that deontological judgements are associated with greater activation in areas of the brain related to affective processing (ventro-medial prefrontal cortex and amigdala).¹⁹ However, these findings appear to relate to extreme, life and death situations ([Greene et al., 2004](#)); indeed, other studies, based on a wider range of dilemmas and controlling for their content and extent of intuitiveness, confute them and find no general association between deontological judgements and automatic processing, on the one hand, and between utilitarian judgements and controlled processing on the other. Instead, the more fundamental distinction in moral decision-making appears to be that between intuitive and counterintuitive judgements, whether deontological or utilitarian in content ([Kahane et al., 2012](#)). This line of research is relevant to us for two reasons. Firstly, it confirms that people engage in

¹⁸Indeed, in line with his preference for a deep utilitarian approach to moral problems, [Greene \(2013\)](#)’s view of rights and duties reminds of Bentham, who saw rights as rhetorical nonsense, not accountable to evidence.

¹⁹According to [Greene \(2013\)](#), utilitarian (well-being maximising) judgements, instead, are associated with longer response times and increased activation of the brain’s areas implicated in deliberative processing (parietal lobe).

moral reasoning of various kinds.²⁰ Secondly and related, conscience appears to be at work when the issue of plural and diverse options of actions and objects of value face the decision maker. It is this kind of situations that appeal to our approach to duty-motivated choices. These do not need to be extreme, life and death situations; on the contrary, they could be more earthly but still play an important role in many types of daily economic behaviours: what food to eat; how many children we have; who takes care of children, the elderly, the home, and so on.

We can now start to outline some of the key elements of a definition of duty-motivated choice, which have emerged from the previous discussion. Duty-motivated choice is originated by reason and could involve substantial reasoning. This is so also because of situations when duties conflict: the individual's moral conscience might command different principles, perhaps inconsistent or incompatible with each other. This might lead to the impossibility of having a complete preference ordering or, in less stringent cases, to allow for assessment of trade-offs. In some circumstances, duty-motivated action could also eliminate trade-offs altogether by restricting the set of alternatives available to choose from.²¹ Duty-motivated choice is intrinsically not egoistic, the action or choice being not motivated by feeling personally better off; the welfare consequences of the action do not matter and are open to empirical investigation. Duty-motivated choice could therefore be counter-preferential, the choices being based on reasons which might make an individual choose contrary to self-interested preferences. This does not exclude the possibility that there is utility to be had, but the derivation of utility is not the agent's reason for action. Duty-motivated action implies obligation on the part of the agent, so it is binding. However, the extent of this binding obligation may be absolute or it may come in degrees. Morality can provide an absolute command but also a way of reasoning through certain actions, that is, a "tool" to weight them. It is in the second, non absolutist case, that consideration of the sense of duty may lead to deliberative considerations. This is consistent with Kant's distinction between perfect and imperfect duties, the latter admitting trade-offs, some latitude, being associated with moral reasoning to evaluate different options and potentially conflicting principles. Following [Zimmerman \(2007\)](#), moral obligation is therefore understood in terms of comparative values of possible actions. But the action performed results as being unique in respect of the value held. Therefore, this uniqueness establishes a superiority relative to alternatives and, consequently by definition, that which is superior *maximises* some value: the individual does what is *maximal* from a sense of duty point of view.²² Another interesting aspect of the duty-motivated action is that it could relate to issues that have a dynamic, temporal and generational dimension. For instance, in the introduction, we have referred to issues of climate change and the responsibility towards future generations. This responsibility has an effective meaning if there is someone who can demand

²⁰Here we refer to the definition of Moral Reasoning proposed by [Greene et al. \(2004\)](#); [Greene \(2013\)](#), namely conscious mental activity through which one, essentially, weights conflicting commitments and/or alternative actions.

²¹There is an extremely interesting question related to whether, in some circumstances, duty-motivated action could actually enlarge the set of alternatives compared to a situation where the person is not committed to a moral obligation. This also relates directly to earlier points on the positive dimension of duty-motivated action, whereby individuals act to assert their own identity and behave authentically.

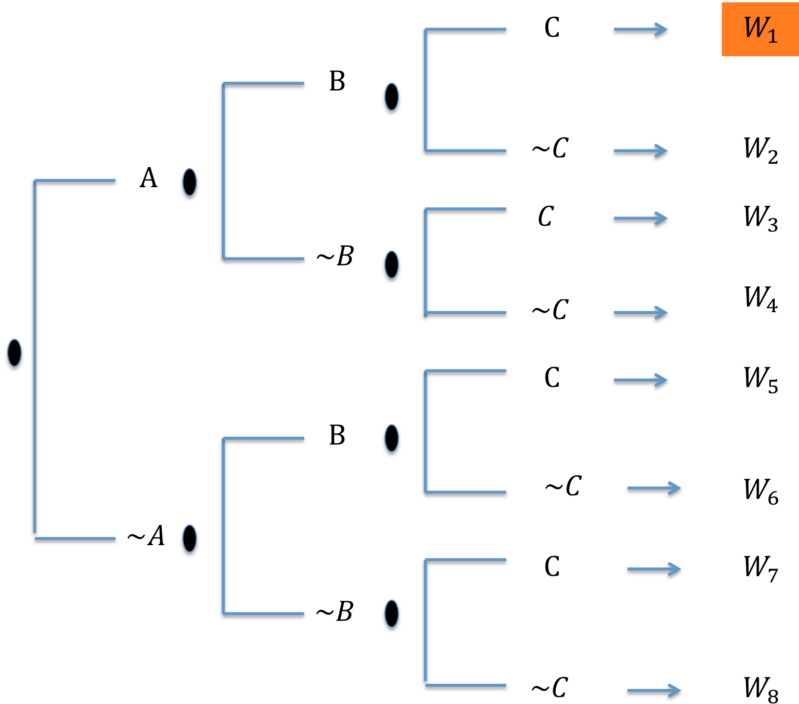
²²We use the term *maximisation* in its broad meaning, so interchangeably with the term *optimisation*. We will come back to this in Section 4.

and exact its fulfillment; however, how can future generations punish current generations for not having absolved their responsibilities? Responsibility towards future generations, therefore, is intrinsically a responsibility that the current generation feels only towards their own conscience and, consequently, it represents a duty.

Given the complexity and diverse dimensions that this approach brings out, it is worth to define two types of duty-motivated choice: following Kant, we call one perfect duty and the other imperfect duty. Perfect duties do not admit trade-offs: there is only one feasible outcome. Imperfect duties admit some trade-offs and allow for deliberative evaluation of alternatives and potentially conflicting options.

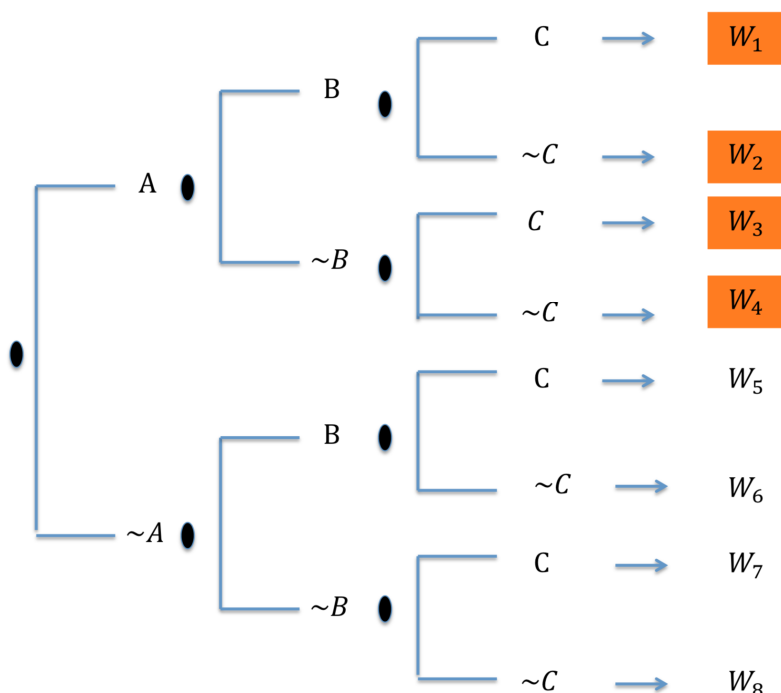
Perfect duty-motivated action is shown in Figure 1, while Figure 2 represents imperfect duty-motivated action.²³ The dots represent moments of choice and the letters (A,B,C and their respective negations $\neg A$, $\neg B$, $\neg C$) represent different possible actions that lead to possible outcomes (W_1, W_2, W_3 and so on). Under a perfect duty, only one outcome is admissible to the individual, W_1 , and this requires the individual to choose A instead of $\neg A$, then to choose B instead of $\neg B$, and finally C instead of $\neg C$. Instead, under imperfect duties, the individual has a number of different possible outcomes accessible, four in the picture, but it could well be all of the eight W_s . It might be the case that the individual tries to do the best she can and aim for W_1 , in the case the outcomes were ranked from best to worse in the same order. But achieving W_1 might require too large a sacrifice compared to, for instance, W_2 , in which case the individual, once having gone through B , will exclude C and opt for $\neg C$.

FIGURE 1: Perfect duty-based action



²³This representation draws from the work of Zimmerman (2007) on moral obligations.

FIGURE 2: Imperfect duty-based action



By representing possible outcomes as arising from decision paths, we are able to admit complexity and a dynamic dimension to duty-motivated action, which is consistent with deliberative cognitive moral reasoning.²⁴ In particular, the complexity associated with duty-motivated action arises from considering the entire course of actions as being obligatory and not just a single act. This approach also allows for the inclusion of three important aspects of the definition we have outlined earlier on. First, it allows for the treatment of the obligatory dimension of a duty-motivated choice, while permitting to distinguish between imperfect and perfect duty.²⁵ For instance, imagine that actions A, B and C would be compatible with compliance with a duty, while their negations would not. Any failure to comply with the perfect duty would be inadmissible, which means that W_1 results as the best uniquely superior outcome for the agent. However, a more complex situation can be envisaged under the imperfect duty scenario, where non compliance can be added up and therefore a kind of ranking can be determined. For instance, following our example above and relating it to the imperfect duty tree in Figure 2, W_1 would still be the best outcome with zero cases of no compliance, then W_2 , W_3 and even W_5 would follow with one case of non-compliance each, while W_4 , W_6 and W_7 would have two cases of non-compliance each. We can also incorporate a different kind of assessment of non-compliance, for instance, one which considers some of the non-compliance worse than others, which might result in a different ranking of the final outcomes. Second, as a result of the first point, the definition is consistent with Mill's approach, according to which the *right* action comes in degrees, depending

²⁴You can think of the moments of choice represented by the various black dots moving from left to right as a time dimension: t , $t + 1$; $t + 2$ and so on. However, the individual could well face circumstances whereby the outcome sought is immediately after the choice between A and $\neg A$, at time t .

²⁵As pointed out by Zimmerman (2007), this approach can accommodate a wide range of substantive theories of obligations and, therefore, is compatible with consequential and deontological theories.

on proximity to the best available action (Mill, 1895). Third, the approach is compatible with the idea of individuals that see duty-motivated choice as intrinsically linked with asserting their own identity and not as something that restricts individual choices: the path, long or short as it might be, given the agent's and time-relative circumstances, allows the individual agent to shape the desired state of the world. In both cases of perfect and imperfect duty-motivated choice, the individual is not giving priority to certain paths over others because of strategic considerations, or because she is motivated by the need to impress others or avoid offending them. The individual is not motivated by interdependencies between own and other individuals' preferences, but is, instead, asserting her own identity, behaving authentically in terms of the duty held.

This is relevant to further understand the difference between duty-motivated action and one motivated by altruism, norms, reciprocity and other behaviours that often go under the umbrella of social preferences. Indeed, while these behaviours are not selfish, they are still based on preferences and, whether because of cost-avoidance or disutility, the derivation of an "enlarged" utility constitutes the reason for the individual's action.²⁶ According to this approach, non-selfish behaviour is rationalised in the way it is anchored to the person's preferences, individuals deriving utility from non self-regarding actions or from following norms. Whether norms are followed to avoid costs or because the individual has fully internalised the norm, both reflect a preference-based view (Peacock, 2019).²⁷ Thinking about the concept and practice of discrimination offers another helpful way to understand the distinction between norms and duty-motivated choice. Many types of discrimination, which make societies unequal and, in many respects, inefficient come from social norms held by various groups. However, it is difficult to see discrimination coming from moral obligations and duty-motivated choices informed from conscience, unless in extreme interpretations of moral obligations and duties.

4 Sense of duty and economic rationality

4.1 Two approaches to rationality in economics

An important element of the definition of duty-motivated choice relates to the act of reasoning, which could involve, depending on the circumstances, substantial deliberation. In economics, decision theory is the field that studies the reasoning underlying people's choices; one of its main areas has been the study of the features for the choices made by individuals to be rational. Following Sen (2004), rationality in economics has been traditionally characterised in two ways: one considers rational behaviour as leading to choices that are internally consistent, meaning that they are based on a preference relation R that satisfies specific axioms of coherence; the other sees rationality as simply the pursuit and maximisation of self-interest, generally referred to as

²⁶See Sen (2004) for a discussion about skilfully "elongating" the self-interest model, using the example of recycling used bottles.

²⁷See Peacock (2019) for a fuller discussion of the relationship between norms-following and preference-based action.

utility. In revealed preference theory (RPT), the two characterisations are however combined: the preference relations that must satisfy certain properties for them to be consistent and, therefore, rational, are represented by choice functions; utility is defined by the same binary preference relation R , so the numerical representation of the preference orderings are utility functions. In other words, according to RPT, decisions are consistent with objectives, the objectives are represented by the maximisation of pay-offs, these being represented by utility functions, which are, therefore, real valued representations of preferences. In summary: choices are equal to preference ordering R which are equal to utility.²⁸ According to this interpretation of rationality, the axioms establish a relation of coherence between choices made from different sets, more specifically establishing what can or cannot be chosen from a set given what is chosen from another set.²⁹ The main properties associated with rational preference relations are those of completeness, transitivity, the related Weak Axiom of Revealed Preference (WARP), the Chernoff condition (property α) and the basic expansion consistency condition (property γ). In fact, a key finding of the axiomatic approach is the equivalence between a choice function being rationalizable, satisfying WARP and property α .³⁰ Property α and property γ ensure binariness of the choice function for finite sets of preference relations, i.e. the choice function generates a revealed preference relation that will in turn generate a choice function; WARP guarantees the stronger condition of transitivity of preferences. Consistency of choices are represented by choices that satisfy conditions of contraction (property α) and expansion (property γ); these allow the principle of revealed preference. It is worth to summarise these properties more formally.³¹ WARP establishes that if an alternative x is picked from some set S and y , also contained in S , is rejected, then y must not be chosen and x rejected from some other set T , which they both belong to.³²

Property α (Chernoff condition) establishes that $[x \in C(S) \text{ and } x \in T \subseteq S] \Rightarrow x \in C(T)$, which means that if x is chosen from a set S and is contained in a subset T of S , then x must be chosen from T as well.

Property γ (Basic expansion consistency) establishes that $[x \in C(S_j) \forall S_j] \Rightarrow x \in C(\cup_j S_j)$, to say that if x is chosen from every set in a particular class, then it must also be chosen from their

²⁸The key element of RPT is, of course, that the underlying preferences of individuals are interpreted (revealed) from the observation of behaviours and choices made by people. Hands (2013) offers a comprehensive account of revealed preference theory and its development over time.

²⁹Indeed, the reason for the use of the term *internal consistency of choice* is because the concept of rationality does not relate in anyway to anything that is outside, i.e. external to, the choice. As Sen (2004) puts it, "Acts of choice are, on their own, like statements that can contradict or be consistent with each other". For a different perspective, see Dowding (2002), which states that Sen's attack on internal consistency does not require to give up the standard approach of revealed preference. Here, we do not aim to contribute to this debate and we use Sen's categorisation of rationality as internal consistency of choice, because it provides us with a helpful tool to assess the relationship between rationality and duty-motivated choice.

³⁰We will make use of this equivalence in section 4.2.1, when we formally assess the relationship between rationality thus intended and duty-motivated choices.

³¹For a comprehensive discussion and proof, see Sen (1971, 2004).

³²Of course, completeness and transitivity are implied by WARP. Completeness means that for all x and y in X , either xRy , yRx or both. Transitivity means that for all x , y and z in X , if xRy and yRz , then xRz .

union.

The equivalence between choices, preferences and utilities means that discussions of rationality generally follow either the relational approach, based on preference relations R , or the approach based on the real valued utility function U ; these are actually treated interchangeably. However, there is a subtle but important difference between the two approaches: the real valued function approach needs ordering properties as in the relational approach, such as completeness and transitivity, but also *additional* properties that allow for mathematical tractability. Key additional properties are those of continuity and local satiation, which are necessary for calculus, specifically in respect to the maximisation problem, to which we now turn. The difference between these two approaches to the way maximisation occurs sheds light on the understanding of the relationship between rationality and duty-motivated choice.

We start by presenting the maximisation problem under the two approaches; this will allow us to appreciate the difference between them and to identify initial aspects of the relationship between duty-motivated choice and rationality in economics, which we will develop further in the following subsection.³³

The relational approach can be presented as follows:

X is the set of all possible alternatives in the positive orthant and $\chi = 2^X \setminus \emptyset$ is the set of all non empty subsets of X . R is the binary relation on X . R is a weak order if and only if it is:

complete: $(\forall x, y \in X)[(x, y) \in R \vee (y, x) \in R]$ and

transitive: $(x, y, z \in X)[((x, y) \in R \wedge (y, z) \in R) \Rightarrow (x, z) \in R]$

For all weak orders R on X , and all $S \in \chi$, $B(S, R) = \{x \in S : (\forall y \in S)(x, y) \in R\}$ is the non-empty subset with the best alternatives in S .

$C : \chi \rightarrow \chi$ is a choice function that assigns a non empty subset $C(S)$ of S to all non empty subsets S of X . C is consistent with maximising a weak order iff there is a weak order R on X such that, for all $S \in \chi$, $C(S) = B(S, R)$. In other words, B is the choice consistent with the optimal weak order. This is, therefore, a representation of the maximisation problem in the relational approach.

The utility approach can be represented as in the standard microeconomics textbooks, as follows:

S becomes the budget polyedra, $S = \{x \in X : px \leq m\}$ and the maximisation problem is expressed typically as:

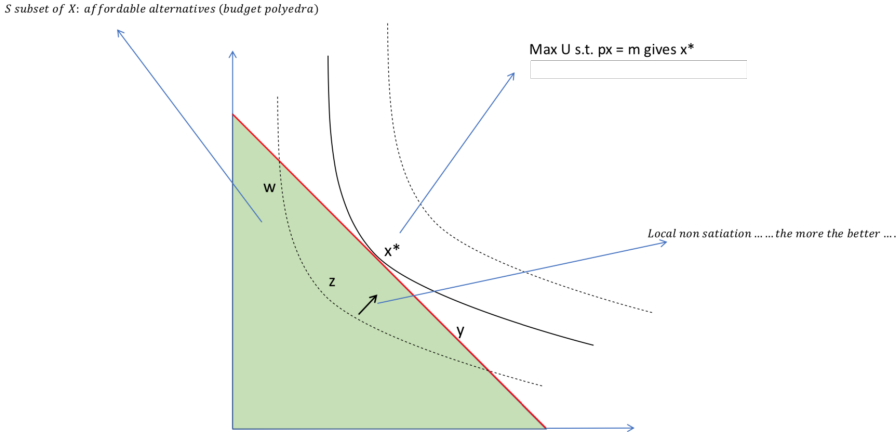
$\max U(x)$ s.t. $px \leq m$ with $x \in X$. A solution to the problem is given if the objective function is continuous and the constrained set is closed and bounded. Importantly, the maximisation on the budget line requires the further assumption of local non-satiation, which says that, given any $x \in X$ and any $\varepsilon > 0$, then there is some bundle $y \in X$ with $|x-y| < \varepsilon$ such that $y \succ x$. In other words, there must be some alternative, close to x^* , which is preferred to x^* . This assumption is crucial to allow maximisation and, therefore, the required tangency between indifference curves and the

³³At this point we stress that we are not distinguishing between maximisation and optimisation. The difference will be clarified later on. See also Sen (1997b, 2017) for a clear elucidation of the relationship between maximisation and optimization.

budget line. This assumption states that combinations with more goods are preferred to those with less goods, namely the more the better: you can always do a little better even if restricted to small changes. The maximisation problem becomes therefore one with equality, rather than inequality, in the budget constraint: $\max U(x) \text{ s.t. } px = m$

Figure 3 represents this utility maximisation problem as typically shown in standard microeconomics textbooks.

FIGURE 3: Maximisation: utility approach



In assessing the difference between the relational and the utility approaches, the key question then becomes whether the choice x^* , which maximises utility on the budget line, is the same as the choice from $C(S) = B(S, R) = \{x \in S : (\forall y \in S)(x, y) \in R\}$. Do the two approaches result in the same choice of x ?

The relational approach does not say anything about the optimal choice being the one on the highest possible utility; that the maximisation occurs on the budget line is simply a result of the local satiation assumption. This assumption is part of the real valued utility function, and not the relational, approach. This, therefore, raises the issue of what maximisation means under the relational approach. We come back to this issue in the following section. In fact, having now clarified the two approaches to rationality in economics (internal consistency of choice and maximisation of utility), in what follows we assess their relationship with duty-motivated choice, in the way we have defined this in Section 3.

4.2 Rationality and duty-based action

4.2.1 Internal consistency and duty-based action

How do duty-motivated choice, therefore, relate to rationality? We start with the relationship between duty-motivated choice and the interpretation of rationality based on internal consistency of choice. In the previous subsection, we have revisited the equivalence between a rationalizable choice, WARP and properties α and γ .

One approach is to consider duty-motivated choice by imposing properties on the choice

functions. For instance, Baigent (1995, 2007); Gaertner and Xu (1997, 1999a,b) have explained the "rationality" of external references by means of choice functions without set contraction. On the one hand, the imposition of restrictions on the choice functions will allow us to reflect the role of duty in decision-making and assign priorities and preclude or limit trade-offs. On the other hand, however, this way of looking at the relationship between duty-motivated choice and rationality is consistent with a view of duty that is restrictive of people's choice sets, rather than one that enlarges people's choices. Therefore, it might stride with the more positive view of duty-motivated action as one that helps individuals to assert their own identity.³⁴

Let X be a finite set of all possible alternatives, so $2 < |X| < \infty$; $\mathcal{X} = 2^X \setminus \emptyset$ is the set of all non-empty subsets of X . $|X|$ denotes the cardinality of the set X . C is the choice function over \mathcal{X} , namely, it is a functional relationship, which specifies a choice set $C(S)$ for any S in a particular domain of non-empty subsets of X : so, for some $S \in \mathcal{X}, C(S) \neq S$. We define a choice set C as duty-constrained iff for some $S \in \mathcal{X}, |C(S)| \geq 1$.

We know that rationality as internal consistency of choice implies that C satisfies both α and γ . Again:

property α : for all $S, T \in \mathcal{X}$ such that $S \subseteq T: x \in S \cap C(T) \Rightarrow x \in C(S)$

property γ : for all $S, T \in \mathcal{X}, x \in C(S)$ and $x \in C(T) \Rightarrow x \in C(S \cup T)$

We start with the case of a perfect duty, which demands to undertake one specific option, so a case where the person, for instance, pursues option w amongst all available options: w is always a uniquely superior and binding option. Continuing with the example of a duty towards the environment associated with different dietary options, let us assume that: x = only meat; y = reduced meat; z = vegetarian; w = vegan, and that, in terms of environmental-friendliness, they go from worst to best in that order. We know the individual likes meat but has a sense of duty towards the environment that obliges him to avoid meals based solely on meat. In this case, we have:

$$X = \{x, y, z, w\}$$

$$|\mathcal{X}| = 2^4 = 16 \text{ and } |\mathcal{X} \setminus \emptyset| = 15^{35}$$

$|S| = 8$ subsets that contain w but $C(S) = w$ for all of them, given the following always applies:

$$M(S, R) = [w \mid w \in S \text{ and } \neg y \in S: wPy]$$

Therefore, just considering some of the subsets, we have: $C(\{x, y, z, w\}) = \{w\}$; $C(\{w, y, z, \}) = \{w\}$; $C(\{x, z, w\}) = \{w\}$; $C(\{x, y, w\}) = \{w\}$; $C(\{w, y\}) = \{w\}$ and so on.

This case of perfect duty satisfies both properties α and γ and, therefore, represents a rational choice in terms of internal consistency.

Let's now turn to the case of imperfect duty. Remember that the key difference with the case of perfect duty is that imperfect duty-motivated choice permits latitudes in execution; in the formalisation adopted here, based on the imposition of restrictions on the choice function, it means

³⁴This is unfortunate but the approach offers us one direct way of formalising and understanding the relationship between duty-motivated choice and rationality, and fulfills one main aim of this paper. There might well be other ways of formalising this relationship. We come back to this issue in the concluding discussion.

³⁵See definition of \mathcal{X} above.

that there is not only one feasible option.³⁶ Given the latitude in execution, we could envisage situations where, for instance, the person, given her liking of meat and the menu available, may prefer a reduced-meat diet, y , or a vegetarian diet, z , when the only-meat diet, x , is also available alongside. These situations can be represented as follows:

$$X = \{x, y, z, w\}$$

$$|\mathcal{X}| = 2^4 = 16 \text{ and } |\mathcal{X} \setminus \emptyset| = 15$$

Given that the case of imperfect duty is characterised by latitudes in execution, the choice function will be such that, for $S \in \mathcal{X}$, $|C(S)| > 1$, which results in $|S| = 11$ subsets.

Considering the case where the person does not always end up choosing the most environmentally-friendly vegan option over the others, it could be that the following choices emerge, whereby vegan w is preferred to all others only when the meat-only x and the reduced-meat y are not available at the same time but, when these latter are available at the same time, the person thinks that some sacrifice is permitted and, therefore, can go for y in the safe knowledge that a larger sacrifice is also foregone, namely renouncing a diet based only on meat. So, for instance:

$$C(\{x, y, z, w\}) = \{y\}; C(\{x, y, z, \}) = \{y\}; C(\{x, z, w\}) = \{w\}; C(\{y, z, w\}) = \{w\}; C(\{x, y, w\}) = \{y\}; C(\{x, y\}) = \{y\}; C(\{x, z, \}) = \{z\}; C(\{y, z, \}) = \{z\}; C(\{x, w\}) = \{w\}; C(\{y, w\}) = \{w\}; C(\{z, w\}) = \{w\}$$

These choices clearly violate contraction and expansion consistency. For instance, property α is violated when considering that y is chosen from $\{x, y, z, w\}$ but not from the subset $\{y, z, w\}$ that also contains it, from which w is instead chosen, nor from the subsets $\{y, z\}$ and $\{y, w\}$, from which z and w are chosen respectively. Similarly, property γ is violated when considering that w is chosen from both the sets $\{x, w\}$ and $\{y, w\}$, while y is instead chosen from their union $\{x, y, w\}$; it is also violated by the choice of z from both $\{x, z, \}$ and $\{y, z, \}$, but of y from the union of the two sets $\{x, y, z, \}$.

A key point here is that combination of menu-dependency and imperfect duty generates a range of choices that are internally inconsistent, while the perfect duty, by eliminating any latitude, paradoxically removes the possibility of inconsistent choices.³⁷

Another source of inconsistency arises when the relational ordering is incomplete. Imperfect duty-motivated action may be associated with incompleteness. This will happen when a person may not be able to converge on a complete ordering; acting under imperfect duty, the person may not be able to balance conflicting considerations before arriving at a reflected judgement. The point here is not that imperfect duty-motivated choice is *always* associated with incompleteness,

³⁶We could also think of a perfect duty that, instead of binding the person to one option, such as in the case above where the person has to pursue w regardless, the duty is such that the person does not have to do x , for instance, "do not eat a diet based on meat only". All other alternatives, for instance, a reduced meat, vegetarian and vegan diets, remain feasible. Given the remaining latitude in execution, we consider this to be a case that better reflects the idea of an imperfect, rather than a perfect, duty-motivated choice.

³⁷It is difficult to qualify the inconsistent choices that arise from imperfect duty as lacking in rationality, but here we limit the discussion to the specific relationship between internal consistency of choice and duty-motivated choice and not to whether the internal consistency interpretation of rationality is more or less sensible. For this, see Sen (1977, 2004). We will come back to these wider considerations on the concept of rationality in the concluding section.

but that it *may be* associated with it in those cases when the person faces too conflicting considerations and is not able to rank the options.

In summary, when relating duty-motivated choices with the axiomatic approach to rationality - this being interpreted in terms of internal consistency of choice - we find that, on one hand, perfect duty-motivated choice is associated with no violation of consistency: behaviours based on respecting a perfect duty, by eliminating any latitude, allow for consistent choices. On the other hand, having consistent preferences and, therefore, making consistent choices, might be problematic when imperfect duty-motivated action is at play. We know that revealed preference theory equates actual and observable choices to preferences; however, duty-motivated choice could be counter-preferential and when, in this context, respecting a sense of duty comes into play, it is not possible to ensure that inconsistencies do not arise. It might also be the case that the person, faced with conflicting considerations, may not be able to determine a complete ordering of the available alternatives that would lead to respecting the imperfect duty.

4.2.2 Maximisation and duty-based action

What about maximisation? In Section 4.1, we have shown the difference in the representation of maximisation between the utility approach and the relational approach. The former typically requires the additional assumption of local non-satiation for the maximisation to occur with equality on the budget constraint and, therefore, achieve tangency between the highest affordable indifference curve and the budget line. The relational approach does not rely on this kind of assumption and allows for a more "flexible" approach to maximisation than possible under the other. One way in which we can appreciate this flexibility is by noting the difference between maximisation and optimisation, which becomes clear under the relational approach. In fact, according to it, maximisation is defined as the choice of the highest ranked amongst possible alternatives. Nothing is imposed on the relations R , over and above the standard properties. In the approach, for an element of the feasible set S to qualify as maximal, no other alternative in the set S must be strictly preferred to it, namely: $M(S, R) = [x \mid x \in S \text{ and } \neg y \in S : xPy]$. When the relational ordering requires weak preference, then optimisation, instead of maximisation, is obtained: $B(S, R) = [x \mid x \in S \text{ \& } \forall y \in S : x R_c y]$.³⁸ This is just one way to show that the relational ordering R can be interpreted in different ways: the preferred option can be interpreted in such a way that, for instance, it is the alternative with the highest number, reflecting the assumption of local non-satiation (the more the better), as in a real utility function approach, but it could well be a different R that takes into consideration other aspects and places importance on, for instance, the sense of duty towards the protection of the environment. Pointing to this difference between the relational and the utility based approach helps us to understand that, under the former, the ranking does not need to satisfy a non-satiation assumption, which is only needed in the utility approach to ensure that the maximisation takes place at the indifference curve with the highest amount of goods

³⁸See Sen (1997b) for a formalisation of the difference, and relationship, between optimisation and maximisation and the role played by the assumption of completeness.

possible given the budget constraint. Once we reject the non satiation assumption, maximisation simply requires that the highest ranked of possible alternatives is chosen, which is to say that the person makes a rationally based consideration to do one's best to achieve the personal objective given feasibility constraints.

Is the choice that emerges from a maximisation of utility - namely, by resolving $\max U(x)$ subject to $px = m$ - the same as the one that emerges from the relational framework - namely $M(S, R) = [x \mid x \in S \text{ and } \neg y \in S : xPy]$? The answer is: not necessarily. The choice can certainly be exactly the same but maximisation under the relational approach, while leading to a choice whereby no other alternative is preferred to it, might well result in the choice x being different from the choice that results from the maximisation of utility subject to the budget constraint, to say the x^* where the indifference curve is tangent to the budget line. This could happen when there is a wedge between preferences and utility, namely when the utility function does not rationalise the observed behaviour and preferences,³⁹ or because the maximisation of utility does not occur on the budget line but strictly inside the budget set and, therefore, on a lower indifference curve than the one that is tangent to the budget line. This is to say that the maximisation occurs with inequality in the budget constraint: $\max U(x)$ s.t. $px \leq m$. In this case, we preserve the possibility of having well-behaved preferences (ranking orders that are complete and transitive) but the maximisation of these preferences does not occur on the highest indifference curve possible given the budget line: individuals, motivated by duties, are not "pushing" for a utility with the largest combination of goods; compliance with the duty restrain them from following the assumption that "more is better". Under the relational approach, instead, individuals motivated by duties, do not choose a second-best alternative but a maximal and, because of the given completeness, an optimal alternative.

5 Concluding Discussion

How do duties relate to economics? Do duties matter to people? Do they inform people's decision-making? And if so, what does that mean for economics? Can economics' typical flexibility incorporate and account for duty-motivated choice? If so, in what ways? Would that be at the expense of major losses in terms of the ability to explain important phenomena, or gains in such ability but losses in terms of formal tractability? Would standard assumptions be still valid when considering duty-motivated actions? These are the same questions that we posed in the Introduction to this paper. In this concluding section, we summarise the answers we found during our exploration of the relationship between duties and economics. In doing so, we also discuss some issues that we believe are pending and would benefit from further research.

How do duties relate to economics? The first step in addressing this question has been to define what we mean by duty-motivated choices. Our definition is strongly based on duties as moral

³⁹This is linked to the typical representation theorem that, if preferences are complete, reflexive, transitive, continuous and strongly monotonic, then there exists a continuous utility function which represents those preference orderings. More specifically, in our case, this theorem would not hold because of the absence of continuity and monotonicity, so the utility function would not rationalise the observed behaviour.

obligations, dictated by own conscience and reasoned approach. It implies that duty-motivated choices are not egoistic and could be counter-preferential, based on reasons which would make the individual make choices contrary to self-interested preferences. The person choosing amongst alternative courses of actions on the basis of duties is not motivated by the inter-dependencies between the preferences of individuals, but is asserting his own identity and behaving authentically in terms of the duty held. Holding the duty means the person has an obligation to act and choose accordingly to the duty held. However, the extent of this binding obligation can be absolute or it may come in degrees. This allows us to distinguish, following Kant, between perfect and imperfect duty-motivated choices. Perfect duties do not admit trade-offs; imperfect duties allow for latitudes in execution and, therefore, admit some trade-offs.

Our brief journey through the history of economic thought has shown that, although economists have largely embraced an approach which sees human action as being motivated by the pursuit of self-interest, they have not completely shied away from other motivations: these were actually predominant in the classical period but have not completely disappeared, even during the period in which neoclassical assumptions have expressed full force and dominated the discipline. However, economics, strongly influenced by utilitarianism, has placed major emphasis on outcomes, and much less so on the deontological dimension of human action. That might represent one reason as to why duty-motivated choices have not received much attention. Amartya Sen's concept of commitment comes closer than all other approaches based on other-regarding preferences, altruism, cooperation and other kinds of social preferences.

We assume that duties matter to people; our approach to duty-motivated choices recognises that problems of conscience are important, if not as important as those associated with the full realisation of an outcome: we oppose, and struggle to eliminate, misery as well as oppression. Is there evidence to support such an assumption? Do duties really matter to people? Do they inform people's decision-making? This paper does not fully engage with this question nor aims, therefore, to provide a definitive answer. While briefly engaging with the literature on the sources of duty-motivated action, we have been able to discern two interesting points. First, the assessment of the evidence from the neuroscience of moral judgements suggests that individuals do act from motivations based on duties. Moral reasoning appears to be underlying individuals' decision making of various kinds, and not just those that involve extreme, life and death, situations. Second, behavioural economics, which has played a fundamental role in bringing back from the cold the idea that human beings have a diverse set of motivations, has shown extensively, through various types of experiments, that individuals are motivated to act on the basis of other-regarding and fairness considerations. However, the games played in these experiments are based on players who are self-interested, although not self-centred.⁴⁰ This can be seen quite directly in prisoner's dilemma games, which show that altruistic behaviour leads to a better outcome than non-altruistic behaviour because the players maximise their own utility, which takes into consideration the

⁴⁰The most relevant ones are the ultimatum game, where players decide how to split resources between them, particularly those in sequential moves where the proposer takes all and offers nothing to the responder; the dictator game, where the proposer dictates how much to allocate to each player; the public good games, where players decide how much of the money to put into a public pot; the prisoner's dilemma types of games.

other player's utility as well. In these games, players are not self-centred but still self-interested maximisers. Their utility is enlarged to take into consideration other people's utilities. In this respect, therefore, these types of experiments are not able to account for duty-motivated behaviours. This is an area which would benefit from further research to shed light on the extent to which individuals, under appropriate experimental conditions, behave as motivated by a sense of duty. At this stage, therefore, we do not have further evidence than the limited one provided by neuroscience.

Harmed with a definition of duty-motivated choices and some limited evidence - and a greater belief - that duties matter to people, we asked whether and how economics' typical flexibility can incorporate and account for duty-motivated choices. We used the tools of decision theory and assessed the relationship between duties and rationality. Following Sen, the latter has been defined in two ways: one, in terms of internal consistency of choices; the other in terms of maximisation of self-interest, generally utility. We summarise three main conclusions. First, when rationality is viewed in terms of internal consistency, we found that choices motivated by a perfect duty are rational. Perfect duty-motivated choices respect contraction and expansion consistency. Second, choices motivated by imperfect-duty, on the contrary, may well be irrational in this respect, as they violate both contraction and expansion consistency. The presence of imperfect duties breaks the identity between the choice $C(S)$ and the preference ordering R , since a duty-motivated choice means the agent's choice might contradict her personal preferences. In this case, rationality as consistency fails to recognise that the choice made by an agent may result from the sense of duty that is not captured by the act of choice itself. Third, there is a subtle but important difference between the relational and the utility interpretations of maximisation. This difference is relevant to the relationship between duties and economics, because the presence of a duty-motivated choice can result in a maximal choice, under the relational representation, which might not be the same as the maximal choice under the utility function representation of maximisation. The latter requires local non-satiation for the maximisation to occur on the highest indifference curve tangent to the budget line. The relation representation of maximisation instead, not requiring the local non-satiation assumption, means that individuals do not choose a second best alternative but an optimal choice. While, in general, maximisation of a real valued utility function is considered the same as maximisation (and optimisation given completeness) under the relational description, the consideration of duty points to the difference in the two descriptions. In fact, it underlines the potential tension between the moral obligation that arises from respecting the duty and the "more the better" assumption associated with local non-satiation.

Two final points are worth considering. First, when imperfect duties are at play, we have seen that rationality conditions can be violated: does it mean that the corresponding choice behaviour is irrational? If violation of properties α and γ are equated with irrational behaviour, then the choice of the individual does not appear reasonable. However, Sen's discussion on the intrinsic deficiency of associating rationality with internal consistency, in his seminal "Rational fools" critique of the behavioral foundation of economic theory, is also relevant here. He pointed to the need to specify an external reference for an effective discussion of rational or irrational behaviour. To understand

whether someone is behaving inconsistently or irrationally, one has to look beyond the choice or choice function itself to the actors' motivations, which themselves require reference to the environment and context in which the choice takes place. The sense of duty could well be one of the possible external references, in which case, duty-motivated choices, although inconsistent from an axiomatic point of view, can be perfectly rational. Once the external reference is described by a duty that the individuals make their own, then a different motive supervenes the monotonicity axiom of standard micro theory of maximisation.

Finally, it is worth reminding the reader that, unfortunately, the formalisation adopted in this paper is based on the restrictive definition of duty-motivated action: indeed, restrictions have been imposed on the choice sets. An extremely interesting research would be to explore ways of formalising the positive interpretation of duty-motivated choice, associated with individuals fully expressing their freedom and identity, in which restrictions are not applied.

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