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On the weighting of homo economicus and homo virtus in human behaviour

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In economic sciences, most analyses focus on the economic person construct. However, this that formalization does not capture the complex nature of human behaviour. This paper estimates the weight that economic and noneconomic dimensions of human behaviour have on wellbeing. A utility function is considered that models behaviour from a complex standpoint, where the motivations of the economic individual (homo economicus) are analysed in a broad perspective by integrating emotional wellbeing and human virtues into the model (homo virtus). Three empirical measures of wellbeing are used: The Well-Being Index developed by the Boston Consulting Group's Sustainable Economic Development Assessment (2008–2018), the Index of Economic Well-Being from the Centre for the Study of Living Standards (1980–2014), and the Happiness Score from the World Happiness Report (2005–2018). Depending on data availability, the model is estimated globally for all countries, OECD countries, European countries, and developing countries using linear regression methods. The results indicate that, on average, the homo virtus dimension of behaviour has a weight of 11% in countries' wellbeing functions, while the economic perspective has a weight of 89%. Additionally, the results show that richer countries value economic factors more than poorer countries. The analyses also show that the maximum level of emotional satisfaction is higher for European and OECD countries than for developing countries.

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Introduction

In economic sciences, most analyses focus on the homo economicus, that is, the economic person construct. It is assumed, normatively, that he or she is a rational being who prefers more to less, with perfectly ordered preferences, and, in a mathematical sense, is a maximizer (Thaler, 2000; Aktipis and Kurzban, 2005; O'Boyle, 2007).¹ The philosophical formalization of economic person does not reflect any of the schools that consider several aspects of human behaviour, such as the ethic of virtue and responsibility, self-realization, vitalism, and formality schools, among others.² We refer to this other dimension as the homo virtus.

The homo virtus perspective of behaviour has been discussed since Ancient Greece, where according to Aristotle, the cultivation of the good (i.e., virtuous behaviour) is critical in achieving satisfaction (Fernando and Chowdhury, 2017). Aristotle presented the habituation hypothesis, which claims that moral virtues are developed through repeated and guided practices (Stewart, 1990). The omission of a conceptualization of a complex human acting by both economic and noneconomic incentives has generated some limitations in social sciences analysis when the economic perspective receives more attention.

Economic sciences have traditionally modelled human behaviour as a function of consumption and income. In the same way, from an economic modelling perspective, wellbeing is modelled as a function of wealth measures contingent on economic variables such as individual income, national product, per capita consumption, and others. However, behaviour is a more complex process with interests other than those accounted for in the economic dimension. Indeed, evidence shows that there is no positive correlation between national product growth and the life satisfaction of the population (Weimann et al., 2015) or between income inequality and global wellbeing (Berg and Veenhoven, 2010). Previous research has shown that the economic person construct does not fully explain individual behaviour in economic settings (Pollak, 2000) and that focusing exclusively on economic wellbeing is a limited approach, especially as societies grow wealthy (Diener and Seligman, 2004). Regarding this last point, the authors argue that economic indicators are extremely important in the early stages of development, as they impact the fulfillment of basic needs. However, as economic development is higher, there is less inequality in wellbeing due to income, and there are more differences that arise from social factors such as relationships and enjoyment (Diener and Seligman, 2004). The evidence also indicates that understanding of the economic person varies across social environments (Henrich et al., 2001; Boyd and Richerson, 2006), where market norms and social contexts impact the behaviour of the homo economicus and the homo virtus (Sandel, 2012; Friedland and Cole, 2019). In this context, this paper investigates the empirical importance (i.e., influence) that economic and noneconomic perspectives have on wellbeing.

The objective of this article is to estimate a utility model that considers individual actions from a complex virtue perspective to quantitatively measure the weight or influence of the economic and noneconomic perspectives on wellbeing. We rely on Parada-Daza (2004) for the empirical model, one of the few works that includes a complete mathematical formalization of the utility function and that allows an econometric estimation. We test three hypotheses: (a) the contributions of economic and noneconomic factors can be assessed quantitatively through the utility model of a complex individual, (b) the estimated coefficients on the relevance of the perspective of the economic man and of emotions caused by noneconomic factors are statistically significant, and (c) the emotional basis of wellbeing varies depending on the country where an individual is located.

For the estimation, we use data from different sources: the Well-Being Index developed by the Boston Consulting Group's Sustainable Economic Development Assessment (2008–2018), the Index of Economic Well-Being from the Centre for the Study of Living Standards (1980–2014), and the Happiness Score from the World Happiness Report (2005–2018). We develop estimations with the model, depending on data availability, globally for all countries, OECD countries, European countries, and developing countries.

Our paper contributes to the literature by empirically determining the influence of economic and noneconomic factors on behaviour, extending previous work in Parada-Daza (2013) by using additional empirical measures of life satisfaction and extending the sample of countries considered. Both the measurement of weights and the compliance of the emotional wellbeing function are estimated. We estimate the weights of homo economicus and homo virtus by considering several geographic definitions to better understand the factors that influence economic and noneconomic valuations.

This article fits the literature that extends the standard neo-classical conceptions of individual behaviour to include other aspects of human behaviour, such as emotions, morality, and ethics. Nobel prizewinner Richard Thaler (2000) argues that the popularity of the homo economicus conception increased due to its ease of construction and tractability. He suggests that economic sciences should extend this conception to a homo sapiens model, where emotions, learning, and other conceptions of rationality should be considered. Similarly, Lawrence and Nohria (2002) discuss basic drives that explain almost all behaviour, such as social position relative to other individuals, long-term relationships with others, and individual understandings of social creation and beliefs. In this context, Parada-Daza (2004) proposes a utility function framework that incorporates human and theological virtues (i.e., prudence, justice, temperance, bravery, faith, charity, and hope) considering behaviours that are not exclusively based on rational economic standards. This function has been dubbed the "Emotional Well-being Function" and has since been extended in Parada-Daza and Parada-Contzen (2013b) to study wealth accumulation. In a similar approach, Friedland and Cole (2019) discuss extensions of the economic person model by including moral motivation such as pride, shame, and guilt in a setting denominating the "model of raising moral self-awareness" where individuals get closer to the homo virtus perspective as they achieve higher levels of societal considerations (e.g., positive and negative externalities of his or her behaviour). The paper also relates to the literature in happiness economics, which extends classic economic considerations and model satisfaction from a measurable perspective (Frey and Stutzer, 2013).

From our empirical analysis, we find that all three hypotheses are confirmed. Our results indicate that, on average, the homo virtus dimension of behaviour has a weight of 11% in countries' wellbeing functions, while the homo economicus perspective has a weight of 89%. Thus, while the economic dimension has an important weight in explaining wellbeing, it should not be the only dimension to consider when measuring wellbeing. We find that richer countries tend to value economic factors more than developing countries. The results also show that the maximum level of emotional satisfaction is higher for European and OECD countries than for developing countries. These results are consistent with the literature. For example, Delhey and Kohler (2006) show that life satisfaction is different for those who have an idea of how people live in other countries. This relates to the "comparison income" or "relative utility" effect, which suggests that wellbeing depends on the utility of a comparison with a reference group (Ferrer-i-Carbonell, 2005; Easterlin, 1995). These results

are also consistent with the literature that analyses the impact of social structures and economic incentives in society on moral behaviour (Aquino and Reed, 2002, 2003; Sandel, 2013).

The rest of the paper is developed as follows. Section “Conceptual background” presents the relevant literature and the conceptual model of emotional wellbeing. This model serves as the conceptual background for the rest of the paper. Section “Data and research sample” presents the data source and wellbeing measures used. Then, Section “Empirical model” presents the empirical model and working hypotheses, and Section “Estimation results” presents the estimation results. Finally, Section “Discussion” draws conclusions from the paper.

Conceptual background

The mathematical representation of the homo economicus started in the 1940s after the rise in the use of mathematical formalizations in economics (Thaler, 2000). Since then, economic behaviour has typically been represented by utility functions that arise from a binary relationship between the level of wealth or consumption and the level of satisfaction. Many of these utility specifications rely on mathematical functions, such as the logarithmic function (first developed by Bernoulli, 1730–1731 and with an autonomous foundation by Quesnay, 1776). Quadratic, exponential and potential utility functions have since been used.

In economics, utility theory is based on the axioms of Von Neumann and Morgenstern (1947). Following this conceptualization, Pratt (1976) and Arrow (1970) incorporated measures of risk aversion. There has been theoretical development of utility functions, especially within financial economics and in fields that address the risk–return trade-off: Debreu (1966), Friend and Blume (1975), Tversky and Kahneman (1992), Inhaber and Carroll (1992), Carroll (1998), Hwang and Satchell (2005), and Rabin (2000). The power utility function has been posited by Ait-Sahalia and Brandt (2001), Mehera and Prescott (1985) and Ang et al. (2005). There are three approaches to understanding the utility function: cardinal utility (Marshall, 2009), ordinal utility (Hicks and Allen, 1934) and the theory of rational behaviour (von Neumann and Morgenstern, 1947).

The utility function explains methodologically how individuals approach their role as an economic person who makes decisions by choosing an option from two alternatives in favour of the one expected to deliver the greatest utility. Schumpeter (1954) analyses the influence of utilitarianism in economic thought and states that it is a mechanistic interpretation of the universe, qualifying it as highly sublimated egocentric hedonism. Laffont (1995) states that the utility function is a normative approach and, therefore, is a working hypothesis that requires empirical verification to be proven. Etzioni (1986) gives a critical interpretation of the maximization of rational utility and, in particular, the concept of the mono-utility function. It is argued that individuals act on at least two irreducible sources of utility: pleasure and morality. Emphasis is placed on the separation of moral obligations from all other satisfactions (Etzioni, 1986).

The central foundational literature regarding the homo virtus comes from ancient Greek culture. Aristotle narrowed the concept of virtue to describe attitudes towards morality, justness, and integrity and defined a virtue as an equilibrium between the deficiency and excess of a personality trait (Dawson, 2015; Song and Kim, 2018). In the first book of the *Nicomachean Ethics*, Aristotle presents the habituation hypothesis, which proposes that individuals develop moral virtues through repeated and guided practices in moral actions. At the same time, some authors claim that humans naturally tend towards actions that pleasure them (Stewart, 1990).

According to Aristotelian ethics, cultivating virtuous behaviour is crucial to attaining satisfaction (Fernando and Chowdhury, 2017). Several modern philosophers have extended the concept of virtue, while the inspiration for Aristotle’s original work remains (Adams, 2006; Song and Kim, 2018). This perspective has evolved to the self-realization concept, where the highest level of individual development is achieved once his or her potential is fully realized (Fernando and Chowdhury, 2017). An application of self-realization theory proposes that individuals achieve satisfaction from the attainment of different dimensions/levels of needs: biological and physiological, safety/security, love/belonging, and self-esteem, where some needs are more related to economic dimensions (e.g., eating and job stability) than others (e.g., love) (Maslow, 1954; Maslow, 1968).

While the complexity of behaviour is not unknown to the science of economics, many researchers do not consider other perspectives. In a review of homo economicus’s origin, O’Boyle (2007) notes the existence of other conceptualizations that have tried to move away from the standard economic rationalization of behaviour, recognizing the following conceptions: homo politicus, homo sociologicus, homo sovieticus, homo sapiens, and homo religiosus, among others. Similarly, Tirole (2017) recognizes homo politicus, homo psychologicus, homo socialis, homo inicitatus, homo juridicus, homo darwinus, and homo religiosus. These different perspectives on human behaviour indicate that individual behaviour is complex and considers several dimensions and that their satisfaction levels do not rely exclusively on economic perspectives, such as income or consumption. In this paper, we refer to the concept of virtue in the Aristotelian view, such that the homo virtus considers individual attitudes towards morality, justice and integrity and encompasses several dimensions of motivations (e.g., the homo politicus, religious and sociologicus are subsets of the homo virtus) in his or her behaviour.

The need for a richer understanding of economic actions arises when we focus on a broader perspective than that of economic man alone, that is, the perspective of a complete and complex human. For example, under this broader perspective, when faced with an economic choice, an individual is understood not only to be complete and complex but also to act as a biological, social and cultural being simultaneously while considering the moral construct for his or her virtuous behaviour. Indeed, in Neo-Aristotelian schools, some focus on community as a context for virtue, such that individuals have to focus on the community to contribute to human good (MacIntyre, 1999).

Friedland and Cole (2019) have recently re-examined the idea that individuals do not act only in self-interest and extend the standard economic persona by defining the moral self-awareness mindset, which integrates the social welfare perspective by considering three individual characteristics: pride, shame, and guilt. While they do not include a mathematical formalization of the model, they consider how the homo economicus perspective displaces homo virtus behaviour and how the three moral motivations interact as individuals consider their self-interest and society in their behaviour. They revisit self-realization theory by proposing a model that considers, on the first level, individual self-interest and, on the second level, self-reflection by considering the role of the negative externalities they cause and using others’ behaviours as feedback. In this third level, the individual is forward-looking and looks at negative externalities before acting. The final level is where they are forward-looking and consider both the negative and positive externalities of their behaviour (Friedland and Cole, 2019). Under this model, homo economicus behaviour gets closer to the homo virtus perspective as the individual operates at higher levels of behaviour.

Another strand of the literature builds upon the concept of moral self-awareness, where individuals' behaviour is modelled to be a function of moral identity, which links individuals to the community and reference groups through social and cultural influences (Aquino and Reed, 2002, 2003). Research also shows that market mechanisms designed to satisfy the homo economicus dimension of behaviour displace nonmarket behaviours associated with the homo virtus perspective in an effect that the literature has called moral crowding-out (Frey and Jegen, 2001; Sandel, 2012, 2013; Bowles, 2016).

The emotional wellbeing function was first presented in Parada-Daza (2004) and further developed in Parada-Daza and Parada-Contzen (2013b). The relationship between utility, ethics and behaviour is analysed in Parada-Contzen and Parada-Daza (2013a). They study the philosophical support for economic man and the representation of the construct's utility function. Parada (2004) and Parada-Daza and Parada-Contzen (2013b) mathematically show that the utility function is an upper envelope of other utility functions, with two components: the classic utility function and a sinusoidal component. From this deduction, a new function is generated that represents economic behaviour in such a way that other noneconomic factors are collected, where the noneconomic factors are ethical and normative restrictions. These other factors influence and condition the decisions of each economic act, following the crowding-out literature that suggests that one perspective displaces the other. The new function is denominated emotional wellbeing (WB). In the cited works, it is shown that there is another lower envelope of the same type as the logarithmic or quadratic function.

The interpretation of the upper utility function (upper envelope) and the lower utility function (lower envelope) makes common sense. The WB function is located between both functions. Thus, the classic utility function (upper envelope) represents the maximum level of emotional satisfaction and, in that case, would be equivalent to the utility function of rational choice theory.

On the other hand, the lower wellbeing function (lower envelope) represents the minimum level of satisfaction demanded by each individual. When an individual makes economic decisions that coincide with the maximum utility function, it is implied that there is no economic sacrifice. However, there is a safety level of utility that is given by the minimum utility function. Therefore, at a specific wealth level, the difference between the maximum utility for this wealth and the WB utility at the same level of wealth represents the sacrifice of not behaving exclusively as a rational economic person.

The WB function allows us to argue that the standard utility function used for economic analysis is an exclusive representation of the purely economic person. Notably, it is a set of points that represents the maximum level of utility than can be obtained for a given level of wealth. However, it is important to consider that some individuals are willing to sacrifice this maximum level of utility for other reasons. This is far from the maximizing behaviour represented by the utility function; however, it is more adequately explained by the WB function.

The function is as follows:

$$WB_{it} = a_0 + a_1 \ln(w_{it}) + a_2 \sin(\pi w_{it}), \text{ with } a_1 + a_2 = 1 \quad (1)$$

where WB_i = Emotional wellbeing of individual i in period t . a_0 = Level of emotional satisfaction of individual i generated by belonging to a community of individuals with rights and obligations and by the collective commodities provided by the public goods of the community. a_1 = weight that individual i assigns to his or her behaviour as an economic person. a_2 = weight that individual i assigns to his or her behaviour as a nonexclusively economic person. Gathering the weight over the other variables

that coincide with an economic decision, w_i = wealth share of individual i relative to the total wealth of a set of individuals within the community. $\ln(w_i)$ = Logarithm of relative wealth. $\sin(\cdot)$ = Trigonometric function sine (i.e., $\pi = 3.14$).

Note that the utility function is a particular case that occurs when $a_1 = 1$ and $a_2 = 0$. This shows that individual i is only motivated by the maximum utility given that this does not sacrifice coincident utility, meaning that $WB_i = a_0 + a_1 \ln(w_i)$. On the other hand, when $a_2 = 1$ and $a_1 = 0$, the individual ignores economic behaviour and is motivated by noneconomic reasons. Therefore, $WB = a_0 + a_2 \sin(\pi w_i)$.

In real life, it is probable that simultaneous importance is given to both the economic person perspective and the human as a complex individual. Therefore, it is expected that $0 < a_1 < 1$ and $0 < a_2 < 1$. Hypothetically, if $a_1 > 1$ and $a_2 < 0$ or $a_1 < 0$ and $a_2 > 1$, then an individual would be willing to sacrifice one dimension to benefit the other.

The upper (WB_{it}^+) and lower (WB_{it}^-) utility functions have the following form:³

$$WB_{it}^+ = a_1 \ln(w_{it}) + (a_0 + a_2) \quad (2)$$

$$WB_{it}^- = a_1 \ln(w_{it}) + (a_0 - a_2) \quad (3)$$

Parada-Daza (2004) and later works follow the same reasoning as other conceptualizations of utility, such as those in Tirole (2017) and O'Boyle (2007). In contrast to these frameworks, Parada-Daza (2004) emphasizes the quantification of economic persona and other dimensions of human behaviour. In a previous study, Parada-Daza (2013) estimates the WB model using only data from 14 (developed) countries (i.e., Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States of America). This paper extends that previous work by considering a wider sample.

This model has been considered for different applications. Briluis (2010a) uses the WB model to explain a dynamic model of dependencies between economic crises and the contribution of corporate social responsibility (CSR) to sustainable development. In another model, Briluis (2010b) uses the WB model to examine to what extent and in what manner global economic downturns affect the CSR contribution to sustainable development. Parada-Daza (2009) uses the WB model in a valuation model for CSR. Soldatos (2014) uses the WB model to examine a religion–public policy correlation. Soldatos and Varelas (2015) use the model to make a first formal approach to animal spirits beyond uncertainty. Parada-Contzen and Parada-Daza (2013b) use the model to conceptually explain wealth concentration, showing that those who concentrate wealth have greater emotional wellbeing than those who have less wealth, despite both having the same coverage between what they fail to gain and the safety cushion granted by the minimum utility function.

Data and research sample

To estimate the model, we need data on wealth for controls and emotional wellbeing, which is the dependent variable of the model presented in Eq. (1). We include variation at the country level, meaning that we use measures of wealth and satisfaction for different countries. Despite the difficulty of measuring wellbeing, measurement indices have been created to elicit general wellbeing in populations. Typically, these indices are available at a country level and can be used as proxy variables of an individual's level of satisfaction in that country. In this paper, we rely on secondary sources of information, and we use validated measures of wellbeing.

Table 1 Summary statistics for wellbeing indices.

Variable	Obs.	Mean	S.D.	Min	Max	#Countries	Years
WBI	1573	0.50	0.19	0.16	0.89	143	2008–2018
IEWB	490	0.50	0.09	0.29	0.82	14	1980–2014
HS	1666	0.54	0.11	0.27	0.80	160	2005–2018

We use three indicators: the Well-Being Index developed by the Boston Consulting Group’s (BCG) Sustainable Economic Development Assessment (SEDA), the Index of Economic Well-Being from the Centre for the Study of Living Standards, and the Happiness Score from the World Happiness Report. For all measures, emotional wellbeing is an index between 0 and 1. In the next paragraphs, we go over the details of each of the measures. Wealth measures are obtained from the World Bank’s indicators (GDP per capita and GDP per capita corrected by international purchase power parity).

The **Well-Being Index from the BCG’s Sustainable Economic Development Assessment (SEDA)** is an annual wellbeing indicator developed by the Boston Consulting Group (BCG). It includes 143 countries for the years 2008–2019.⁴ SEDA defines wellbeing through ten dimensions to extend the standard measure of welfare, complements purely economic indicators, and considers observed outcomes, relative performance of countries, and quasiobjective data. The dimensions considered are as follows: (1) income (GDP), (2) economic stability (inflation and its stability), (3) employment and unemployment, (4) health (access to health care and its outcomes), (5) education (access to education and its outcomes), (6) infrastructure (power, water, sanitation, transportation, among others), (7) equality (income distribution, equality in education, life expectancy), (8) civil society (civic activism, intergroup cohesion, safety, trust, gender equality), (9) governance (effectiveness, accountability, stability, freedom), and (10) quality of the environment (BCG, 2023). While the index is based on observed variables for measuring wellbeing, it is strongly correlated with other wellbeing measures based on subjective assessments such as the UN’s happiness scores (BCG, 2023). We refer to this index as the WBI.

The **Index of Economic Well-Being from the Centre for the Study of Living Standards of Canada (CSLS)** is an annual wellbeing indicator based on an article by Lars Osberg (1985) for the MacDonald Commission entitled “The Measurement of Economic Well-Being.” The data cover the period 1980–2014 for 14 OECD countries.⁵ The index incorporates four dimensions of economic wellbeing: (1) effective per capita consumption flows, including market goods and services; government services; effective per capita flows of household production; leisure; and changes in lifespan; (2) net societal accumulation of stocks of productive resources, including net accumulation of tangible capital; housing stock; net changes in the value of natural resources; environmental costs; net changes in the level of foreign indebtedness; accumulation of human capital; and the stock of R&D investment; (3) income distribution, including the intensity of poverty (incidence and depth) and income inequality; and (4) economic security from job loss and unemployment, illness, family breakup, and poverty in old age. The variables chosen for constructing this index capture dimensions such as the value of leisure, lifespans, and the value of accumulation for future generations to construct a measure of wellbeing (CSLS, 2023). We refer to this index as the IEWB.

The **World Happiness Score from the Gallup World Poll (HS)** is an annual wellbeing indicator provided in the World Happiness Report (editors: John F. Helliwell, Richard Layard and Jeffrey D. Sachs) measured for the period 2005–2018. In total, it

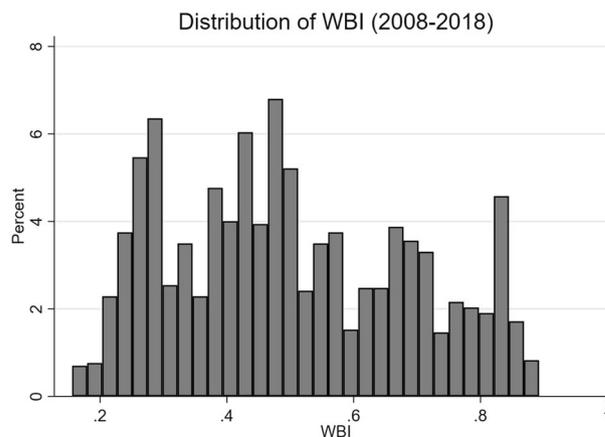


Fig. 1 Distribution for the Wellbeing Index from the BCG’s Sustainable Economic Development Assessment. This figure shows the distribution of values for the WBI. The distribution is relatively flat with peaks between 0.3 and 0.5 for the WBI.

includes approximately 160 countries (note that not all countries include data for all periods).⁶ The index incorporates survey responses and data for the following dimensions: (1) GDP per capita, (2) social support, (3) healthy life expectancy, (4) freedom to make life choices, (5) generosity and (6) perceptions of corruption. This index was analysed by Deaton (2008), who notes that the questionnaire covered many aspects of wellbeing, including life satisfaction, where an overall evaluation of life is measured. We refer to the index as the HS.

The research sample is defined all countries for which we have data on wellbeing and GDP. We consider information up to 2018, which is the end of the period containing data available for the authors. Summary statistics for all three wellbeing indices are presented in Table 1. The distribution of the index across the sample for each index is presented in Figs. 1–3.

Across samples, the indices have similar behaviour. Note that for all three measures, the mean is approximately 0.5, and the maximum is approximately 0.80–0.89. The distributions shown Figs. 1–3 indicate that the indices are similar in the sense that bell-shaped curves can be detected. This shape is less evident for the WBI.

The indices are constructed considering different dimensions. Because their construction and the background used in defining wellbeing are different, they are also different measures of wellbeing. While they all capture satisfaction at the country level, the concept of satisfaction in each of them varies. Obviously, because the construction is different, the magnitudes for each index also differ. Thus, estimation results will be different across measures, meaning that, for example, the constant may take very different values for each measure. Nevertheless, the coefficients can be compared in the way that they represent weights for homo economicus and homo virtus. Regardless of the index, the estimated weights have the same interpretation in the sense that we will be able to compute the weight that economic and noneconomic factors have on wellbeing, being at first agnostic regarding how wellbeing is being measured. Note that variation in the indices

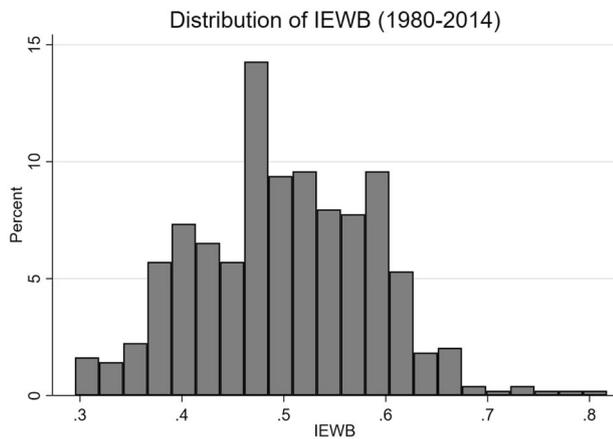


Fig. 2 Distribution for the Index of Economic Wellbeing from the Centre for the Study of Living Standards of Canada. This figure shows the distribution of values for the IEWB. The distribution is bell-shaped with peaks between 0.4 and 0.5 for the IEWB.

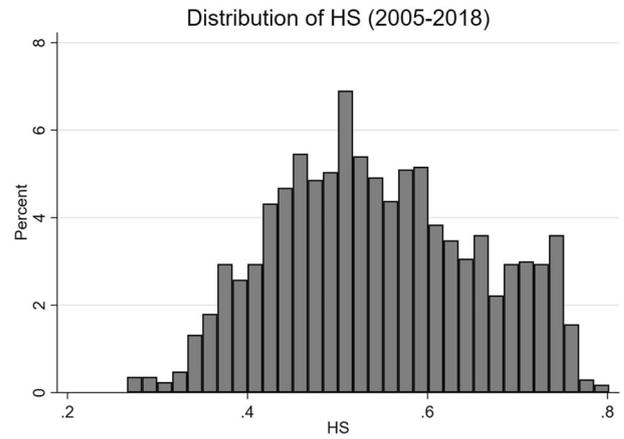


Fig. 3 Distribution of the Happiness Score from the Gallup World Poll. This figure shows the distribution of values for the HS. The curve is bell-shaped with a smaller kurtosis than for Fig. 2, with peaks about at the same value and with values ranging in the same interval for the HS.

and dimensions included in their measures also implies that utility levels differ depending on the wellbeing index used. However, because utility functions are ordinal rather than cardinal, this does not impose limitations on the analysis, in which we are interested in the weights.

Empirical model

Using the data presented in the previous section, we estimate a variation of the model of emotional wellbeing presented in Eq. (1). To ensure that the coefficients on the logarithm of wealth and the sinusoidal component are one hundred percent of the events that affect emotional wellbeing, it is assumed that the sum of both is equal to one. Thus, replacing $a_2 = 1 - a_1$, a new model is obtained from which a_0 and a_1 are estimated. The new model to be estimated is presented in Eq. (4):

$$WB_{it} - \text{Sin}(\pi w_{it}) = a_0 + a_1 [\text{Ln}(w_{it}) - \text{Sin}(\pi w_{it})] + \varepsilon_{it} \quad (4)$$

Note that in this specification, the subindex i represents a country, t the year, and N the total number of countries in the sample. In this case, the set of countries represents the community, where WB_{it} represents the emotional wellbeing of country i in year t , $\text{Sin}(\cdot)$ is the trigonometric function sine (in radians), $w_{it} = \text{GDP}_{it} / \sum_1^N \text{GDP}_n$ (in percentage) and represents relative wealth, defined as the wealth participation of country i with respect to total wealth each year, $\text{Ln}(w_i)$ is the logarithm of relative wealth of country i in year t , and ε_{it} is an independent and identically distributed random error. Envelope functions WB_{it}^+ and WB_{it}^- are computed according to Eqs. (2) and (3).

The dependent and control variables are defined according to the modified model presented in Eq. (4). The summary statistics by subsample for the dependent and control variables are presented as follows in Tables 2–4 for each model (WBI, IEWB, and HS, respectively).

The hypotheses to test are as follows:

- a. The contributions of economic and noneconomic factors can be assessed quantitatively through the WB function, which captures the utility of a complex and complete person, considering emotional wellbeing from a more general perspective than the exclusively economic view. Thus, the hypothesis to test is that the model presented in Eq. (4) is significant in explaining emotional wellbeing, versus that it is not.
- b. The coefficients that weight the relevance of the perspective of economic man (a_1) and of the emotion caused by

noneconomic factors (a_2) are different from zero; in other words, the null hypothesis is $H_0: a_k = 0$, versus the alternative, $H_1: a_k \neq 0$, where $k = 1, 2$. In this case, rejection of the null hypothesis is to be tested.

- c. The emotional basis of emotional wellbeing varies depending on the country where an individual is located, which is verified through the following hypothesis: $H_0: a_0 = 0$ and $H_1: a_0 \neq 0$.

The regression model presented in Eq. (4) is estimated using ordinary least squares controlling for year and country fixed effects and clustered standard errors at the country level.

Estimation results

We present and compare the estimation results for Eq. (4) under the three indices of wellbeing considered. Note that one should not expect the coefficients across models to be the same since each index is unique in the way it defines and measures wellbeing. However, conclusions based on similarities or patterns could be derived. We end this section by presenting estimates regarding maximum and minimum levels of demand for emotional satisfaction.

Well-Being Index from the BCG’s Sustainable Economic Development Assessment. The estimation results are presented in Table 5. Several regressions are performed considering, first, all countries in the sample and, second, specific subsamples by continent, geographic area, and level of economic development. All models are statistically significant in explaining the dependent variable, and all estimated coefficients are significant at the 1% level.

Generally, we find that when considering the 143 countries in the sample, homo economicus behaviour represents 74.8% of human behaviour, while the homo virtus dimension represents 25.2%. There is important heterogeneity in these weights when we estimate the model with specific subsamples.

The results for the subsample suggest that richer countries put higher weight on the economic dimension, with a coefficient above 80%. For example, the results for Europe, OECD countries and Arabic countries demonstrate this trend. On average, the homo economicus weight for these three sets of countries is 88%, while the weight for homo virtus is 22%. In contrast, we find that developing countries (according to the International Monetary Fund (IMF)) and Latin American countries show a much lower valuation of the economic perspective, with an average of 43%. In these cases, the homo virtus perspective has greater

Table 2 Summary statistic by subsample, for dependent and control variables (model WBI).

Sample	WBI		GDP		Y		X	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
All countries	0.50	0.18	14,668.69	19,759.86	0.11	0.51	-1.68	1.52
Europe	0.67	0.13	28,020.29	24,625.74	0.30	0.64	-0.53	1.35
Americas	0.50	0.11	11,322.82	12,656.1	-0.25	0.20	-1.77	0.70
Asia	0.48	0.14	12,378.32	16,713.32	0.18	0.50	-1.73	1.50
Africa	0.31	0.10	3237.95	6241.90	0.02	0.30	-2.91	0.96
OECD	0.74	0.96	40,903.86	22,369.03	0.44	0.67	0.20	0.95
Developing countries (IMF)	0.41	0.13	5887.06	8157.00	-0.06	0.31	-2.36	0.97
Latin America	0.47	0.77	7677.03	4428.85	-0.24	0.20	-1.93	0.49
Arabic countries	0.47	0.16	14,753.08	17,956.88	0.23	0.54	-1.34	1.54

Table 3 Summary statistic for dependent and control variables (model IEWB).

Sample	IEWB		GDP		Y		X	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
All countries	0.50	0.09	40,118.71	13,144.84	0.47	0.73	10.52	0.87

Table 4 Summary statistic by subsample, for dependent and control variables (model HS).

Sample	HS		GDP		Y		X	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
All countries	0.54	0.11	14,150.83	19,006.99	0.18	0.53	8.25	1.59
Europe	0.59	0.10	25,247.33	22,954.58	0.27	0.67	9.36	1.40
Americas	0.61	0.08	10,834.48	13,008.12	-0.03	0.40	8.15	0.98
Asia	0.54	0.09	13,513.75	17,468.04	0.24	0.54	8.27	1.62
Africa	0.43	0.06	1963.08	2276.91	0.14	0.25	6.82	0.66
OECD	0.67	0.08	39,155.53	20,906.57	0.49	0.70	10.25	0.94
Developing countries (IMF)	0.51	0.09	5236.95	6736.98	0.03	0.35	7.51	0.98
Latin America	0.60	0.08	6825.79	4366.63	-0.04	0.35	7.92	0.75
Arabic countries	0.53	0.10	12,593.43	16,026.54	0.22	0.53	8.40	1.51

Table 5 Estimation results using the Well-Being Index from the BCG's SEDA.

Sample	α_0	α_1	$\alpha_2=1-\alpha_1$	N	R ² Adj.	Global F
All countries	1.571*** (t = 50.59)	0.748*** (t = 11.28)	0.252	1572	0.9859	718.79***
Europe	1.734*** (t = 30.99)	0.841*** (t = 32.38)	0.159	473	0.9959	2185.26***
Americas	0.072 (t = 0.48)	0.289*** (t = 3.36)	0.711	253	0.9702	249.35***
Asia	0.705*** (t = 32.17)	0.719*** (t = 8.66)	0.281	351	0.9838	507.93***
Africa	1.358 (t = 1.53)	0.709* (t = 1.76)	0.291	429	0.9472	157.64***
OECD	-0.156*** (t = -16.58)	0.867*** (t = 42.68)	0.133	348	0.9976	3335.04***
Developing countries (IMF)	1.198*** (t = 3.32)	0.574*** (t = 3.52)	0.426	1176	0.9629	261.66***
Latin America	0.072 (t = 0.48)	0.286*** (t = 3.29)	0.714	209	0.9709	240.11***
Arabic countries	1.778*** (t = 7.11)	0.933*** (t = 7.92)	0.067	176	0.9752	265.26***

Note: (a) t computed using clustered standard errors. (b) All models control for year effects and country fixed effects. (c) *** represents significance at the 1% level, and * at the 10% level. (d) α_1 represent the influence of the homo economicus dimension of behaviour on wellbeing and α_2 represents the influence of the homo virtus dimension of behaviour on wellbeing.

importance, reaching levels above 50%. Note that we do not expect this to be the case for the US and Canada since both are economically and culturally different from the rest of the countries in the Americas. However, due to the small number of observations for these two countries, specific effects cannot be detected. A surprising result is the one for Africa, which indicates that the economic perspective on behaviour reaches 71% in

importance, above the levels of Latin American and developing economies.

Index of Economic Well-Being from the Centre for the Study of Living Standards of Canada. In Table 6, we present the estimation results using the data from the CSLs. Recall that these data are only available for 14 OECD countries. One of the benefits

Table 6 Estimation results using the Index of Economic Well-Being from the CSLS.

	α_0	α_1	$\alpha_2 = 1 - \alpha_1$	N	R ² Adj.	Global F
All countries	-8.157*** (t = -21.90)	0.820*** (t = 21.93)	0.180	490	0.9339	6905.59***
All countries (year FE)	-8.243*** (t = -20.02)	0.845*** (t = 19.86)	0.155	490	0.9446	239.44***
All countries (year and country FE)	-9.748*** (t = -54.25)	0.984*** (t = 60.56)	0.016	490	0.9965	2925.44***

Note: (a) t computed using clustered standard errors. (b) *** represents significance at the 1% level. (c) α_1 represent the influence of the homo economicus dimension of behaviour on wellbeing and α_2 represents the influence of the homo virtus dimension of behaviour on wellbeing.

Table 7 Estimation results using the World Happiness Score from the Gallup World Poll.

Sample	α_0	α_1	$\alpha_2 = 1 - \alpha_1$	N	R ² Adj.	Global F
All countries	-5.373*** (t = -53.92)	0.933*** (t = 65.94)	0.067	1659	0.9775	418.86***
Europe	-7.652*** (t = -81.44)	0.984*** (t = 89.56)	0.016	514	0.9931	1266.90***
Americas	-7.723*** (t = -22.08)	0.917*** (t = 26.18)	0.083	285	0.9744	271.62***
Asia	-5.328*** (t = -26.61)	0.924*** (t = 27.93)	0.076	407	0.9710	267.81***
Africa	-0.758 (t = 0.146)	0.042 (t = 0.58)	n/a	429	0.9570	157.14***
OECD	-9.981*** (t = -75.21)	0.991*** (t = 81.72)	0.009	388	0.9951	1614.44***
Developing countries (IMF)	-4.670*** (-20.48)	0.839*** (t = 25.84)	0.161	1222	0.9489	172.68***
Latin America	-7.122*** (t = -20.80)	0.862*** (t = 23.00)	0.138	241	0.9670	196.12***
Arabic countries	-7.250*** (t = -13.90)	0.937*** (t = 13.65)	0.063	161	0.9652	144.23***

Note: (a) t computed using clustered standard errors. (b) All models control for year effects and country fixed effects. (c) *** represents significance at the 1% level. (d) n/a = coefficient cannot be computed due to the nonsignificance of its complementary coefficient. (e) α_1 represent the influence of the homo economicus dimension of behaviour on wellbeing and α_2 represents the influence of the homo virtus dimension of behaviour on wellbeing.

Table 8 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Well-Being Index from the BCG's SEDA.

	Maximum satisfaction function (upper envelope)	Minimum satisfaction function (lower envelope)	Emotional well-being function
All countries	0.748Ln(w) + 1.823	0.748Ln(w) + 1.319	1.571 + 0.748Ln(w) + 0.252Sin(πw)
Europe	0.841Ln(w) + 1.893	0.841Ln(w) + 1.575	1.734 + 0.841Ln(w) + 0.159Sin(πw)
OECD	0.867Ln(w) - 0.023	0.867Ln(w) - 0.289	-0.156 + 0.867Ln(w) + 0.133Sin(πw)
Developing countries (IMF)	0.574Ln(w) + 1.624	0.574Ln(w) + 0.772	1.198 + 0.574Ln(w) + 0.426Sin(πw)

Note: upper and lower envelope functions computed based on Parada-Daza and Parada-Contzen (2013b).

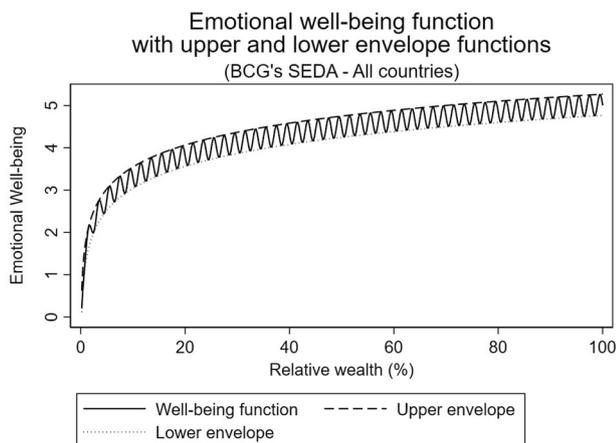


Fig. 4 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Well-Being Index from the BCG's SEDA—all countries. This figure shows the estimated wellbeing function with its upper and lower envelope, where the sinusoidal component indicate the potential values that emotional wellbeing may take.

of this dataset is the long history of its panel duration. Among these countries, we find that the results follow similar patterns to those shown in Table 2. Note that unlike in the previous dataset, after controlling for country fixed effects, most of the importance of the homo virtus perspective vanishes. A difference regarding the results from Table 5 is that the OECD countries included in the CSLS are only those that have participated in the organization since 1980. This again suggests that richer countries put a higher weight on the economic perspective.

World Happiness Score from the Gallup World Poll. The estimation results for the World Happiness Score are presented in Table 7. All models are significant for globally explaining the variation in the dependent variable. For comparison purposes, we estimate the model for the same subsamples as those defined in Section “Well-Being Index from the BCG’s Sustainable Economic Development Assessment.” Generally, we find that the economic perspective has a weight of 93%, while the difference is the weight derived from the homo virtus dimension of behaviour. The results indicate similar patterns. Specifically, richer countries (Europe, OECD, Arabic countries) have a higher homo economicus weight, while as before, this weight is lower for

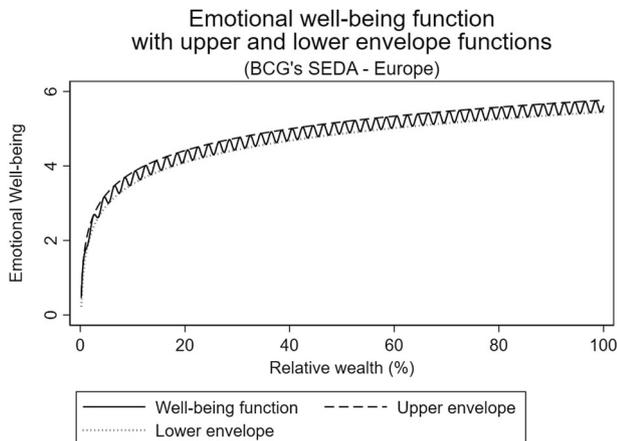


Fig. 5 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Well-Being Index from the BCG's SEDA—European countries. The gap between the upper and lower envelopes for European countries is smaller than for other subsamples.

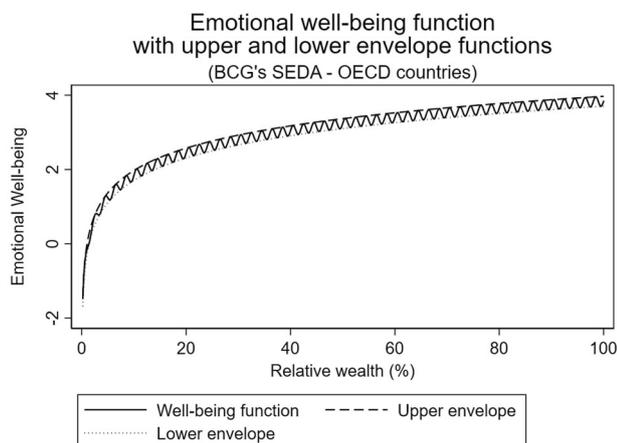


Fig. 6 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Well-Being Index from the BCG's SEDA—OECD countries. The curves behaves similarly for OECD countries than for Europe.

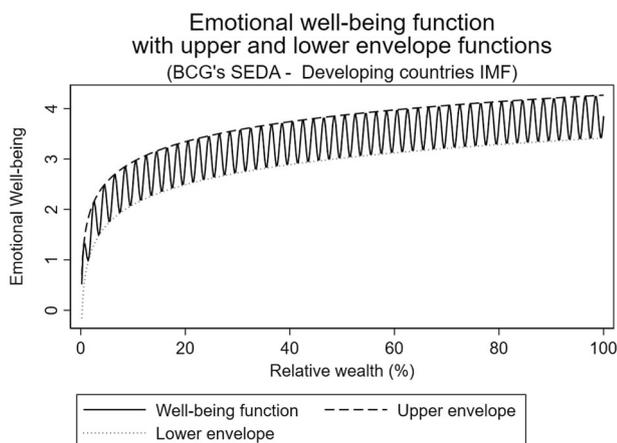


Fig. 7 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Well-Being Index from the BCG's SEDA—developing countries. Note that the sinusoidal component of the curve has more variation for developing countries than for Europe and OECD countries.

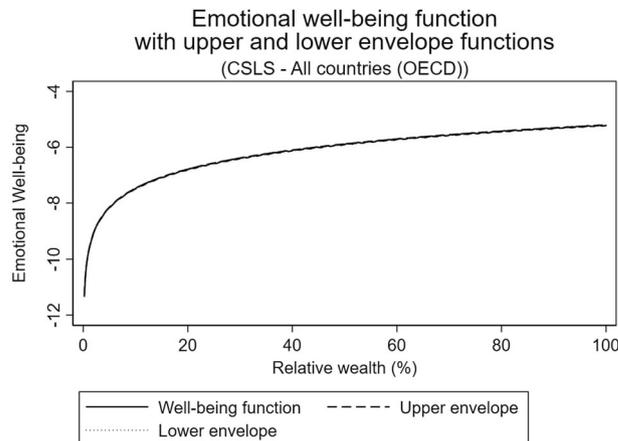


Fig. 8 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Index of Economic Well-Being from the CSLS—entire relative wealth distribution. The sinusoidal component is less visible than for other measures as the range of the function is larger than for the other cases. This because of the magnitude of the estimated coefficients.

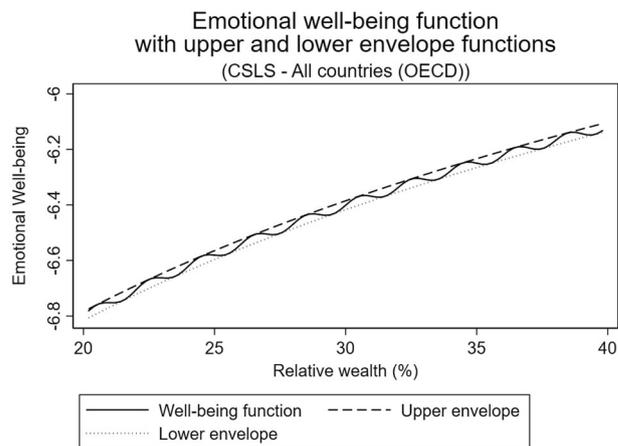


Fig. 9 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Index of Economic Well-Being from the CSLS—zoom on relative wealth between 20 and 40%. When zooming into the function, the sinusoidal component is visible.

developing and Latin American countries. On average, richer countries have a homo economicus weight of 97%, while the average for the set defined by Latin America and developing economies is 85%. As before, the only subsample that does not follow the general pattern is Africa, where no significant effect for the economic perspective can be detected.

Based on the previous analysis, all hypotheses are accepted.

Estimated well-being function and envelope functions. Based on the estimates presented in Sections “Well-Being Index from the BCG’s Sustainable Economic Development Assessment,” “Index of Economic Well-Being from the Centre for the Study of Living Standards of Canada” and “World Happiness Score from the Gallup World Poll,” we are now able to compute the well-being function and its upper and lower envelope functions. Recall that the envelope functions represent the maximum and minimum levels of emotional satisfaction that, in this case, countries are willing to accept. The upper envelope represents the maximum utility level agents demand when no emotional considerations are modelled (i.e., no economic sacrifice), being

equivalent to the utility derived from a rational choice maximization model. Within the envelope functions, we find a sinusoidal-shaped curve representing emotional wellbeing. The magnitudes of the maximum and minimum levels of satisfaction depend on the estimated coefficients reported in the previous section.

For the WBI (see Table 8), we can appreciate clear differences for the functions in different subsamples. For example, the maximum level of emotional satisfaction (no economic sacrifice) is notably higher for European and OECD countries than for developing countries. For representation purposes, the functions are presented in Fig. 4 for the entire sample and in Figs. 5–7 for subsamples.

Regarding the IEWB (see Table 9), there is a small gap between the lower and upper envelope functions since the homo virtus weight determines this gap. Nevertheless, the general specification with the sinusoidal emotional function is still present, represent-

ing variations in emotional wellbeing. For expositional purposes, Figs. 8 and 9 present the functions for the entire relative wealth magnitudes (Fig. 8) and then zoom over a specific interval of relative wealth so that the sinusoidal component can be observed (Fig. 9).

Finally, Table 10 and Fig. 10 present the estimated functions for the HS for the entire sample, and Figs. 11–13 present the estimated functions by subsections defined by regions. Because the results derived from this index show that the homo virtus weight is small relative to the homo economicus weight, we also find that the gap between the upper and lower envelope is small. Intuitively, this suggests that as the homo economicus dimension is relatively more important than the homo virtus dimension, the utility difference with no economic sacrifice and with total economic sacrifice is rather small. Therefore, agents under this representation behave mostly as rational maximizers, consistent with neoclassical economic behaviour.

Table 9 Estimated emotional wellbeing function, maximum and minimum satisfaction using the Index of Economic Well-Being from the CSLS.

	Maximum satisfaction function (upper envelope)	Minimum satisfaction function (lower envelope)	Emotional well-being function
All countries (OECD)	$0.984\ln(w) - 9.732$	$0.984\ln(w) - 9.764$	$-9.748 + 0.984\ln(w) + 0.016\sin(\pi w)$

Note: upper and lower envelope functions computed based on Parada-Daza and Parada-Contzen (2013b).

Table 10 Estimated emotional wellbeing function, maximum and minimum satisfaction using the World Happiness Score from the Gallup World Poll.

	Maximum satisfaction function (upper envelope)	Minimum satisfaction function (lower envelope)	Emotional well-being function
All countries	$0.933\ln(w) - 5.306$	$0.933\ln(w) - 5.440$	$-5.373 + 0.933\ln(w) + 0.067\sin(\pi w)$
Europe	$0.984\ln(w) - 7.636$	$0.984\ln(w) - 7.668$	$-7.652 + 0.984\ln(w) + 0.016\sin(\pi w)$
OECD	$0.991\ln(w) - 9.972$	$0.991\ln(w) - 9.990$	$-9.981 + 0.991\ln(w) + 0.009\sin(\pi w)$
Developing countries (IMF)	$0.839\ln(w) - 4.509$	$0.839\ln(w) - 4.831$	$-4.670 + 0.839\ln(w) + 0.161\sin(\pi w)$

Note: upper and lower envelope functions computed based on Parada-Daza and Parada-Contzen (2013b).

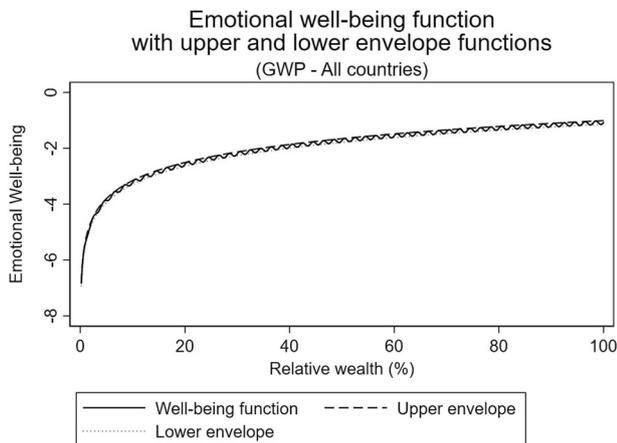


Fig. 10 Estimated emotional wellbeing function, maximum and minimum satisfaction using the World Happiness Score from the Gallup World Poll—all countries. When using the GWP we also observed a wider range than what observed for Fig. 6.

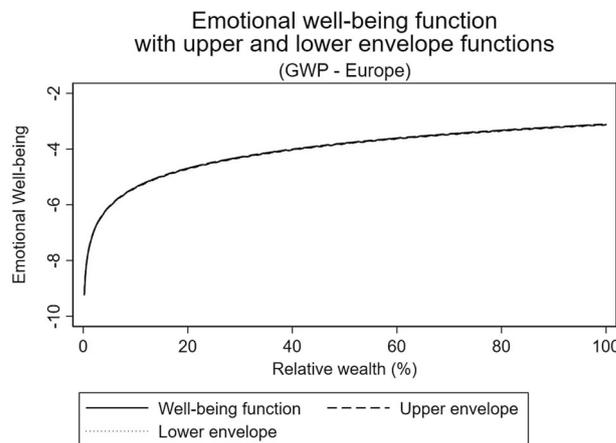


Fig. 11 Estimated emotional wellbeing function, maximum and minimum satisfaction using the World Happiness Score from the Gallup World Poll—European countries. European countries have a lower range in Wellbeing than for the entire sample.

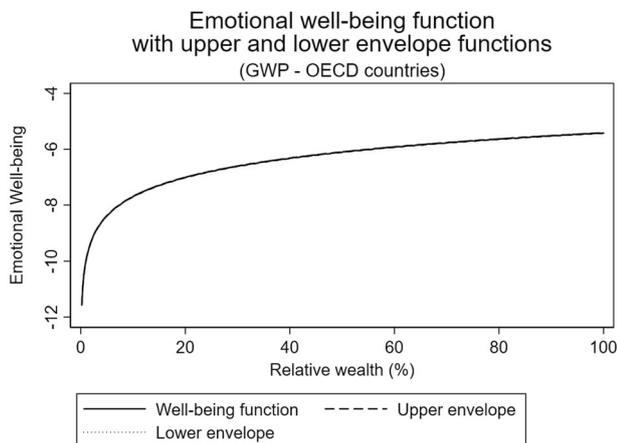


Fig. 12 Estimated emotional well-being function, maximum and minimum satisfaction using the World Happiness Score from the Gallup World Poll —OECD countries. As before, the values for wellbeing in OECD countries lower than for the entire sample, with a more negative range than when considering exclusively European countries.

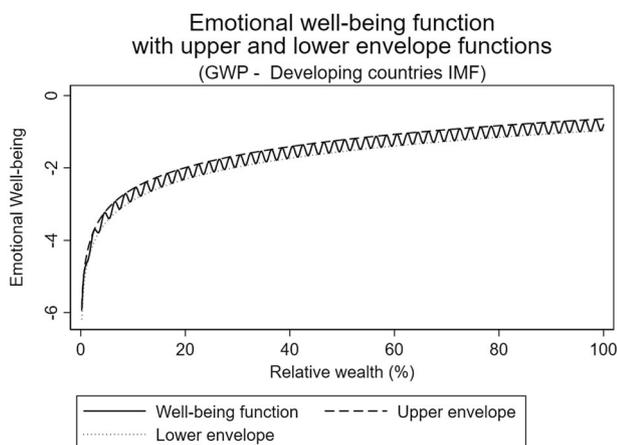


Fig. 13 Estimated emotional wellbeing function, maximum and minimum satisfaction using the World Happiness Score from the Gallup World Poll —developing countries. Wellbeing is higher for developing countries than for European and OCDE countries and we can observe a larger sinusoidal range versus the entire sample.

Discussion

Our main result shows that for all the measures of wellbeing used, richer countries put higher weight on the homo economicus side of behaviour. The estimated results also implied that the maximum level of emotional satisfaction is higher for European and OECD countries than for developing countries. These first results are consistent with the findings from the moral crowding-out literature, which suggest that market mechanisms displace moral behaviour since individuals adapt their actions by responding to economic incentives in society. In particular, developed countries might be placing higher incentives on market mechanisms that motivate individuals to put higher weight on the economic perspective of behaviour. In this setting, market incentives might have crowded-out noneconomic motivations.

The strand of the literature on moral crowding-out relates to the research line in social psychology that suggests that external incentives crowd out intrinsic moral motivation from the individual. In the paper, less developed countries or countries with

lower economic standards might have less prevalent market incentives, so moral motivation has yet to be displaced, and individual moral identity has not switched towards economic incentives. The results are also coherent with the “comparison income” theory, which indicates that individual satisfaction depends on comparison groups’ utility levels. We suppose that we extrapolate this to the country level, in countries or regions with a higher weight on the homo economicus perspective. In that case, individuals in those countries or regions will be incentivized to increase the weight on the economic side of behaviour.

Concerning comparison groups, growing countries might consider more developed countries as a benchmark. If more developed countries put a higher weight on economic factors, less developed countries move in that direction. However, this prediction is not clear since, within less developed countries, individuals might compare themselves with other members in that same country, meaning that the homo virtus perspective may gain importance as the economic perspective is less prevalent.

We can also relate to the literature on self-realization, where individuals achieve wellbeing from fulfilling different dimensions or levels. These levels might differ in distinct regions since they are affected by community feedback and ideals. Thus, we can expect countries/regions to evolve differently towards higher levels of realization. For example, some regions might place a higher weight on economic factors in higher dimensions, while others might prefer a more significant influence on moral aspects.

Interestingly, countries with higher economic growth rates that are not necessarily developed, such as Arabic countries, place an important weight on the homo economicus perspective. This is consistent with the moral crowding-out theory and the reference income hypotheses, where our results indicate that depending on where on the curve of economic growth the country is, the weight on the economic perspective might switch over time. Additionally, it is coherent with the idea that economic market mechanisms might drive off moral behaviour. One can consider that countries in rapid growth phases are placing substantial weight on the design of economic and financial incentives. Importantly, this paper adds evidence to the empirical research that attempts to measure the impacts of moral crowding-out in different settings, such as Wu (2019), Corduneanu et al. (2020), Cinner et al. (2021), Park et al. (2022), and Rai (2022).

The predictions regarding levels of satisfaction coming from the self-realization literature cannot be tested since self-realization levels are not directly observed in the data. The empirical results discussed in this section depend on the well-being measures used and the research sample considered for the estimation. We rely on three measures available for long periods and in different countries. Importantly, we found a pattern of results that is consistent across measures.

A limitation of this study is that all three measures of wellbeing used in this paper are conceptually different, and their original conception gives their definition. The wellbeing measures used several dimensions of observed outcomes and assessments; thus, they capture different phenomena. All measures rely on economic standpoints and other variables for assessing satisfaction. The indices consider economic factors as sources of economic satisfaction and other dimensions that provide wellbeing.

With these measures of wellbeing, we cannot disentangle which dimensions provide higher levels of virtuous self-realization. The indices are constructed recognizing several sources of satisfaction, but they are not ranking them nor attempting to assess the importance of virtuous self-realization as opposed to other related aspects of wellbeing such as emotional satisfaction. Comparing estimation results for countries grouped by regions and development level allows one to draw a map of potential hypotheses regarding levels of self-realization. Future research, however,

could explore empirical models to estimate the different levels of self-realization, as explained by other characteristics, and to treat dimensions used to define a composed index.

Conclusion

This paper estimates the weighting coefficients of factors influencing behaviour by disentangling the economic perspective on behaviour and other variables typically not considered in economic analysis, such as human virtues and ethical factors. On average, the homo virtus dimension of behaviour weights 11%, while the homo economicus perspective weights 89%. Although the proxy indices used are not directly comparable because they value different attributes, the results show a general pattern of comparison.

Generally, the results indicate that the weighting of behaviour from the perspective of economic man is greater than the weight given to the other factors that influence emotional wellbeing. The estimation patterns also indicate that richer countries (e.g., European and OECD countries) tend to value the homo economicus perspective more than developing countries and Latin American countries. The results also show that the maximum emotional satisfaction (no economic sacrifice) level is higher for European and OECD countries than for developing countries.

An important contribution of this research is that it captures weights in behaviour globally and compares valuations in different regions. While this research does not analyse potential explanations for the detected effect, future research should consider whether the differences stem from economic, moral, cultural, or other factors. Future research should also approach the limitation of the wellbeing measures used in this paper. For example, because the measures of wellbeing used are constructed considering several sources of satisfaction but without ranking them, we cannot unravel which dimensions provide higher levels of realization or quantify effects such as levels for the homo virtus perspective. In future investigations, other measures of wellbeing could be used to complement our findings. While it is costly to implement measures at global levels, one could consider surveying a reduced sample of individuals with instruments that allow the researcher to investigate the levels of realization. With these data, one could estimate the same regression model in this paper to complement the results.

Data availability

All data are publicly available from third parties. All sources are referenced in the article. No data were generated by the authors.

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Notes

- 1 For a general review of the homo economicus conception, please see Rodriguez-Sickert (2009).
- 2 For a detailed description of ethics in economic modelling, see Parada-Daza (2013).
- 3 See Parada-Daza and Parada-Contzen (2013b) for details.
- 4 Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chad, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Czech Republic (Czechia), DR Congo, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Eswatini, Ethiopia, Finland, France, Gabon, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Lao PDR, Latvia, Lebanon, Lesotho, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova,

Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, the Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Republic of the Congo, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, the United States, Uruguay, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe.

5 Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, the United Kingdom and the United States.

6 Generally, it includes the following countries: Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kosovo, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, the Netherlands, New Zealand, Nicaragua, Niger, Nigeria, North Cyprus, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, RD Congo, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, South Korea, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, the United Kingdom, the United States, Uruguay, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, and Zimbabwe.

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Additional information

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