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ECONOMIC PREFERENCES IN THE HEALTH SETTING. THREE CASE STUDIES CONCERNING THE NEEDS OF BREAST CANCER PATIENTS, PAIN MANAGEMENT IN ONCOLOGY AND EXTREME END-OF-LIFE DECISIONS.

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Economic Preferences in the health setting.

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the needs of breast cancer patients,
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by

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Contents.

I

Introduction.

1 General aspects.

The three studies that make up this thesis originate from my interest in the changes that people's economic behavior seems to undergo in relation to severe, unexpected, extreme or otherwise particularly stressful events. On the individual level, examples of such situations might be represented by illness or internment in Total Institutions (not only in the foucaldian sense, but in the more general meaning set forth in Goffman, 1961), while on the collective level we can think of financial or health crises.

In addition to more practical purposes that may inspire such research (think, for example, of the economic problems that often occur in individuals who have been diagnosed with cancer, see Riva et al, 2021, or the hoarding of key assets, if not cash, in the case of economic or health crises), I believe that the exploration of economic behavior in these particular circumstances can help to elucidate aspects that are less apparent in normal situations. In this regard, I was struck, for example, by the peculiar and, I think, counterintuitive attitude toward money that seems to manifest near death documented in Zaleskiewicz et al, 2013a and 2013b: summarily, if in such an extreme situation one continues to attach importance to money, one must think that in it one recognizes meanings that not only go far beyond the practical ones, but also seem unrelated to the more symbolic ones, in any case unrelated to the practical value of money, that accompany human beings when they are not in such an extreme situation as the proximity of death.

However, a substantial body of observational and experimental evidences indicates how, in driving economic behavior, specific and structured systems of attitudes, inclinations, preferences play an important role: so I felt I had to shift my focus to this more basic level in order to seek explanations for the phenomena of my interest.

In this regard, looking at the system of preferences specifically investigated in the Global Preference Survey (acronym: GPS) by Falk et el, 2018, it quickly became apparent to me that, at least common sense, these preferences could not fail to also play a role in guiding attitudes and

behaviors specific to the health care context. It seems obvious to me, indeed, that pro-social preferences, namely Positive Reciprocity, Altruism and Trust, play a role at any level of the care and treatment relationship; but so do the other three constructs detected by GPS, namely Patience (more generally, the concept of Time Attitude), Negative Reciprocity and Willingness to Take Risk: a positively expectant attitude, for example, should make one more likely to accept long and demanding courses of care; the propensity to accept asymmetrical social relations could be understood in the sense of a greater inclination toward private health care systems; finally, in view of an increasingly "defensive" attitude in modern medicine, aimed at prioritizing the containment of the risk of litigation, Willingness to Take Risk cannot fail to play an important role. But these are only examples among many that could be cited in support of my hypothesis: which, in this thesis, is investigated in relation to three different perspectives, specific to the outcomes under investigation:

- in the first study, the perspective is that of women who have been diagnosed with breast cancer: the aim of the study is to investigate whether a specific set of their needs are related to Economic Preferences;

- In the second study, on the other hand, the perspective is that of the health care provider or researcher aimed at assessing the quality of cancer pain treatment: in this case, the goal is to understand whether whether whether cancer pain is adequately treated also depends on Economic Preferences. Although this objective may seem very specific, it should be considered that the topic of oncological pain is not only, in itself, very important, but is linked to the more general dimension of quality of care in the palliative context;

- the third study, finally, extends the perspective of analysis to the country level, at least to the extent that a country's laws express its dominant views: the goal is to understand whether the fact that euthanasia

or assisted suicide is legal in a country correlates with Economic Preferences.

Obviously, in each of these studies, other covariates were considered in addition to Economic Preferences: chosen on the basis of context, data availability and treatability of the problem from a statistical point of view.

In general, all the studies testified to a relevance, more or less marked, of Economic Preferences. Rather, there were perplexities about the role of some other covariates, which were understood to be important a priori, and in the interpretation of the results that emerged.

Purely common to all the studies are some limitations: in particular, that of having been conducted on aggregate data; however, the amount of evidence that has emerged is such, at least on a strictly statistical level, as to support the hypothesis of a correlation between Economic Preferences and the outcomes studied, at least to warrant further study.

2 Economic Preferences and health: current status of research.

The relationship between Economic Preferences and health issues seems to be more than occasionally the subject of scientific research. For example, as of May 03, 2023, 10.9% of indexed papers in Scopus citing Falk et al, 2018 pertain to one of the following areas:

- medicine: 25 papers;
- neuroscience 11;
- Biochemistry, genetics and molecular biology: 4;
- immunology and microbiology: 1;
- Pharmacology, toxicology and pharmaceutics: 1;
- health professions 1.

for a total of 52 papers. Considering that, with its 476 total citations, Falk et al, 2018 ranks in the 99th percentile for number of citations in the

Scopus archive, 52 papers from areas so distant from economic research does not seem small for a single paper.

One might think that this result is to be expected in relation to the importance of the survey by Falk and colleagues: but an overlapping situation in terms of percentages is also found for Hofstede, 2001, which was used in Falk et al, 2018 for validation purposes: out of 15 492 citations, in fact, 1 026 concern the health setting, or 9.8%.

Even for the 1,557 papers citing the other source used for validation purposes in Falk et al, 2018, namely the World Values Survey (see: https://www.worldvaluessurvey.org/wvs.jsp), we find a similar result: 176 papers concern the health setting, or 11.3% of the total.

In principle, therefore, the studies presented in this thesis fit fully into a stream of research activity that, although very particular, seems fairly well-established, at least when looking at bibliometric data (even taking into account a certain degree of non-specificity in querying the Scopus database): this consideration is to be understood not only in relative terms, but also in absolute terms, since as many as 1,254 papers are noted that cite the three sources under consideration. Consider also that these, although relevant, by no means exhaust the research activities concerning the topic of Economic Preferences, reinforcing this conclusion.

For all three cases considered, however, the citing literature is extremely fragmented among very different topics, as can be easily inferred from the area distribution reported for Falk et al, 2018, and which is repeated, albeit with different distributions, for the other two cases as well: in fact, for Hofstede, 2001 we have:

- medicine: 674 papers;
- neuroscience: 95;
- nursing: 91;
- Biochemistry, genetics and molecular biology: 73;
- health professions: 67.
- Pharmacology, toxicology and pharmaceutics: 15;

- immunology and microbiology: 10;
- dentistry: 1.

and for the World Value Survey:

- Medicine: 109 papers;
- nursing: 23;
- Biochemistry, genetics and molecular biology: 18;
- neuroscience: 15;
- health professions: 7.
- immunology and microbiology: 3;
- Pharmacology, toxicology and pharmaceutics: 1.

In particular, the role being played by Economic Preferences is the most varied, and no well-characterized strand of research seems to be emerging that is explicitly and primarily aimed at investigating the role of these preference systems on health behaviors, attitudes, and decisions.

It could be argued that Economic Preferences, at least in the form in which they are declined in Falk et al, 2018, can also be investigated in their relations to health phenomena from perspectives other than economics (e.g., sociology or psychology) and that the respective findings are also relevant from the perspective of behavioral economics, despite the difference in terms of their respective rationales, explanatory paradigms, methodologies of investigation, data analysis techniques, etc. Assuming that such overlap does indeed exist however, in Section 4 "Thesis contribution to scientific literature: a bibliometry-driven assessment" we will see that, for their respective topics, pure contributions from disciplines such as the Social Sciences and Psychology are of little more than episodic character in relation to the topics covered by this thesis.

3 Background and my research setting.

The studies presented in this thesis stand in a relationship of continuity with the research activity and methodological and statistical support that I carry out as Head of the Clinical Trials and Statistics Unit of the Azienda USL – IRCCS di Reggio Emilia.

Regarding the first study, it is part of a systematic review that is the subject of the PhD thesis of Sara Paltrinieri, MSc in Rehabilitation Sciences (Physical Medicine and Rehabilitation Unit, Azienda USL - IRCCS di Reggio Emilia and Department of Clinical Sciences and Community Health, University of Milan).

Sara, who is attending the PhD program in Public Health Sciences, cycle XXXVII, at the Department of Clinical Sciences and Community Health, University of Milan (tutors: Stefania Costi, PhD, Physical Medicine and Rehabilitation Unit, Azienda Unità Sanitaria Locale-IRCCS di Reggio Emilia and Department of Surgery, Medicine, Dentistry and Morphological Sciences, University of Modena and Reggio Emilia; Francesca Bravi, PhD, Department of Clinical Sciences and Community Health, University of Milan) had involved me in order to assess the possibility of conducting a meta-analysis: but, not finding it feasible for technical reasons, I proposed to exploit the data for the study presented here and, as for his thesis, to conduct a systematic review instead, which is now in progress.

Then, Sara proceeded to research the articles, which she appropriately documented in the flow-chart reported for the first study, and to extract the data that I used for the first study. Having agreed on the importance that the health care system may have in the study at hand, Sara then proceeded to identify, among various alternatives, the one proposed in Bohm et al, 2013 and formulated a rationale that, for the sake of fairness, I have reported entirely in her own words (not only for the first study, but also for the two subsequent ones-I felt, in fact, that the health care system could be very important for the latter as well).

With regard to the second study, I started from the consolidated database for the analysis presented in Roberto et al, 2022, which is in my availability as a co-author of the study (as well as of the earlier Greco et al, 2014), to which I added the GPS scores and classified the relevant health systems according to the above scheme.

The third study, on the other hand, is in the context of my more recent research activities relating specifically to end-of-life.

4 Thesis contribution to scientific literature: a bibliometry-driven assessment.

Although the situation described in section 2 "Economic preferences and health: current status of research" testifies to some volume of research concerning the dimensions proper to Economic Preferences in relation to multiple health contexts, or close to them, nevertheless, there does not seem to be much research analyzing the relationship between the health phenomena considered in this thesis and a unified, coherent, well-structured and empirically validated system of Economic Preferences such as the one studied in Falk et al, 2018, that is, that are comparable to my studies. To this end, we report data collected between 05 and 08 May 2023 by querying Scopus bibliographic database in relation to the three studies presented in this thesis.

4.1 Needs of breast cancer patients.

The needs of breast cancer patients represent a much-studied topic. In fact, the query mentioned in section 3.1.1 of chapter II, on which the systematic review from which the data for the first study was based, for being very focused returned as many as 4 926 entries. Taking a more sensitive and less specific approach, which seems more useful for immediate purposes, a search on Scopus using the following query:

(TITLE-ABS-KEY("breast cancer") OR TITLE-ABS-KEY("breast tumor") OR TITLE-ABS-KEY("breast tumour") OR TITLE-ABS-KEY("breast neoplasm")) AND(TITLE-ABS-KEY(needs))

reports as many as 33 227 entries: as nonspecific as this query may be, it is still indicative of a very substantial volume of research activity.

In order to identify documents in which the topic is also addressed in relation to the dimensions of Economic Preferences that we have considered, the database is then queried again by means of this more focused query (terms related to Economic Preferences are searched only in the abstracts, otherwise an extremely nonspecific result is obtained):

(ABS(altruism) OR ABS(reciprocity) OR ABS(trust) OR ABS(patience) OR ABS("time attitude") or ABS("willingness to take risk"))

AND

((TITLE-ABS-KEY("breast cancer") OR TITLE-ABS-KEY("breast tumor") OR TITLE-ABS-KEY("breast tumour") OR TITLE-ABS-KEY("breast neoplasm")) AND (TITLE-ABS-KEY(needs)))

which returns 180 documents. The number would be of absolute significance, considering the particularity of the topic, if:

1) the terms indicated in the first two lines had, in the respective articles, the same meaning as we are interested in, or otherwise reasonably aligned with the concept of Economic Preferences in the sense investigated in Falk et, 2018;

2) the needs of patients with cancer were understood in a sense quite similar to that considered in our study (thus, not very different needs or understood in too general a sense);

3) articles were focused on the relationship between the needs of patients with cancer and preferences, perhaps even defined differently from the meaning they have in Falk et al, 2018.

However, it seems that this three circumstances do not occur simultaneously in any case.

Already a superficial analysis of the results, however, suggests taking a more specific approach by narrowing the field further: we then proceed by extracting only those papers classified in the "Social Sciences" area (11 entries), which, at least nominally, seems to be more relevant for our purposes, as well as "Psychology" (11 entries), which also seems to have relevance. After an initial skimming, these articles are reduced to 8 for the Social Sciences area and 10 for the Psychology area, discarding articles that had been retrieved due to lack of specificity of the research query.

Beginning with articles placed in the "Social Sciences" area, the first thing one notices is that these deal only with the trust dimension and that this construct is typically declined in terms strictly contextual to each article's own research area (e.g., trust in healthcare providers, in information/media sources, in scientific investigators, etc.). The only exception is DeRosa et al, 2022 (cited 0 times), which studies the concept of trust in a more general sense: but the article is not relevant for our purposes, as it focuses on shared decision-making in women with breast cancer rather than on needs. In any case, it is interesting that the religious dimension was also considered: in my study of the needs of breast cancer patients, this was not possible due to constraints caused by the small sample size, but I included it in the study of legalization of euthanasia and assisted suicide. The data are collected through an ad hoc survey and analyzed using a qualitative technique (phenomenological design and inductive thematic analysis procedure); it should be noted that for all other

empirical articles classified in the Social Sciences area, data are also always collected through ad hoc surveys and analyzed in 3 cases using quantitative methods and 3 using qualitative methods (in addition to the study already mentioned by DeRosa and colleagues, which thus brings to 4 the number of studies that used qualitative methods).

As for the articles classified in the "Psychology" area, again each considers only one dimension among those of interest to us. In particular, the most studied dimension is trust (7 articles), which, similar to the Social Sciences articles, is almost always considered from a very specific perspective, closely contextual to the research aims of the respective article (e.g., "trust in healthcare providers" or "trust in science"). In broader terms, however in the sense that seems closer to that indicated by the same label in Falk et al, 2018, the trust dimension is studied in:

- Kenen et al, 2007 (cited 33 times): in this article, however, the trust dimension is not studied as a potentially explanatory variable of the needs considered in the article. Interesting, however, is the method used to analyze the data, which is qualitative (more precisely, quoting the article literally, the method is described as: "qualitative research inductive process involving close reading, coding and identification of recurrent patterns, relationships and processes in the data);

- Song et al, 2022 (cited 0 times): in this article, trust is seen as a need, thus from a very different perspective than the one considered in my study. Interesting, however, for the fact that the data are collected through a behavioral experiment and analyzed with quantitative techniques ("time-frequency analysis and repeated measure ANOVA"), since the predominant mode of analysis for retrieved articles in the Psychology area is qualitative.

The reciprocity dimension is studied in only one article, which is therefore worth mentioning: Pistrang et al, 2012 (cited 37 times), partly due to the fact that it turns out to be the most cited article in this group. In it, however, reciprocity is considered in a very specific sense, as one of the components of the peer support process and without distinguishing between positive and negative reprocity. As for the method, a qualitative approach was followed, according to which semi-structured interviews conducted by telephone were analyzed thematically using the 'Framework' approach.

Closer to the meaning of our interest seems the study of altruism in Sequeira et al, 2022 (cited 0 times), which analyzes data collected through semi-structured interviews using a qualitative approach (thematic analysis). In particular, the authors consider this behavioral dimension in the sense of "altruism to help close relatives": of particular interest, if we consider that in my study I also consider the Kinship Tightness Index. However, the article is not otherwise relevant, since it does not really explore needs, except in a relatively general sense.

Among the constructs labeled as one of the Economic Preference studied in this thesis, patience is the last to be treated in psychological area articles: more specifically in Fearon et al, 2021 (cited 0 times). Although in that article patience has a meaning rather contextualized to the disease state, the research is interesting for the fact that it also analyzes the religious dimension: unfortunately, I could not consider this aspect in my study on the needs of breast cancer patients due to constraints caused by the small sample size, but I included it in the one concerning the end-of-life setting. Methodologically, data were collected through semi-structured interviews and audio-journals, then analyzed qualitatively (constructivist Stakian multi-case study approach). Otherwise, however, purpose, context, type of needs (palliative care needs), and methods make this article unrelevant for our purposes.

To recap:

- in relation to the needs of women with breast cancer, only in a very limited subset of articles (18 out of 33 227) can the behavioral dimensions analyzed be interpreted in a sense relatively similar to that proper to Economic Preferences, albeit often from a perspective more contextualized to the particular field of inquiry. Even considering an excess of specificity of the query that was used, the actual number should not be much higher;

- Each article studies only one dimension;

- the most studied construct is trust, while reciprocity, altruism and patience are studied by only one article each;

- there is considerable heterogeneity among the needs studied in these researches, in any case hardly traceable to the needs investigated in my study; in any case, no article considers a similarly broad and structured set of needs;

- for articles of an empirical nature, the predominant method of analyzing results is qualitative: while recognizing the importance of this kind of approach, at least for certain types of surveys, I think we can agree on the desirability of more research being conducted using quantitative methods, such as my study.

On the basis of these considerations, I therefore believe I can say that my study has the features to be a novelty in the relevant literature: in fact, it seems to be the only one in which a large and well-structured set of needs expressed by women with breast cancer, surveyed in different countries and contexts with validated instruments, is studied in relation to an articulated and coherent system of preferences of economic relevance such as the one investigated in Falk et al, 2018 considering contextually

also the following potentially explanatory variables: mean age; - % of working woman; - Healthcare System; - Kinship Tightness Index.

4.2 Pain undertreatment in oncology.

Cancer pain is a subject of great research interest, as denoted by the amount of results from the following query conducted on Scopus:

(TITLE-ABS-KEY(pain) AND (TITLE-ABS-KEY(treatment) OR.

TITLE-ABS-KEY(undertreatment)))

AND

(TITLE-ABS-KEY(oncology) OR TITLE-ABS-KEY(cancer) OR.

TITLE-ABS-KEY(tumor) OR TITLE-ABS-KEY(tumour))

which returns 135 726 entries (without also specifying "undertreatment" the result is very similar, i.e. 135 652: but this term was also included so as to ensure that the next draw results in an exact subset of this one).

However, investigating undertreatment alone, which is the case of our precise interest, we can observe an incredible drop of as much as three orders of magnitude (very striking in itself for those dealing with this issue): in fact, running the following query:

(TITLE-ABS-KEY(pain) AND TITLE-ABS-KEY(undertreatment))

AND

(TITLE-ABS-KEY(oncology) OR TITLE-ABS-KEY(cancer) OR.

TITLE-ABS-KEY(tumor) OR TITLE-ABS-KEY(tumour))

only 223 entries are retrieved.

Doing the same exercise already conducted for Breast Cancer Needs, we cross-reference this result with the documents regarding the terms by which the Economic Preferences of interest are indicated using this query:

(ABS(altruism) OR ABS(reciprocity) OR ABS(trust) OR ABS(patience) OR ABS("time attitude") or ABS("willingness to take risk"))

AND

((TITLE-ABS-KEY(pain) AND TITLE-ABS-KEY(undertreatment))

AND

(TITLE-ABS-KEY(oncology) OR TITLE-ABS-KEY(cancer) OR.

TITLE-ABS-KEY(tumor) or TITLE-ABS-KEY(tumour)))

but in this case no entries are returned: thus, there do not seem to be any publications dealing with the preferences of our interest in relation to the specific field of pain undertreatment in oncology. Therefore, it can be said that this result argues in favor of the character of absolute novelty that should represent my study in the literature on this topic.

4.3 Euthanasia and assisted suicide.

Similar to cancer pain, intensive research is also being conducted on the topics of euthanasia and assisted suicide. In fact, the query:

(TITLE-ABS-KEY(euthanasia) OR TITLE-ABS-KEY("assisted suicide"))

It returns as many as 41 317 entries. However, after a spot check, it is deemed appropriate to eliminate the search for the strings of interest from

the keywords, as highly nonspecific results are obtained. Therefore, launching the following query:

(TITLE-ABS(euthanasia) OR TITLE-ABS("assisted suicide"))

the result contracts greatly to 19 435.

Proceeding, then, as in the previous two cases, we launch the following query:

(ABS(altruism) OR ABS(reciprocity) OR ABS(trust) OR ABS(patience) OR ABS("time attitude") or ABS("willingness to take risk"))

AND

(TITLE-ABS(euthanasia) OR TITLE-ABS("assisted suicide"))

which returns 116 entries, and focus on those classified in the "Social sciences" or "Psychology" group, distributed as follows:

- Social Sciences: 36
- Psychology: 8

As for Social Sciences, however, 15 entries turn out to be irrelevant, due to a lack of specificity of the query and the preference most covered by the majority of articles in the group turns out to be trust (19 articles)

Studies are very frequently based on data collected through cross-sectional surveys conducted on an ad hoc basis, the data of which are analyzed at the level of the individual using quantitative techniques (typically, regression type). Unfortunately, however, as in the case of "Needs of breast cancer patients," the trust dimension is understood primarily in the very specific sense (e.g., trust in physician or, more generally, in healthcare providers/system). The following articles are worth

noting, however, as exceptions to this approach or for other relevant reasons:

- Parker, 2010 (cited 72 times): though this is a theoretical article suggested by an empirical analysis of two public discussions, the concept of trust is treated in a sense that seems close to that of our interest. The author, however, does not come to any conclusions of relevance to our study;

- Rapp, 2016 (cited 25 times): very interesting because, in addition to studying the concept of trust in a relatively general sense, the research is based on data from World Values Survey, more specifically from its fifth wave (2005-2008). Thus, similarly to our study, we rely on data from a pre-existing survey; in this case, however, the analysis is conducted at the level of the individual (which in our case, however, would not have been possible, since our outcome, i.e., legalization of euthanasia and assisted suicide, obviously makes sense only at the level of nation-states). Also relevant is that the statistical analysis is conducted through a technique that can be seen as a generalization of that used in the study presented in this thesis (logistic regression), as the data are analyzed by resorting to logit random intercept models. Finally, it is interesting that religiosity was considered in this research as well. The results obtained, however, are not directly relevant, and in any case not comparable, with mine, since the study is aimed at defining the role of moral opinion polarization regarding homosexuality, abortion and euthanasia impacts on trust: the result is that "individuals living in countries characterized by more opinion polarization tend to have less trust in other people."

- Köneke, 2014 (cited 18 times): interesting in that it explores different types of trusts and also considers religiosity. Methodologically, it is based on data collected by the European Values Study, then on a pre-existing survey like my study The analysis is multilevel so, by its nature, involving

both the individual level and hierarchically higher levels. The result is in line with that obtained in my study, as the authors conclude that "Trust seems to be a noteworthy construct to explain differences in attitudes toward euthanasia, especially when drawing cross-country comparisons."

-   Hall et al, 2005 (cited 18 times): very much focused on an outcome similar to ours, namely legalizing physician aid in dying. However, the data are collected through telephone interviews conducted on an ad hoc basis. Statistical analysis is conducted using basic inferential techniques (chi-square test, Wilcoxon test, etc.). The findings, although referring to the concept of trust in the very specific sense of "trust in physician," are also of interest to my study: in fact, my analyses show that pro-social variables such as trust are positively correlated with the greater likelihood that euthanasia and assisted suicide will be legalized, which seems in line with the conclusion reached by Hall and colleagues, although referring more specifically to trust in the sense of "trust in physician." "Despite the widespread concern that legalizing physician aid in dying would seriously threaten or undermine trust in physicians, the weight of the evidence in the U.S. is to the contrary, although views vary significantly."

-   Richard & Rotter, 2013 (cited 12 times): worthy of mention because it is the only article that simultaneously explores three dimensions: trust, time attitude a risk. Methodologically, it is an empirical analysis of two very different case studies. Contexts and purposes, however, do not make the results relevant for comparison with my study;

-   Stolz et al, 2017 (cited 7 times): interesting for studying both "social trust," a concept that can be considered close to the dimension of nsotro interest, and "trust in doctors"; in addition, the religious dimension was also considered. The data were collected, through computer-assisted personal interviews, as part of an ad hoc survey, "a nationwide cross-sectional survey among older care allowance recipients (50+) in private households in Austria was conducted in 2016" and, as for my study,

analyzed by logistic regression. As far as social trust is concerned, no statistically significant results are obtained, in contrast to our results (although difficult to compare given the very different nature of the outcomes considered by Stolz and colleagues), which instead identify a positive correlation between trust and position regarding assisted suicide (to the extent that its legalization can be understood in this sense, of course); as far as "trust in doctor" is concerned, on the other hand, although the comparison is less suitable for a much more specific construct such as this, the data even seem to support a situation that runs counter to our results: in fact, the only statistically significant result indicates that greater trust in doctor is related to a lower propensity to consider medically assisted suicide. Finally, as far as the religious dimension is concerned, it is practically impossible to establish a comparison: in this study, in fact, the level of religiosity is considered, while in mine it is the dominant religion in a certain nation: however, at least in the case of the availability of euthanasia, the finding is statistically significant, indicating a role of religiosity that does not appear in such terms in my study. More specifically, it is observed that being rather religious disposes more favorably toward euthanasia availability than very religious people. This association is even stronger for people who declare themselves "not at all religious."

- Rudnev, 2019 (cited 0 times: I assume the article is also written in Russian): in this research trust is studied both in the sense of trust in physician and in the sense closest to my study, namely trust in people. The article is also interesting because it explores the religious dimension, albeit in different terms than in my study: "in fact, the indicators included in this methodology reflected self-assessment of religiosity (on an 11-point scale), the extent to which respondents perceive themselves as religious (on an 11-point scale), frequency of visits to religious services (on a 7-point scale), frequency of prayers, and frequency of religious socialization, [understood as] frequency of participation in religious services as a child" (translation from the original in Russian; in square brackets a personal adaptation by

me). It is worth detailing these aspects, because they implement Billet's 2002 directions for international studies adapted to different religious faiths. In any case, the author concludes "Religiosity demonstrated only marginally significant coefficients," which seems more in line with my results than Stolz et al, 2017. The role of "trust in people," on the other hand, seems more in line with my results (while trust in physician does not seem statistically significant, but that fact is of less importance for a comparison with my results); in fact, in this regard the author states "The indicators of trust in physicians are not correlated with the acceptability of euthanasia, [while] two of the three measures of trust in people are generally positively correlated." Methodologically, the data were obtained through a probabilistic survey of the Russian population and treated by factor analysis and linear regression.

Turning to altruism, this dimension is considered in:

- Aghababaei, 2014 (cited 10 times): interesting article as it explores altruism in a relatively general sense, as well as considering religiosity. Data are collected through an ad hoc survey of Iranian university students based on validated scales, then analyzed using models a hierarchical regression model. To the extent that the dependent variable considered (ATE = Attitude Towards Euthanasia scale) is comparable with the legality status of euthanasia considered in my study, the result contrasts with the one I obtain: in fact, Aghababaei finds that altruism is negatively correlated with the ATE scale, while my data argue that altruistic behaviors are positively correlated with the likelihood that euthanasia is legal. The result regarding religion is also different, although Aghababaei considers interest in religion, while I consider the prevailing religion in a nation: this dimension is also found to be negatively correlated with the ATE scale, while my results do not support a statistically significant role for the religious dimension;

- Tajaâte et al, 2021 (cited 3 times): in this article, however, altruism is studied in relation to organ donation after euthanasia, thus not directly relevant for our purposes. However, by arguing in favor of a correlation (in a broad sense, since this is a case study) between altruism and a phenomenon that in the specific context is evaluated in correspondence with euthanasia, I thought it appropriate to cite it since it could be interpreted in the sense of a relevant altruistic trait in people in favor of euthanasia: it would thus be a relationship oriented in the same sense found in my study between altruism and the likelihood that euthanasia would be legalized.

Regarding, finally, to time attitude and risk, the same applies as in Richard & Rotter, 2013, which, moreover, is the only article that deals with more than one preference. That study, however, is very different from mine in objectives and context.

Switching to the articles classified by Scopus in the "Psychology" group, 2 entries are found to be irrelevant, due to a lack of specificity of the query. About the remaining 6 articles, 4 deal with trust and 2 reciprocity, but show some relevance to my study on euthanasia and assisted sucide only the following 2:

- Leichtentritt & Rettig, 1999 (cited 24 times): particularly relevant for the following reasons: 1) in this study the concept of trust is declined as "trust the others," thus in a sense very close to that of my study ; 2) the role of religion in directing individual views on euthanasia is outlined (with particular reference to Orthodox Judaism, since the study was conducted in Israel); 3) the fact that the heterogeneity of the positions that emerged is considered by the authors to be particularly challenging for legislating in the context of end-of-life in Israel. Thus, similar to my study, this research involves issues that are considered relevant as they pertain to the legalization of controversial practices in end-of-life such as euthanasia and

assisted suicide may be. Methodologically, the researchers collected data through an ad hoc survey; the data were then analyzed, at the individual level, using qualitative techniques;

- Wisneski et al, 2009 (cited 45 times): though this article considers the concept of trust in the very specific sense of "trust in political authorities," it is interesting because it recognizes a role for religiosity. Specifically, it concludes that "greater religiosity was associated with greater trust in the U.S. Supreme Court to decide" about "the legal status of physician-assisted suicide." The data were collected through a representative survey and analyzed quantitatively.

In order to outline the contribution my study can make to the scientific literature on the topic at hand, I believe the following considerations are useful:

- **data collection:** most of the studies mentioned above collect data through ad hoc surveys, although in some cases data collected during surveys already conducted are used, as in my study. In the latter case, however, the data all come from a single survey: in my study, however, I converge data from different sources;

- **type of preference considered:** practically it is studied to some extent only trusts and often in a different sense than the one considered in my study;

- **covariate/adjusting variables:** in common with my study, I found only religiosity, moreover in terms of its intesity or for its own role (e.g., adhering or not adhering to specific doctrinal indications), thus unlike my study, which instead considers the denomination of the religion practiced. Apart from religion, variables such as those I included in my study, namely, Healthcare System, Legal Origin and Kinship Tightness Index, are never considered;

- **analysis level:** in the studies mentioned, the analysis is always conducted at the level of the individual, although in some cases multilevel models are used, which also allow for the study of hierarchically higher levels; in my study, however, only aggregate data are used. In this regard, however, keep in mind that my dependent variable (legal status of euthanasia and assisted suicide) only makes sense at the nation level; however, it is quite common to conduct studies like mine based on aggregate data;

- **data analysis techniques:** regression techniques are almost always used, as in my study;

- **comparability of results:** in the very few cases in which reasonable comparability of results can be assumed, as far as trusts are concerned the situations in which results in line with mine are obtained are more frequent than the opposite (respectively, 3 times vs. 1), even though we are talking about very small numbers. In the case of altruism, for which the numbers are even smaller, in one paper results in line with mine are presented, while in the other research evidence in the opposite direction is obtained. So we can say that in this field we are still in the presence of controversial results, so further study such as mine may be useful.

In conclusion, on the basis of the above considerations, I believe I can legitimately say that my study has the characteristics to represent a novelty in the relevant scientific literature, even considering the very limited number of articles that have been published on the subject at hand and the variability of the conclusions they reach.

5 Methodological remarks.

The literature review set forth in Section 3 suggests the following methodological considerations regarding the three studies presented in this thesis. Despite several features common to these studies from a

methodological perspective, we report these notes separately for each study for clarity.

5.1 Needs of breast cancer patients.

For the empirical articles among the 18 selected at the end of the research process described in Section 3.1, regarding the most methodologically relevant issues for studies such as the ones I present, i.e., data sources, analysis level, and analysis method, it is observed that:

- **data sources:** data are always collected through ad hoc surveys;
- **analysis level:** data analysis is always conducted at the level of the individual;
- **analysis methods:** the prevailing method of analysis of results is qualitative, considering that: - data in researches classified in the Social Science area are analyzed in 4 articles by qualitative methods and in 3 by quantitative methods; - for those in the psycholological area, on the other hand, the prevailing method of analysis is qualitative (apart from one case in which ANOVA for repeated measures is used and one case of mixed-method, in which the quantitative part is reduced, however, only to descriptive analysis of counting data).

In my study, however:

- **data sources:** use only data already collected during other studies or surveys;

- **analysis level:** analysis is conducted on aggregate data only;

- **analysis methods:** using quantitative methods.

Therefore, I think it is useful to provide some justification for the methodological choices I made in conducting my study in relation to the points above:

- **data sources:** all the studies consulted refer to individual countries, more generally to very specific contexts. My study, on the other hand, by its very nature explores data from several countries: it would be very difficult to organize an ad hoc collection of such magnitude and comuany little justification for a study exploring for the first time the relationship between the needs of women with breast cancer and Economic Preferences in the terms in which I set up my research;

- **analysis level:** although data from the GPS survey are also available at the individual level, it was not possible to conduct the analysis at this level because the data concerning needs and related covariates, as well as the other covariate represented by the Kinship Tightness Index, are available only on an aggregate basis. Moreover, even assuming that some of the authors of the items concerning needs surrendered data on an individual basis, it would not have been possible to perform the data linkage between the relevant records and the individual records in the GPS survey. Obviously, the use of aggregate data represents a compromise in terms of methodology and imposes cautions in the interpretation of results, but it is a well-established and commonly accepted practice in those areas in which it would not be possible, except with great difficulty, to conduct research at the individual level;

- **analysis methods:** in view of the quantitative nature of the data I use (apart from the Healthcare System type), I do not see qualitative techniques applicable, except that I would not see them as informative for the type of objectives I am setting myself. On the other hand, examining the quantitative methods used in the few articles that resort to this approach is not of particular relevance to the type of analysis I wanted to

conduct, which cannot, in any case, disregard a regression-type approach. More precisely, for each need score I resorted to a simple generalized linear model, conceptually not dissimilar to an analysis of covariance: I aprioristically chose it because the other options I might have considered would have been too data driven, an approach that I do not consider suitable for an eminently exploratory analysis such as the one I wanted to conduct; in any case, it is a sufficiently general approach for my purposes. Before estimating these models, however, in order to save degrees of freedom, it was necessary to apply a dimension reduction technique to the variables representing the Economic Preferences: for this purpose, variables clustering was carried out, a technique that is perhaps less popular than other more common methods, but represents nothing more than a more practical way of performing a more normal factor analysis; more precisely, it is analogous to performing an orthoblique rotation on principal components (raw quartimax rotation on the eigenvectors, see: Harris and Kaiser, 1964).

5.2 Pain undertreatment in oncology.

Since I have not found studies somewhat similar to my own with which to compare myself, I cannot begin this section by listing the choices acted upon for similar research. Again, however, for my own study I acted as follows:

- **data sources:** use only data already collected during other studies or surveys;

- **analysis level:** analysis is conducted only on aggregate data;

- **analysis methods:** use quantitative methods.

however, for reasons more trivial than those set forth for the study on the needs of women with breast cancer. In fact, the research regarding

pain undertreatment in oncology can certainly be considered as an extension of Roberto et al, 2022 in which I participated (as well as the earlier Greco et al, 2014): so it is normal that, for my study as well, I adopted a similar approach.

5.3 Euthanasia and assisted suicide.

Regarding the studies that appeared relevant as a result of the literature review outlined in section 3.3, the situation is more complex for this topic than for those concerning the bsognizes of women with breast cancer. Indeed:

- **data collection:** although the majority of the studies cited collect data through ad hoc surveys, in a few cases data collected during surveys already conducted are used. In the latter case, however, the data all come from a single source;

- **analysis level:** the analysis is always conducted at the level of the individual, although in some cases multilevel models are used, allowing units located at hierarchically higher levels to be studied as well;

- **analysis methods:** quantitative techniques are almost always used, more specifically regression techniques.

For my study, however, what has already been stated about the study on the needs of women with breast cancer and pain undertreatment in oncologists remains valid, namely:

- **data sources:** use only data already collected during other studies or surveys;

- **analysis level:** analysis is conducted on aggregate data only;

- **analysis methods:** use quantitative methods.

Though, for this study there is a greater similarity with the studies in the literature for the previous points, some consideration is still useful:

- **data sources:** my study considers a wide range of countries, so it would be very difficult to set up an ad hoc survey. Also, I think it is relevant that it converges data from different sources;

- **analysis level:** unlike the other two studies, in this case the dependent variable, namely the legal status of euthanasia and assisted suicide, does not make sense at the individual level, but only at the country level. Thus, although the GPS survey data are also available at the individual level, nevertheless in this case one is still forced to conduct the analysis at the country level: therefore, we are not faced with a real methodological compromise as with the other two studies, and the interpretation of the results should prove easier;

- **analysis methods:** similar to most of the reviewed articles, I also use a regression method in my study, more precisely a logistic regression, since the dependent variable is dichotomous. On the side of the independent variables, similar to the study on the needs of women with breast cancer, a problem of dimension reduction was also posed here. In this regard, the same variables clustering technique already used in the needs study was applied for Economic Preferences. The 3 categorical variables (Healthcare System, Legal Origin and Main Religion) were treated separately because, more than their number, the problem lay in the fact that the relative parameterization exploded into a very large number of binary dummy variables. Therefore, first their appropriate quantification using the Optimal Scoring method described in Fisher, 1938, was applied by optimizing the properties of the transformed variables using the iterative MGV (Minimum Generalized Variance, Sarle, 1984) algorithm in the implementation of the PROC PRINQUAL procedure of the SAS/STAT

module of the SAS System software. After that, a common principal component analysis was conducted to see if there was a possibility of achieving further size reduction. The quantification of categorical variables represents a problem for which there are, in my best knowledge, no commonly recognized practices: I chose the method mentioned because I have long experience with it, the MGV optimization algorithm is excellently implemented in SAS/STAT, and Fisher's quantification principle is very well established long ago.

6 Reading warnings.

Each study is presented independently from the others, as they are already set up as independent papers. Thus:

- numbering of sections within thesis chapter always starts from 1;

- at the end of each chapter are the references cited in that chapter;

- some sections, covering common aspects, are repeated. More specifically: the section concerning the classification of health systems is taken up in all studies as is the section concerning GPS scores, while the section concerning the Kinship Tightness Index appears only in the first and third studies. Some concepts expressed in the "Strengths and limitations" sections are also common, as they recur in all studies.

7 Thesis abstract.

For ease of reading, I thought it appropriate to include in this introduction the abstracts of the three studies presented in the thesis.

These three projects are concerned with the role of the economic preference set investigated in the Global Preference Survey (Falk et al, 2018) in the following cases:

- the needs of women with breast cancer;
- pain undertreament in oncology;
- legal status of euthanasia and assisted suicide.

The analyses were always conducted on the basis of aggregate data and revealed in all cases a possible role of the Economic Preferences studied, also resisting the concomitant effect of the other covariates that were considered from time to time.

More specifically, regarding individual studies:

7.1 "ARE THE NEEDS OF BREAST CANCER PATIENTS INFLUENCED BY UNDERLYING ECONOMIC PREFERENCES? A STUDY BASED ON AGGREGATED DATA."

Purpose. To test whether a specific set of needs, typically investigated in women with breast cancer, is affected by a basic set of economic preferences.

Methods. Aggregated data about breast cancer patients needs collected using SCNS-SF34 questionnaire or compatibles were collected from a subset of 9 papers selected from a group of 44 chosen for ongoing systematic review for other purposes. They were merged by country ISOCODE with GPS data (Falk et al, 2018) and Kinship Tightness Index (Henke et al, 2019), then classified based on the characteristics of the relevant Healthcare System according to Bohm et al, 2013. Then, each of the need scores and their first principal component (the latter used as a summary index) were separately studied as dependent variables by a generalized linear model having as independent variables: - mean age; - % of working woman; Healthcare System; - Kinship Tightness Index; - two factors (cluster components), obtained by variables clustering, respectively synthesizing prosocial preferences (Positive Reciprocity, Altruism, Trust), placed in the first cluster, and the remaining preferences (Patience,

Negative Reciprocity, Willingness to Take Risk), placed in the second cluster. Unfortunately, the original GPS scores could not be modeled due to lack of degrees of freedom (important for interpretation purposes: all original GPS scores are positively correlated with the factor that represents them synthetically).

Results. The first GPS factor, relating to pro-social variables, is always positively correlated with the dependent variables (in two out of 6 cases only in trend, in the others statistically significantly). The second GPS factor, on the other hand, is always negatively, and statistically significantly, correlated with the dependent variables, with the exception of the Sexuality score, with which it is positively correlated. All other independent variables generally confirm the patterns of association expected a priori.

Conclusions. Economic Preferences appear to play a role in influencing the needs of women with breast cancer, albeit of non-trivial interpretation, statistically "resisting" the concomitant effect of the other independent variables considered. However, these results should be considered preliminary and need further confirmation, possibly with prospective studies conducted at the level of the individual.

7.2 "PAIN UNDERTREATMENT IN ONCOLOGY: IN SEARCH FOR NEW EXPLANATORY VARIABLES AMONG ECONOMIC PREFERENCES."

Purpose. To test whether, in addition to the explanatory variables already identified in Roberto et al, 2022, Economic Preferences may also play a role in explaining pain undertreatment in oncology.

Methods. Data regarding the % of pain undertreated patients in oncology and related covariates, collected from 66 articles published between 1994 and 2020 and stored in the database constructed to conduct

the analyses set forth in Roberto et al, 2022, were classified based on the Healthcare System then merged by country ISOCODE with GPS data (Falk et al, 2018). The share of negative PMIs, expressed in percentage terms, was studied as a dependent variable in a Generalized Linear Model having the following as independent variables:

- Year of publication;
- Economic level;
- Healthcare System;
- GPS scores: Positive Reciprocity, Altruism, Trust, Patience, Negative Reciprocity, Willingness to Take Risk;

From the original database of studies, only Publication Year and Economic level were included among the independent variables because they were the only ones found to be significant in the multivariate analysis in Roberto et al, 2022.

Results. All pro-social variables, i.e., Positive Reciprocity, Altruism, and Trust, in terms of trend are shown to be negatively correlated with the share of pain undertreated patients, as common sense would suggest: that is, as the related scores increase, the share of pain undertreated patients would decrease; however, these results are not statistically significant. Among the other GPS scores, Patience results positively correlated with the share of pain undertreated patients: this result is also not easy to explain, so the hypothesis was sketched that a greater inclination to patience better disposes to the acceptance of pain. Finally, there appears to be a negative correlation between Willingness to Risk and the % of pain undertreated patients, which could be explained by assuming that greater risk tolerance makes the use of opioids more acceptable, since there is still a rather widespread misconception that these drugs expose people to serious risks. With regard to the other covariates, the positive correlation with economic level, already found in Roberto et al, 2022, On the other hand, the role of the year of publication of the articles from which the data are taken, included as a proxy for the period in which the relevant studies were

conducted, is not confirmed, as is, among the new covariates, Healthcare System.

Conclusions. The results show a good degree of internal consistency with regard to pro-social GPS scores, since they are all found to be non-statistically significant and united, albeit only weakly in trend, by a negative correlation with the % of pain undertreated patients. Sharper, at least statistically, is the role of Patience and Willingness to Take Risk, although of more complex empirical interpretation. Among the other variables, the role of economic level, already noted in Roberto et al, 2022, is confirmed, while the role of year and, unexpectedly, Healthcare System is not.

7.3 "ECONOMIC PREFERENCES AND END-OF-LIFE SETTING: THEIR ROLE IN THE LEGALIZATION OF EUTHANASIA AND ASSISTED SUICIDE."

Purpose. Test whether constructs seemingly far removed from the dimensions proper to end-of-life, such as the Economic Preferences found in the Global Preference Survey by Falk et al, 2018, are associated with the legal status of euthanasia and assisted suicide.

Methods. The legal status of euthanasia and assisted suicide, as per ProCon.org, 2022, was merged by country ISOCODE with GPS data (Falk et al, 2018), Kinship Tightness Index (Enke, 2019) and classified by Healthcare System according to Bohm et al, 2013, Legal Origin according to La Porta et al, 1999 and Main Religion according to DeAgostini Libri Srl , 2022. In addition to GPS scores, these variables were also considered because, a priori, they are considered important. However, for computational reasons the Kinship Tightness Index could not be kept in the final model, and the three categorical variables were studied through their first two principal components after optimal quantification. The outcome, structured as a

dichotomous variable having value 1 if euthanasia or assisted suicide is legal and 0 otherwise, was then studied as a dependent variable in a logistic regression model having as independent variables: Important for interpretive purposes: all original GPS scores are positively correlated with the factor that represents them synthetically; - the two principal components synthesizing Healthcare System, Legal Origin and Main Religion; - two factors (cluster components), obtained by variables clustering, synthesizing respectively the prosocial preferences (Positive Reciprocity, Altruism, Trust), placed in the first cluster, and the remaining preferences (Patience, Negative Reciprocity, Willingness to Take Risk), placed in the second (I had to use these two factors instead of the original GPS scores since, unfortunately, the latter could not be included in the model due to computational problems. Important for interpretation purposes: all original GPS scores are positively correlated with the factor that represents them synthetically).

Results. Relative to the conventional cut-off of significance α = 0.05, both GPS factors are found to be statistically significant, with coefficients > 0: thus, as the GPS scores increase, the probability that euthanasia or assisted suicide is legal in a country increases; while the principal components associated with Healthcare System, Legal Origin, and Main Religion are also not borderline significant. A bivariate analysis, however, seems to indicate a role for Healthcare System, Legal Origin, and Kinship Tightness Index as well; while, unexpectedly, the role of Main Religion does not appear to be significant.

Conclusions. The results seem to indicate an obvious role of Economic Preferences, however difficult to interpret empirically. Less evidence, at least on the inferential level, emerged, however, regarding variables that, based on common sense, should play an even more obvious role than Economic Preferences in orienting attitudes toward euthanasia and assisted suicide, namely Healthcare System, Legal Origin, and Kinship Tightness; striking, in particular, is the inability to prove a role for the dominant religious orientation even with a simple bivariate analysis, which

instead suggested some evidence for the other ancillary variables to the Economic Preferences system that were considered in this research.

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II

Are the needs of breast cancer patients

influenced by underlying Economic Preferences?

A study based on aggregated data.

1 Introduction.

Breast cancer, with 2.3 million new cases in 2020 worldwide in represents the most common form of cancer not only among women (25.8% of total 2020 new cases for the female gender) but in general (12.5% of total females + males). Due to survival continuing to rise in recent decades, such a high incidence cannot fail to be accompanied by a very high prevalence as well: again with reference to 2020, in fact, as many as 7.8 million women have been diagnosed with breast cancer, making this the form of cancer characterized by the highest prevalence. Moreover, the number of life years lost due to this disease (DALY) is higher than that of any other form of cancer. All these data, together with the fact that the disease can strike at any age starting from puberty (albeit with an increasing risk with age), that the set of available treatments is very articulated, and that a physical sphere dense with very important symbolic meanings is affected, made the study of the needs expressed by women affected by this disease particularly relevant.

Various survey instruments in the form of questionnaires have been developed to study the needs expressed by cancer patients, and many studies aimed at detecting such needs have been conducted with these instruments. Typically, such surveys aim to precisely quantify the phenomenon in order to know it in its various dimensions, thus constituting a now substantial base of data useful for the formulation of individual or collective intervention plans.

Much more complex, however, is the study of the determinants, or more generally the conditions associated with the different types of these needs and the intensity with which they are expressed. Underlying this study, therefore, is the hypothesis that specific preference systems for which are known to play a role in guiding the economic behavior of individuals are also associated with these needs; the reference, more specifically, is to the preferences studied by the Global Preference Survey (Falk et al, 2018) namely: Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, Altruism and Trust.

The SCNS-SF34 questionnaire, for example, declines the dimensions underlying the needs in question around factors such as psychological, health system and information, physical and daily living, patient care and support, and sexuality needs, which suggest suggestive connections with the preference system investigated by GPS. Thus it is safe to assume relationships, for example, between psychological needs, physical and daily living, patient care and support, and the reciprocity, altruism, and trust constructs of GPS. Still, it is to be expected that these relationships, or at least some of them, are modulated by the type of health care system and the dominant kinship structures, which may, moreover, be in a subservient relationship (some needs, for example, can be reasonably met, in the absence of efficient and accessible health care systems, if one can rely on extensive and cohesive kinship networks: conversely, in the absence of the latter, which may be the case in Scandinavian societies, an efficient health welfare system could provide for them equally).

This study, therefore, aims to investigate the relationship between the needs expressed by women with breast cancer with the components of the preference system investigated by the GPS survey, in conjunction with the role played by the specific type of the afferent health care system and the dominant kinship system in the home context.

2 Background.

As mentioned in the introduction, the aspects that make the study of the needs expressed by women with breast cancer rather complex are as follows:

a) age at onset and related characteristics of the disease (U.S. 2020 data, cited for illustrative purposes): although the risk increases with age, nevertheless the disease can occur as early as after puberty, in any case at ages for which other forms of cancer are much less frequent. In addition, the more juvenile forms tend to have different features, with prognoses

tending to be worse, from those that more commonly appear in later life. In this regard, considering only the stage at onset, 47% of diagnoses in the 15-39 age group are diagnosed at an early stage, compared with 68% of women over 65 years of age, with a significant impact on survival prospects (see next point). It is obvious that a disease that presents itself, possibly in a severe form, at the beginning or in the midst of a woman's reproductive and working life, can only induce different problems and needs than if it occurs at a much later age;

b) survival (U.S. 2020 data, cited for illustrative purposes only): since 1980, medical advances have increasingly increased survival for this disease, bringing it now to 99% at 5 years after diagnosis in the case of localized disease, which affects about 65% of women. In the case only regional lymph nodes are affected, the figure drops to 86%, which is still a remarkable value, to a remarkable 84% at 10 years in the case of nonmetastatic disease. It is inevitable that the needs expressed by patients still undergoing treatment, or at any rate close to diagnosis, can only be different from people who are years away from onset, or who have even been declared cured;

c) the type of treatment: as the most prevalent type of cancer, it has played a primary role in driving medical innovation, so there is now a considerable variety of treatment approaches available. It is therefore obvious, for example, that the type of needs expressed by women who have undergone radical surgeries is very different from the case of minimal surgeries; likewise, it is obvious how therapies that are prolonged for years induce different needs from the case of brief therapies;

d) symbolic aspects: in any human society, the breast has a very significant symbolic value. Needs therefore related to aesthetics, relationship life, and sexuality take on much greater relevance than other

types of cancer, even with the same severity. Consider also that symbolic aspects change according to different cultural and social contexts.

The examples could go on: but those given should be sufficient to understand the reasons why several studies have been conducted to investigate the needs of women diagnosed with this disease, the complexity of these studies, and the difficulty of drawing a unified picture based on the respective results.

The latter also depends on the variety of instruments that are used to detect needs. In this regard, the following questionnaires are among the generic (i.e., not breast cancer-specific) instruments:

- CaSUN (Cancers Survivors Unmet Needs; Hodgkinson et al 2007). Questionnaire structured on 42 items, including 35 need items, particularly focused only on unmet needs. Explores the following domains (range indicating unmet need in parentheses): existential survivorship (0-14), comprehensive cancer care (0-6), information (0-3), quality of life (0-2), relationship (0-3). The total score is obtained by summing the scores of individual items and ranges from 0 to 35. In Buris et al, 2015, although its excellent psychometric properties are, acknowledged, an adapted version was proposed claiming that the original is difficult to administer due to the wording of some items and response options: this version contains only 30 need items (so the range of the total score is 0-30).

- SCNS-SF34 (Boyes et al, 2009). Questionnaire based on 34 items, exploring the following domains (score ranges in parentheses): psychological (10-50), health system and information (11-55), patient care and support (5-25), physical and daily living (5-25), and sexuality needs (3-15). The range of the sum of the scores is 34-170, which are then reported on a standardized Likert summated score whose range is 0-100.

- Need Evaluation Questionnaire (Tamburini et al, 2000). Questionnaire based on 23 dichotomous items, characterized by a rather complex factorial structure (for which, in addition to the original article, see also Annunziata et al, 2009). Dimensions explored (with relative score ranges in parentheses): informational needs (0-9), needs related to assistence/care (0-3), relational needs (0-3), needs for a psychoemotional support (0-3) material needs (0-3).

A breast cancer-specific questionnaire, however, is as follows:

- Cancer Survivor Profile-Breast Cancer (Gehrke et al, 2018). Developed for use on tablets (more specifically iPad by Apple Inc., Cupertino, CA), it is structured on 5 domains,18 subscales, and 71 items. The domains investigated are symptom burden, function, financial strain, health behavior domain, and health care-seeking skills domain. Each item was scored using a five-point Likert-type scale (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Totally disagree, 5 = Strongly agree). The 5 domains were symptom burden (6 subscales, 14 items), function (5 subscales, 6 items), health behavior (3 subscales, 3 items), financial strain (1 subscale, 2 items), and healthcare-seeking (3 subscales, 3 items).

Although it is designed specifically for breast cancer, however, it is much less widely used than generic tools such as the aforementioned CaSUN and SCNS-SF34: for the latter, moreover, breast cancer-specific tools have also been developed, namely a "breast cancer module" structured on 8 items (Brèdart et al, 2012) and a breast cancer-specific "survivors module" (Thewes et al 2004), structured on as many as 41 items.

Finally, if we consider that:

- the results of studies using the same instrument may be presented in different and unreconcilable ways;

-   there are smaller instruments, perhaps used in a single study or specific to a particular setting (such as the Needs Self-Rating Questionnaire for Breast Cancer (NSQ-BC), Zhou et al, 2019)

it should come as no surprise how difficult it is to construct a unified and comprehensive picture of the needs expressed by these patients: in fact, this was the original rationale behind the systematic review from which the needs data used in this article were later drawn (see "Breast cancer needs studies" paragraph in "Materials and methods" section).

Instead, it may seem surprising how a rather specific and minimal set of preferences can guide human decisions in even very different contexts, so much so as to suggest an exercise such as the one proposed in this article. This position should appear supportable, however, when one considers that the preferences in question involve such dimensions as risk, time, reciprocity, altruism, and trust: it seems likely, for example, that the levels of altruism and reciprocity characteristic of a specific community may play a role in conditioning choices about health care policies; perceptions of risk and attitudes about time may not fail to condition opinions about preventive medicine and lifestyles or about practices of therapeutic endangerment; trust influences the propensity to participate in clinical trials, provide sensitive data for observational studies, adhere to new or controversial therapies, and the examples could be many more.

It is possible that there is a resistance to interpreting behaviors and attitudes concerning the health sphere on the basis of those same preferences called upon to explain economic phenomena, as if a kind of return "economism" were feared and as if economic categories could enter this sphere only according to the established canons of health economics. But, paradoxically, precisely in this way it would close the circle: a) since it cannot, any health choice, whether at the individual or collective level, disregard its economic sustainability; b) since economic decisions and behaviors are guided (also) by the system of preferences in question, a connection between them and the health dimension of human life cannot but follow anyway.

Rather, it should strike one as striking that, even limited to disciplines dealing with human behavior, there is a dearth of systematic and large-scale studies concerning the role of the preferences in question in guiding behaviors distant from the economic sphere. The opportunity provided by studies such as GPS (Falk et al, 2018), which, by setting out to study the preference system itself should be characterized by a good degree of transferability across disciplines, seems to shatter against the difficulties these results have in spreading outside the disciplinary fields that produced them.

Instead, in this article we would like to attempt to seize this opportunity for "contamination" between data concerning Economic Preferences and health aspects that are the subject of much attention in the original fields of investigation, not neglecting also the fact that a purely relevant aspect of this challenge is the juxtaposition of very general constructs, such as those of the preference system, to very specific domains, such as that of the health phenomena being investigated: we will therefore cross at the same time the space between different disciplines (economic prefences vs. health-related attitudes and behaviors) and that between different scales of observation (general vs. specific dimensions).

I think I can say that the research presented in this article has the features to be a novelty in the relevant literature: in fact, it seems to be the only one in which a large and well-structured set of needs expressed by women with breast cancer, surveyed in different countries and contexts with validated instruments, is studied in relation to an articulated and coherent system of preferences of economic relevance such as the one investigated in Falk et al, 2018.

3 Materials and methods.

3.1   Raw data.

3.1.1 Studies concerning the needs of patients with breast cancer.

Data regarding the needs of individuals with breast cancer were taken from the articles selected for a systematic review in which I am collaborating, the article selection phase having been completed. For the purpose of this review, the bibliographic databases Medline, Embase, Cinahl and PsycInfo were queried by applying the following query:

(supportive care need*[Title/Abstract] OR psychosocial care need*[Title/Abstract] OR unmet need*[Title/Abstract] OR social need*[Title/Abstract] OR emotional need*[Title/Abstract] OR physical need*[Title/Abstract] OR work need*[Title/Abstract] OR employment need*[Title/Abstract] OR necessit*[Title/Abstract]) AND ("Breast Neoplasms"[Mesh] OR breast cancer* OR breast tumor OR breast tumour OR breast neoplasm)

Filters: from 2012 - 2022

which returned 4 926 items. These items were then selected as described in the following flow chart (Paltrinieri, 2022a):

Identification of studies via databases and registers

Records identified from:
Medline (n= 1761)
Embase (n= 2463)
Cinahl (n= 541)
PsycInfo (n= 161)
Total (n= 4926)

Records removed *before screening*:
Duplicate records removed (n= 1877)

Records screened
(n= 3049)

Records excluded
(n= 2772)

Reports sought for retrieval
(n= 277)

Reports not retrieved (n= 7)
Conference proceedings (n=111)

Reports assessed for eligibility
(n= 159)

Reports excluded:
Relevant data on the prevalence of needs are not reported (n= 20)
qualitative methodology (n= 39)
other reasons (n= 23) *
not using validate tools (n= 29)
focused on a specific need (n=5)

Identification of studies via other methods

Records identified from:
citation searching (n= 6)

Reports sought for retrieval
(n= 6)

Reports not retrieved
(n= 0)

Reports assessed for eligibility
(n= 6)

Reports excluded:
qualitative methodology (n= 4)
focused on a specific need (n=1)

Studies included in review
(n= 44)

Identification

Screening

Included

* full text is not in English (n= 3), duplicate full text (n= 3), development/ validation of a tool (n= 4), mixed populations (e.g., breast cancer patients and caregivers were interviewed together, n= 3), overlapped cohort (n= 6), data request to authors (n=4)

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The 44 selected articles are listed in section 8.2 "Papers selected for the systematic review."

The majority of these articles, i.e., 30, used the SCNS-SF34 or compatible questionnaire as their needs survey instrument, while only 9 used the CaSUN or compatible (the remaining 5 articles used other instruments): therefore, it was decided to consider only those articles using the SCNS-SF34 or compatible questionnaire.

However, only 19 items in this subset reported mean scores for the 5 dimensions studied by the SCNC-SF34, namely, psychological, health system and information, patient care and support, physical and daily life, and sexuality, so only these items could be used in the analyses. On the other hand, some of them reported information referring to different circumstances, each of which was treated as a separate statistical unit in the analyses: therefore, the final number of records rises to 27. In relation to these scores, it should be mentioned that the relative scares are all oriented in the sense that as the need increases, the value of the relative scale increases.

In addition to average scores for the 5 dimensions mentioned above, average age and percentage of working women were also considered in the analyses: but only 10 out of 19 articles reported both data, bringing the number of analyzable entries to 18. Unfortunately, apart from the country in which the relevant studies were conducted, it was not possible to use other data from the articles besides mean age and percentage of working women because the articles are too heterogeneous in terms of the type of data collected.

To recapitulate, then, for the purpose of statistical analysis:

- The following data were collected from each item: country in which the study was conducted, mean age and percentage of working women, the mean values for the SCNS-SF34 questionnaire scores (or compatible) related to the following dimensions: psychological, health system and information, patient care and support, physical and daily life, and sexuality;

- the database resulting from the selection process described in this section consists of 18 records related to 10 studies.

3.1.2 Preferences: Global Preference Survey.

Preference data come from the study generally known as the Global Preference Survey (GPS; Falk et al, 2018), which is undoubtedly the largest and most reliable survey conducted on this topic. In fact, it is a survey conducted on a representative sample of 80,000 individuals from 76 nations that was conducted as part of the 2012 Gallup World Poll and experimentally validated. This survey is specifically aimed at investigating the set of constructs consisting of time preference, risk preference, positive and negative reciprocity, altruism, and trust through a questionnaire consisting of 12 items broken down as follows:

- Patience (time preference): 2 items;
- Risk taking: 2 items;
- Positive reciprocity: 2 items;
- Negative Reciprocity: 3 items;
- Altruism: 2 items;
- Trust: 1 item.

For this study I used scores for these 6 dimensions calculated at the nation level that are publicly available and downloadable from the BRIQ Institute website (https://www.briq-institute.org/global-preferences/downloads); however, individual-level data are also available.

3.1.3 Kinship Tightness.

Regarding the Kinship Tightness indicator, I used the one proposed in Enke, 2019. This measure, called the Kinship Tightness Index, is based on data from Murdock's Ethnographic Atlas (Murdock, 1967) and can be downloaded from:

For the purpose of this study, I used the index calculated at the country level.

Summarily, it is in index obtained as an unweighted mean of the 4 binary variables coded as follows (cited from the On Line Appendix of Enke, 2019):

Extended vs. nuclear family. Q8 in EA. Binary variable that takes on a value of:

- Zero, if domestic organization is:
- Independent polyandrous families (3)
- Polygynous: unusual co-wives pattern (59)
- Polygynous: usual co-wives pattern (222)
- Minimal (stem) extended families (45)
- Small extended families (323)
- Large extended families (236)

- One, if domestic organization is:
- Independent nuclear family, monogamous (122)
- Independent nuclear family, occasional polygyny (273)

Post-marital residence. Q11. Binary variable that takes on a value of:

- Zero, if post-wedding residence is:
- Couple to either group or neolocal (164)
- No common residence (8)

- One, if post-wedding residence is:
- Wife to husband's group (915)
- Husband to wife's group (200)

Lineages. Q43. Binary variable that takes on a value of:

- Zero, if descent is:
- Patrilineal (593)
- Duolateral (52)
- Matrilineal (161)
- Quasi-lineages (12)
- Ambilineal (49)
- Mixed (50)

- One, if descent is: Bilateral (374)

Segmented communities and localized clans. Q15. Binary variable that takes on a value of:

- Zero, if community organization is:
- Demes, not segregated into clan barrios (86)
- Agamous communities (404)
- Exogamous communities, not clans (119)

- One, if community organization is:
- Segmented communities without local exogamy (262)
- Segmented communities, localized clans, local exogamy (9)
- Clan communities, or clan barrios (242)

(legend:
- Qn in EA: Qn variable in the Ethnographic Atlas;
- number in parentheses: number of observations).

3.1.4   Healthcare Systems classification.

"To analyze the results, we categorized articles that we have included according to the healthcare system type of the country where the study was conducted by using the classification of Böhm et al., 2013. The authors classified the healthcare systems of 30 countries according to three core dimensions: regulation, financing, and services provision. As reported by Böhm et al., five types of plausible healthcare systems exist, namely National Health Service, National Health Insurance, Social Health Insurance, Private Health System, and Etatist Social Health Insurance. All these categories are united by the feature of universal coverage of the population. In the National Health Service the state holds the regulatory power, the funding derives from general tax, and the healthcare infrastructure are a public ownership; the National Health Insurance has the features of the previous type but the service provision depends mostly on for-profit; in the Social Health Insurance the funding coming mainly from contributions and public or private delivery; the Private Health System is based on private insurance only, which is also the major funding source; Etatist Social Health Insurance is a combination of state regulation, societal financing and private provision.

Although Bredart et al. 2013 recruited breast cancer patients both in France and in Switzerland, it has been classified in the Etatist Social health Insurance, as 64% of participants were French.

Articles that have been conducted in countries not classified by Bohm et al., 2013 have been grouped into a category of Mixed types because, to our

knowledge, there are no other studies comparing these healthcare systems.

For all of the following reasons it was not possible to categorize these countries into one of the five healthcare systems. First of all, some of these countries do not have universal coverage of the population and the equitable access to healthcare services is not guaranteed, as for Iran (Heashmati et al., 2016); while in China some reforms have been implemented in the last decade to move the country toward this direction (Yip et al., 2019). In Singapore, various actors (i.e., public and private) contribute to the sustenance of the healthcare system and the delivery of services (Tan et al., 2021), bringing to greater complexity that could impact on the provision of services for patients and, therefore, on the likelihood of addressing their needs (Jefford et al., 2022). The payment also of private insurance schemes may impact the capacity of the patient to afford for the services that could help him/her to address needs, as in the case of Malaysia (Rannan-Eliya et al., 2016). In addition, in Kenya, out of pocket costs for health can be for the most part borne by the citizens (Chuma et al., 2011). Furthermore, insufficient data does not allow to classify the country, as in the case of Mexico (Böhm et al., 2013)." (Paltrinieri, 2022b).

The 30 countries studied in Bohm et al, 2013, were classified as follows:

Type of healthcare system	Countries
Etatist Social Health Insurance	Belgium, Estonia, France, Czech Republic, Hungary, Netherlands, Poland, Slovakia, Israel, Japan, Korea
National Health Insurance	Australia, Canada, Ireland, New Zealand, Italy
National Health Service	Denmark, Finland, Iceland, Norway, Sweden, Portugal, Spain, United Kingdom

Private Health System	United States of America
Social Health Insurance	Austria, Germany, Luxembourg, Switzerland

For each needs study, the type of Healthcare System concerning the subjects under study was directly entered into the original database of 44 studies described in Section 3.1.1 "Breast cancer needs studies." Therefore, the studies are distributed as follows by Healthcare System:

Healthcare System	N.	%
Etatist Social Health Insurance	8	18.2
Mixed Type	19	43.2
National Health Insurance	8	18.2
National Health Service	3	6.8
Private Health System	5	11.4
Social Health Insurance	1	2.3
ALL	44	100.0

while the relevant countries are grouped as follows:

Healthcare System	Country
Etatist Social Health Insurance	France France & Switzerland Japan South Korea The Netherlands
Mixed Type	China Ghana Iran Kenya Malaysia Mexico Singapore Taiwan
National Health Insurance	Australia Canada
National Health Service	Denmark

	UK
Private Health System	USA
Social Health Insurance	Switzerland

3.2 Analysis database making.

In order to save degrees of freedom of deviance of the Generalized Linear Models that will be used to analyze the SCNS-SF34 scores, the 6 GPS scores were subjected to a variable clustering procedure (see section "Statistical methods"), so that only the respective cluster components were used in the models instead of the original scores. As a result of this procedure, the following two clusters were identified:

- Cluster 1: consisting of the scores related to Positive Reciprocity, Altruism and Trust;

- Cluster 2: consisting of the scores related to Patience, Negative Reciprocity and Risk Taking.

(scores are listed in order of increasing value of statistic $1 - R^2$ ratio). The 2 corresponding cluster components, standardized to mean = 0 and standard deviation = 1, were then added to the dataset containing the GPS scores and will be used among the independent variables of the analysis models instead of the original variables, since it would not be possible to use the latter directly because of the collapse of the degrees of freedom.

In the merging process between:

- The database of the 18 entries selected as described in section 3.1.1 "Breast cancer needs studies"

- the GPS data database (see section 3.1.2. "Preferences: Global Preference Survey) containing the 76 country-level records and augmented by the two cluster components from the two cluster components described above

a record from the first database is lost because the relevant study was conducted in a country, Malaysia, for which GPS data is not available: more specifically, this is the study described in Fong et al, 2016

In the subsequent merging with the database containing the Kinship Tightness Index, however, no additional records are lost.

Thus, the final database that will be analyzed consists of 17 records related to the following 9 items:

- Akechi et al, 2015
- Akechi et al, 2021
- Brédart et al, 2016
- Im et al, 2021
- Kemp et al, 2018
- Mirzaei et al, 2019
- Momino et al, 2017
- Park et al, 2012
- Perez-Fortis et al, 2018

A further dimension reduction technique was applied on the final database, but aimed now at the SCNS-SF34 scores: in fact, although there is the possibility of calculating a total score for the items of that questionnaire, this data is available on only 7 of the 17 selected records. Therefore, the first principal component of the 5 SCNS-SF34 scores was calculated (see section 3.3 "Statistical methods" for details), which will be used as a dependent variable in the analysis models in addition to the original scores, with the intention of producing a summary assessment based on a single summary indicator of the different types of need. This component, calculated on the scori standardized to mean = 0 and standard deviation = 1, was itself standardized in the same way.

3.3 Statistical methods.

As mentioned in section 3.2 "Analysis database making," a dimension reduction procedure was prioritized by variable clustering on the 6 GPS scores. For this purpose, the technique implemented in the PROC VARCLUS procedure of the SAS/STAT module embedded in the statistical software package SAS System was used: summarily, this technique is analogous to performing an orthoblique rotation on principal components (raw quartimax rotation on the eigenvectors, see: Harris and Kaiser, 1964). As cluster splitting criteria, a cluster is further split if its second eigenvalue is greater than 1.

Based on this criterion, the procedure identifies 2 clusters composed as follows:

- Cluster 1: consisting of the scores related to Positive Reciprocity, Altruism and Trust;

- Cluster 2: consisting of the scores related to Patience, Negative Reciprocity and Risk Taking.

where the GPS scores are listed in order of increasing value of the $1 - R^2$ ratio statistic, as can be seen from this more comprehensive table:

| 2 Clusters | | R-squared with | | | |
| | | Own | Next | 1-R**2 | Variable |
Cluster	Variable	Cluster	Closest	Ratio	Label
Cluster 1	posrecip	0.8103	0.0332	0.1962	Positive reciprocity
	altruism	0.7513	0.0056	0.2501	Altruism
	trust	0.3675	0.0206	0.6458	Trust
Cluster 2	patience	0.5324	0.0039	0.4694	Patience
	negrecip	0.4826	0.0065	0.5208	Negative reciprocity
	risktaking	0.4402	0.0212	0.5719	Will. to take risks

Regarding the performance of the clustering procedure, we can instead refer to the following table:

Cluster Summary for 2 Clusters					
Cluster	Members	Cluster Variation	Variation Explained	Proportion Explained	Second Eigenvalue
1	3	3	1.929145	0.6430	0.7890
2	3	3	1.455178	0.4851	0.8104

Total variation explained = 3.384323 Proportion = 0.5641

from which it can be deduced that the two cluster components identified by the procedure explain 56.41 % of the overall variability: all in all, this can be considered a reasonably good result, if we consider that the 6 GPS scores are poorly correlated with each other, as can be seen from the corresponding correlation matrix:

Spearman Correlation Coefficients, N = 76 Prob > |r| under H0: Rho=0						
	posrecip	altruism	trust	patience	negrecip	risktaking
posrecip **Positive reciprocity**	1.00000	0.72142 <.0001	0.39759 0.0004	-0.09222 0.4282	-0.16287 0.1598	-0.16782 0.1473
altruism Altruism	0.72142 <.0001	1.00000	0.26975 0.0184	-0.03341 0.7745	-0.17479 0.1310	0.04643 0.6905
trust Trust	0.39759 0.0004	0.26975 0.0184	1.00000	0.12153 0.2957	0.16172 0.1628	0.04552 0.6962
patience Patience	-0.09222 0.4282	-0.03341 0.7745	0.12153 0.2957	1.00000	0.31871 0.0050	0.29649 0.0093
negrecip **Negative reciprocity**	-0.16287 0.1598	-0.17479 0.1310	0.16172 0.1628	0.31871 0.0050	1.00000	0.18838 0.1032
risktaking **Will. to take risks**	-0.16782 0.1473	0.04643 0.6905	0.04552 0.6962	0.29649 0.0093	0.18838 0.1032	1.00000

In fact, the separation between the two clusters is very high, the correlation between the two cluster components being a negligible -0.07372: and this is a very positive aspect for the interpretation of the results.

Pure extremely relevant to the interpretation of the results is the cluster structure, or the set of correlations between each original variable and the cluster components:

Cluster Structure			
Cluster		**1**	**2**
posrecip	Positive reciprocity	0.900187	-.182309
altruism	Altruism	0.866797	-.075119
trust	Trust	0.606194	0.143536
patience	Patience	0.062260	0.729658
negrecip	Negative reciprocity	-.080731	0.694689
risktaking	Will. to take risks	-.145630	0.663463

As can be seen, the variable most correlated with the first cluster component (r = 0.90) is the score concerning Positive Reciprocity, while the variable most correlated with the second cluster component is the score concerning patience (r = 0.73). Purely to be emphasized, for interpretive purposes, how each variable is positively correlated with the cluster component of the cluster in which it was placed.

Again for the purpose of interpretation, it is noted that the two cluster components were standardized to mean = 0 and standard deviation = 1.

On the other hand, with regard to the dimension reduction technique applied to the 5 SCNS-SF34 scores, it was a more common extraction of the first principal component. There was no need to consider additional components, since the first one explains as much as 83.14 % of the overall variability and the eigenvalue associated with the second one is well below 1, being 0.56. In this regard, see the following table:

Eigenvalues of the Correlation Matrix				
	Eigenvalue	Difference	Proportion	Cumulative
1	4.15712193	3.59269921	0.8314	0.8314
2	0.56442272	0.34142975	0.1129	0.9443
3	0.22299297	0.17485228	0.0446	0.9889
4	0.04814069	0.04081899	0.0096	0.9985
5	0.00732169		0.0015	1.0000

To facilitate interpretation, the first principal component was then standardized to mean = 0 and standard deviation = 1.

Again for interpretive purposes, it would be useful to know if there are variables that are more correlated than others to their first principal component. However, as can be seen from the table below, they all appear to be highly correlated, confirming the fact that the first principal component represents in this case an excellent synthesis of the underlying variables; as well, it is worth noting, for interpretation purposes, how positively correlated they all are:

Pearson Correlation Coefficients, N = 17 Prob > |r| under H0: Rho=0	
	Prin1
psychological_MEAN	0.94031 <.0001
health_system_and_info_MEAN	0.87913 <.0001
patient_care_and_support_MEAN	0.93245 <.0001
physical_and_daily_life_MEAN	0.92947 <.0001
sexuality_MEAN	0.87562 <.0001

The above with regard to pre-processing statistics activities.

Relative, however, to the analyses concerning the objective of the study, each SCNS-SF34 score, as well as their first principal component (Prin1 in the following), was studied as a dependent variable in a Generalized Linear Model having the following as independent variables:

- Healthcare System
- Age (mean)
- % of working women
- Kinship Tightness Index
- 1.st cluster component of GPS scores (summarizing Positive Reciprocity, Altruism and Trust)
- 2.st cluster component of GPS scores (summarizing Patience, Negative Reciprocity and Risk Taking)

The categorical Healthcare System variables were parameterized according to the reference parameterization, assuming the class "Etatist Social Health Insurance" as the reference level, this class being the most numerous. Thus, the subsequent design variables were generated:

Class Level Information				
Class	Value	Design Variables		
healthcare_system	Etatist_Social_Health_Insurance	0	0	0
	Mixed_Type	1	0	0
	National_Health_Insurance	0	1	0
	Private_Health_System	0	0	1

Finally, the distribution of the dependent variable was assumed to be normal and the identity function was chosen as the linking function.

The two-sided 95% confidence interval according to the Wald approach was calculated for each model parameter, and type 3 p-values were calculated for the likelihood ratio Statistics.

4   Results.

4.1   Variables distribution.

The following table shows the main distributional information on the dependent variables, namely the SCNS-SF34 and their first principal component:

	Min	10.th pctl	25.th pctl	50.th pctl	Mean	75.th pctl	90.th pctl	Max	Std Dev
psychological_MEAN	2.1	2.1	15.5	26.3	23.0	33.8	36.2	45.3	13.8
health_system_and_info_MEAN	2.7	2.8	13.0	30.5	29.3	36.0	62.1	62.5	20.3
patient_care_and_support_MEAN	2.5	2.5	5.8	11.6	16.1	27.8	38.3	47.4	14.3
physical_and_daily_life_MEAN	1.9	1.9	8.0	10.0	12.4	14.9	31.2	36.9	9.8
sexuality_MEAN	1.8	1.8	4.0	4.9	10.1	14.6	28.0	47.4	12.2
Prin1	-1.2	-1.2	-0.6	-0.1	0.0	0.9	1.3	2.1	1.0

Regarding the independent variables, however, starting with the only categorical variable, namely, Healthcare System, we have:

	N.	%
Healthcare System		
Etatist_Social_Health_Insurance	11	64.7
Mixed_Type	4	23.5
National_Health_Insurance	1	5.9
Private_Health_System	1	5.9
All	17	100.0

while for the quantitative variables (in addition to the original GPS scores, added for completeness), the distributional data are:

	Min	10.th pctl	25.th pctl	50.th pctl	Mean	75.th pctl	90.th pctl	Max	Std Dev
age_MEAN	43.9	46.8	47.8	53.6	52.2	56.0	56.0	56.0	4.1
working_pct	11.1	22.0	27.8	35.6	34.6	45.0	45.0	49.1	10.0
kinship_score	0.1	0.2	0.3	0.6	0.5	0.8	0.8	0.8	0.2
CL1_PosRecip_Altruism_Trust	-2.8	-2.8	-1.1	-1.1	-0.6	0.3	1.1	2.0	1.4
CL2_Patience_NegRecip_RiskTaking	-0.6	-0.6	-0.0	-0.0	0.5	1.3	1.6	1.6	0.8
Positive reciprocity	-1.0	-1.0	-0.2	-0.2	-0.3	-0.2	0.2	0.6	0.4
Altruism	-0.8	-0.8	-0.2	-0.2	-0.1	0.4	0.4	0.6	0.5
Trust	-0.5	-0.5	-0.5	-0.4	-0.2	-0.1	0.3	0.3	0.3
Patience	-0.4	-0.1	0.1	0.1	0.2	0.4	0.7	0.8	0.3
Negative reciprocity	-0.1	-0.1	0.0	0.2	0.3	0.5	0.7	0.7	0.3
Will. to take risks	-0.4	-0.4	-0.4	-0.1	-0.1	-0.0	0.1	0.3	0.2

(where CL1_PosRecip_Altruism_Trust indicates the first cluster component and CL2_Patience_NegRecip_RiskTaking the second: these names were given to facilitate understanding in terms of the original underlying variables).

4.2 Model estimates.

Results are reported separately for each dependent variable.

4.2.1 Psychological score.

Analysis Of Maximum Likelihood Parameter Estimates						
Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits	
Intercept		1	88.8050	27.5703	34.7681	142.8418
healthcare_system	Mixed_Type	1	-6.0221	3.6443	-13.1648	1.1206
healthcare_system	National_Health_Insurance	1	-34.2340	5.0699	-44.1708	-24.2971
healthcare_system	Private_Health_System	1	-2.5085	4.3104	-10.9568	5.9398
age_MEAN		1	-0.2292	0.4199	-1.0522	0.5938
working_pct		1	-0.2028	0.0747	-0.3492	-0.0563
kinship_score		1	-63.2364	7.9001	-78.7202	-47.7525
CL1_PosRecip_Altruism_Trust		1	6.5854	1.0016	4.6224	8.5485
CL2_Patience_NegRecip_RiskTaking		1	-15.1855	2.3174	-19.7275	-10.6434
Scale		1	1.7118	0.2936	1.2231	2.3957

Analysis Of Maximum Likelihood Parameter Estimates			
Parameter		Wald Chi-Square	Pr > ChiSq
Intercept		10.38	0.0013
healthcare_system	Mixed_Type	2.73	0.0984
healthcare_system	National_Health_Insurance	45.59	<.0001
healthcare_system	Private_Health_System	0.34	0.5606
age_MEAN		0.30	0.5852
working_pct		7.37	0.0066
kinship_score		64.07	<.0001
CL1_PosRecip_Altruism_Trust		43.23	<.0001
CL2_Patience_NegRecip_RiskTaking		42.94	<.0001
Scale			

Notes: The scale parameter was estimated by maximum likelihood.

LR Statistics For Type 3 Analysis			
Source	DF	Chi-Square	Pr > ChiSq
healthcare_system	3	38.35	<.0001
age_MEAN	1	0.30	0.5868
working_pct	1	6.12	0.0134
kinship_score	1	26.56	<.0001
CL1_PosRecip_Altruism_Trust	1	21.51	<.0001
CL2_Patience_NegRecip_RiskTaking	1	21.42	<.0001

4.2.2 Health System and Info score.

Analysis Of Maximum Likelihood Parameter Estimates						
Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits	
Intercept		1	64.6276	24.2895	17.0211	112.2341
healthcare_system	Mixed_Type	1	13.9099	3.2106	7.6172	20.2027
healthcare_system	National_Health_Insurance	1	-27.6388	4.4666	-36.3932	-18.8844
healthcare_system	Private_Health_System	1	6.6338	3.7975	-0.8091	14.0768
age_MEAN		1	-0.0154	0.3699	-0.7404	0.7097
working_pct		1	-0.1350	0.0658	-0.2641	-0.0060
kinship_score		1	-51.1741	6.9600	-64.8154	-37.5328
CL1_PosRecip_Altruism_Trust		1	0.6601	0.8824	-1.0693	2.3895
CL2_Patience_NegRecip_RiskTaking		1	-11.7163	2.0416	-15.7178	-7.7148
Scale		1	1.5081	0.2586	1.0776	2.1106

Analysis Of Maximum Likelihood Parameter Estimates			
Parameter		Wald Chi-Square	Pr > ChiSq
Intercept		7.08	0.0078
healthcare_system	Mixed_Type	18.77	<.0001
healthcare_system	National_Health_Insurance	38.29	<.0001
healthcare_system	Private_Health_System	3.05	0.0807
age_MEAN		0.00	0.9668
working_pct		4.21	0.0402
kinship_score		54.06	<.0001
CL1_PosRecip_Altruism_Trust		0.56	0.4544
CL2_Patience_NegRecip_RiskTaking		32.93	<.0001
Scale			

Notes: The scale parameter was estimated by maximum likelihood.

LR Statistics For Type 3 Analysis			
Source	DF	Chi-Square	Pr > ChiSq
healthcare_system	3	46.06	<.0001
age_MEAN	1	0.00	0.9668
working_pct	1	3.76	0.0525
kinship_score	1	24.32	<.0001
CL1_PosRecip_Altruism_Trust	1	0.55	0.4581
CL2_Patience_NegRecip_RiskTaking	1	18.32	<.0001

4.2.3 Patient Care and Support score.

Analysis Of Maximum Likelihood Parameter Estimates						
Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits	
Intercept		1	162.3511	40.6524	82.6739	242.0283
healthcare_system	Mixed_Type	1	-0.7722	5.3735	-11.3042	9.7597
healthcare_system	National_Health_Insurance	1	-40.8335	7.4756	-55.4854	-26.1816
healthcare_system	Private_Health_System	1	-2.0476	6.3557	-14.5046	10.4094
age_MEAN		1	-1.9779	0.6191	-3.1914	-0.7644
working_pct		1	0.1122	0.1102	-0.1037	0.3281
kinship_score		1	-76.9684	11.6486	-99.7994	-54.1375
CL1_PosRecip_Altruism_Trust		1	1.3976	1.4768	-1.4968	4.2921
CL2_Patience_NegRecip_RiskTaking		1	-9.1441	3.4170	-15.8413	-2.4469
Scale		1	2.5241	0.4329	1.8035	3.5325

Analysis Of Maximum Likelihood Parameter Estimates			
Parameter		Wald Chi-Square	Pr > ChiSq
Intercept		15.95	<.0001
healthcare_system	Mixed_Type	0.02	0.8857
healthcare_system	National_Health_Insurance	29.84	<.0001
healthcare_system	Private_Health_System	0.10	0.7473
age_MEAN		10.20	0.0014
working_pct		1.04	0.3085
kinship_score		43.66	<.0001
CL1_PosRecip_Altruism_Trust		0.90	0.3440
CL2_Patience_NegRecip_RiskTaking		7.16	0.0074
Scale			

Notes: The scale parameter was estimated by maximum likelihood.

LR Statistics For Type 3 Analysis			
Source	DF	Chi-Square	Pr > ChiSq
healthcare_system	3	32.62	<.0001
age_MEAN	1	7.99	0.0047
working_pct	1	1.01	0.3157
kinship_score	1	21.62	<.0001
CL1_PosRecip_Altruism_Trust	1	0.87	0.3502
CL2_Patience_NegRecip_RiskTaking	1	5.98	0.0145

4.2.4 Physical and Daily Life score.

Analysis Of Maximum Likelihood Parameter Estimates						
Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits	
Intercept		1	94.0306	16.5008	61.6897	126.3715
healthcare_system	Mixed_Type	1	-7.6738	2.1811	-11.9487	-3.3989
healthcare_system	National_Health_Insurance	1	-35.4811	3.0343	-41.4283	-29.5339
healthcare_system	Private_Health_System	1	-5.4763	2.5798	-10.5325	-0.4200
age_MEAN		1	-0.6353	0.2513	-1.1279	-0.1427
working_pct		1	-0.1474	0.0447	-0.2350	-0.0597
kinship_score		1	-64.0276	4.7282	-73.2947	-54.7606
CL1_PosRecip_Altruism_Trust		1	5.4604	0.5994	4.2856	6.6353
CL2_Patience_NegRecip_RiskTaking		1	-7.1286	1.3870	-9.8470	-4.4102
Scale		1	1.0245	0.1757	0.7320	1.4338

Analysis Of Maximum Likelihood Parameter Estimates			
Parameter		Wald Chi-Square	Pr > ChiSq
Intercept		32.47	<.0001
healthcare_system	Mixed_Type	12.38	0.0004
healthcare_system	National_Health_Insurance	136.73	<.0001
healthcare_system	Private_Health_System	4.51	0.0338
age_MEAN		6.39	0.0115
working_pct		10.86	0.0010
kinship_score		183.38	<.0001
CL1_PosRecip_Altruism_Trust		82.98	<.0001
CL2_Patience_NegRecip_RiskTaking		26.42	<.0001
Scale			

Notes: The scale parameter was estimated by maximum likelihood.

LR Statistics For Type 3 Analysis			
Source	DF	Chi-Square	Pr > ChiSq
healthcare_system	3	53.04	<.0001
age_MEAN	1	5.43	0.0199
working_pct	1	8.40	0.0038
kinship_score	1	41.94	<.0001
CL1_PosRecip_Altruism_Trust	1	30.12	<.0001
CL2_Patience_NegRecip_RiskTaking	1	15.94	<.0001

4.2.5 Sexuality score.

Analysis Of Maximum Likelihood Parameter Estimates						
Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits	
Intercept		1	5.4301	10.2415	-14.6427	25.5030
healthcare_system	Mixed_Type	1	7.8432	1.3537	5.1899	10.4965
healthcare_system	National_Health_Insurance	1	-27.1076	1.8833	-30.7988	-23.4164
healthcare_system	Private_Health_System	1	17.3458	1.6012	14.2076	20.4841
age_MEAN		1	0.4877	0.1560	0.1820	0.7934
working_pct		1	-0.0420	0.0278	-0.0964	0.0124
kinship_score		1	-42.7162	2.9346	-48.4680	-36.9645
CL1_PosRecip_Altruism_Trust		1	1.6008	0.3720	0.8716	2.3300
CL2_Patience_NegRecip_RiskTaking		1	4.3464	0.8608	2.6592	6.0336
Scale		1	0.6359	0.1091	0.4544	0.8899

Analysis Of Maximum Likelihood Parameter Estimates			
Parameter		Wald Chi-Square	Pr > ChiSq
Intercept		0.28	0.5960
healthcare_system	Mixed_Type	33.57	<.0001
healthcare_system	National_Health_Insurance	207.18	<.0001
healthcare_system	Private_Health_System	117.36	<.0001
age_MEAN		9.78	0.0018
working_pct		2.29	0.1302
kinship_score		211.88	<.0001
CL1_PosRecip_Altruism_Trust		18.51	<.0001
CL2_Patience_NegRecip_RiskTaking		25.49	<.0001
Scale			

Notes: The scale parameter was estimated by maximum likelihood.

LR Statistics For Type 3 Analysis			
Source	DF	Chi-Square	Pr > ChiSq
healthcare_system	3	82.57	<.0001
age_MEAN	1	7.72	0.0055
working_pct	1	2.15	0.1428
kinship_score	1	44.20	<.0001
CL1_PosRecip_Altruism_Trust	1	12.52	0.0004
CL2_Patience_NegRecip_RiskTaking	1	15.57	<.0001

4.2.6 PRIN1 (First principal component of the SCNS-SF34 scores).

Analysis Of Maximum Likelihood Parameter Estimates						
Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits	
Intercept		1	5.5305	1.3195	2.9443	8.1167
healthcare_system	Mixed_Type	1	-0.0065	0.1744	-0.3483	0.3354
healthcare_system	National_Health_Insurance	1	-2.7717	0.2426	-3.2473	-2.2961
healthcare_system	Private_Health_System	1	0.1701	0.2063	-0.2342	0.5744
age_MEAN		1	-0.0411	0.0201	-0.0805	-0.0017
working_pct		1	-0.0071	0.0036	-0.0141	-0.0001
kinship_score		1	-4.9835	0.3781	-5.7246	-4.2424
CL1_PosRecip_Altruism_Trust		1	0.2897	0.0479	0.1958	0.3837
CL2_Patience_NegRecip_RiskTaking		1	-0.6031	0.1109	-0.8205	-0.3857
Scale		1	0.0819	0.0141	0.0585	0.1147

Analysis Of Maximum Likelihood Parameter Estimates			
Parameter		Wald Chi-Square	Pr > ChiSq
Intercept		17.57	<.0001
healthcare_system	Mixed_Type	0.00	0.9704
healthcare_system	National_Health_Insurance	130.47	<.0001
healthcare_system	Private_Health_System	0.68	0.4096
age_MEAN		4.18	0.0410
working_pct		3.92	0.0478
kinship_score		173.72	<.0001
CL1_PosRecip_Altruism_Trust		36.53	<.0001
CL2_Patience_NegRecip_RiskTaking		29.57	<.0001
Scale			

Notes: The scale parameter was estimated by maximum likelihood.

LR Statistics For Type 3 Analysis			
Source	DF	Chi-Square	Pr > ChiSq
healthcare_system	3	59.31	<.0001
age_MEAN	1	3.74	0.0533
working_pct	1	3.52	0.0605
kinship_score	1	41.10	<.0001
CL1_PosRecip_Altruism_Trust	1	19.50	<.0001
CL2_Patience_NegRecip_RiskTaking	1	17.13	<.0001

5 Discussion.

Interpreting the results for the different scores in a unified way is not easy, so it is preferable to start with their first principal component, which summarizes them very effectively. In this regard, however, it is worth mentioning that the first principal component was standardized to mean = 0 and standard deviation = 1.

5.1 First principal component of SCNS-SF34 scores.

As can be seen from the results reported in the dedicated section (4.2.6), both the first cluster component and the second cluster component are highly statistically significant ($p < 0.0001$); equally significant are the Healthcare System and the Kinship Tightness Index. In contrast, the variables measured at the paper level, i.e., mean age and percentage of significant women, are both characterized by a borderline level of significance with respect to the conventional $\alpha = 0.05$ level (being $p = 0.0533$ and $p = 0.0605$, respectively).

In terms of the effect on the dependent variable, for each independent variable statistically significant or borderline significant at 0.05 we have:

- **Healthcare System.** National Health Insurance is the only system that appears to be different ($p < 0.0001$) from the reference system, i.e., Etatist Social Health Insurance, negatively impacting the dependent variable relative to the reference. Considering that Prin1 is standardized, the fact that the coefficient associated with National Health Insurance has a value of -2.7717 is of extreme significance.

- **Mean age.** It appears negatively correlated with the dependent variable, but the impact seems modest, even considering that this is an average figure.

- **% of working women.** As for average age.

- **Kinship Tightness Index.** This variable, too, appears negatively correlated with the dependent variable, and its impact may appear surprising in absolute terms: however, it should be remembered that this measure varies over a range from 0 to 1 and that, being an average of four binary variables coded as 0/1, it should vary by increments of 0.25, (were it not for some aspects of detail for which the variation is actually finer: for example, the fact that the calculation was also performed for cases in which only 3 of the four binary variables considered were available; for these specifics, see the aforementioned On Line appendix in Henke, 2019. Thus, a unit variance for this variable corresponds to its entire theoretical range of variation. In any case, its impact is very significant in absolute terms;

- **First Cluster Component of the GPS scores (CL1).** This variable, which summarizes the GPS scores Positive Reciprocity, Altruism and Trust, appears positively correlated with the dependent variable. Considering that it is standardized (albeit with respect to mean and standard deviation of the source population), the impact on a standardized variable such as Prin1 appears significant;

- **Second Cluster Component of the GPS scores (CL2).** This variable, which summarizes the GPS scores Patience, Negative Reciprocity, Risk Taking, unlike the first cluster component is instead negatively correlated with the dependent variable; its coefficient, moreover, is much higher in absolute terms.

We now turn to analyze the results for the individual SCNS-SF34 scores:

5.2 Psychological score.

In terms of statistical significance, except for mean age (p = 0.5868), the results are superimposable on those already seen for Prin1: indeed, the p-value related to the percentage of working women now passes below the conventional significance threshold α = 0.05, being 0.0134.

In terms of the direction of correlations and effect sizes, what has already been seen for Prin1 also basically applies.

5.3   Health System and Info score.

Similar to the previous cases, the variables Healthcare System (p < 0.0001), Kinship Tightness Score (p < 0.0001), CL1 (p < 0.0001) are extremally significant, with only the borderline case concerning the percentage of working women reported for the remaining ones.

Regarding the direction of the correlations and the size of the effects, for Kinship Tightness Score and CL1 what has already been said in the previous cases applies, while it is noteworthy that now, in addition to National Health Insurance (p < 0.0001) the coefficient associated with Mixed Type (p< 0.0001) also appears significant: Mixed Type, however, compared to the level of comparison (Etatist Social Health Insurance) has a positive impact (13.9099), while the negative impact of National Health Insurance is confirmed (-27.6388)

5.4   Patient care and Support score.

For this variable, the very high statistical significance of Healthcare System (p < 0.0001) and Kinship Tightness Score (p < 0.0001) is confirmed. Also highly significant is mean age (p = 0.0047); significant with respect to the conventional α = 0.05 level, however, much less than the above (p = 0.0145).

For Healthcare System, the particular prominence of National Health Insurance is confirmed, whose coefficient is the only one to be statistically significant ($p < 0.0001$) among those concerning this variable: again, the impact on the dependent variable operates in a negative direction (-40.8335) compared to the reference level (Etatist Social Health Insurance). Mean age correlates negatively in more relevant terms than in previous cases and confirms the negative direction of the relationship involving CL2, also relevant in absolute terms.

5.5 Physical Life and Daily Score.

Pattern of significance overlaps with Prin1, but with a level of significance for Mean age ($p = 0.0199$) and percentage of working women ($p = 0.0038$) that now falls below the conventional level of significance $\alpha = 0.05$. Towards of correlations and relative effect sizes also appear similar.

5.6   Sexuality score.

Except for the percentage of working women, all other variables were statistically highly significant (Healthcare System: $p < 0.0001$, Mean Age, $p = 0.0055$, Kinship Tightness Score: $p < 0.0001$, CL1: $p = 0.0004$, CL2, $p < 0.0001$).

For this SCNS-SF34 score, however, it shows some unique peculiarities in the sense of direction or size of correlations. To begin with, it is the only case for which all coefficients related to the design variables parameterizing Healthcare System are significant (for $p < 0.0001$): regarding the size of the respective effects, while the negative direction of National Health Insurance in comparison with the reference level (Etatist Social Health Insurance) is confirmed, for the other two the relationship moves in the opposite direction, moreover with relevant values.

Another specific aspect of this score is its relationship with CL2: it is the only case in which the direction is positive, moreover for a very high value

of the relative coefficient. Much less relevant, on the other hand, appears to be the role of CL1, while on the Kinship Tightness score what has already been seen for all the other dependent variables is confirmed.

5.7   Summary.

To interpret the results in a unified way, it may be useful to represent them briefly together as follows (statistically significant or borderline significant results are highlighted):

Dependent variables	p-values							
	Independent variables							
	Healthcare System (design variables)			Mean Age	% of Working Women	Kinship Tightness Index	CL1	CL2
	Mixed Type	National Health Insurance	Private Health System					
Prin1	0.9794	**<0.0001**	0.4096	**0.0533**	**0.0605**	**<0.0001**	**<0.0001**	**<0.0001**
Psychological score	0.0984	**<0.0001**	0.5606	0.5868	**0.0134**	**<0.0001**	**<0.0001**	**<0.0001**
Helth System and Info score	**<0.0001**	**<0.0001**	0.0807	0.9668	**0.0525**	**<0.0001**	0.4581	**<0.0001**
Patient Care and Support score	0.8857	**<0.0001**	0.7473	**0.0047**	0.3157	**<0.0001**	0.3502	**0.0145**
Physical and Daily Life score	**0.0004**	**<0.0001**	**0.0338**	**0.0199**	**0.0038**	**<0.0001**	**<0.0001**	**<0.0001**
Sexuality score	**<0.0001**	**<0.0001**	**<0.0001**	**0.0055**	0.1428	**<0.0001**	**0.0004**	**<0.0001**

Dependent variables	Direction of relationship							
	Independent variables							
	Healthcare System (design variables vs. ref level = Etatist Social Health Ins)			Mean Age	% of Working Women	Kinship Tightness Index	CL1	CL2
	Mixed Type	National Health Insurance	Private Health System					
Prin1	-	-	+	-	-	-	+	-
Psychological score	-	-	-	-	-	-	+	-
Health System and Info score	+	-	+	-	-	-	+	-
Patient Care and Support score	-	-	-	-	+	-	+	-
Physical and Daily Life score	-	-	-	-	-	-	+	-
Sexuality score	+	-	+	+	-	-	+	+

With regard to the objective of this study, that is, the relationship between GPS scores and needs, it is apparent that CL1 is always positively correlated with the SCNS-F34 scores (in terms of trend, even in the 2 cases where it is not statistically significant), while CL2 is always negatively correlated, with the exception of only the score concerning sexuality.

Relative to the other variables, the consistent significance of the Healthcare System fully justifies its inclusion in the model, regardless of the sign of the correlations. Ditto for the Kinship Tightness Index: since its role might not have been as much and obvious a priori, the results obtained, moreover all in the same direction, are relevant in their own right.

Finally, with regard to the only two variables at the paper level, interesting is the behavior of the % of working women, always negatively correlated in cases where it is significant; slightly more articulated seems to be the behavior of mean age, negatively correlated when it is significant (and, more generally, at the trend level) except for the case represented by the sexuality score.

In interpreting the results, one should not overlook the fact that the SCNS-SF34 scores are highly correlated with each other in a positive sense, as shown by the executing correlation matrix:

Pearson Correlation Coefficients, N = 17 Prob > |r| under H0: Rho=0				
	psychological	health_system_and_info	patient_care_and_support	physical_and_daily_life	sexuality
psychological	1.00000	0.88538 <.0001	0.80530 <.0001	0.86711 <.0001	0.72343 0.0010
health_system_and_info	0.88538 <.0001	1.00000	0.88876 <.0001	0.65747 0.0041	0.57463 0.0158
patient_care_and_support	0.80530 <.0001	0.88876 <.0001	1.00000	0.78470 0.0002	0.77197 0.0003
physical_and_daily_life	0.86711 <.0001	0.65747 0.0041	0.78470 0.0002	1.00000	0.92437 <.0001
sexuality	0.72343 0.0010	0.57463 0.0158	0.77197 0.0003	0.92437 <.0001	1.00000

The level of collinearity among the quantitative independent variables, on the other hand, does not seem to be relevant to interpretation, as can be seen from the following table:

Pearson Correlation Coefficients, N = 17 Prob > |r| under H0: Rho=0				
	age_MEAN	working_pct	kinship_score	CL1 _PosRecip_Altruism_Trust	CL2 _Patience_NegRecip_RiskTaking
age_MEAN	1.00000	0.36548 0.1491	-0.49796 0.0419	-0.51992 0.0324	-0.59460 0.0118
working_pct working_pct	0.36548 0.1491	1.00000	-0.20223 0.4363	-0.24724 0.3387	-0.07750 0.7675
kinship_score	-0.49796 0.0419	-0.20223 0.4363	1.00000	0.27426 0.2868	0.18082 0.4874
CL1_PosRecip_Altruism_Trust	-0.51992 0.0324	-0.24724 0.3387	0.27426 0.2868	1.00000	0.74262 0.0006
CL2_Patience_NegRecip_RiskTaking	-0.59460 0.0118	-0.07750 0.7675	0.18082 0.4874	0.74262 0.0006	1.00000

Paradoxically, the highest level of correlation is found precisely between the two cluster components of the GPS scores, which are practically uncorrelated in the original population ($r = -0.0732$, $p = 0.5268$). However, this fact does not seem to have any noticeable effect on the models, since their behavior is always opposite except for the relationship with the sexuality score.

It would remain to test the level of dependence between the quantitative independent variables and the only qualitative independent variable, namely Healthcare System. Such an assessment could be conducted, for example, on the basis of the Wilks' Lambda statistic obtained by performing a multivariate analysis of variance having the other independent variables of the model in the role of dependent variables and Healthcare System as the independent variable: in that case, we would obtain a value of 0.007, with which is associated a highly significant $F_{15,\,25.246} = 8.47$ ($p < 0.0001$):

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall healthcare_system Effect H = Type III SSCP Matrix for healthcare_system E = Error SSCP Matrix					
S=3 M=0.5 N=3.5					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.00700208	8.47	15	25.246	<.0001
Pillai's Trace	1.87922562	3.69	15	33	0.0009
Hotelling-Lawley Trace	22.05560635	12.25	15	12.5	<.0001
Roy's Greatest Root	14.05188249	30.91	5	11	<.0001
NOTE: F Statistic for Roy's Greatest Root is an upper bound.					

Regardless of significance, considering that the 1's complement of Wilks' Lambda can be assumed to be a multivariate measure of explained variability, the extraordinarily low value of this statistic would indicate a very close relationship between the vector of quantitative variables considered and the categorical variable Healthcare System. However, it should be considered that:

- For small samples, the Wilks Lambda value can be biased;

- the behavior of this statistic is not ideal in view of the "sparsity" of the data (in fact, the first canonical variable explains quite 63.7 percent of the overall variability and the second almost all the rest, or 36.0 percent):

Characteristic Roots and Vectors of: E Inverse * H, where H = Type III SSCP Matrix for healthcare_system E = Error SSCP Matrix						
Characteristic Root	Percent	Characteristic Vector V'EV=1				
		age_MEAN	working_pct	kinship_score	CL1	CL2
14.0518825	63.71	0.22492824	-0.00738974	4.44134275	-0.40293910	1.24500123
7.9427326	36.01	0.06821719	0.03375058	-1.17194637	0.34863993	0.37529752
0.0609912	0.28	-0.03322587	0.02591662	0.12768387	-0.01585253	-0.16191406

Characteristic Roots and Vectors of: E Inverse * H, where H = Type III SSCP Matrix for healthcare_system E = Error SSCP Matrix						
Characteristic Root	Percent	Characteristic Vector V'EV=1				
		age_MEAN	working_pct	kinship_score	CL1	CL2
0.0000000	0.00	0.06118865	-0.00508749	-0.01970057	-0.00845556	-0.00905579
0.0000000	0.00	0.00878608	0.00373009	0.42780550	0.24102912	-0.33991180

- again from the analysis of the characteristic roots it appears that there is only one variable particularly connected with Healthcare System, namely Kinship Tightness Index: in fact it is the only one to be statistically significant by performing a univariate analysis of variance ($F_{3, 13}$ = 4.50, p-value = 0.0224. However, as can be seen, the corresponding R^2 is worth 0.51: a value in absolute terms of some significance, but of no concern for our purposes:

Dependent Variable: age_MEAN

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	4.9551396	1.6517132	0.08	0.9689
Error	13	263.5183545	20.2706427		
Corrected Total	16	268.4734941			

R-Square	Coeff Var	MSE Root	age_MEAN Mean
0.018457	8.623528	4.502293	52.20941

Source	DF	Type III SS	Mean Square	F Value	Pr > F
healthcare_system	3	4.95513957	1.65171319	0.08	0.9689

Dependent Variable: working_pct

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	394.936136	131.645379	1.43	0.2785
Error	13	1195.043864	91.926451		
Corrected Total	16	1589.980000			

R-Square	Coeff Var	MSE Root	working_pct Mean
0.248391	27.71049	9.587828	34.60000

Source	DF	Type III SS	Mean Square	F Value	Pr > F
healthcare_system	3	394.9361364	131.6453788	1.43	0.2785

Dependent Variable: kinship_score

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.43157760	0.14385920	4.50	0.0224
Error	13	0.41516737	0.03193595		
Corrected Total	16	0.84674497			

R-Square	Coeff Var	MSE Root	kinship_score Mean
0.509690	35.26501	0.178706	0.506753

Source	DF	Type III SS	Mean Square	F Value	Pr > F
healthcare_system	3	0.43157760	0.14385920	4.50	0.0224

Dependent Variable: CL1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	8.59193490	2.86397830	1.72	0.2116
Error	13	21.62184802	1.66321908		
Corrected Total	16	30.21378292			

R-Square	Coeff Var	MSE Root	CL1 Mean
0.284371	-211.2695	1.289659	-0.610433

Source	DF	Type III SS	Mean Square	F Value	Pr > F
healthcare_system	3	8.59193490	2.86397830	1.72	0.2116

Dependent Variable: CL2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	4.47625229	1.49208410	2.75	0.0854
Error	13	7.06185776	0.54321983		
Corrected Total	16	11.53811005			

R-Square	Coeff Var	MSE Root	CL2 Mean
0.387954	156.4117	0.737034	0.471214

Source	DF	Type III SS	Mean Square	F Value	Pr > F
healthcare_system	3	4.47625229	1.49208410	2.75	0.0854

In terms of interpretation, for the purposes of the study it seems very effective to conduct the discussion mainly at the level of the first major component of SCNS-SF34 scores for the following reasons:

1) Prin1 explains a very high proportion of the overall variability in the underlying scores (83.14%);

2) these scores are all highly correlated with Prin1;

3) these correlations are all in the positive direction;

4) The need scores themselves show a good level of mutual correlation;

5) the results concerning the relationship between the individual need scores and the cluster components of the GPS scores are perfectly aligned, with the sole exception of the relationship between the score concerning sexuality and CL2; however, a fairly consistent pattern can also be grasped in the relationship with the other independent variables. are perfectly aligned to formulate a unified and non-redundant picture

In this perspective, the most striking aspect is undoubtedly the opposite behavior of the two cluster components: summarily, we see that as CL1 increases, the perception of all needs increases, while the opposite happens for CL2.

On the one hand, this fact seems to clothe the different placement of GPS scores in two distinct clusters with empirical significance. On the other, however, it poses nontrivial interpretive problems: which, while outside the scope of primarily exploratory purposes such as those of this study, we can try to sketch out as follows.

Beginning with CL2, its correlation in the negative sense with need scores seems clearer: behaviors marked by patience, in fact, may make one more tolerant of needs that are not satisfactorily met. Ditto risk tolerance: the propensity to accept and deal with perceived riskier scenarios in the absence of adequate external supports as well could modulate in the observed sense the relationship between Prin1 and CL2. Finally, negative

reciprocity: the fact of accepting more readily that the relationship that one's neighbor may be fulfilled according to asymmetrical dynamics may place one in a better disposition toward an external world less likely to satisfy one's own when one perceives oneself in a situation of need, if not minority.

Concerning CL1, on the other hand, it should happen that realities marked by greater altruism, trust, and positive reciprocity should be more capable of satisfying needs such as those in question.It is therefore difficult to find an interpretation, even a tentative one, to the relationship in a positive sense that Prin1 and CL1 observe. Reversing the perspective, perhaps on the individual level it can happen that people who are particularly helpful to others, when they experience very dramatic situations such as the one brought about by an oncological diagnosis feel more the burden of a daily life spent on behalf of others: the most emblematic case, I believe, is the well-known case of women who, following an oncological diagnosis, are left by their respective partners. In this case, it is evident how a greater demand for help cannot fail to emerge in women who, in most cases, will have to continue to take care of their not-yet-adult children alone, despite the illness and the economic and work difficulties that are more likely to arise for women after a separation and that overlap with those that, more generally, are determined after a diagnosis of oncological illness (the so-called "financial toxicity," for which see, for example, Riva et al., 2021). An alternative, or additional, explanation might lie in overly high expectations that are created in contexts marked by altruism, trust, and symmetrically perceived human relationships, when one is suddenly thrown into a dramatic situation such as that imposed by an oncological diagnosis.

6 Strengths and limitations.

The main limitation is, of course, that the study was conducted on aggregate data, moreover at different levels of aggregation and from different sources: paper level, for data concerning needs, as well as the respective covariates in terms of mean age and percentage of working women, and country level and country level for Kinship Tightness Score and GPS score. Thus, all the problems associated with "ecological" inferential processes, with associated potential biases, arise.

The classification that was adopted for health systems is not the only one possible: in view of the importance of this covariate, this aspect may also have influenced the results. Other critical points regarding this variable are:

- The imbalance in favor of the "Etatist Social Health Insurance" system;

- sparsity: out of 4 levels, 2 (National Health Insurance System and Private Health System) consist of only one case;

- the Mixed Type class could be very heterogeneous.

Another aspect to consider concerns the reliability of the Kinship Tightness Index: in fact, being based on data from Murdock's Ethnographic Atlas, which was released in 1967, could be an important limitation of this study, considering the strong explanatory power that this variable has consistently shown. However, in Baharami et al, 2021, the relevance of this data is effectively defended.

Finally, from a strictly statistical point of view, the main limitation is due to the limited sample size. Purely the fact that we relied on asymptotically valid results using methods that assume normality of the dependent variables may have had negative consequences. Indeed, although it is difficult to assess conformity to the normal distribution for samples of this size, nevertheless it should be pointed out that tests of nonconformity to the normal distribution are often significant:

Variable	Tests for Normality				
	Test	Statistic		p Value	
Prin1	Shapiro-Wilk	W	0.919444	Pr < W	0.1445
	Kolmogorov-Smirnov	D	0.155259	Pr > D	>0.1500
	Cramer-von Mises	W-Sq	0.081681	Pr > W-Sq	0.1907
	Anderson-Darling	A-Sq	0.512687	Pr > A-Sq	0.1738
Psychological	Shapiro-Wilk	W	0.90057	Pr < W	0.0694
	Kolmogorov-Smirnov	D	0.173882	Pr > D	>0.1500
	Cramer-von Mises	W-Sq	0.09504	Pr > W-Sq	0.1237
	Anderson-Darling	A-Sq	0.67141	Pr > A-Sq	0.0689
Health System and Info	Shapiro-Wilk	W	0.902549	Pr < W	0.0749
	Kolmogorov-Smirnov	D	0.136182	Pr > D	>0.1500
	Cramer-von Mises	W-Sq	0.070672	Pr > W-Sq	>0.2500
	Anderson-Darling	A-Sq	0.554718	Pr > A-Sq	0.1339
Patient Care and Support	Shapiro-Wilk	W	0.822933	Pr < W	0.0043
	Kolmogorov-Smirnov	D	0.31878	Pr > D	<0.0100
	Cramer-von Mises	W-Sq	0.250034	Pr > W-Sq	<0.0050
	Anderson-Darling	A-Sq	1.298737	Pr > A-Sq	<0.0050
Physical and Daily Life	Shapiro-Wilk	W	0.865004	Pr < W	0.0183
	Kolmogorov-Smirnov	D	0.19865	Pr > D	0.0743
	Cramer-von Mises	W-Sq	0.1164	Pr > W-Sq	0.0640
	Anderson-Darling	A-Sq	0.780143	Pr > A-Sq	0.0358
Sexuality	Shapiro-Wilk	W	0.695901	Pr < W	0.0001
	Kolmogorov-Smirnov	D	0.326298	Pr > D	<0.0100
	Cramer-von Mises	W-Sq	0.37754	Pr > W-Sq	<0.0050
	Anderson-Darling	A-Sq	2.018051	Pr > A-Sq	<0.0050

The skewness and kurtosis values in several cases also seem relevant:

Variable	Skwness	Kurtosis
Prin1	0.51844882	-0.5812011
Psychological	-0.4696997	-0.8857141
Health System and Info	0.26812583	-0.7034017
Patient Care and Support	1.06951968	-0.1046735
Physical and Daily Life	1.30258901	1.69866327
Sexuality	2.15508744	4.86284591

However, it should be emphasized, in view of the role this variable played in the interpretation of the results, that at least Prin1's behavior does not seem particularly worrisome from the standpoint of deviation from normality.

Finally, again in relation to statistical aspects, it must be considered that the set of women studied in the selected articles cannot be considered a random sample of the population of women with breast cancer, so generalization of the results is critical on an inferential level.

As for strengths, however:

- to our best knowledge no one, to date, has tried to relate fundamental, somewhat "primitive" dimensions such as Economic Preferences to scores measuring specific needs of women with breast cancer. Beyond the setting represented by the particular needs of these specific patients, however interesting in itself, the results obtained seem to suggest the existence of a research space characterized by unexpected connections between constructs peculiar to behavioral economics and

related disciplines such as Economic Preferences and dimensions peculiar to the individual experience of subjects living in a disease state.

- this study shows that it is possible to investigate the relationship mentioned in the previous point on the basis of literature data by obtaining statistically consistent results;

- the dimension reduction techniques that were used produced summary variables characterized by excellent statistical properties, which facilitated the process of data interpretation;

- results show a strong degree of internal consistency;

- the variables Healthcare System, mean age, percentage of working women, and Kinship Tightness Index, which were included among the independent variables alongside the variables of interest CL1 and CL2 confirmed the role they appeared to play a priori and thus allowed for an interpretation of CL1 and CL2 that was not tainted by the confounding effects that might have resulted if those variables had not been properly considered;

- the effect of CL1 and CL2 is, in general, very statistically clear, allowing easier interpretation of the results.

7 Conclusions.

The idea behind this study is that a relatively narrow set of constructs that have been found to be fundamental, if not unifying, in various behavioral disciplines, play a relevant role even in contexts as distant as the experience of patients affected by serious illness and, more pretentiously, proper to the disease state.

Well, the study, albeit with the limitations set forth in the previous section, clearly brings evidence to support a relationship between the

variables collected by the GPS survey and the scores quantifying the intensity of needs expressed by women who have been diagnosed with breast cancer. Whether this relationship can be extended to a more general context from that expressed by these patients, thus bridging attitudes, perceptions, and feelings specific to the disease state to that, even more general, of dimensions specific to behavioral economics, can only be the subject of further investigation.

Another aspect that has emerged from this study is the relevance of boundary variables, specifically represented in this particular context by Healthcare System, average age, percentages of working women, which cannot be neglected in defining any conceptual model.

Interpretation of these relationships, however, is not trivial and is beyond the scope of this study, which was intended to be primarily exploratory, and probably beyond the scope of investigations based only on aggregate data: further guidance can only come from prospective studies conducted at the level of the individual.

In addition, the scientific literature that, in some way, has dealt with this topic is not useful for interpretive purposes for the following reasons:

- in relation to the needs of women with breast cancer, only in a very limited subset of articles (18 of 33 227 retrieved in Scopus at the time of this article making - early May 2023 - that deal with the needs of breast cancer patients) can the behavioral dimensions analyzed be interpreted in a sense relatively similar to that proper to Economic Preferences, albeit often from a perspective more contextualized to the particular field of inquiry. Even considering an excess of specificity of the query that was used, the actual number should not be much higher;

- each article studies only one dimension;

- the most studied construct is trust, while reciprocity, altruism and patience are studied by only one article each;

- there is considerable heterogeneity among the needs studied in these researches, in any case hardly traceable to the needs investigated in my study; in any case, no article considers a similarly broad and structured set of needs;

- for articles of an empirical nature, the predominant method of analyzing results is qualitative.

To conclude, the fact that even a survey conducted on aggregate data seems to give such clear indications, at least on a strictly statistical level, corroborates the idea that inspired this research: that is, of a pervasiveness of the fundamental dimensions of economic action in contexts where they are not expected to play a particularly relevant role such as the individual experience of a state of serious illness.

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III

Pain undertreatment in oncology:

in search for new explanatory variables among Economic Preferences.

1 Introduction.

Pain is a very important problem in cancer patients, affecting about 64 percent of those with advanced or metastatic disease (Breibart al, 1996); more generally, no less than 50 percent and with peaks of up to 70 percent (van den Beuken-van Everdingen et al, 2014). In the cancer patient, pain can manifest itself according to a wide range of intensity: from relatively mild forms to levels to be decisive in worsening the quality of life. In fact, in addition to the pain itself, it may become difficult or impossible to do certain activities (involving, for example, certain movements), with possible limitation of social life, concentration, or, more simply, taking the mind off the disease in the case of chronic or very frequent pain. Insomnia as well can be pain-induced and, more generally, aggravate the state of stress inherent in a situation that is already psychologically complex for other, understandable reasons. Consider also that pain may be due to, or aggravated by, necessary therapies: which may induce a withdrawal from treatment, triggering a dangerous vicious cycle. However, there is a well-documented proportion of around 40 percent of individuals who are found to be inadequately treated for pain (Roberto et al, 2022), although cancer pain can be appropriately treated in 70 to 90 percent of cases (Jadad and Browman, 1995).

Thus, the problem has arisen of defining indicators designed to measure the quality of cancer pain management. The most famous of these is, most likely, the Pain Management Index (Cleeland et al, 1994), built around the concept of considering pain treatment adequate if there is congruence between the level of pain reported by the patient and the appropriateness of the therapy conducted. The index takes discrete values from - 3, representing the worst situation (patient reporting to severe pain and receiving no analgesic treatment) to + 3 (patient treated with morphine or similar and reporting no pain); negative values indicate unsatisfactory pain treatment, while scores of 0 or above are to be considered a conservative indication of acceptable treatment.

Modifications to the original index have been proposed in subsequent years, including PMI-Revised (Ward et al, 1998) and Amsterdam PMI (de Wit et al, 2001), while in earlier years Zelman et al, 1987 and Ward et al, 1993 had already proposed indexes that deviated slightly from the structure that would be consolidated in Cleeland et al, 1994.

A short time after their introduction, these indices were used in the context of studies aimed at investigating the adequacy of analgesic treatments in cancer patients, producing considerable amounts of data that made possible reviews such as Deandrea et al, 2008, Greco et al, 2014, Roberto et al, 2022, in whose wake this study is placed. These latter reviews, in fact, in assessing the status and evolution of pain treatment in the oncology setting, share the additional goal of identifying possible causes of pain undertreatment. In this study we want to try to evaluate, alongside these causes, also measures of Economic Preferences, in the hypothesis that these may help to explain the phenomenon according to a perspective not yet explored to date. With reference to the preference system surveyed with the GPS survey (Falck et al, 2018), which is the one we will use, it is safe to assume, for example: - that pro-social dimensions (Altruism, Trust, Positive Reciprocity) are positively correlated with better pain management; - conversely, an attitude marked by patience might be more tolerant of shortcomings in analgesic interventions; - higher risk tolerance makes the use of opioids more acceptable, in view of the mistaken belief that these drugs can expose people to risks.

2 Background.

The reviews cited in the previous section (Deandrea et al, 2008; Greco et al, 2014; Roberto et al, 2022) represent three moments of a monitoring of the status of cancer pain treatment based on data reported in studies having that subject. Each article was presented as an update of the

previous one, so from now on we will refer only to the last one, namely Roberto et al, 2022.

In that article, based on 66 studies published from 1994 to 2020, it was observed in the multivariate analysis that the proportion of negative PMIs, indicating an unsatisfactory pain treatment situation:

decreases significantly (about -0.8 points/year, $p = 0.046$) over the time period considered;

is negatively associated with the country's economic level, quantified as GNP per capita (in dollars) in purchasing power parity calculated for the year of publication (regression coefficient = - 0.48, $p = 0.002$);

was not significantly associated with any of the other variables considered, namely: study setting (cancer pain treatment specific, nonspecific, mixed), sample size, patient age (dichotomized versus 59.5 years), study quality index (see section 3.1.1 "PMI data" for details).

In the space that therefore seems to be there for the search for new "determinants," fits this study, aimed at assessing the role of Economic Preferences such as those detected by the GPS study (Falk et al, 2018): albeit suggested only by common sense considerations such as those set forth in section 1 "Introduction," in the absence of stronger preliminary evidence.

Another potentially explanatory variable, which was not considered in Deandrea et al, 2008, Greco et al, 2014, Roberto et al, 2022, but which will instead be included in the analyses conducted in this research, is the type of health system of the country where each study was conducted, in view of the relevance that this variable should have for the purposes of our analysis (for this aspect see section 3.1.3 "Health Systems classification"): in fact, the adequacy of pain management practices can be considered a proxy for the more general dimension constituted by the quality of

palliative care and treatments specific to the end-of-life setting, which also depends on the type of health system.

Although cancer pain treatment is a widely studied topic (135 726 entries retrieved in Scopus about this issue at the time of this article making, namely early May 2023), only a very small subset (223) are specifically focused on the undertreatment: within this selected bunch, it do not seem to be any publications dealing with the preferences of our interest in relation to the specific field of pain undertreatment in oncology. Therefore, it can be said that this result argues in favor of the character of absolute novelty that should represent my study in the literature on this topic.

3 Materials and methods.
3.1   Raw data.
3.1.1 PMI studies.

Having participated in both Greco et al, 2014 and Roberto et al, 2022, I have full availability of the relevant databases. For the reason already mentioned at the beginning of section 2 "Background," however, only the database constructed for the latter article will be used.

In it of were considered 66 studies on cancer pain management published between 1994 and 2020, selected based on the criteria described in detail in the article. For each study, the following variables had been noted:

- Author;
- Year of article publication: considered as a proxy for the year of conducting the relevant study;
- Purpose of the study: whether or not aimed at detecting the prevalence of pain undertreatment;

- PMI: Assuming that only articles that used Cleeland's PMI Index (Cleeland, 1964) were selected, the proportion of cases for which PMI had a negative value was noted for each article, indicating inadequate management of cancer pain;

- Country: the country where the study described in the article was conducted;

- sample size;

- characteristics of study participants: mean age, percentages of male subjects, type of cancer, presence of metastasis);

- setting: whether specific for cancer pain treatment, nonspecific or mixed.

A database was then consolidated in which the above variables (apart from the purpose of the study, % of male subjects, and type of cancer) were reported in addition to the following:

- economic level: Gross National Index (GNI) per capita in Purchasing

Power Parity (PPP) terms for the year of publication of the studies (in thousands of US dollars), extracted from International Human Development Indicators (IHDI) (United Nations Development Programme:

Inter-nationalhumandevelopment   indicators. http://hdr.undp.org/en/conte nt/human-developmen t-index-hdi);

- quality score: study quality indicator calculated "using the methodologic quality criteria for prevalence studies developed by Leboeuf-Yde and Lauritsen, 1995 and Walker, 2000 later adapted to cancer pain by van den Beuken-van Everdingen et al, 2007 and (Deandrea et al., 2014) For the current analysis, questions targeted to cancer pain were replaced with PMI questions (Appendix Table A1, online only). This resulted in quality scores from 0 to 19 points for studies where all the criteria were applicable and from 0 to 15 when some were not applicable" (Greco et al, 2014);

ISOCODE's country was finally manually added to the original database for merging with GPS data.

3.1.2   Preferences: Global Preference Survey.

Preference data come from the study generally known as the Global Preference Survey (GPS; Falk et al, 2018), which is undoubtedly the largest and most reliable survey conducted on this topic. In fact, it is a survey conducted on a representative sample of 80,000 individuals from 76 nations that was conducted as part of the 2012 Gallup World Poll and experimentally validated. This survey is specifically aimed at investigating the set of constructs consisting of time preference, risk preference, positive and negative reciprocity, altruism, and trust through a questionnaire consisting of 12 items broken down as follows:

- Patience (time preference): 2 items;
- Risk taking: 2 items;
- Positive reciprocity: 2 items;
- Negative Reciprocity: 3 items;
- Altruism: 2 items;
- Trust: 1 item.

For this study I used scores for these 6 dimensions calculated at the nation level that are publicly available and downloadable from the BRIQ Institute website (https://www.briq-institute.org/global-preferences/downloads); however, individual-level data are also available.

3.1.3 Healthcare Systems classification.

"To analyze the results, we categorized articles that we have included according to the healthcare system type of the country where the study was conducted by using the classification of Böhm et al., 2013. The authors classified the healthcare systems of 30 countries according to three core dimensions: regulation, financing, and services provision. As reported by Böhm et al., five types of plausible healthcare systems exist, namely National Health Service, National Health Insurance, Social Health Insurance, Private Health System, and Etatist Social Health Insurance. All these categories are united by the feature of universal coverage of the population. In the National Health Service the state holds the regulatory power, the funding derives from general tax, and the healthcare infrastructure are a public ownership; the National Health Insurance has the features of the previous type but the service provision depends mostly on for-profit; in the Social Health Insurance the funding coming mainly from contributions and public or private delivery; the Private Health System is based on private insurance only, which is also the major funding source; Etatist Social Health Insurance is a combination of state regulation, societal financing and private provision.

Articles that have been conducted in countries not classified by Bohm et al, 2013 have been grouped into a category of Mixed types because, to our knowledge, there are no other studies comparing these healthcare systems.

For all of the following reasons it was not possible to categorize these countries into one of the five healthcare systems. First of all, some of these countries do not have universal coverage of the population and the equitable access to healthcare services is not guaranteed, as for Iran (Heashmati et al, 2016); while in China some reforms have been implemented in the last decade to move the country toward this direction (Yip et al, 2019). In Singapore, various actors (i.e., public and private) contribute to the sustenance of the healthcare system and the delivery of services (Tan et al, 2021), bringing to greater complexity that could impact

on the provision of services for patients and, therefore, on the likelihood of addressing their needs (Jefford et al, 2022). The payment also of private insurance schemes may impact the capacity of the patient to afford for the services that could help him/her to address needs, as in the case of Malaysia (Rannan-Eliya et al, 2016). In addition, in Kenya, out of pocket costs for health can be for the most part borne by the citizens (Chuma et al., 2011). Furthermore, insufficient data does not allow to classify the country, as in the case of Mexico (Böhm et al, 2013)." (Paltrinieri, 2022).

The 30 countries studied in Bohm et al, 2013, were classified as follows:

Type of healthcare system	Countries
Etatist Social Health Insurance	Belgium, Estonia, France, Czech Republic, Hungary, Netherlands, Poland, Slovakia, Israel, Japan, Korea
National Health Insurance	Australia, Canada, Ireland, New Zealand, Italy
National Health Service	Denmark, Finland, Iceland, Norway, Sweden, Portugal, Spain, United Kingdom
Private Health System	United States of America
Social Health Insurance	Austria, Germany, Luxembourg, Switzerland

For each pain management study, the type of Healthcare System concerning the subjects under study was directly entered into the original database of 66 studies described in Section 3.1.1 "PMI studies." Therefore, the studies result distributed as follows by Healthcare System:

	N.	%
Healthcare System		
Etatist_Social_Health_Insurance	16	24.2
Mixed_Type	17	25.8
National_Health_Insurance	9	13.6
National_Health_Service	7	10.6
Private_Health_System	16	24.2
Social_Health_Insurance	1	1.5
All	66	100.0

while the relevant countries are grouped as follows:

Healthcare System	Country
Etatist Social Health Insurance	France Israel Japan South Korea The Netherlands
Mixed Type	China Ethiopia Greece India Lebanon Nigeria Russia South Africa Taiwan
National Health Insurance	Australia Italy
National Health Service	Norway Portugal UK
Private Health System	USA
Social Health Insurance	Germany

3.2 Analysis database making.

The analysis database was obtained by merging by ISOCODE's country between the study database (see Section 3.1.1. "PMI studies") manually supplemented by the variable indicating Healthcare System (see Section 3.1.3 "Healthcare Systems classification") and the database containing GPS scores (see Section 3.1.2 "Preferences: Global Preference Survey." In this process, 8 records are lost because GPS data are not available for these countries (the number of records in the study database is shown in parentheses):

- Ethiopia (2)
- Lebanon (1)
- Norway (2)
- Taiwan (3).

The final database, therefore, consists of 58 records.

3.3 Statistical methods.

The share of negative PMIs, expressed in percentage terms, was studied as a dependent variable in a Generalized Linear Model having the following as independent variables:

- Year of publication;
- Economic level;
- Healthcare System;
- GPS scores: Positive Reciprocity, Altruism, Trust, Patience, Negative Reciprocity, Willingness to Take Risk;

From the original database of studies, only Publication Year and Economic level were included among the independent variables because they were the only ones found to be significant in the multivariate analysis in Roberto et al, 2022.

The categorical Healthcare System variables were parameterized according to the reference parameterization, assuming the class "Etatist Social Health Insurance" as the reference level, this class being the most numerous. Thus, the subsequent design variables were generated:

Class Level Information							
Class	**Value**	**Design Variables**				
healthcare_system	Etatist_Social_Health_Insurance	0	0	0	0	0
	Mixed_Type	1	0	0	0	0
	National_Health_Insurance	0	1	0	0	0
	National_Health_Service	0	0	1	0	0
	Private_Health_System	0	0	0	1	0
	Social_Health_Insurance	0	0	0	0	1

Finally, the distribution of the dependent variable was assumed to be normal and the identity function was chosen as the linking function.

The two-sided 95% confidence interval according to the Wald approach was calculated for each model parameter, and type 3 p-values were calculated for the Likelihood Ratio Statistic.

4 Results.

4.1 Variables distribution.

The following table shows the main distributional information on the dependent variable, namely the percentage of negative PMIs:

	N.	Min	10.th pctl	25.th pctl	50.th pctl	Mean	75.th pctl	90.th pctl	Max	Std Dev	Skewness	Kurtosis
% of negative PMI	58	4.0	12.0	26.0	41.0	41.6	62.0	70.0	82.0	21.0	0.1	-1.0

(Note: Skewness is measured by the adjusted Fisher-Pearson standardized moment coefficient, normally denoted G1 (Doane and Seward, 2011), while kurtosis refers to excess kurtosis, obtained as the fourth moment from the standardized mean-3).

Although skewness is negligible and kurtosis does not deviate too much from 0, normality tests were still conducted in view of the relevance of this pre-requisite for the model that will be estimated:

Tests for Normality				
Test		**Statistic**	**p Value**	
Shapiro-Wilk	W	0.965758	Pr < W	0.1006
Kolmogorov-Smirnov	D	0.093349	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.090174	Pr > W-Sq	0.1503
Anderson-Darling	A-Sq	0.576966	Pr > A-Sq	0.1330

As can be seen, no test is significant with respect to the conventional cut-off of significance α = 0.05 (although, by construction, the percentage of negative SMBs cannot have a normal distribution). In any case, the

skewness and kurtosis measures above indicate a departure from negligible normality.

Regarding the independent variables, however, starting with the only categorical variable, namely, Healthcare System, we have:

	N.	%
Healthcare System		
Etatist_Social_Health_Insurance	16	27.6
Mixed_Type	11	19.0
National_Health_Insurance	9	15.5
National_Health_Service	5	8.6
Private_Health_System	16	27.6
Social_Health_Insurance	1	1.7
All	58	100.0

while for quantitative variables the distributional data are:

	N.	Min	10.th pctl	25.th pctl	50.th pctl	Mean	75.th pctl	90.th pctl	Max	Std Dev	Skewness	Kurtosis
Economic	58	0.8	5.4	18.6	36.6	32.5	45.0	48.6	54.4	15.3	-0.8	-0.7
Positive reciprocity	58	-0.8	-0.2	-0.1	0.2	0.0	0.2	0.2	0.5	0.3	-0.8	1.4
Altruism	58	-0.3	-0.3	-0.2	0.3	0.2	0.4	0.4	0.5	0.3	-0.5	-1.5
Trust	58	-0.5	-0.2	-0.1	0.1	0.0	0.2	0.3	0.6	0.3	-0.2	0.3
Patience	58	-0.4	-0.1	0.1	0.4	0.4	0.8	0.8	1.0	0.4	-0.3	-1.0
Negative reciprocity	58	-0.4	0.0	0.0	0.0	0.2	0.3	0.4	0.7	0.2	0.3	0.4
Will. to take risks	58	-0.8	-0.4	-0.1	0.0	-0.0	0.1	0.2	1.0	0.3	-0.2	4.8

(Obviously, the year of publication was not considered in this table, although it is formally a quantitative independent variable).

4.2 Model estimates.

PROC GENMOD of the SAS/STAT module embedded in the statistical software package SAS System was used for model estimation. This procedure returned the following results:

Analysis Of Maximum Likelihood Parameter Estimates					Wald 95% Confidence Limits			
Parameter		DF	Estimate	Standard Error			Wald Chi-Square	Pr > ChiSq
Intercept		1	1148.152	683.1655	-190.828	2487.131	2.82	0.0928
healthcare_system	Mixed_Type	1	18.5023	15.9285	-12.7171	49.7217	1.35	0.2454
healthcare_system	National_Health_Insurance	1	26.7059	11.9466	3.2909	50.1208	5.00	0.0254
healthcare_system	National_Health_Service	1	10.4807	16.6465	-22.1459	43.1073	0.40	0.5290
healthcare_system	Private_Health_System	1	3.4257	16.0112	-27.9556	34.8070	0.05	0.8306
healthcare_system	Social_Health_Insurance	1	1.8221	25.6459	-48.4430	52.0872	0.01	0.9434
year		1	-0.5511	0.3395	-1.2166	0.1144	2.63	0.1046
Economic		1	-1.0094	0.3185	-1.6336	-0.3852	10.05	0.0015
posrecip		1	-10.6260	21.4262	-52.6205	31.3685	0.25	0.6199
altruism		1	-22.1008	18.4051	-58.1741	13.9725	1.44	0.2298
trust		1	-29.5586	31.9560	-92.1913	33.0740	0.86	0.3550
patience		1	67.9293	26.5165	15.9578	119.9008	6.56	0.0104
negrecip		1	-1.6305	23.1150	-46.9351	43.6740	0.00	0.9438
risktaking		1	-30.7024	14.6419	-59.4000	-2.0049	4.40	0.0360
Scale		1	16.2621	1.5099	13.5564	19.5078		

Notes: The scale parameter was estimated by maximum likelihood.

LR Statistics For Type 3 Analysis			
Source	DF	Chi-Square	Pr > ChiSq
healthcare_system	5	6.18	0.2894
year	1	2.58	0.1085
Economic	1	9.26	0.0023
posrecip	1	0.25	0.6203
altruism	1	1.42	0.2327
trust	1	0.85	0.3567
patience	1	6.22	0.0127
negrecip	1	0.00	0.9438
risktaking	1	4.24	0.0395

In relation to the conventional cut-off of significance α = 0.05, only Economic, Patience and Risk Taking are found to be statistically significant; all other variables are not borderline significant either, but we still consider the related results worthy of comment.

Beginning with Healthcare System, it should be noted that this variable, which does not appear in the analysis of Roberto et al, 2022 nor in the previous two, was included because it was considered likely to be important for the phenomenon under consideration. It should be noted, however, that although the overall test is not significant (i.e., that of type 3, for which we have p = 0.2894), the tests for the parameters estimated by Maximum Likelihood return us a significant result for the National Health Insurance level (coefficient= 26.7059, p = 0.0254). Although not relevant in terms of significance, (since the type 3 test related to the entire original variable is dominant in the interpretation) nevertheless it is worth noting as a trend, also in relation to the very high value assumed by the related coefficient: thus, at least in terms of trend, it seems that National Health Insurance is characterized by a significantly higher share of pain undertreated subjects than the reference level (Etatist Social Health Insurance).

On the other hand, with regard to the pro-social GPS scores, namely Positive Reciprocity, Altruism and Trust, it should be noted that although not statistically significant, at least in terms of trend they seem to align with what common sense would suggest: in fact, the relevant coefficients are all negative, so that as the respective scores increase, the proportion of pain undertreated patients would decrease.

Turning to the statistically significant variables, for Economic (coefficient = -1.0094, p = 0.0023) what has already been seen in Roberto et al, 2022 is confirmed: also in terms of the direction of the relationship, in the sense that as economic level increases, the share of pain undertreated subjects decreases.

Turning finally to the variables of most direct interest to this study, namely GPS scores, Patience (coefficient = 67.9293, p = 0.0127) and Risk Taking (coefficient = -30.7024, p = 0.0035) are significant. The coefficients may seem huge, but it should be considered that they are related to scores characterized by a relatively modest standard deviation (0.4 and 0.3, respectively) and whose range, however, is between -0.4 and 1 for Patience -0.8 and 1 for Risk Taking: thus, a one-unit increase for these variables is about 70 percent of the sample range of variation for Patience and 55 percent of that for Risk Taking.

5 Discussion.

The non-significance of Healthcare System may depend on the fact that its role is at least partially obscured by Economic, as would also be expected: in fact, the relative R^2 is worth 0.69 (p < 0.0001). However, conducting a more extensive check, it turns out that Healthcare System is, more generally, connected with the set of other independent variables: in fact, the Wilks' Lambda statistic, which is obtained by performing a multivariate analysis of variance having the other quantitative variables in the role of independent variables and Healthcare System as the dependent variable, takes a value of 0.003, with which is associated a highly significant F40, 198.94 = 14.76 (p < 0.0001).

Regardless of significance, considering that the Wilks' Lambda 1's complement can be assumed to be a multivariate measure of explained variability, the extraordinarily low value of this statistic would indicate a very close relationship between the vector of quantitative variables considered and the categorical variable Healthcare System. It then becomes necessary to verify whether, and to what extent, this relationship also involves the GPS scores, particularly those found to be significant, based on the Characteristic Roots and Vector:

Characteristic Roots and Vectors of: E Inverse * H, where H = Type III SSCP Matrix for healthcare_system E = Error SSCP Matrix									
Characteristic Root	**Percent**	**Characteristic Vector V'EV=1**							
		year	**Economic**	**posrecip**	**altruism**	**trust**	**patience**	**negrecip**	**risktaking**
11.9764780	61.34	-0.00127668	0.00118311	0.37374282	0.57982529	-1.71138415	1.29480968	-0.57286058	0.09330998
4.7960178	24.56	0.00352546	0.00158511	0.45562473	-0.66943614	-0.32794596	0.34553675	1.19833435	-0.25442806
1.9933470	10.21	0.00122576	0.01640301	0.63238525	0.00286617	0.25303052	-0.86505676	0.38423507	0.35429650
0.6920371	3.54	-0.00222627	-0.00822886	0.33359968	0.26242928	-0.54404877	0.01108079	0.11328752	0.56566843
0.0664563	0.34	-0.00145107	0.00223199	-0.33307480	0.08151057	0.64215322	-0.04880194	0.23943557	0.03791237
0.0000000	0.00	0.02023071	-0.00404711	-0.03974615	0.08993826	-0.21895663	0.23667394	-0.05921555	0.05257780
0.0000000	0.00	0.00050933	0.00093801	0.84327124	-0.64188568	-0.05828769	-0.05585252	0.00696820	0.32835600
0.0000000	0.00	-0.00194620	-0.00453885	0.23204439	0.03086650	0.03702290	0.22996256	0.18670540	-0.42390597

With the exception of year, in addition to Economic, all other variables seem to be involved, albeit to varying degrees. This fact is confirmed by univariate analyses of variance, the results of which are summarized in the table below:

Variable	Source	DF	Type III SS	Mean Square	F Value	Pr > F
Year	healthcare_system	5	314.0623433	62.8124687	1.35	0.2602
Economic	healthcare_system	5	9175.420198	1835.084040	22.64	<.0001
Positive reciprocity	healthcare_system	5	1.15411778	0.23082356	4.67	0.0013
Altruism	healthcare_system	5	2.28902039	0.45780408	8.82	<.0001
Trust	healthcare_system	5	0.79634811	0.15926962	2.72	0.0295
Patience	healthcare_system	5	4.40277400	0.88055480	13.09	<.0001
Negative Reciprocity	healthcare_system	5	2.09775290	0.41955058	21.46	<.0001
Will. to Take Risk	healthcare_system	5	0.68044794	0.13608959	2.28	0.0597

More diriment, however, are undoubtedly the related R^2 :

Variable	R-Square	Coeff Var	MSE Root	Mean
Year	0.114534	0.340337	6.833211	2007.776
Economic	0.685261	27.73504	9.002412	32.45862
Positive reciprocity	0.310089	478.6378	0.222217	0.046427
Altruism	0.458805	138.5946	0.227870	0.164414
Trust	0.207299	487.2692	0.241995	0.049663
Patience	0.557298	60.77206	0.259342	0.426746
Negative Reciprocity	0.673597	92.16459	0.139815	0.151701
Will. to Take Risk	0.180006	-11271.91	0.244151	-0.002166

Based on the values of R^2 , it is reasonable to conclude that Negative Reciprocity (R^2 = 0.67) and Patience (R^2 = 0.56) also contributed, synergistically with Economic, to overshadow the role of Healthcare System.

Regarding finally the target variables of this study, namely GPS scores, the relevant aspects are:

- all pro-social variables, namely Positive Reciprocity, Altruism, and Trust, were found to be unrelated to the share of pain undertreated patients. On the one hand, this result seems internally consistent, since it would have been difficult to explain a relationship involving only one or two variables; on the other hand, however, it is strange that variables that we might consider an expression of an overall empathetic attitude do not turn out to be positively related to better pain management. In any case, the relevant coefficients would all show a negative correlation with the share of undertreated patients: confirming both the internal consistency of the results concerning these three scores and an alignment with the expected behavior for pro-social variables, albeit supported only by a very weak inferential trend;

- concerning Patience, an explanation for the fact that it is positively correlated with the proportion of pain undertreated patients can be

sketched by assuming that greater patience better disposes one to the acceptance of pain;

- finally, the negative correlation between Willingness to Risk and the % of pain undertreated patients could be explained by assuming that higher risk tolerance makes the use of opioids more acceptable, as there is still a fairly widespread misconception that these drugs expose people to serious risks.

Of course, these conclusions represent only an attempt to explain, on the basis of common sense, the results found: confirmatory studies would be needed, possibly in a prospective setting if not, as far as possible, experimental.

6 Strengths and limitations.

The main limitation is, of course, that the study was conducted on aggregate data, moreover at different levels of aggregation and from different sources: paper level, for data concerning the share of pain undertreated patients, and country level for all others (except, of course, year and Healthcare System: since these are not statistical data, however, the question of aggregation does not arise for them). Thus all the problems associated with "ecological" inferential processes, with associated potential biases, arise.

Purely relevant from a statistical point of view is the fact that the countries studied in the various papers certainly do not represent a random sample, so generalization of the results is inferentially critical.

The classification that has been adopted for health systems is not the only possible one: since this is a dimension that cannot not be considered relevant a priori, this aspect may also have influenced the results. Consider also that the Mixed Type class, in which as many as 11 items fall, may be very heterogeneous.

Finally, one must consider the fact that the GPS survey data refer to 2012, while the articles considered refer to a time period from 1994 to 2020. Even assuming that the constructs detected by the GPS survey are relatively stable over short time intervals, an interval of that magnitude may be too long for that assumption to hold.

As for strengths, however:

- to our best knowledge no one, to date, has tried to relate fundamental, somewhat "primitive" variables such as economic preferences to a variable such as the proportion of individuals who do not receive adequate treatment for cancer pain: important not only in itself, so much so that it has inspired dozens of studies, but for the fact that it can also be considered as a proxy for quality of care in the end-of-life setting;

- the sample is quite large for this kind of research and was consolidated for conducting a review series in which recognized world experts in cancer pain therapy collaborated;

- results show a good degree of internal consistency and, with regard to covariates in common with the analysis of Roberto et al, 2022, confirm the role of Economic and, at least in trend, do not refute that of Year;

- for Patience and Willingness to Take Risk, the indications from the analysis seem plausible.

7 Conclusions.

The 3 reviews in the wake of which this study stands demonstrate how difficult it is to find explanatory variables for pain undertreatment, which is a fundamental problem for the cancer patient. Moreover, as already mentioned in section 5, "Strengths and limitations," this situation has a more general significance, since the quality of pain management can legitimately be considered as a very indicative proxy for the status of the treatment of issues in the more specific and complicated end-of-life setting; in it, in fact, strictly medical issues such as pain treatment are compounded by others that, although present in the earlier stages of the disease, become increasingly relevant: these include, by way of example, psychological and relational aspects, up to more specifically spiritual ones (which are obviously more difficult to detect: in the very particular case of spirituality, for example, see Rabitti et al, 2020).

With this study, therefore, we set out to contribute to this research from a different and certainly unique perspective.

Obviously, the results presented here are to be considered absolutely preliminary and require confirmatory studies, if not yet further exploration aimed at better defining the design of confirmatory studies.

In this regard, wishing to conduct further research on aggregate data, confirmatory analyses could be set up using data from surveys akin to GPS, such as the WVS (World Values Survey, for which see: https:// https://www.worldvaluessurvey.org/wvs.jsp) and Hofstede, 2001: these surveys moreover were used in Falk et al, 2018 for a validation exercise of the data collected from the GPS survey. As well, some data from the Gallup World Poll could come in handy as adjustment covariates: starting perhaps with those from the survey conducted in 2012, since the GPS data were collected as part of that very survey and would therefore be contemporaneous with it.

More definitive results, however, can only come from prospective studies explicitly aimed at investigating the relationship between PMI and economic preferences at the individual level.

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IV

Economic Preferences and end-of-life setting:

their role

in the legalization of

euthanasia and assisted suicide.

1 Introduction.

The quantitative dimension of the phenomenon of euthanasia and assisted suicide where they are legal, although often at the forefront of the chronicle, may not be perfectly known even to people working professionally in the field of palliative care and end-of-life more generally: however, limited to Europe, it ranges from 4% of all deaths in a country like the Netherlands, where both practices are legal, to 1.4% in Switzerland, where only assisted suicide is legal. The latter figure is not dissimilar to Canada (1.1%, both legal), to cite one of the few non-European cases for which we have solid data (Mroz et al, 2021). Numbers of this magnitude would per se justify epidemiological or, more generally, medical studies: but, in view of the fact that these are deaths acted upon voluntarily and mediated by health institutions or, at any rate, structured organizations, the phenomenon must also be viewed from other perspectives, beginning with the bioethical and legal ones.

From a strictly medical point of view, it is quite obvious that the situation described above is justified by the fact that medicine is now succeeding, in an increasing number of cases, in making people survive in conditions that subjectively may be considered undesirable. It is a fairly widespread opinion among many practitioners in the field of palliative care that better access to quality palliative care can reduce the demand for extreme interventions such as those at issue here: but evidently other dimensions also play a role, since we cannot think that countries such as the Netherlands or Switzerland are backward in this area.

On the other hand, from the bioethical and legal point of view, views are evidently becoming increasingly favorable to euthanasia or assisted suicide: on the bioethical side, despite a religious orientation that may be opposed to these practices and that seems to be dominant in many countries; while on the legal side, it may raise some concern that such practices are legal in countries medicine is solidly entrenched in very defensive positions (aimed, that is, at avoiding legal disputes), as in the US.

The feeling, therefore, is that dimensions such as legal, health, religious, or more generally bioethical dimensions fail to fully explain the phenomenon. From this reflection, therefore, comes the study presented here, with which we try to understand whether a basic system of preferences that seems to guide decisions in different social spheres, starting with the economic one, can also turn a role in this very particular context.

2 Background.

Corresponding to each news case involving euthanasia or assisted suicide, in countries where such practices are illegal or of uncertain or controversial legal status, punctually discussions aimed at comparing them with countries in which such practices are current, to the point of explaining a significant share of total deaths, recur. However, such comparisons are very complex on a strictly legal level, even within countries sharing the same Legal Origin (in the commonly accepted sense, for which see Glaeser and Shleifer, 2022): in this regard, consider that within the U.S. in some states assisted suicide is legal, while in most others it is not (ProCon.org, 2022a). A similar situation, (although more symmetrical in terms of states, 2 out of 6, but not in terms of affected population out of the total) is found for Australia, where both euthanasia and assisted suicide are legal in the states of Victoria and West Australia (ProCon.org, 2022b). Thus, although the characteristics of a specific legal system are likely to be important in determining and characterizing the legal status of the practices in question, they certainly have significance that must be interpreted in conjunction with other factors. Among these, the first is certainly represented by the specific health care system, since we are talking about "services" that, in the case, would in any case be provided by health care facilities or closely linked to them; moreover, the system's ability to provide adequate support in end-of-life, suicide prevention and, in general, lifestyles that may be linked to suicide (e.g.,

certain addictions) should also play a role. But in addition to the striking examples constituted by the U.S. and Australia, one could cite others characterized by similar health systems, but with a different legalization status for the two practices in question (or, conversely, with different health systems, but sharing the same legalization status). Even the dominant religious orientation in a certain country, if any, which seems to inspire many public positions on issues of bioethical relevance, does not seem to be sufficient to explain the phenomenon. Emblematic in this sense is the case of Italy, for example, where a well-known pronouncement of the Constitutional Court has made assisted suicide legal in certain circumstances despite the strong Catholic orientation of the majority of the population (confirming, however, the existence of attitudes differing from the Magisterium of the Catholic Church that have already been seen in relation to the issue of divorce and abortion). A further determinant can perhaps be found in family relationships, as it seems evident that these play an important role in cases of euthanasia in which the person concerned is not deemed conscious and, more generally, in end-of-life.

However, it should not escape one's notice how euthanasia and assisted suicide result in deaths that, invariably, are premeditatedly acted upon, and therefore attitudes or preferences that have been shown to play a role in helping to explain behaviors peculiar to other, and perhaps very different, domains of human action cannot fail to play a role as well. Thus, it was decided to investigate whether, and how, a "primitive" system of preferences such as the one studied in the 2012 Global Preference Survey (Falk et al, 2018), namely Positive Reciprocity, Altruism, Trust (dimensions considered pro-social) and Patience, Negative Reciprocity and Risk Taking, relates to the legal status of euthanasia and assisted suicide; to this end, to avoid bias, Healthcare System, Legal Origin, Main Religion and an appropriate measure of Kinship Tightness were also considered for the above to avoid bias.

Since, to our knowledge, the very few studies that show any degree of comparability with the one presented in this article arrive at

controversial results (see the considerations below about the expected contribution to literature), it is difficult to formulate hypotheses about the results to be expected: beyond a role which, in common sense, should emerge for at least some Economic Preferences net of the other variables mentioned (Healthcare System, etc.) which, while they cannot completely explain the phenomenon, certainly cannot be neglected. In any case, while not the main objective of this study, elements that should emerge regarding the role of such "ancillary" variables will certainly also be of interest, since we are not aware that they have ever been studied in the terms that we propose with this study.

About the contribution that this article can bring to the literature, I believe a bibliometric assessment showing current the situation can be useful. First of all, it should be considered that euthanasia and assisted suicide are widely studied topics, as a search conducted on Scopus at the time of writing this article (early May 2023) showed a number of articles ranging from 19 435 to 41 317, depending on the specificity of the search criteria). However, only 27 articles seem to treat the topic from a perspective that shows some overlap with mine. Regarding these articles, I must point out important differences from my approach at least in relation to the following points:

- **data collection:** most of the studies mentioned above collect data through ad hoc surveys, although in some cases data collected during surveys already conducted are used, as in my study. In the latter case, however, the data all come from a single survey: in my study, however, I converge data from different sources;

- **type of preference considered:** practically it is studied to some extent only trusts and often in a different sense than the one considered in my study;

- **covariate/adjusting variables:** in common with my study, I found only religiosity, moreover in terms of its intesity or for its own role (e.g.,

adhering or not adhering to specific doctrinal indications), <u>thus unlike my study, which instead considers the denomination of the religion practiced. Apart from religion, variables such as those I included in my study, namely, Healthcare System, Legal Origin and Kinship Tightness Index, are never considered</u>;

- **analysis level:** in the studies mentioned, the analysis is always conducted at the level of the individual, although in some cases multilevel models are used, which also allow for the study of hierarchically higher levels; in my study, however, only aggregate data are used. In this regard, <u>however, keep in mind that my dependent variable (legal status of euthanasia and assisted suicide) only makes sense at the nation level; however, it is quite common to conduct studies like mine based on aggregate data</u>;

- **data analysis techniques:** regression techniques are almost always used, as in my study;

- **comparability of results:** in the very few cases in which reasonable comparability of results can be assumed, as far as trusts are concerned the situations in which results in line with mine are obtained are more frequent than the opposite (respectively, 3 times vs. 1), even though we are talking about very small numbers. In the case of altruism, for which the numbers are even smaller, in one paper results in line with mine are presented, while in the other research evidence in the opposite direction is obtained. So we can say that in this field we are still in the presence of controversial results, so further study such as mine may be useful.

In conclusion, on the basis of the above considerations, I believe I can legitimately say that my study has the characteristics to represent a novelty in the relevant scientific literature, even considering the very limited number of articles that have been published on the subject at hand and the variability of the conclusions they reach.

3 Materials and methods.

3.1 Raw data.

3.1.1 Legal status of euthanasia and assisted suicide.

The concepts of "euthanasia" and "assisted suicide" are often interpreted very articulately and differently in the various legislations: as it is therefore very difficult to trace the different laws concerning them back to common canons, depending on the sources, a country may be classified differently in relation to the legal status of these two practices: for a synoptic overview of the different definitions see, for example, Mroz et al, 2021. In this article, however, we will refer to the classification reported in ProCon.org, 2022b, which is based on broader and, in any case, more recent criteria. In this regard, it should be noted that, in order to increase the sensitivity of our analysis, the following was done for:

- Australia: since euthanasia is legal in the states of Victoria and Western Australia, euthanasia in the whole of Australia was considered legal for the purposes of the analysis; ditto for assisted suicide;

- United States of America: for the purposes of the analysis, assisted suicide was considered legal for the U.S. although it is legal in only 11 states of the union (more specifically, in California, Colorado, Hawaii, Maine, New Jersey, New Mexico, Oregon, Vermont, Washington and the District of Columbia it is legalized via legislation, while in Montana via court ruling: see ProCon.org, 2022a).

3.1.2 Preferences: Global Preference Survey.

Preference data come from the study generally known as the Global Preference Survey (GPS; Falk et al, 2018), which is undoubtedly the largest and most reliable survey conducted on this topic. In fact, it is a survey

conducted on a representative sample of 80,000 individuals from 76 nations that was conducted as part of the 2012 Gallup World Poll and experimentally validated. This survey is specifically aimed at investigating the set of constructs consisting of time preference, risk preference, positive and negative reciprocity, altruism and trust through a questionnaire consisting of 12 items broken down as follows:

- Patience (time preference): 2 items;
- Risk taking: 2 items;
- Positive reciprocity: 2 items;
- Negative Reciprocity: 3 items;
- Altruism: 2 items;
- Trust: 1 item.

For this study I used scores for these 6 dimensions calculated at the nation level that are publicly available and downloadable from the BRIQ Institute website (https://www.briq-institute.org/global-preferences/downloads); however, individual-level data are also available.

3.1.3 Healthcare Systems classification.

"To analyze the results, we categorized articles that we have included according to the healthcare system type of the country where the study was conducted by using the classification of Böhm et al., 2013. The authors classified the healthcare systems of 30 countries according to three core dimensions: regulation, financing, and services provision. As reported by Böhm et al., five types of plausible healthcare systems exist, namely National Health Service, National Health Insurance, Social Health Insurance, Private Health System, and Etatist Social Health Insurance. All these categories are united by the feature of universal coverage of the

population. In the National Health Service the state holds the regulatory power, the funding derives from general tax, and the healthcare infrastructure are a public ownership; the National Health Insurance has the features of the previous type but the service provision depends mostly on for-profit; in the Social Health Insurance the funding coming mainly from contributions and public or private delivery; the Private Health System is based on private insurance only, which is also the major funding source; Etatist Social Health Insurance is a combination of state regulation, societal financing and private provision.

Articles that have been conducted in countries not classified by Bohm et al, 2013 have been grouped into a category of Mixed types because, to our knowledge, there are no other studies comparing these healthcare systems.

For all of the following reasons it was not possible to categorize these countries into one of the five healthcare systems. First of all, some of these countries do not have universal coverage of the population and the equitable access to healthcare services is not guaranteed, as for Iran (Heashmati et al., 2016); while in China some reforms have been implemented in the last decade to move the country toward this direction (Yip et al, 2019). In Singapore, various actors (i.e., public and private) contribute to the sustenance of the healthcare system and the delivery of services (Tan et al, 2021), bringing to greater complexity that could impact on the provision of services for patients and, therefore, on the likelihood of addressing their needs (Jefford et al, 2022). The payment also of private insurance schemes may impact the capacity of the patient to afford for the services that could help him/her to address needs, as in the case of Malaysia (Rannan-Eliya et al, 2016). In addition, in Kenya, out of pocket costs for health can be for the most part borne by the citizens (Chuma et al., 2011). Furthermore, insufficient data does not allow to classify the country, as in the case of Mexico (Böhm et al, 2013)." (Paltrinieri, 2022).

The 30 countries studied in Bohm et al, 2013, on the other hand, were classified as follows:

Type of healthcare system	Countries
Etatist Social Health Insurance	Belgium, Estonia, France, Czech Republic, Hungary, Netherlands, Poland, Slovakia, Israel, Japan, Korea
National Health Insurance	Australia, Canada, Ireland, New Zealand, Italy
National Health Service	Denmark, Finland, Iceland, Norway, Sweden, Portugal, Spain, United Kingdom
Private Health System	United States of America
Social Health Insurance	Austria, Germany, Luxembourg, Switzerland

3.1.4 Legal Origin.

To classify countries according to their respective Legal Origin (understood in the sense of which Glaeser and Shleifer, 2022) I relied on the classification referred to in La Porta et al, 1999, available online at the following URL:

https://scholar.harvard.edu/shleifer/publications/quality-government

In this source, countries are classified into the following groups based on their Legal Origin:

- French;
- English;

- Germanic;
- Scandinavian;
- Socialist.

(since Serbia was not considered in that source, I classified it in the Socialist group on par with the other former Yugoslav republics).

3.1.5 Religion.

Data found in a common reference work such as DeAgostini Libri Srl (2022) were used, where original sources are given.

3.1.6 Kinship Tightness.

Regarding the Kinship Tightness indicator, I used the one proposed in Enke, 2019. This measure, called the Kinship Tightness Index, is based on data from Murdock's Ethnographic Atlas (Murdock, 1967) and can be downloaded from

https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/JX1OIU.

For the purpose of this study, I used the index calculated at the country level.

Summarily, it is in index obtained as an unweighted mean of the 4 binary variables coded as follows (cited from the On Line Appendix of Enke, 2019):

Extended vs. nuclear family. Q8 in EA. Binary variable that takes on a value of:

- Zero, if domestic organization is:
- Independent polyandrous families (3)
- Polygynous: unusual co-wives pattern (59)
- Polygynous: usual co-wives pattern (222)
- Minimal (stem) extended families (45)
- Small extended families (323)
- Large extended families (236)

- One, if domestic organization is:
- Independent nuclear family, monogamous (122)
- Independent nuclear family, occasional polygyny (273)

Post-marital residence. Q11. Binary variable that takes on a value of:

- Zero, if post-wedding residence is:
- Couple to either group or neolocal (164)
- No common residence (8)

- One, if post-wedding residence is:
- Wife to husband's group (915)
- Husband to wife's group (200)

Lineages. Q43. Binary variable that takes on a value of:

- Zero, if descent is:
- Patrilineal (593)
- Duolateral (52)
- Matrilineal (161)
- Quasi-lineages (12)
- Ambilineal (49)
- Mixed (50)

- One, if descent is: Bilateral (374)

Segmented communities and localized clans. Q15. Binary variable that takes on a value of:

- Zero, if community organization is:
- Demes, not segregated into clan barrios (86)
- Agamous communities (404)
- Exogamous communities, not clans (119)

- One, if community organization is:
- Segmented communities without local exogamy (262)
- Segmented communities, localized clans, local exogamy (9)
- Clan communities, or clan barrios (242)

(legend:
- Qn in EA: Qn variable in the Ethnographic Atlas;
- number in parentheses: number of observations).

3.2 Analysis database making.

The 6 GPS scores were subjected to a variable clustering procedure (see Section 3.3 "Statistical methods"), so that only the respective cluster components were used in the models in place of the original scores due to a computational problem that manifested itself when attempting to estimate a logistic regression model containing the original scores.

As a result of this procedure, the following two clusters were identified:

- Cluster 1: consisting of the scores related to Positive Reciprocity, Altruism and Trust;

- Cluster 2: consisting of the scores related to Patience, Negative Reciprocity and Risk Taking.

(scores are listed in order of increasing value of statistic $1 - R^2$ ratio).

The 2 corresponding cluster components, standardized to mean = 0 and standard deviation = 1, were then added to the dataset containing GPS scores.

Data on the following were then manually added to the GPS database thus integrated:

- legal status of euthanasia and assisted suicide (see 3.1.1, Legal status of euthanasia and assisted suicide.);

- Legal Origin (see 3.1.4 "Legal Origin");

- Main Religion (see 3.1.5 "Religion"): for each country, only the most frequent religion was reported based on data reported in DeAgostini Libri Srl (2022). In the case of Protestantism, Anglicanism was also classified in this group in order to contain sparsity of data. The countries are then classified according to the prevailing religion using the following labels:

- Buddhism;
- Catholicism;
- Orthodox Christianity;

- Hinduism;
- Islam;
- Judaism;
- No Religion - Atheism;
- Protestantism;
- Shintoism.

The three principal components of Healthcare System, Legal Origin, and Main Religion were then calculated, since it is certainly preferable to use them in place of the original variables to recover degrees of freedom. Since these are categorical variables, a rather special technique had to be used, described in Section 3.3 "Statistical methods." Of these principal components, however, only the first two will be used in the logistic regression model, based on the R^2 values with which the original variables explain the principal components:

Principal components	Original variables		
	Healthcare System	Legal Origin	Main Religion
First	0.77	0.96	0.33
Second	0.35	0.16	0.73
Third	0.04	0.04	0.01

Thus, the first main component contains information mainly concerning Healthcare System and Legal Origin, while the second appears to be related mainly to Main Religion.

The supplemented database of the three main components was merged by ISOCODE with the Kinship Tightness data (see section 3.1.6 "Kinship Tightness"): this results in a database of 74 records, since there is no data for Serbia and United Arab Emirates in the Kinship Tightness database.

Finally, what will be studied as the dependent variable in the logistic regression model was generated, namely a dichotomous variable that

takes value 1 if euthanasia or assisted suicide is legal for the respective country and 0 in the opposite case.

3.3 Statistical methods.

As mentioned in section 3.2 "Analysis database making," a dimension reduction procedure was firstly carried out by variable clustering on the 6 GPS scores. For this purpose, the technique implemented in the PROC VARCLUS procedure of the SAS/STAT module of SAS System software was used: summarily, this technique is analogous to performing an orthoblique rotation on principal components (raw quartimax rotation on the eigenvectors, see: Harris and Kaiser, 1964). As cluster splitting criteria, a cluster is further split if its second eigenvalue is greater than 1.

Based on this criterion, the procedure identifies 2 clusters composed as follows:

- Cluster 1: consisting of the scores related to Positive Reciprocity, Altruism and Trust;

- Cluster 2: consisting of the scores related to Patience, Negative Reciprocity and Risk Taking.

where the GPS scores are listed in order of increasing value of the $1 - R^2$ ratio statistic, as can be seen from this more comprehensive table:

2 Clusters		R-squared with			
Cluster	Variable	Own Cluster	Next Closest	1-R**2 Ratio	Variable Label
Cluster 1	posrecip	0.8103	0.0332	0.1962	Positive reciprocity
	altruism	0.7513	0.0056	0.2501	Altruism
	trust	0.3675	0.0206	0.6458	Trust

2 Clusters		R-squared with			
Cluster	Variable	Own Cluster	Next Closest	1-R**2 Ratio	Variable Label
Cluster 2	patience	0.5324	0.0039	0.4694	Patience
	negrecip	0.4826	0.0065	0.5208	Negative reciprocity
	risktaking	0.4402	0.0212	0.5719	Will. to take risks

Regarding the performance of the clustering procedure, we can instead refer to the following table:

Cluster Summary for 2 Clusters					
Cluster	Members	Cluster Variation	Variation Explained	Proportion Explained	Second Eigenvalue
1	3	3	1.929145	0.6430	0.7890
2	3	3	1.455178	0.4851	0.8104

Total variation explained = 3.384323 Proportion = 0.5641

from which it can be deduced that the two cluster components identified by the procedure explain 56.41 % of the overall variability: all in all, this can be considered a reasonably good result, if we consider that the 6 GPS scores are poorly correlated with each other, as can be seen from the corresponding correlation matrix:

Spearman Correlation Coefficients, N = 76 Prob > |r| under H0: Rho=0						
	posrecip	altruism	trust	patience	negrecip	risktaking
posrecip **Positive reciprocity**	1.00000	0.72142 <.0001	0.39759 0.0004	-0.09222 0.4282	-0.16287 0.1598	-0.16782 0.1473
altruism Altruism	0.72142 <.0001	1.00000	0.26975 0.0184	-0.03341 0.7745	-0.17479 0.1310	0.04643 0.6905
trust Trust	0.39759 0.0004	0.26975 0.0184	1.00000	0.12153 0.2957	0.16172 0.1628	0.04552 0.6962
patience Patience	-0.09222 0.4282	-0.03341 0.7745	0.12153 0.2957	1.00000	0.31871 0.0050	0.29649 0.0093
negrecip **Negative reciprocity**	-0.16287 0.1598	-0.17479 0.1310	0.16172 0.1628	0.31871 0.0050	1.00000	0.18838 0.1032
risktaking **Will. to take risks**	-0.16782 0.1473	0.04643 0.6905	0.04552 0.6962	0.29649 0.0093	0.18838 0.1032	1.00000

In fact, the separation between the two clusters is very high, the correlation between the two cluster components being a negligible -0.07372: and this is a very positive aspect for the interpretation of the results.

Pure extremely relevant to the interpretation of the results is the cluster structure, or the set of correlations between each original variable and the cluster components:

Cluster Structure			
Cluster		**1**	**2**
posrecip	Positive reciprocity	0.900187	-.182309
altruism	Altruism	0.866797	-.075119
trust	Trust	0.606194	0.143536
patience	Patience	0.062260	0.729658
negrecip	Negative reciprocity	-.080731	0.694689
risktaking	Will. to take risks	-.145630	0.663463

As can be seen, the variable most correlated with the first cluster component (r = 0.90) is the score concerning Positive Reciprocity, while the variable most correlated with the second cluster component is the score concerning patience (r = 0.73). Purely to be emphasized, for interpretive purposes, how each variable is positively correlated with the cluster component of the cluster in which it was placed.

Again for the purpose of interpretation, it is noted that the two cluster components were standardized to mean = 0 and standard deviation = 1.

On the other hand, with regard to the calculation of the principal components of Healthcare System, Legal Origin and Main Religion, since these are categorical variables, it was necessary to first carry out an adequate quantification of them. To this end, the Optimal Scoring method described in Fisher, 1938, was applied by optimizing the properties of the transformed variables using the iterative MGV (Minimum Generalized Variance, Sarle, 1984) algorithm in the implementation of the PROC PRINQUAL procedure of the SAS/STAT module of the SAS System software.

The dichotomous variable describing the legal status of euthanasia or assisted suicide taking the value 1 if euthanasia or assisted suicide is legal for the respective country and 0 in the opposite case, was first studied as a dependent variable in a logistic regression model having the following as independent variables:

- the first two main components of Healthcare System, Legal Origin and Main Religion, obtained through the method described in section 3.2 "Analysis database making."

- Kinship Tightness Index;

- 1.st cluster component of GPS scores (summarizing Positive Reciprocity, Altruism and Trust);

- 2.st cluster component of GPS scores (summarizing Patience, Negative Reciprocity and Risk Taking).

The two cluster components of the GPS scores were used instead of the original variables because computational problems seem to manifest themselves with the latter, evidenced by values tending toward infinity for some estimators.

Due to additional computational problems attributable to the Kinship Tightness Index variable, the final model was built without that variable.

The PROC LOGISTIC procedure of the SAS/STAT module of SAS System software was used for the estimates.

4 Results.

4.1 Variables distribution.

The table below shows distribution of the dependent variable:

	N.	%
euthanasia_or_assisted_suicide		
0	63	85.1
1	11	14.9
All	74	100.0

In more detail:

- Countries in which only euthanasia is legal are:
o Colombia;

- countries for which only assisted suicide is legal:

o Austria;
o Finland;
o Germany;
o Italy;
o Switzerland;
o USA;

- Countries for which both are legal:

o Australia;
o Canada;
o Netherlands;
o Spain.

Regarding Healthcare System, Legal Origin and Main Religion, on the other hand, although they enter the model only through their first two principal components, we nevertheless provide the distribution of the original variables because it is not straightforward to interpret the principal components of qualitative variables in terms of their original levels:

	Is Euthanasia or Assisted Suicide legal?					
	NO		YES		All	
	N.	%	N.	%	N.	%
healthcare_system						
Etatist_Social_Health_Insurance	8	88.9	1	11.1	9	100.0
Mixed_Type	52	98.1	1	1.9	53	100.0
National_Health_Insurance	.	.	3	100.0	3	100.0
National_Health_Service	3	60.0	2	40.0	5	100.0
Private_Health_System	.	.	1	100.0	1	100.0
Social_Health_Insurance	.	.	3	100.0	3	100.0
All	63	85.1	11	14.9	74	100.0

	Is Euthanasia or Assisted Suicide legal?					
	NO		YES		All	
	N.	%	N.	%	N.	%
legal_origin						
English	18	85.7	3	14.3	21	100.0
France	26	86.7	4	13.3	30	100.0
German	.	.	1	100.0	1	100.0
Germany	2	50.0	2	50.0	4	100.0
Scandinavian	1	50.0	1	50.0	2	100.0
Socialist	16	100.0	.	.	16	100.0
All	63	85.1	11	14.9	74	100.0

	Is Euthanasia or Assisted Suicide legal?					
	NO		YES		All	
	N.	%	N.	%	N.	%
main_religion						
Buddhism	3	100.0	.	.	3	100.0
Catholicism	20	74.1	7	25.9	27	100.0
Hinduism	1	100.0	.	.	1	100.0
Islam	16	100.0	.	.	16	100.0
Judaism	1	100.0	.	.	1	100.0
NO_Religion_Atheism	5	71.4	2	28.6	7	100.0
Orthodox_Christianity	6	100.0	.	.	6	100.0
Protestantism	10	83.3	2	16.7	12	100.0
Shintoism	1	100.0	.	.	1	100.0
All	63	85.1	11	14.9	74	100.0

while for the quantitative independent variables the distributional data are:

		N.	Min	10.th pctl	25.th pctl	50.th pctl	Mean	75.th pctl	90.th pctl	Max	Std Dev
kinship_score	**Is Euthanasia or Assist Suicide legal?**										
	NO	63	0.0	0.2	0.3	0.6	0.6	0.8	0.9	1.0	0.3
	YES	11	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.1
	All	74	0.0	0.1	0.3	0.5	0.5	0.8	0.9	1.0	0.3
GPS: 1.st cluster comp.											
	NO	63	-2.8	-1.4	-0.7	-0.3	-0.1	0.6	1.3	2.4	1.1
	YES	11	-0.2	0.0	0.0	0.5	0.5	0.8	1.0	1.1	0.4
	All	74	-2.8	-1.2	-0.7	-0.0	-0.0	0.7	1.2	2.4	1.0
GPS: 2.nd cluster comp.											
	NO	63	-2.4	-1.4	-0.9	-0.1	-0.1	0.5	1.2	2.3	1.0
	YES	11	-1.1	0.1	0.2	0.6	0.7	1.3	1.3	2.3	0.9
	All	74	-2.4	-1.4	-0.8	0.1	0.0	0.8	1.3	2.3	1.0

Similar to the categorical variables, although they appear among the independent variables in the model only through their two cluster components, nevertheless we find it useful to provide the distribution of the original GPS scores as well:

		N.	Min	10.th pctl	25.th pctl	50.th pctl	Mean	75.th pctl	90.th pctl	Max	Std Dev
Posrecip (1.st cluster)	**Is Euthanasia or Assist Suicide legal?**										
	NO	63	-1.0	-0.5	-0.3	-0.0	-0.1	0.2	0.3	0.6	0.4
	YES	11	-0.1	-0.1	0.1	0.2	0.1	0.2	0.2	0.3	0.1
	All	74	-1.0	-0.5	-0.3	0.0	-0.0	0.2	0.3	0.6	0.3
Altruism (1.st cluster)											
	NO	63	-0.9	-0.5	-0.3	-0.1	-0.1	0.1	0.5	0.9	0.4
	YES	11	-0.3	-0.2	-0.1	0.1	0.1	0.2	0.3	0.4	0.2
	All	74	-0.9	-0.4	-0.2	-0.1	-0.0	0.2	0.5	0.9	0.3
Trust (1.st cluster)											
	NO	63	-0.7	-0.4	-0.2	-0.1	-0.1	0.1	0.3	0.6	0.3
	YES	11	-0.1	-0.1	0.0	0.2	0.1	0.2	0.3	0.3	0.1
	All	74	-0.7	-0.4	-0.2	-0.1	-0.0	0.2	0.3	0.6	0.3
Patience (2.nd cluster)											
	NO	63	-0.6	-0.4	-0.3	-0.1	-0.1	0.1	0.4	1.1	0.3
	YES	11	-0.3	0.1	0.2	0.6	0.5	0.7	0.8	1.0	0.4
	All	74	-0.6	-0.4	-0.3	-0.1	-0.0	0.2	0.6	1.1	0.4
NegRecip (2.nd cluster)											
	NO	63	-0.5	-0.4	-0.2	-0.0	0.0	0.2	0.4	0.7	0.3
	YES	11	-0.3	-0.3	-0.1	0.0	0.0	0.2	0.3	0.4	0.2
	All	74	-0.5	-0.3	-0.2	0.0	0.0	0.2	0.4	0.7	0.3
RiskTaking (2.nd cluster)											
	NO	63	-0.8	-0.3	-0.2	-0.0	0.0	0.2	0.5	1.0	0.3
	YES	11	-0.3	-0.2	-0.1	-0.0	-0.0	0.1	0.2	0.2	0.1
	All	74	-0.8	-0.3	-0.2	-0.0	0.0	0.2	0.4	1.0	0.3

4.2 Model estimates.

Since SAS PROC LOGISTIC estimates an extraordinarily low value (< 0.001) for the Odds Ratio associated with the Kinship Score, it is safe to suspect a computational problem due to the presence of this variable in the model. By eliminating it, the following results are obtained:

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	18.5359	4	0.0010
Score	20.0433	4	0.0005
Wald	10.6990	4	0.0302

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-2.5153	0.5920	18.0501	<.0001
pri_1	1	0.3764	0.2982	1.5935	0.2068
pri_2	1	-0.5468	0.5912	0.8553	0.3551
CL1_PosRecip_Altruis	1	1.0441	0.4921	4.5007	0.0339
CL2_Patience_NegReci	1	1.0846	0.4815	5.0730	0.0243

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
pri_1	1.457	0.812	2.614
pri_2	0.579	0.182	1.844
CL1_PosRecip_Altruis	2.841	1.083	7.453
CL2_Patience_NegReci	2.958	1.151	7.602

Association of Predicted Probabilities and Observed Responses.			
Percent Concordant	83.3	Somers' D	0.665
Percent Discordant	16.7	Range	0.665
Percent Tied	0.0	Tau-a	0.171
Pairs	693	c	0.833

Parameter Estimates and Wald Confidence Intervals.			
Parameter	Estimate	95% Confidence Limits	
Intercept	-2.5153	-3.6757	-1.3549
pri_1	0.3764	-0.2080	0.9608
pri_2	-0.5468	-1.7056	0.6120
CL1_PosRecip_Altruis	1.0441	0.0795	2.0086
CL2_Patience_NegReci	1.0846	0.1408	2.0284

Relative to the conventional cut-off of significance α = 0.05, both cluster components of the GPS scores are found to be statistically significant, while the principal components associated with Healthcare System, Legal Origin and Main Religion are also not borderline significant.

In the logistic regression model, a regression coefficient greater than 0 is estimated for both the first cluster components of GPS scores and the second: thus, as their value increases, the probability that euthanasia or assisted suicide is legal increases. However, these results, which seem to indicate an exclusive role for GPS scores, should be interpreted with caution in light of the various computational problems encountered and the indications that seem to emerge from examining the joint distributions reported at the beginning of section 4.1. In fact, running tests designed to investigate the relationship between the dependent variable and, respectively, Healthcare System, Legal Origin, Main Religion, and Kinship Tightness Score considered individually yields the following results:

Variable	Test	Effect size	p-value
Healthcare System	Exact Chi-Square	0.8199[a]	<0.0001
Legal Origin	Exact Chi-Square	0.4417[a]	0.0196
Main Religion	Exact Chi-Square	0.3403[a]	0.4313
Kinship Tightness Index	t-test	1.6082[b]	<0.0001

Notes:

a = Cramer's V
b = Cohen's d

Apart from Main Religion, these results seem to suggest a relevant role for these variables; unfortunately, however, it is not possible to adequately test whether these results withstand multivariate analysis because of the aforementioned computational problems.

5 Discussion.

As for the target variables of this study, namely GPS scores, to the extent that these are adequately represented by their respective cluster components, they seem to be the only variables for which relevance can be fully ascertained among those attempted to be studied.

We have seen that both the pro-social variables, which belong to the first cluster, and those in the second GPS variables cluster, seem to be positively correlated with the likelihood that euthanasia or assisted suicide are legal. Conversely, variables that to common sense would seem even more relevant, such as categorical variables, do not seem so on a strictly statistical level: although the fact of studying them through principal

components computed on their quantitative transforms might obscure their role that seems to emerge from univariate assessments. Ditto, for reasons related to computational problems, for the Kinship Tightness Index.

Returning to the GPS scores, which are the main focus of this study, however, the interpretation of the results is complex. Regarding the GPS scores of the first cluster, the fact that the related variables are positively correlated with the greater propensity to legislate in favor of euthanasia or assisted suicide would indicate that these practices are associated with a pro-social attitude: which, however, does not seem to conform to the opinion of those who oppose them. In any case, placing one's life in the hands of a third party in such a definitive manner certainly implies an attitude marked by the utmost trust in one's neighbor.

For the second cluster, too, it is not easy to give interpretations: it could be that a higher Willingness to Take Risk is associated with a higher propensity to evaluate euthanasia or assisted suicide favorably, since one is exposed to the risk that the health condition that has led to such extreme resolutions may not turn out to be as irreversible as one might have believed at first. As well, the inclination to place oneself in asymmetrical social relationships (Negative Reciprocity), I believe, is congruent with such a propensity; on the other hand, I see it less understandable how time preferences positively marked by patience can be.

Comparison with results obtained from the very few researches that have studied the topic of interest is very difficult for the reasons already mentioned at the end of section 3.2 "Background." About trust, to the extent that it is possible to make such comparisons, the studies that are in agreement with my results represent the majority. They are:

- Köneke et al, 2014
- Hall et al, 2005
- Rudnev et al, 2019

In Stolz et al, 2017, on the other hand, the construct "social trust" does not appear to be statistically significant, even though aligned with mine in terms of trend for 3 outcomes out of the 4 that these authors consider in relation to the phenomenon of interest (euthanasia and assisted suicide). On the other hand, the result regarding the more specific construct "trust in doctor" is sharper, for which these authors obtain a result contrary to mine: in terms of trend for 3 of the outcomes they consider and statistically significant for one of them.

Relative instead to altruism, in Tajaâte et al, 2021 the authors find a result similar to mine, while in Aghababaei et al, 2014, a contrary result.

6 Strengths and limitations.

The main limitation concerns the attribution of legality status for euthanasia or assisted suicide, as different jurisdictions formally interpret and decline these concepts in different ways, and different sources, in turn, interpret the relevant laws differently. Consider also that this status may be much more formal than substantive: in Italy, for example, assisted suicide would be legal following a famous Constitutional Court pronouncement in 2019, but the situation is quite different from the Netherlands or Switzerland, for example.

Still on the subject of classifications, the one that was adopted for health systems is not the only one possible: in view of the importance of this covariate, this aspect may also have influenced the results. Consider also that the Mixed Type class, in which fatally the majority of systems fall, is certainly very heterogeneous.

Another aspect to consider concerns the reliability of the Kinship Tightness Index: in fact, since it is based on data from Murdock's Ethnographic Atlas, which was released in 1967, it could be an important

limitation for this study. However, in Baharami-Rad et al, 2021, the relevance of this data is effectively defended.

Another important limitation concerns the absence, among the covariates, of a measure of the quality of health care treatments at the end of life, which is not available for the set of countries considered: indeed, it is fairly widely believed that the availability of adequate palliative care may limit the demand for euthanasia or assisted suicide interventions, thus influencing the respective legislation.

From a statistical point of view, the main limitation is, of course, that the study was conducted on aggregate data, thus exposed to the biases inherent in "ecological" type studies: on the other hand, the unit of interest is the country, so it is not easy to combine the different plans of analysis into a unified picture.

Purely relevant is having had to resort to dimension reduction techniques, which certainly limited the informativeness of the statistical analyses conducted, as did the computational problems encountered in estimating the models.

As for strengths, however:

- to our best knowledge no one, to date, has tried to relate fundamental, somewhat "primitive" variables such as Economic Preferences to a variable such as the legal status of euthanasia and assisted suicide: the results, therefore, although provisional and in need of further confirmation and investigation, may open the door to contributions from a disciplinary field such as Behavioral Economics, hitherto foreign to the context represented by these kinds of interventions in the end-of-life context;

- however difficult to interpret, the results seem to clearly argue in favor of a role for Economic Preferences in guiding attitudes in favor of

euthanasia and assisted suicide, at least to the extent that the relevant legal status reflects this;

- Finally, the sample is quite large for this kind of research.

7 Conclusions.

This study set out to investigate the relationship between appropriate measures of Economic Preferences and the legal status of euthanasia or assisted suicide in the hypothesis of recognizing, in attitudes toward these practices, a role also of these dimensions, which we do not feel are normally considered in this kind of study.

The results, albeit amid technical difficulties and with the limitations outlined above, seem to indicate an obvious role for such a preference system, however difficult to interpret empirically. Less evidence, at least on the inferential level, has emerged, however, regarding variables that, based on common sense, should play an even more obvious role than Economic Preferences in orienting attitudes toward euthanasia and assisted suicide, namely Healthcare System, Legal Origin and Kinship Tightness; striking, in particular, is the inability to prove a role for the dominant religious orientation even with a simple bivariate analysis, which instead suggested some evidence for the other ancillary variables to the Economic Preferences system that were considered in this research.

Of course, the results presented here are to be considered preliminary and require confirmatory studies; in particular, should a role of Economic Preferences be confirmed, further data are needed to interpret the direction of correlations on the empirical level. For this purpose, however, I do not believe it is possible to disregard data collected at the individual level.

Wanting instead to conduct further studies on aggregate data, one could set up confirmatory analyses using data from surveys related to GPS,

such as the WVS (World Values Survey, for which see: https:// https://www.worldvaluessurvey.org/wvs.jsp) and Hofstede, 2001: these surveys moreover were used in Falk et al, 2018 for a validation exercise of the data collected from the GPS survey. As well, some data from the Gallup World Poll could come in handy as adjustment covariates: starting perhaps with those from the survey conducted in 2012, since the GPS data were collected as part of that very survey and would therefore be contemporaneous with it.

Among the aggregate data, as well might be useful the suicide rate at the country level, although the relationship between this phenomenon and those in question is not necessarily as obvious as one might think. The very fact that the role of Healthcare System, Legal Origin, Dominant Religious Orientation and Kinship Tightness could not be easily proven, although attributable in part to technical difficulties, suggests that what is expected a priori about the field at hand is less obvious than one might believe.

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