UNIVERSITA' DI ROMA – TOR VERGATA

DEPARTMENT OF ECONOMICS AND LAW

Doctoral Thesis

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ESSAYS ON MICROECONOMICS: CONSUMERS' OPTIMIZATION PROCESS AND ITS MEASURES

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INTRODUCTION

This work provides an insight about three main aspects of consumption theory. The first chapter deals with the consumers optimization process. Based on what Heinrich et al. (2010) did with his study on different ethnic groups it aims to verify whether and to what extent professional or often practiced activities may shape individual preferences. In this chapter an experiment has been designed based on what Akerlof and Shiller (2010) wrote about the diffusion of poker. Notably, as they suggested, the switch from playing bridge to poker may be related to the shift in the individual preferences and especially in the role played by social capital for the optimization process. Moreover some poker peculiarities as deception may, in turn, have affected financial agents' practices which lie at the root of recent financial crises and scandals. More specifically, we test whether the implicit assumption that the reduction in the number of bridge players and the increase in the number of poker players imply a reduction of social skills. By the means of a a large scale online survey and as we were expecting we document a difference between the two groups of players, a higher propensity for the bridge players to account for the role of social capital in the optimization process and a higher polarization of their choices with respect to poker players. The results are proven to be robust to econometric analysis which controls for confounding factors and to sensitivity analysis based on the removal of the CIA assumption.

The second chapter deals with allocative efficiency of non-marketed goods and political orientation. With an online survey on major Italian newspapers we ask respondents to simulate the typical policymaker decision, that is, the dilemma of allocating scarce financial resources among alternative competing goals using the domains of the newly defined Italian BES (sustainable and equitable wellbeing) indicators. We find that two major factors explaining heterogeneity in preferences on expenditure in major wellbeing domains are left/right wing political orientation and low/high education. With regard to political orientation we identify "large coalition" items where left/right positions are similar and domains where opinion are more polarized. Overall, our findings document that left wing respondents would spend relatively more on environment, research and innovation, culture and education and relatively less on safety and measures directly aimed at improving economic wellbeing. We conclude that these findings make them- selves significantly more oriented toward environmental sustainability in a hypothetical trade off between economic growth and the latter.

The third chapter deals with the link between consumption theory and inflation mea- sure, a major concern for both micro and macroeconomic theory. Standard consumption theory agrees in assessing an effect of price dynamics on the individual agent wellbeing. As stated in Boskin (1998) in economics the extent to which consumers are affected by a change in price is still an issue economic and statistical theory are trying to disentangle. In order to give an original contribution to the ongoing academic debate this chapter focuses on the index number theory supporting the different ways a change in the gen- eral level of consumer prices can be tracked. Based on the solid ground of the standard economic approach to the index numbers and endorsing its latest

contributes given by the introduction of dynamics, this chapter proposes a new inflation measure. The new Dynamic Inertial Price Index (DIPI) is able to consider all the standard feature of the best former economic indexes. It is able to consider the substitution effect, through which consumers smooth their reaction to a change in relative prices. It is also dynamic, in that accounting for the forward looking dimension of consumption and stochastic, to consider the uncertainty underpinning the individual choices through time. What uniquely characterize the DIPI index, though, is the ability to combine everything into a more reliable representation of consumption based on the most recent economic the- ory. Everything else remaining the same it is able to introduce an inertial component able to give a representation of consumption that is both forward and backward look- ing, as argued by the most recent economic theory. The final result is a more correct theoretical representation of the impact the index has on the individual welfare and a great flexibility from an empirical point of view. With the new formulation it is pos- sible to disentangle the different contribution of two categories of goods: durable and non-durable. Without loss of generality it is, then, possible to adopt a relatively sim- ple analytical framework whose results are comparable with more complicated setups in terms of the main statistical measure of the index. Finally, due to its theoretical properties and the correctness of its baseline assumption, it is a better candidate to be part of macroeconomic models and policy making measures.

Part I

2. Card games and economic behaviour

A well-established tradition in the literature challenges the old tenet of time-invariant preferences (Becker and Stigler, 1977) and discusses the nexus between frequently practiced (leisure, games, job) activities and individual preferences.[1] The idea that activities may shape individual preferences is the core of the seminal Henrich et al. (2010) experiment on primitive ethnic groups. That research reports that Lamalera whale hunters in Indonesia display an extremely high average contribution (58 percent) as proposers in ultimatum games,[2] which is the highest among the 15 primitive populations that participated in the research. At the other extreme, the average contribution of Machiguenga, who engage only in family activities without cooperation with other village members, is 27 percent. The interpretation of the Lalamera findings is that their everyday activity (hunting whales in large groups with canoes) cannot be performed in isolation and requires a high degree of cooperation and coordination, which progressively creates and is in turn naturally strengthened by social norms on equitable sharing rules among workmates.

Consistent with the hypothesis of the existence of a nexus between activities and preferences, Akerlof and Shiller (2010) have recently argued that the traders' bad financial practices that led to the global crisis may be a reflection of changes in their leisure activities, notably the decline in popularity of more cooperative games like

[1] See among others Loewenstein and Angner (2003) and Malmendier and Nagel (2011).

[2] As is well known, if the offer of the proposer in the ultimatum game is not accepted by the receiver (i.e., because it is not considered fair) the payoff is nil for both.

bridge and the increased diffusion of individualistic games like poker.[3] [4] The authors observe that 44 percent of Americans played bridge in 1941, which was a game "*recommended as a means of learning social skills.*" By contrast, bridge is currently considered a game for the elderly[5] and is in strong decline while poker is becoming increasingly popular. [6] Akerlof and Shiller's implicit argument is that a professional or often practiced activity may shape individual preferences, exactly as in Henrich et al. (2010): although poker players are individualistic, bridge players act in teams and develop their cooperation skills consistently with the characteristics of their preferred game practice, which is analogous to the behavior of whale hunters. To provide support in favor of their argument, Akerlof and Shiller (2010 p.40) remark that poker is always

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[3] What the authors imply is that the financial crisis and the related scandals that occurred in the same period in leading financial institutions were caused by a deterioration of social skills and an increase in self-regarding attitudes of financial traders (see Akerlof and Shiller, 2010, p. 40).

[4] Such a reduced propensity to play team games is consistent with the well-known parallel evidence provided by Putnam (2000) that shows a decrease in the number of people who bowl in leagues despite the increase of bowling players in the last 20 years.

[5] The average age of English Bridge Union members was 55 in 2006 (The Independent (2006)), but the average age was 67 for members of the American Contract Bridge League in 2005 (Moore (2005)).

[6] It is hard to find updated and reliable data about the relative diffusion of the two games. About bridge, the WBF (World Bridge Federation) states that *"…The WBF has shown strong and steady growth and its membership now comprises 124 National Bridge Organizations (NBOs) with approximately 1,000,000 affiliated members who participate actively in competitive bridge events (locally, nationally and internationally)…*" (see the WBF website). Reliable data on poker diffusion are even harder to find given its tight regulation in some countries. Therefore, we refer to the statistics of one of the major online cardrooms, PokerStars, which had over 50 million active players at the beginning of 2012 (see PokerScout online traffic report (2012)).

played for money, which differs from what usually occurs in bridge, and has the characteristics that "deception" (*variously called bluffing and keeping a "poker face*") is one of the most important tactics followed to maximize the players' payoff[7].

Card games and particularly bridge and poker have always been an issue of great curiosity, inspiration and interest for academics. For example, Borel's (1938) and Von Neumann's analysis of bluffing in poker (Von Neumann and Morgenstern, 1944) contributed to the foundations of information and game theory. Borel's model of poker (called "la relance") finds the optimal player's strategies (including bluff) by differentiating the cases of plain game and pot-limit poker[8]. Bridge has elicited similar interest among academics and has greatly contributed to the development of probability theory[9] even though it still poses a great challenge for game theorists due to its complexity[10].

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[7] The reasoning of the authors ends with the following question: "*Of course there may be no link between what is taking place at the card table and what is taking place in the economy. But if card games played by millions of people shift the role of deception, wouldn't be so naïf simply to assume that such shifts do not occur also in the word of commerce?*" (p. 40).

[8] Von Neumann finds new implications by only limiting losses for players. A further extension of Borel's model is given by the work of Bellman and Blackwell (1949), Bellman (1952) and Karlin and Restrepo (1957).

[9] Borel and Cheron (1940) explain how bridge has greatly helped in developing an understanding of the practical implications of probabilistic laws and theorems through the analysis of hand distributions and the design of playing strategies. A new statistical method for evaluating bridge hands has been proposed by Cowan (1987).

[10] There is no comparable literature on game theory models of bridge. To our knowledge, there are only Binmore's suggestions of classifying bridge as either a game of imperfect information and perfect recall or as a two player, zero-sum game, in which case it would be a game of imperfect recall (Binmore 1992, 2007).

Two of the most influential billionaires in the world, Warren Buffett and Bill Gates, have been advocating bridge qualities for years and have argued for the importance of teaching bridge starting in the lower school grades. They have recently financed million dollar programs to introduce bridge at school because they are convinced that "*anyone's good in bridge is gonna be great in a lot of things*"[11] and that in bridge "*You have to look at all the facts. You have to draw inferences from what you've seen, what you've heard. You have to discard improper theories about what the hand had as more evidence comes in sometimes. You have to be open to a possible change of course if you get new information. You have to work with a partner, particularly on defense.*"[12] Although poker actually shares most of the rationality enhancing characteristics of bridge described in this statement, a qualifying difference among the two games is that bridge players are accustomed to working with a partner but poker players do not work with partners. This is one of the reasons we are interested in testing whether bridge players behave differently than poker players in trust game experiments, which typically test participants' cooperative attitudes.

The investigation of bridge and poker player preferences is an issue so far unexplored in the literature that falls into the broader and more investigated branch that studies how field experts behave in lab experiments. Along this line, Becker et al. (2005) study how game theory experts play in the traveler's dilemma, Palacios-Huerta and Volij (2009) document that professional chess players are closer than students to the subgame perfect equilibrium in the centipedes game, and Palacios-Huerta (2003) and Palacios-Huerta and Volij (2008) investigate how professionals play zero sum, two

[11] Bill Gates in ACBL news archive (2009)

[12] Warren Buffett interviewed by A. Crippen on the CNBC website (2008).

person strategic games. As a general result, this literature confirms that professional activities do affect experimental behavior, which is consistent with what we find in our research.

To test whether this also happens in our case, we formulate the hypothesis that bridge players are more likely to adopt team reasoning vis-à-vis standard purely self-regarding behavior and thereby send a significantly higher amount of the endowment received in trust games and produce Pareto superior outcomes given the game structure.[13] This should occur even though the analogy between the bridge partnership and the trust game partnership is not perfect. Both trustors and bridge partners may increase their payoffs if they cooperate with their partners (the trustee in the case of the trust game, the teammate in the case of the bridge game). However, the bridge teammate unlike the trustee cannot derive any benefit from an opportunistic behavior against her teammate. For this reason, our focus is on trustors. In spite of these dissimilarities, it is of great interest to test whether the role differences of bridge and poker players may affect their decisions in well-known game theoretic benchmarks such as incentivized and non-incentivized trust games. More specifically, one half of the participants in bridge matches are partners, but all of the participants of poker matches are rivals. What we

[13] As is well known, the optimal strategy of a *homo economicus* (that is, of an individual with standard purely self-regarding preferences) trustee in a trust game is to give back nothing, and that of a trustee following team reasoning is to give back half of the money received. As a consequence, in the presence of common knowledge of *homo economicus* players' characteristics (both players are fully self-interested consistently follow the strategy of maximizing their own payoff and believe that their counterpart will also do so), the optimal strategy for the Nash maximizing trustor would be to give nil. However, in presence of common knowledge of a team reasoning players' characteristics, the optimal strategy will be to give everything.

conveniently assume in our paper is that rivals play as homo economicus (maximize their own payoff) and that partners adopt a team reasoning or a we-thinking approach[14] in attempt to devise strategies that maximize the team payoff.

Our research strategy includes an online simulated experiment (OSE) without monetary payoffs and a monetary payoff experiment (MPE). Given this original structure of our empirical work, a second related contribution of our research is testing whether findings from non-incentivized experiments are good predictors of those in incentivized experiments.

In the first non-incentivized experiment, we compare the preferences of 1,414 bridge and 836 poker players when they play as trustors in simulated experiments with an original dataset built in cooperation with the Italian Bridge Federation and the poker online section of Snai S.p.a., the most important Italian betting agency[15]. In the second incentivized experiment, we repeat our test on a smaller sample of expert bridge and poker players to check whether evidence from the simulated experiment corresponds with that from experiments with monetary payoffs.

Our findings do not reject our main hypothesis as they provides evidence that bridge players contribute significantly more than poker players as trustors in both experiments. This is mainly accounted for by an 11 percent higher share of players sending all of their game endowment in the OS experiment and an 8 percent higher share of players sending all of their game endowment in the MP experiment, which is consistent with the optimal strategy when team rationality is common knowledge. In addition to this, in the incentivized experiment where we can control for the years of bridge and poker

[14] We use the two terms as synonyms.

[15] An online questionnaire was proposed to bridge and poker affiliates in the summer 2012. See Appendix A for a detailed description of the modalities of the experiment.

experience, we document that any additional year of bridge practice significantly increases the probability of team reasoning choice. The superior giving of bridge players does not seem to be motivated by risk aversion, pure altruism or inequity aversion (factors which we control for by extracting them with side experiments).

This paper is divided into five sections (introduction and conclusions included). The second section outlines our theoretical hypothesis. The third section describes our simulated experiment and provides evidence on its descriptive findings, parametric and non-parametric tests, econometric analysis and sensitivity analysis. The fourth section describes our incentivized experiment, which provides the same type of empirical evidence, and compares it with the evidence from the simulated experiment. The final section concludes the paper.

2.2 Theoretical hypothesis

Individual utility maximizing behavior is the standard assumption about players' preferences. An alternative view (Hodgson (1967), Regan (1980), Kramer, Roderick and Brewer (1984), Gilbert (1989), Hurley (1989), Sugden (1993, 2000 and 2003), Tuomela (1995), Hollis (1998), Bacharach (1997, 1999 and 2006), Gold (2008)) takes into account that individuals may use a we-mode instead of an I-mode attitude or, in other terms, wonder whether "it would be good for us if we did…" instead of the classic, purely self-regarding behavior reasoning that "It would be good for me if I did…" (Becchetti, Degli Antoni and Faillo (2010)).

Beyond the above mentioned hypothesis of a social preference foundation of team reasoning, a "strategic" factor that could facilitate its adoption in social dilemmas is the

"common reason to believe" (Sugden (2003)). The main idea is that team reasoning has a conditional nature. Group members are not committed to reason as a team unless there is a common (reciprocal) motive to believe that other members are doing the same.[16]

Team thinking may be stimulated by the specific features of the game structure. The game we use in our simulated experiment, the trust game, has the property of "strong interdependence" (Bacharach (2006)), that is, of a game in which (as in Prisoners' dilemmas and Traveler's games) there exists an outcome that is preferred by both partners and that can be achieved with we-thinking, which is Pareto superior with respect to the outcome that would be attained with standard individual rationality.

Our experiment tests the hypothesis that bridge players have a higher predisposition for we-thinking than poker players. We argue that such a higher predisposition is given by their regular practice of a game in which success may be obtained by using we-thinking with their playing partners.

Note that we do not specify whether the counterpart of the trust game is another bridge/poker player in either of the experiments to avoid framing effects that could per se lead to the rejection of the null hypothesis. In this sense, we created weaker conditions for our test because the information on the counterpart game experience does not reinforce the "common reason to believe" (Sugden (2003)).

2.3 The survey and the simulated experiments

The trust investment game is a well-known sequential game that illustrates an important social dilemma: trusting others (in an economic environment, which is

[16] *"The internal problem is that, from the viewpoint of any individual, the validity or acceptability of team reasoning, narrowly defined, may be conditional on his confidence that other members of the team are reasoning in a similar way"* (Sugden (2003), p.168).

typically characterized by asymmetric information and incomplete contracts because it is implicit in the game rules) may be rewarding because it produces super-additive outcomes, but it is also a "social risk" because the counterpart's opportunism may lead the trusting player to a result that is inferior to that obtained with the non-cooperative strategy. Berg, Dickhaut and McCabe (1995) develop this idea in their sequential two-player game in which a trustor, who is the first mover, has to decide the share of her endowment that she wants to transfer to an anonymous counterpart (the trustee). The amount sent by the trustor is tripled[17] due to the game rules. After this choice, the trustee moves and may return to the trustor a share of what she received (including all or nothing).[18]

In the Nash equilibrium of the game in which both players adopt purely self-regarding rationality and this purely self-regarding rationality is common knowledge (that is, each player expects that their counterpart will adopt purely self-regarding rationality), both the trustor and trustee transfers are zero, and the individual and aggregate payoffs are suboptimal. By contrast, if the two players adopt a we-thinking

[17] One of the rationales for the trust game rule of tripling the trustor contribution hinges on the assumption of the superadditive effects of trust and trustworthiness. With high levels of trust, individuals share information and knowledge and cooperate, which generates outcomes that go beyond the sum of their stand-alone contributions.

[18] The success of the trust game in the behavioral literature stands in its capacity to stylize some crucial elements of "social dilemmas" in real life interactions: asymmetric information, incomplete contracts, superadditivity (see footnote 17) in case of cooperation and the fact that cooperation is profitable if reciprocated by the counterpart but unprofitable if the trust is abused. Trust-game-like interactions typically characterize relationships among individuals, organizations, companies, states and workers within productive organizations. For a survey of experimental findings on trust games, see the meta-paper of Johnson and Mislin (2011) and Fehr (2009).

attitude and this we-thinking is common knowledge (that is, each player expects that her/his counterpart will adopt the same we-thinking attitude), both players do their best to maximize the aggregate outcome and divide it in equal parts.[19] That is, the trustor will send all, and the trustee will receive it tripled and return half of it.

In our non-incentivized trust game experiment, the trustor is told to receive 100 euros and has to decide the amount of her endowment to give to another anonymous player (the trustee) knowing that the amount will be tripled and that the trustee will choose how much of the amount to return to the trustor. The game is only simulated and no real money is at stake. Beyond the trust game, our design also includes a dictator game and a risk aversion simulated experiment to measure the participants' risk attitudes and other regarding preferences separately.

In the dictator game, a sender is told to receive an amount of money (100 euros in our case) and has to decide how much to transfer to a second anonymous player (receiver). After this decision, the game ends. Because there is no reply from the receiver, the sender does not send anything if she follows a purely self-regarding strategy. Therefore, deviations from the Nash equilibrium (non-zero transfers) are generally explained in terms of altruism or inequity aversion. Lastly, our risk aversion test is based on the mean preserving spread principle. It asks the participants to choose among six different lotteries that have distributions with the same mean value but ranked in ascending order of variance.[20]

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[19] Assuming that we-thinking players are also inequality averse, they will maximize and divide the team outcome in equal parts.

[20] In the literature, the test is traditionally considered to be the most easily understandable alternative to more complex experimental schemes that elicit risk and time preferences such as those of Andersen et al. (2008) and Holt and Laury (2002).

The dictator game and the risk aversion simulated experiments are proposed to extract variables that can be used as controls when trying to provide a rationale for trustors' transfer in the simulated trust game experiment. The experiment is presented through an online survey. For bridge players, it is managed by the official website of the Italian Bridge Federation, and it is managed by the Snai S.p.a. through a registration process for poker players. The respondents in both cases are affiliated regular players[21].

2.3.1 Database and descriptive evidence

The OS experiment sample comprises 1,414 poker and 836 bridge players who participated online to our mini-survey and simulated experiment.[22] The properties of the two groups are not balanced because the bridge players are 15-year older on average (approximately 56 years old vs. 41 years old for poker players) and contain a larger share of females players (26 vs. 7 percentage points) (see Table III). The observed age difference is consistent with evidence from the UK and the US (see footnote 5) and the observation by Akerlof and Shiller (2010) that bridge is becoming a game for the elderly.

Due to the imbalanced socio-demographic characteristics of our respondents, the robustness of the results from the standard parametric and non-parametric tests (section 3.2) will be checked with an econometric analysis by controlling for the influence of such factors (section 3.3) and a sensitivity analysis that tests the robustness of our findings for departures from the assumption of conditional independence of potential

[21] See Appendix A for a detailed description of the modalities of the experiment.

[22] The variable legend and descriptive statistics for the variables used in the empirical analysis are provided in Tables I and II, respectively.

outcomes and treatment assignment given observables (Conditional Independence Assumption, henceforth also CIA) (section 3.4).

2.3.2 Hypothesis testing

We test the following three null versus alternative hypotheses:

i)	*Trust*	H_{0A}: $TR^{Poker} = TR^{Bridge}$	*vs.*	H_{1A}: $TR^{Poker} < TR^{Bridge}$
ii)	*Risk aversion*	H_{0B}: $RA^{Poker} = RA^{Bridge}$	*vs.*	H_{1B}: $RA^{Poker} > RA^{Bridge}$
iv)	*Altruism*	H_{0C}: $Al^{Poker} = Al^{Bridge}$	*vs.*	H_{1C}: $Al^{Poker} > Al^{Bridge}$

Both the parametric and non-parametric tests document that the first null hypothesis is strongly rejected in the expected direction. The bridge players exhibit a significantly higher level of trust than the poker players in both the parametric (t-stat -4.00, p-value 0.000) and non-parametric tests (z-stat -2.63 p-value 0.008). In terms of magnitude, the difference is 7 points because the bridge players send on average 48 vs. 41 experimental units, that is, 17 percent more than the poker players' on average (see Table IV).

If we look at the distribution of choices, we find that most of the difference depends on what happens at the two extreme transfer choices (Figure IA). A far higher share of the bridge players follows team rationality by sending all (31 percent vs. 20 percent of poker players), but somewhat surprisingly, a higher share of the bridge players also sends zero even though the distance here is smaller (30 percent vs. 24 percent). This implies a strong rejection of the hypothesis that the share of team rational players is the same among bridge and poker players (non-parametric test z-stat -34.55, p-value 0.000 and parametric test t-stat -5.92, p-value 0.000) but also that the share of zero contributors is the same among bridge and poker players (z-stat 11.65 and p-value 0.003

in non-parametric test, t-stat -3.44 and p-value 0.002 in parametric test).[23] This evidence also indicates that bridge players' choices are much more polarized than poker players' choices (61 percent vs. 44 percent). As expected, the rejection of the null is even sharper in this case (z-stat 64.64 and p-value 0.000 in the non-parametric test, t-stat 8.15 and p-value 0.000 in the parametric test). Beyond polarized choices, the tendency of the bridge players to give more is reinforced by what happens in next-to-polarized choices where the bridge players chose transfers of 80 and 90 euros in a higher proportion than poker players and transfers in the range from 10 to 70 euros in a lower proportion (see Figure IA).

According to the literature on trust games (section 2), superior transfers of trustors have been interpreted in terms of lower risk aversion, higher pure or strategic altruism and higher inequity aversion. Our separate test of risk aversion shows that the bridge players are slightly less risk averse (non-parametric test z-stat 4.13, p-value 0.000 and parametric test t-stat -2.90, p-value 0.002). Furthermore, our test on "other regarding preferences" documents that the bridge players give significantly less in the dictator game where giving may be interpreted in terms of pure altruism or inequity aversion, but only the non-parametric test rejects the null at high levels of significance (non-parametric test z-stat 3.95, p-value 0.000 and parametric test t-stat 1.83, p-value 0.067). Here again, the result is strongly influenced by the fact that the bridge players' choices

[23] We approximate trustor giving with a continuous variable and therefore test the between-subject difference with the Mann-Withney test. For all the other dichotomous variables in Table 4, we test the differences in proportions with a Chi-square test. The difference between the poker and bridge players remains highly significant if we remove the simplifying assumption of continuity on trustor giving and test the difference of distributions.

are much more polarized, and the bridge players also have a higher share of zero contributors.

A first conclusion from these tests is that the bridge player trustors give significantly more but not because they are more altruistic or inequity averse. The econometric analysis that follows may help us to check whether our findings on trustor transfers are robust to confounding factors (older people and women are over-represented among the bridge players compared to the poker players as shown in Table III) and whether they are more or less significant once we control for risk aversion and dictator giving.

2.3.3 Econometric analysis

Our benchmark specification is

$$TrustorG_i = \alpha_0 + \alpha_1 DBridge_i + \sum_i \beta_i X_{it} + \varepsilon_i \quad (2.1)$$

where *TrustorG* is a measure of trustor giving, *DBridge* is a dummy that takes a value of one if the survey respondent is a bridge player (which implies that the respondent is a poker player when it is zero) and X are controls that include a gender dummy, age classes and (accordingly to the various specifications) a dummy for early responses,[24] our experimental measures of risk aversion and dictator giving, regional and province dummies and/or proxies of education and social capital.[25]

The relevant additional contribution of the regression analysis is in the possibility of controlling for factors that affect differences in the trustors' transfers after controlling

[24] The survey for bridge players was launched on July 2012 and remained online until the end of September. The dummy gives a value of one to those answering before the midterm.

[25] Details on the construction of the age classes and the regional and province dummies are provided in Table 1.

for the impact of risk aversion, pure altruism and inequity aversion. In Table V, the dependent variable is the trustor's giving, and the specifications are estimated using ordered logit. Standard errors are clustered at the province level. We first include only gender and age as controls (column 1) then add experimental measures of risk aversion and dictator giving (column 2), (20-1) region or province dummies[26] (columns 3 and 4) and experimental measures plus region or province dummies as additional regressors (columns 5 and 6). We finally replace the province dummies with proxies of human and social capital at the province level (column 7).[27]

The findings illustrated in Table V document that the bridge dummy variable is always significant. This implies that the bridge effect is larger once we control for risk aversion and dictator giving (the latter presumably captures both pure altruism and inequity aversion). This is consistent with our original hypothesis that bridge players are more trained to we-thinking and team-thinking, that is, they do not give more due to higher altruism, inequity aversion or lower risk aversion. Regarding the significance of other regressors, note that our proxy of social capital at the province level in column 7 (the number of social cooperatives) is positive and significant, which is consistent with what can be assumed on theoretical grounds about the relationship between social capital and trustor giving. Human capital is also shown to affect our dependent variable because the provincial share of those with higher than an intermediate education is positive and significant.

[26] In Italy, there are 20 administrative regions that encompass 110 provinces (smaller administrative areas that roughly coincide with the biggest urban areas).

[27] We use the province population's share of inhabitants with higher than an intermediate school degree as a proxy of human capital and the number of cooperatives and the number of donations in the province as a proxy of social capital.

In Table VI, we take our test on the relationship between bridge and team rationality as a reference. Therefore, we estimate a probit model where the dependent variable is a dummy that takes a value of one if the trustor follows team rationality (gives all) and zero otherwise. The controls are arranged as in Table I in the seven specifications. Our findings document that playing bridge raises the probability of being a team maximizer by 10-11 percentage points, which is consistently with what was found descriptively, and the same probability is increased by 14-15 percentage points when we control for risk aversion and dictator giving (Table VI, columns 2, 5 and 6).

In Table VII, we replace the dummy that picks up the top extreme choice with a *Polarized* dummy that picks up both (top and down) extreme choices. As expected, the *Bridge* dummy grows both in significance and magnitude (adding 19 percent to the probability of making polarized choices).

In summary, our empirical analysis highlights three strong results that are robust in both the parametric tests, non-parametric tests and regression analysis once we controlled for additional confounding factors: i) bridge players choose the top extreme choice, which is the optimal choice when both players follow team rationality (and assume that also the counterpart will do so), in a significantly higher proportion; ii) bridge players are significantly more polarized on the two extreme choices (maximum or zero contribution). These findings support our hypothesis that the bridge game is associated with a significantly higher amount of we-thinking or team rationality. However the findings also show some apparently counterintuitive evidence by documenting that the poker players are zero contributors at a significantly lower rate. Hence, the poker players do not seem to behave like irresponsible gamblers or to act

more selfishly than the bridge players, but they act less cooperatively, as is the nature of the game.

2.3.4 Discussion of our results and sensitivity analysis

The absence of an ex ante random selection of participants to the two bridge and poker player groups prevents us from knowing whether our results depend on the impact of the game characteristics on the players' preferences or on a selection bias that brings individuals with higher social capital to become bridge rather than poker players. In such a case, the shift in the share of bridge to poker players should not be considered the cause but a signal of a change in preferences (reduction of team or we-reasoning), which may be caused by other factors. To clarify this point, we propose a sensitivity analysis to see whether the observed correlation is robust when we remove the conditional independence assumption and simulate the effect of a confounder that is correlated with both the treatment and the outcome.

A key assumption for the validity of our main result in identifying a causality nexus from the (poker or bridge) activity to individual preferences relies on the CIA. This means that what leads individuals to become bridge or poker players must be independent from the outcome we intend to observe (trustor transfer). We are aware that this is not necessarily the case in our empirical analysis. There may be factors, such as family education, that drive both the decision to become a bridge player and the observed outcomes of our simulated experiment.

To evaluate whether and to what extent the observed difference between the bridge and poker players is robust to deviations from the CIA, we perform the Ichino et al.

(2008) sensitivity analysis[28]. This can be done by modelling a "confounder" (an additional unobservable binary variable) and, more specifically, the probabilities of the effect of such a variable on our data when it is used as an additional covariate in the matching regression[29].

This approach requires the transformation of our outcome variable into a dichotomous variable. Given that our two sharper results are on the share of trustors giving all (team or we-thinking trustors) and on the trustors making polarized choices, we decide to perform our sensitivity analysis on the polarized dummy variable. The baseline effect of the bridge dummy on polarized choices is 0.175 and is highly significant (WSE: 0.022, t-stat 8.01).

Our findings document that the bias is small and the simulated Average Treatment Effect on Treated (ATT) remains positive and significant in all of the performed simulations (Table VIII). The ATT remains strongly significant for any simulated confounder even under the extreme assumption that the probability of coming from a highly educated family is 50 percent higher for bridge players who follow polar strategies than for those who do not follow them (*maximum simulated outcome effect for the treated*). Our main findings remain robust even when we remove the assumption that the confounder does not modify the odds for the poker players. Under the most unfavorable scenario, we assume that the probability of coming from a highly educated family is 30 percent higher for poker players who follow polar strategies than for those who do not follow polar strategies (*maximum simulated outcome effect for the control*). The robustness of our results is also confirmed when there is a 30 probability point

[28] See also Rosenbaum and Rubin (1983), Imbens (2004) and Blatmann and Annan (2010).

[29] See Appendix B for further details on the sensitivity analysis.

difference between being a bridge player and being a poker player when coming from a highly educated family (p1.-p0.) (*maximum simulated effect of the confounder on selection into treatment*).

The probability differences assumed for our killer confounders are by far larger if compared with the same conditional probabilities for observables (male gender, age above median, dummy for early respondents), which therefore produce even smaller biases (Table VIII, first three rows)[30]. This gives us additional confidence in the robustness of our findings for reasonable deviations from CIA.

2.4 The incentivized experiment

We wonder whether the results from the online simulated experiment are reliable and correspond to what would have happened in an experiment with monetary payoffs. To test this, we build an additional experiment with monetary payoffs where both the trustors and trustees are endowed with 10 euros. The goal of our additional experiment with monetary payoffs is twofold: i) testing whether the results of our null hypotheses of no difference between the bridge and poker players (which was rejected in the simulated experiment) are confirmed; ii) testing whether behavior in the online simulated experiment is a good predictor of behavior in the experiment with monetary payoffs.

To implement the incentivized experiment, we plan two different sessions for bridge and poker players and adopt the same protocol as in the non-incentivized experiment

[30] Under this assumption, the largest difference in terms of maximum simulated outcome for the treated or the control group (d1 or d0) is slightly less than .10, but for our killer confounders we consider a much wider difference (up to 0.6 percent).

(with the exception of the monetary payoff and a proportionally reduced endowment). We introduce the monetary payoffs explicitly by informing the respondents that they would collect one of the realized payoffs randomly at the end of the session. The questionnaire is administered after the experiment to avoid framing effects and coincide with that of the non-incentivized experiment (with questions in the same order) with the exception of the additional final questions on the years of bridge and poker experience.

We run the experiment on 150 experimental units for each card game (poker and bridge) group, and within each group we split the sample into 75 trustor and 75 trustee participants.

Expert bridge players were selected during the Italian national championship in March 2013 at Salsomaggiore Terme (Parma). The experiment session was organized in the hall of the building in a setting in which the respondents had the possibility to sit down without looking at each other's answers. The session took place during the registration procedures, before the beginning of the matches; it started at 9 AM and lasted until 2 PM. The players were solicited to participate in the experiment, provided with the experiment instructions and, answered the questionnaire after they played. The overall amount of liquidated payoffs was € 1,531, and a participant earned €10.21 on average.

There is no official national (or regional) poker competition in Italy. The poker events that are most similar to an official championship are tournaments organized by the largest private clubs in which the best players usually participate. Private tournaments follow the standard rules of the game, with real monetary stakes and a participation fee. Given the private nature of the tournament, the entry fee and the monetary stakes, the probability that an occasional player would participate in our

experiment was extremely low. The poker players' experiment was run in two distinct sessions, which were organized in two of the largest poker rooms in Rome[31]: the "*Mirage*" on April, 20th 2013 and the "*Cotton Club*" on July, 5th 2013. The experiment took place outside the playing room in the hall of the two clubs and started at 10 PM. before the beginning of the tournament and lasted until 1 AM. Players were solicited to participate in the experiment during the registration procedure[32]. At the end of the sessions, all of the payoffs were liquidated for an overall amount of € 1,277; a participant earned € 8.18 on average.

2.4.1 The monetary payoff experiment (MPE) sample

The characteristics of the MPE sample are quite similar to those of the OSE sample. As in the OSE sample, the bridge players are older (57.6 against 41.3) and more gender balanced than the poker players (53.3 percent male players against 87.3 percent) (Tables IX-X). The average years of bridge experience was 25.2 for the bridge players, and the average years of poker experience was 11.6 for the poker players. Approximately 7 percent of the bridge players also play poker, and their average poker experience is approximately 26.29 years. On the contrary, only 8.67 percent of the poker players also play bridge, and their average bridge experience is 6.15 years. The impact of game "fuzziness" (that is, the fact that the bridge and poker player's identities are not

[31] Rome and Milan are the two largest and most important cities in which poker is played in Italy. Hence, players go there from all over the country to compete with the best Italian players.

[32] As in the bridge tournaments, the registration in private poker rounds is when the entry fees are paid and (unlike bridge) the monetary stakes (fiches) are bought.

mutually exclusive) and the years of game experience on our findings will be dealt with in our econometric analysis.

2.4.2 Players' behavior and hypothesis testing in the MPE

Even though the number of observations in the MPE sample is far smaller, we observe results that are strikingly similar to those of the OSE sample (Figure IB). That is, we find a significant difference in terms of the trustor giving polar attitudes as a sum of the share of zero and maximum contributors (those following self-regarding rationality with self-regarding rationality being common knowledge or those following team rationality with team rationality being common knowledge) (Table XII). More specifically, we find that 34.6 percent of the bridge players (vs. 26.6 percent of the poker players) follow team rationality. This 8 percent difference is strikingly similar to the 11 percent difference found in the OSE experiment, and shares of team players in the two subgroups are also not so distant in absolute value from those of the MPE (31 and 20 percent, respectively). The bridge players also lead in terms of share of zero contributors in the MP experiment as in the OS experiment (22.7 vs. 12 percent). Note, that the distance was slightly smaller in the OS experiment (6 vs. 10 points), with the use of real money reducing the total share of zero contributors by more than 10 percent in both the bridge and poker subsamples. The far lower number of observations we have in the MP experiment prevents the difference in zero and maximum contributors from being statistically significant in the parametric and non-parametric testing. However, the difference in terms of polar attitudes (sum of zero and maximum contributors) is much more remarkable (57.3 vs. 38.7) and statistically significant (non-parametric test z-stat 5.24, p-value 0.02 and parametric test t-stat -2.31, p-value 0.02).

2.4.3 Econometric findings in the MPE

In the MP experiment and like in the OS experiment, the poker players are younger and are males to a higher proportion, which reflects the respective differences of the populations in the two games. A further test on the significance of the behavioral differences between the bridge and poker players will be provided by an econometric analysis that controls for the influence of such factors and for the players' "fuzziness" and game experience.

We start our econometric analysis with the following specification:

$$Y_i = \alpha_0 + \alpha_1 DBridge_t + \sum_i \beta_i X_{it} + \varepsilon_i \quad (2.2)$$

where the dependent variable Y_i is, in three different probit specifications, a 0/1 dummy that takes a value of one if the trustors i) send the maximum contribution, ii) send zero or iii) play polar (either choice i or ii). In a fourth and final ordered probit specification, the dependent variable is a qualitative discrete variable that measures the amount sent by the trustor.

The X vector of controls in the specification includes a Male dummy, Age class dummies calculated as in the non-incentivized experiment, *Dictator* (a variable that measures the amount sent by the player in the dictator game) and *Riskav* (our experimental measure of risk aversion). The province fixed effects are controlled for and the standard errors are clustered at the province level.

In a first simpler specification, we add the bridge player dummy (*Dbridge*), which takes a value of one if the participant is a bridge player, to this set of regressors. The empirical findings document that being a bridge player significantly raises the

probability of choosing a polar strategy as a trustor (Table XII, column 1). In terms of magnitude, the result is stronger than what was found descriptively. Being a bridge player also significantly raises the probability of choosing a team strategy (on which being male and the amount sent in the dictator game both have positive and significant effects) (Table XII, column 3).[33] The bridge dummy is also positive and significant in the final ordered probit estimate in which the dependent variable is trustor giving (Table XII, column 4). Additionally, male gender and dictator giving also have a positive impact. As already mentioned, information collected in the MPE allows us to control (differently from what happened in the OSE) for "game fuzziness." Therefore, we estimate a second specification in which we add a dummy for bridge players who also play poker (7.3 percent of the sample). The dummy is not significant and the significance of our main finding is substantially unchanged with the magnitudes becoming slightly larger and the significance of the impact on trustor giving becoming stronger (Table XII, columns 5-8). In our final specification, we finally fully account for game fuzziness and game experience problems by replacing our dummies with two variables that measure years of bridge experience and years of poker experience, respectively. With these new estimates, we find that one year of bridge experience significantly raises the probability of becoming a polar player by approximately 3.6

[33] The gender and age effects contribute to explain the different magnitude of the impact of the bridge dummy in the parametric (non-parametric) testing and in the econometric estimates: once we control for the fact that young and male trustors are more likely to be maximum contributors, the impact of bridge player (where males are significantly less and players are older) on the same dependent variable is stronger. We further check whether our magnitudes are affected by multicollinearity by calculating the VIF factor (Marquardt, 1970) of the estimate and find that this is not the case with VIF always being below 5.

percent and the probability of becoming a team player by approximately 2.2 percent (Table XII, columns 9-12).

The significant relationship between bridge experience and polar strategies seems to indicate that the nexus we observe cannot be solely explained by a causality link that goes from preferences to game selection. In a final robustness check on our main findings, we find that our main results are unchanged when we modify our benchmark specifications from Table XII by i) introducing regional dummies, ii) replacing the age classes with a continuous age dummy without regional dummies, iii) replacing the age classes with a continuous age dummy with regional dummies, or iv) replacing the regional and provincial dummies with the social and human capital variables used in Tables V-VII, column 7.[34]

We repeat the sensitivity analysis on the polar dummy using exactly the same simulation criteria reported in section 3.4. Again, the effect of the polar dummy remains strongly significant as documented by the ratio between the ATE and the WSE (i.e., 0.90 and 0.025, respectively, when the confounder is calibrated based on the male dummy correlation), which is far larger than the 99 percent significant threshold in all of the simulations (Table XIII). As with the OSE, the bias simulated with killer confounders is much larger than that calibrated on observables, and the main finding remains robust under the more extreme perturbations considered in the simulation exercise. Significance is confirmed in all of the sensitivity analyses.

[34] The results are omitted for reasons of space but are available upon request.

2.5 Conclusions

Our research provides new evidence for the nexus between game experience and preferences. We show with an online simulated experiment (OSE) and a second experiment with monetary payoffs (MPE) that bridge players choose significantly more polar (and team) strategies than poker players when playing as trustors in trust games. Our findings are significant when controlling for "game fuzziness" (a few bridge players also play poker and vice versa) and years of game experience in the MPE. The results are reinforced by finding in the MPE that any additional year of bridge experience significantly raises the probability of choosing team strategies. A related important finding of our research is that results from the OSE predict the results from the MPE reasonably well in terms of our main finding providing interesting evidence on the usually questioned issue (see Rubinstein, 2007 among others) of the unbiasedness/biasedness of non-incentivized experiments.

Our findings may partially shed light on the argument set forth by Akerlof and Shiller (2010) (an argument that inspired our research) about whether the switch from playing bridge to playing poker in the US may be related to a reduction in social skills and to the shift in financial agents' practices, which lie at the root of recent financial crises and scandals. The paper's results are mixed in this respect. We find confirmation that bridge practice is (and years of bridge experience are) significantly associated with more cooperative behavior. However, we also find that bridge play is significantly associated with purely self-regarding behavior (even though not significantly so in the econometrics of the incentivized experiment). The combination of these two findings is that bridge players choose markedly more polar strategies, which is the stronger result and encompasses the previous two. The reason bridge players are more "aut-aut"

players (that is, they stick to an extreme cooperative or purely self-regarding behavior) calls for future research and discussion.

APPENDIX A - The simulated experiment and the questionnaire

The following questionnaire was proposed to the bridge players over the period of July 15 –September 30, 2012 via the official web site of the Italian Bridge Federation (FIGB), which counts 24,900 affiliates, all of whom are identified by a code number that is necessary to play official competitions at the club, national and international level. Such a code is also necessary to play in the bridge tournaments that organized online daily by the American Contract Bridge League. The total number of respondents was 843.

The questionnaire was proposed to the poker players from July 9th to July 31st 2012 by SNAI via a secure system developed for them by the specialized firm Problem Free Limited.

Registered poker players, all of whom are identified by their social security number, could see the popup that proposed the questionnaire once they logged into the secure playing platform. The sample of respondents was 1,401.

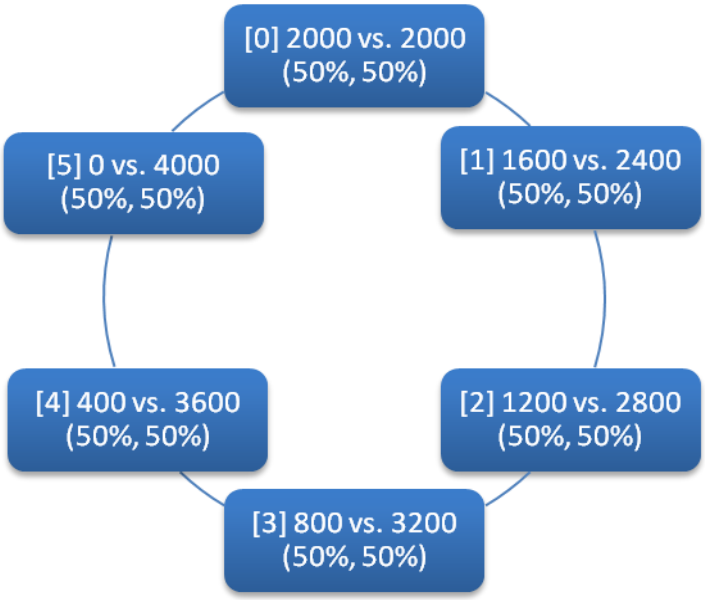
The questionnaire:

1. Sex M F

2. Age

3. Choose which of the "head or tail" lotteries shown below you prefer to participate in [indicate the number in square brackets]

For each lottery, we indicate in round brackets the probability of the above indicated win. This is a "head or tail" lottery, where each of the two outcomes has a 50 percent probability of occurring (i.e., lottery [3] indicates that, by choosing this lottery, you have a 50 percent probability of winning 800 euros and a 50 percent probability of winning 3200 euros).



4. Assume you are given 100 euros and you can choose how much of this amount (between 0 and 100) you will give to an anonymous player. The amount sent will be multiplied by 3 (i.e., if you send 10, it will become 30; if you send 100, it will become 300) and given to the anonymous player. At this point, the anonymous player will decide how much to send back to you. He will not know your identity. After this choice, the game ends.

   How much would you give? Please choose one among the following:

   0 – 10 – 20 – 30 – 40 – 50 – 60 – 70 – 80 – 90 – 100

5. Assume you are given 100 euros and you can choose how much of this amount (between 0 and 100) you will give to an anonymous player. After this choice, the game ends.

   How much would you give? Please choose one among the following:

   0 – 10 – 20 – 30 – 40 – 50 – 60 – 70 – 80 – 90 – 100

APPENDIX B – Sensitivity Analysis

The sensitivity analysis allows us to assess the extent to which our baseline ATT (see section 3.4) is robust to the exclusion of a potential confounder that might have different characteristics.

The distribution of the confounder *U* is then described on the basis of four choice-parameters:

$$p_{ij} = Pr(U = 1|T = i, Y = j) = Pr(U = 1|T = i, Y = j)$$

with $i, j = \{0, 1\}$, where Y is the outcome (that is, the binary transformation of the outcome for continuous outcomes, which is the probability of team or polarized rationality in our case) and T is the binary treatment (T=1 equals being a bridge player).

In this way, we can model each simulation parameter p_{ij} as representing the probability that U=1 if T=i and Y=j.

We conveniently conceive our potential confounder as a trait that makes individuals more likely to become bridge players (T=1) and, at the same time, more likely to make polarized choices in the trust game (Y=1). An example of this is family education which could increase both the probability of selection into treatment (becoming a bridge player) and outcome (behaving as a polarized player, that is, choosing the maximum or the minimum). If we define our outcome variable as *POLARIZED*, a reasonable way to model the distribution of the confounder is by setting

i) $p_{11} > p_{10}$, so that $Pr(U = 1|\ Bridge = 1|Polarized = 1) > Pr(U = 1|\ Bridge = 1|Polarized = 0)$, which implies that the probability of coming from a highly educated family is higher for bridge players who follow polarized choices than for bridge players who do not follow polarized choices;

ii) $p_{01} = p_{00}$, so that $Pr(U = 1|\ Bridge = 0\ |Polarized = 1) = Pr(U = 1|\ Bridge = 0|Polarized = 0)$, which implies that the probability of coming from a highly educated family is the same for poker players who follow polarized choices as for poker players who do not follow polarized choices;

iii) $p_{1.} > p_{0.}$, so that $Pr(U = 1|Bridge = 1) > Pr(U = 1|Bridge = 0)$, which implies that the probability of coming from a highly educated family is higher for bridge players than for poker players. In other words, the confounder has a positive effect on the treatment assignment.

Following Ichino et al. (2008), we define $d_1 = p_{11} - p_{10}$, $d_0 = p_{01} - p_{00}$ and $s = p_{1.} - p_{0.}$ to characterize the sign of the bias when estimating the baseline ATT (i.e., computed when *U* is not in the matching set). In our framework, we look at cases in which $d_1 > 0$ and $d_0 = 0$ (*positive effect of U on treated outcome and no effect of U on the untreated outcome*) and $s > 0$ (*positive effect of U on selection*). In this way, it is possible to identify the levels of d_1 and *s* that produce an estimated ATT substantially different from the baseline ATT and discuss the extent to which the existence of a "killer" confounder with these characteristics is plausible.

The results are reported in Table VIII for the online simulated experiment and in Table XII for the experiment with monetary payoffs, and they include simulations where the maximum d_1 is 0.6 and the maximum d_0 is 0.3.

All of the tables report values for s, the new ATT, the percent bias (calculated as the difference between the baseline ATT and the simulated ATT scaled on the original ATT), and the within estimated standard error (WSE).

TABLE I.
VARIABLE LEGEND

Male	Dummy that takes a value of one if the respondent is male
Trustor transfer	Amount sent by the trustor in the simulated trust game
Dictator giving	Amount sent by the sender in the simulated dictator game
Risk aversion	Lottery chosen in the risk aversion test based on the mean preserving spread principle (see Appendix A). The six lotteries have the same mean and are ranked on the basis of ascending order of variance (i.e., 0=lowest risk aversion,..,5= highest risk aversion)
Early response	Dummy for early respondents (responses before midterm) in the online survey
Above intermediate education	Share of inhabitants above 15 years old with more than an intermediate school degree at the province level
Donations	Total amount of officially registered donations in the province (thousands of euros)
Social cooperatives	Number of social cooperatives created at the province level

TABLE II. DESCRIPTIVE STATISTICS – SIMULATED EXPERIMENT

Variables	N. of obs.	Mean	S.Dev.	Min.	Max.
Male	2250	0.861	0.346	0	1
Age	2249	46.319	14.129	18	100
Risk aversion	2250	4.711	1.714	1	6
Trustor giving	2250	43.462	38.113	0	100
Early response	2250	0.537	0.499	0	1
Above intermediate education	2232	44.742	6.604	35.206	57.17
Donations	2232	16.995	5.871	6.8	31.9
Social cooperatives	2232	21.147	21.285	0	65

Variable legend: see Table I

TABLE III.
CHARACTERISTICS OF BRIDGE AND POKER PLAYERS – SIMULATED EXPERIMENT

Variables	Bridge Players (1) (Means)	Poker Players (2) (Means)	Non parametric test* H_0: (Poker) = (Bridge) (P-value)	Parametric test T- test H_0: (Poker) = (Bridge) (P-value)
MALE	74.2	93.21	159.60 (0.00)	13.10 (0.00)
AGE	55.75	40.73	-25.11 (0.00)	-28.39 (0.00)

*For continuous variables (Age) we test - through nonparametric statistics - between-subject differences by using the Mann-Whitney test. For dichotomous variables (Male) we use the Chi square test to analyse the differences in proportions

TABLE IV. HYPOTHESIS TESTING (DIFFERENCES BETWEEN GROUPS) – SIMULATED EXPERIMENT

Variables	Bridge Players (1) (Means)	Poker Players (2) (Means)	Non parametric test* H_0: (1) = (2) (P-value)	Parametric test T- test H_0: (1) = (2) (P-value)
TRUSTOR GIVING	47.63	41.00	-2.63 (0.008)	-4.00 (0.000)
MAXIMUM CONTRIBUTORS (%) (A)	30.98	20.01	-34.55 (0.000)	-5.92 (0.000)
Zero contributors (%) (b)	30.26	23.69	11.65 (0.000)	-3.44 (0.002)
Polarized (%) (a+b)	61.24	43.60	64.64 (0.000)	8.15 (0.000)
Risk aversion	4.838	4.01	4.13 (0.000)	-2.896 (0.002)
Dictator giving	18.82	21.31	3.95 (0.000)	1.83 (0.067)

*For (approximated) to continuous variables such as trustor giving we test - through nonparametric statistics – between subject differences by using the Mann-Whitney test. For dichotomous variables (all the other variables) we use the Chi square test to analyse the differences in proportions.

TABLE V.
TRUSTOR GIVING (ORDERED PROBIT ESTIMATE) – SIMULATED EXPERIMENT*

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male	0.0162	0.139***	0.0230	0.0287	0.139***	0.136**	0.144***
	(0.0540)	(0.0528)	(0.0536)	(0.0601)	(0.0528)	(0.0573)	(0.0526)
30-40 age class	0.167*	0.149	0.168*	0.178*	0.141	0.141	0.146
	(0.0872)	(0.0942)	(0.0889)	(0.0931)	(0.0961)	(0.101)	(0.0962)
40-50 age class	0.259***	0.208***	0.262***	0.279***	0.202***	0.215***	0.198***
	(0.0671)	(0.0655)	(0.0654)	(0.0674)	(0.0654)	(0.0684)	(0.0643)
50-60 age class	0.221***	0.0894	0.225***	0.231***	0.0869	0.0801	0.0809
	(0.0718)	(0.0778)	(0.0714)	(0.0735)	(0.0776)	(0.0824)	(0.0782)
60-70 age class	0.181*	0.0533	0.179*	0.174*	0.0500	0.0389	0.0417
	(0.0926)	(0.0903)	(0.0938)	(0.0949)	(0.0921)	(0.0933)	(0.0902)
70-80 age class	-0.0421	-0.274*	-0.0429	-0.0523	-0.264*	-0.279*	-0.277*
	(0.135)	(0.149)	(0.135)	(0.136)	(0.149)	(0.150)	(0.151)
Above 80 age class	0.0533	-0.103	0.0580	-0.0174	-0.102	-0.135	-0.129
	(0.400)	(0.275)	(0.401)	(0.441)	(0.264)	(0.296)	(0.266)
Bridge	0.108**	0.265***	0.122**	0.130**	0.269***	0.269***	0.261***
	(0.0546)	(0.0512)	(0.0567)	(0.0583)	(0.0523)	(0.0550)	(0.0511)
Early response			-0.0419	-0.0323	0.0180	0.0234	0.0197
			(0.0407)	(0.0431)	(0.0453)	(0.0480)	(0.0450)
Risk aversion					-0.0147	-0.0173	-0.0152
					(0.0140)	(0.0142)	(0.0143)
Dictator giving					0.0185***	0.0189***	0.0184***
					(0.000956)	(0.00106)	(0.000944)
Above Intermediate Education							0.00160
							(0.00174)
Donations							0.00423
							(0.00424)
Social cooperatives							0.00223**
							(0.000938)
Province dummies	NO	NO	NO	YES	NO	YES	NO
Region dummies	NO	NO	YES	NO	YES	NO	NO
Observations	2,238	2,238	2,238	2,238	2,238	2,238	2,231

*Intercept cut coefficients and standard errors are omitted for reasons of space and available upon request

TABLE VI.
THE DETERMINANTS OF THE MAXIMUM TRUSTOR GIVING CHOICE

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male	0.0589***	0.0630***	0.0691***	0.0877***	0.0889***	0.0935***	0.0894***
	(0.0217)	(0.0204)	(0.0215)	(0.0189)	(0.0178)	(0.0182)	(0.0180)
30-40 age class	0.104**	0.0995**	0.111**	0.0903**	0.0842**	0.0944**	0.0899**
	(0.0406)	(0.0403)	(0.0448)	(0.0434)	(0.0425)	(0.0476)	(0.0443)
40-50 age class	0.118***	0.113***	0.131***	0.0912***	0.0838**	0.103***	0.0900***
	(0.0356)	(0.0343)	(0.0382)	(0.0346)	(0.0335)	(0.0374)	(0.0345)
50-60 age class	0.127***	0.119***	0.129***	0.0757**	0.0678*	0.0724*	0.0731*
	(0.0347)	(0.0342)	(0.0378)	(0.0369)	(0.0366)	(0.0401)	(0.0377)
60-70 age class	0.102**	0.0894**	0.0949**	0.0523	0.0406	0.0428	0.0460
	(0.0408)	(0.0395)	(0.0426)	(0.0401)	(0.0391)	(0.0418)	(0.0396)
70-80 age class	0.0399	0.0311	0.0206	-0.0270	-0.0299	-0.0400	-0.0304
	(0.0478)	(0.0459)	(0.0480)	(0.0519)	(0.0500)	(0.0505)	(0.0512)
Above 80 age class	0.0471	0.0456	-0.0313	-0.0128	-0.0171	-0.0631	-0.0210
	(0.134)	(0.131)	(0.103)	(0.0829)	(0.0802)	(0.0679)	(0.0781)
Bridge	0.110***	0.117***	0.124***	0.154***	0.158***	0.164***	0.155***
	(0.0201)	(0.0211)	(0.0235)	(0.0191)	(0.0195)	(0.0218)	(0.0195)
Early response		-0.0277	-0.0285		-0.0127	-0.0147	-0.0128
		(0.0183)	(0.0199)		(0.0187)	(0.0204)	(0.0189)
Risk aversion				-0.000242	3.65e-05	-0.00166	-0.000104
				(0.00538)	(0.00509)	(0.00527)	(0.00538)
Dictator giving				0.00404***	0.00399***	0.00419***	0.00403***
				(0.000281)	(0.000293)	(0.000329)	(0.000288)
Above Intermediate Education							0.00189**
							(0.000891)
Donations							0.00274
							(0.00194)
Social cooperatives							0.00111**
							(0.000432)
Province dummies	NO	NO	NO	YES	NO	YES	NO
Region dummies	NO	NO	YES	NO	YES	NO	NO
Constant	-1.312	-6.966	-7.026	-1.701	-7.459	-7.492	-2.187
	(0.12)	(0.23)	(0.16)	(0.16)	(0.17)	(0.18)	(0.29)
Observations	2,238	2,238	2,166	2,238	2,238	2,166	2,231
Pseudo_R-squared	0.0218	0.0307	0.0541	0.1108	0.1192	0.1455	0.1133
Log pseudolikelihood	-1209.70	-1198.71	-1150.57	-1099.57	-1089.27	-1039.33	-1094.81

Notes: Dependent variable is 1 if transfer=100 or zero otherwise .

Variable legend: see Table I. Standard errors in parentheses are clustered at province level . *** p<0.01, ** p<0.05, * p<0.1. Age class: the omitted benchmark is the age class below 30.

TABLE VII.
THE DETERMINANTS OF THE TRUSTOR POLARIZED CHOICES – SIMULATED EXPERIMENT

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male	0.135***	0.140***	0.149***	0.134***	0.139***	0.148***	0.134***
	(0.0282)	(0.0275)	(0.0283)	(0.0282)	(0.0276)	(0.0282)	(0.0275)
30-40 age class	0.0701*	0.0639*	0.0678*	0.0706*	0.0647*	0.0685*	0.0674*
	(0.0384)	(0.0387)	(0.0412)	(0.0388)	(0.0391)	(0.0416)	(0.0387)
40-50 age class	0.0561*	0.0476	0.0554	0.0556*	0.0473	0.0548	0.0544*
	(0.0326)	(0.0325)	(0.0346)	(0.0329)	(0.0329)	(0.0351)	(0.0331)
50-60 age class	0.0742**	0.0610*	0.0655*	0.0762**	0.0631*	0.0673*	0.0729**
	(0.0343)	(0.0341)	(0.0374)	(0.0342)	(0.0341)	(0.0372)	(0.0349)
60-70 age class	0.0524	0.0409	0.0446	0.0533	0.0418	0.0452	0.0461
	(0.0393)	(0.0392)	(0.0419)	(0.0402)	(0.0401)	(0.0427)	(0.0403)
70-80 age class	0.0548	0.0472	0.0357	0.0572	0.0492	0.0370	0.0518
	(0.0701)	(0.0697)	(0.0735)	(0.0714)	(0.0712)	(0.0749)	(0.0718)
Above 80 age class	0.0364	0.0264	-0.0499	0.0335	0.0234	-0.0549	0.0282
	(0.156)	(0.162)	(0.165)	(0.153)	(0.159)	(0.162)	(0.158)
Bridge	0.192***	0.193***	0.196***	0.189***	0.190***	0.194***	0.187***
	(0.0257)	(0.0269)	(0.0293)	(0.0260)	(0.0272)	(0.0294)	(0.0268)
Early response		-0.0191	-0.0209		-0.0207	-0.0222	-0.0235
		(0.0234)	(0.0245)		(0.0231)	(0.0241)	(0.0230)
Risk aversion				0.00582	0.00593	0.00555	0.00588
				(0.00550)	(0.00536)	(0.00558)	(0.00552)
Dictator giving				-0.000290	-0.000290	-0.000231	-0.000303
				(0.000377)	(0.000370)	(0.000390)	(0.000372)
Above Intermediate Education							0.000954
							(0.00104)
Donations							0.00284
							(0.00208)
Social cooperatives							0.000639
							(0.000531)
Province dummies	NO	NO	YES	NO	NO	YES	NO
Region dummies	NO	YES	NO	NO	YES	NO	NO
Observations	2,238	2,238	2,214	2,238	2,238	2,214	2,231
Pseudo_R-squared	0.0218	0.0307	0.0541	0.1108	0.1192	0.1455	0.1133
Log pseudolikelihood	-1209.70	-1198.71	-1150.57	-1099.57	-1089.27	-1039.33	-1094.81

Notes: Dependent variable is 1 if transfer=100 or zero otherwise .

Variable legend: see Table I. Standard errors in parentheses are clustered at province level . *** p<0.01, ** p<0.05, * p<0.1. Age class: the omitted benchmark is the age class below 30.

TABLE VIII.
SENSITIVITY OF THE *POLARIZED* EFFECT TO DEPARTURES FROM THE CIA ASSUMPTION – SIMULATED EXPERIMENT

Assumptions	p_{11}	p_{10}	p_{01}	p_{00}	$p_{1.}$	$p_{0.}$	S	d_0	d_1	Bias %	ATE	Selection effect (Odds)	Outcome Effect (Odds)	WSE
Confounders calibrated on observables														
Male	0.79	0.75	0.95	0.93	0.77	0.94	-0.17	0.04	0.02	-0.0857	0.19	0.226	1.505	0.025
Ageabmedian	0.82	0.82	0.41	0.32	0.82	0.36	0.46	0	0.09	0.2514	0.131	8.22	1.484	0.028
Early response	0.7	0.66	0.5	0.56	0.68	0.53	0.15	0.04	-0.06	-0.0514	0.184	1.906	0.793	0.022
Killer confounders														
Killer confounders	0.6	0.5	0.5	0.2	0.56	0.33	0.23	0.1	0.3	0.434	0.099	2.589	4.016	0.024
	0.7	0.5	0.5	0.2	0.62	0.33	0.29	0.2	0.3	0.549	0.079	3.344	4.023	0.025
	0.8	0.5	0.5	0.2	0.68	0.33	0.35	0.3	0.3	0.669	0.058	4.408	4.026	0.026
	0.6	0.4	0.5	0.2	0.52	0.33	0.19	0.2	0.3	0.366	0.111	2.221	4.056	0.024
	0.7	0.4	0.5	0.2	0.58	0.33	0.25	0.3	0.3	0.480	0.091	2.86	4.031	0.025
	0.8	0.4	0.5	0.2	0.64	0.33	0.31	0.4	0.3	0.600	0.07	3.692	4.045	0.026
	0.6	0.3	0.5	0.2	0.48	0.33	0.15	0.3	0.3	0.291	0.124	1.902	4.026	0.023
	0.7	0.3	0.5	0.2	0.54	0.33	0.21	0.4	0.3	0.406	0.104	2.426	4.043	0.024
	0.8	0.3	0.5	0.2	0.61	0.33	0.28	0.5	0.3	0.057	0.165	3.133	4.054	0.025
	0.6	0.2	0.5	0.2	0.44	0.33	0.11	0.4	0.3	0.217	0.137	1.625	4.044	0.023
	0.7	0.2	0.5	0.2	0.51	0.33	0.18	0.5	0.3	0.331	0.117	2.077	4.014	0.023
	0.8	0.2	0.5	0.2	0.57	0.33	0.24	0.6	0.3	0.446	0.097	2.653	4.046	0.024
	0.6	0.5	0.5	0.5	0.56	0.50	0.06	0.1	0.0	0.000	0.175	1.284	1.000	0.022
	0.7	0.5	0.5	0.5	0.62	0.50	0.12	0.2	0.0	0.000	0.175	1.656	1.004	0.022
	0.8	0.5	0.5	0.5	0.68	0.50	0.18	0.3	0.0	0.000	0.175	2.172	1.012	0.023
	0.6	0.5	0.5	0.4	0.56	0.44	0.12	0.1	0.1	0.063	0.164	1.612	1.503	0.022
	0.7	0.5	0.5	0.4	0.62	0.44	0.18	0.2	0.1	0.097	0.158	2.079	1.508	0.023
	0.8	0.5	0.5	0.4	0.68	0.44	0.24	0.3	0.1	0.137	0.151	2.733	1.516	0.023
	0.6	0.5	0.5	0.3	0.56	0.39	0.17	0.1	0.2	0.206	0.139	2.035	2.345	0.023
	0.7	0.5	0.5	0.3	0.62	0.39	0.23	0.2	0.2	0.274	0.127	2.618	2.340	0.024
	0.8	0.5	0.5	0.3	0.68	0.39	0.29	0.3	0.2	0.343	0.115	3.424	2.333	0.024

Note: Ageabmedian: dummy taking value 1 if age of the respondent is above sample median. Bias % = (ATE baseline-ATE)/ATE baseline - NB: Baseline ATE (no confounders) = 0.175 (WSE:.022, t-stat 8.01). $d_1 = p_{11} - p_{10}$ *(outcome effect of U for the treated);* $d_0 = p_{01} - p_{00}$ *(outcome effect of U for the controls);* $s = p_1 - p_0$ *(effect of U on the selection into treatment*

Selection effect (odds $\frac{\Pr(T=1|U=1,W)}{\Pr(T=0|U=1,W)} / \frac{\Pr(T=1|U=0,W)}{\Pr(T=0|U=0,W)}$ *; Outcome effect (odds)* $\frac{\Pr(Y=1|T=0,U=1,W)}{\Pr(Y=0|T=0,U=1,W)} / \frac{\Pr(Y=1|T=0,U=0,W)}{\Pr(Y=0|T=0,U=0,W)}$*; T and W being the treatment indicator and the observable set of covariates respectively.* WSE = "within-imputation standard errors". For further details see Ichino et al., (2008)

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TABLE IX.
DESCRIPTIVE STATISTICS (OVERALL SAMPLE) - INCENTIVIZED EXPERIMENT

Variable	Obs	Mean	Std. Dev.	Min	Max
Trust game	150	5.433	3.701	0	10
Maximum contributors	150	0.307	0.463	0	1
Zero contributors	150	0.173	0.380	0	1
Polar	150	0.480	0.501	0	1
Male	300	0.703	0.458	0	1
Bridge experience (years)	150	25.213	11.764	2	50
Poker experience (years)	149	11.557	10.844	0	50
Age	299	49.455	14.068	18	79
Dictator giving	299	3.712	2.947	0	10
Risk aversion	299	3.983	2.208	1	6
Future discounting	289	10.329	4.274	1	17
Experience in poker for a bridge player (years)	21	26.285	14.926	3	50
Experience in bridge for a poker player (years)	13	6.15	5.800	1	16

TABLE X.
DESCRIPTIVE STATISTICS

Variables	Bridge Players (1) (Means)	Poker Players (2) (Means)	Non parametric test* H_0: (Poker) = (Bridge) (P-value)	Parametric test T-test H_0: (Poker) = (Bridge) (P-value)
Male (%)	53.30	87.33	41.55 (0.000)	6.921 (0.000)
Age	57.63	41.33	-10.229 (0.000)	-12.277 (0.000)
Game experience	25.21	11.56	-9.482 (0.000)	-10.434 (0.000)
Playing also the other game (%)	14.00	8.77	2.123 (0.145)	1.457 (0.146)

TABLE XI

Variables	Bridge Players (1) (Means)	Poker Players -(2) (Means)	Non parametric test* H0: (1) = (2) (P-value)	Parametric test T-test H0: (1) = (2) (P-value)
Trustor giving	5.560	5.306	0.1067 (0.7870)	-0.418 (0.6765)
Maximum contributors (%) (a)	34.66	26.66	1.1288 (0.2880)	-1.059 (0.2912)
Zero contributors (%)(b)	22.66	12.00	2.9777 (0.0840)	-1.731 (0.0855)
Polarized (%) (a+b)	57.33	38.66	5.235 (0.0220)	-2.313 (0.0221)
Risk aversion	3.993	3.973	-0.3650 (0.7150)	-0.078 (0.0937)
Dictator giving	3.664	3.760	0.1320 (0.8950)	0.280 (0.7797)

*For (approximated) to continuous variables such as Risk aversion, we test - through nonparametric statistics – between subject differences by using the Mann-Whitney test. For dichotomous variables (all the other variables) we use the Chi square test to analyse the differences in proportions
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TABLE XII. ECONOMETRIC FINDINGS – INCENTIVIZED EXPERIMENTS

VARIABLES	POLAR	ZERO C.	TEAM	TRUST	POLAR	ZERO C.	TEAM	TRUST	POLAR	ZERO C.	TEAM	TRUST
Male	0.153	-0.0384	0.179**	0.497*	0.149	-0.0340	0.173**	0.478*	0.0158	-0.0530	0.0704	0.377
	(0.1016)	(0.0434)	(0.0624)	(0.2141)	(0.1001)	(0.0401)	(0.0658)	(0.2266)	(0.0885)	(0.0420)	(0.0824)	(0.2184)
Below 30 age class	0.288*	-0.0456	0.186*	-0.106	0.294*	-0.0540	0.181*	-0.0602	0.522***	-0.0314	0.399*	-0.00773
	(0.1223)	(0.0595)	(0.0823)	(0.2462)	(0.1232)	(0.0561)	(0.0855)	(0.2524)	(0.0961)	(0.1043)	(0.1752)	(0.3748)
30-40 age class	0.134	-0.0979***	0.398***	0.946**	0.143	-0.102***	0.400***	1.004***	0.413**	-0.0942**	0.593***	1.067***
	(0.1426)	(0.0244)	(0.0918)	(0.2965)	(0.1448)	(0.0310)	(0.0922)	(0.2819)	(0.1356)	(0.0321)	(0.1036)	(0.2981)
40-50 age class	-0.0777	-0.279*	0.285***	0.942***	-0.0728	-0.297*	0.277***	0.984***	0.173	-0.262	0.502***	1.133***
	(0.1227)	(0.1093)	(0.0708)	(0.2066)	(0.1235)	(0.1352)	(0.0732)	(0.1982)	(0.1335)	(0.1342)	(0.0857)	(0.2149)
50-60 age class	0.0160	-0.121	0.119	0.313	0.0230	-0.134	0.120	0.368	0.204	-0.116	0.272*	0.471
	(0.1300)	(0.0723)	(0.0985)	(0.3325)	(0.1298)	(0.0907)	(0.0996)	(0.3395)	(0.1423)	(0.0843)	(0.1159)	(0.3388)
60-70 age class	-0.397**	-0.0992***	-0.169	0.246	-0.397**	-0.101***	-0.180	0.277	-0.456**	-0.103***	-0.149	0.508
	(0.1443)	(0.0280)	(0.1555)	(0.4851)	(0.1385)	(0.0295)	(0.1496)	(0.5036)	(0.1741)	(0.0286)	(0.1676)	(0.4427)
70-80 age class	-0.445***	-0.0725***		0.0394	-0.447***	-0.0721***		0.0379	-0.500***	-0.0757***		0.0716
	(0.0771)	(0.0117)		(0.3275)	(0.0745)	(0.0105)		(0.3423)	(0.0133)	(0.0116)		(0.3127)
Dictator giving	0.00764	-0.0341***	0.0586***	0.249***	0.00792	-0.0340***	0.0593***	0.250***	0.00915	-0.0335***	0.0621***	0.247***
	(0.0106)	(0.0086)	(0.0081)	(0.0455)	(0.0103)	(0.0092)	(0.0080)	(0.0440)	(0.0095)	(0.0075)	(0.0086)	(0.0409)
Bridge	0.563***	0.0170	0.555***	0.884***	0.573***	0.00779	0.578***	0.934***				
	(0.1125)	(0.0333)	(0.0990)	(0.2084)	(0.1242)	(0.0419)	(0.0907)	(0.1862)				
Risk aversion	-0.0416**	-0.00796	-0.0211*	-0.0111	-0.0415**	-0.00744	-0.0214*	-0.0116	-0.0456**	-0.00845	-0.0265**	-0.0131
	(0.0134)	(0.0050)	(0.0090)	(0.0281)	(0.0132)	(0.0052)	(0.0088)	(0.0285)	(0.0148)	(0.0053)	(0.0097)	(0.0296)
Province dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region dummy	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Both games played					-0.0797	0.0370	-0.139***	-0.333				
					(0.1622)	(0.1544)	(0.0398)	(0.4885)				
Bridge experience									0.0359***	0.00169	0.0222***	0.0190
									(0.0065)	(0.0024)	(0.0045)	(0.0121)
Poker experience									0.00907	0.00118	0.00275	0.00130
									(0.0050)	(0.0009)	(0.0041)	(0.0061)
Observations	112	108	104	148	112	108	104	148	112	108	104	148

Zero C.= Zero contributors. * p<0.05 ** p<0.01 *** p<0.001"

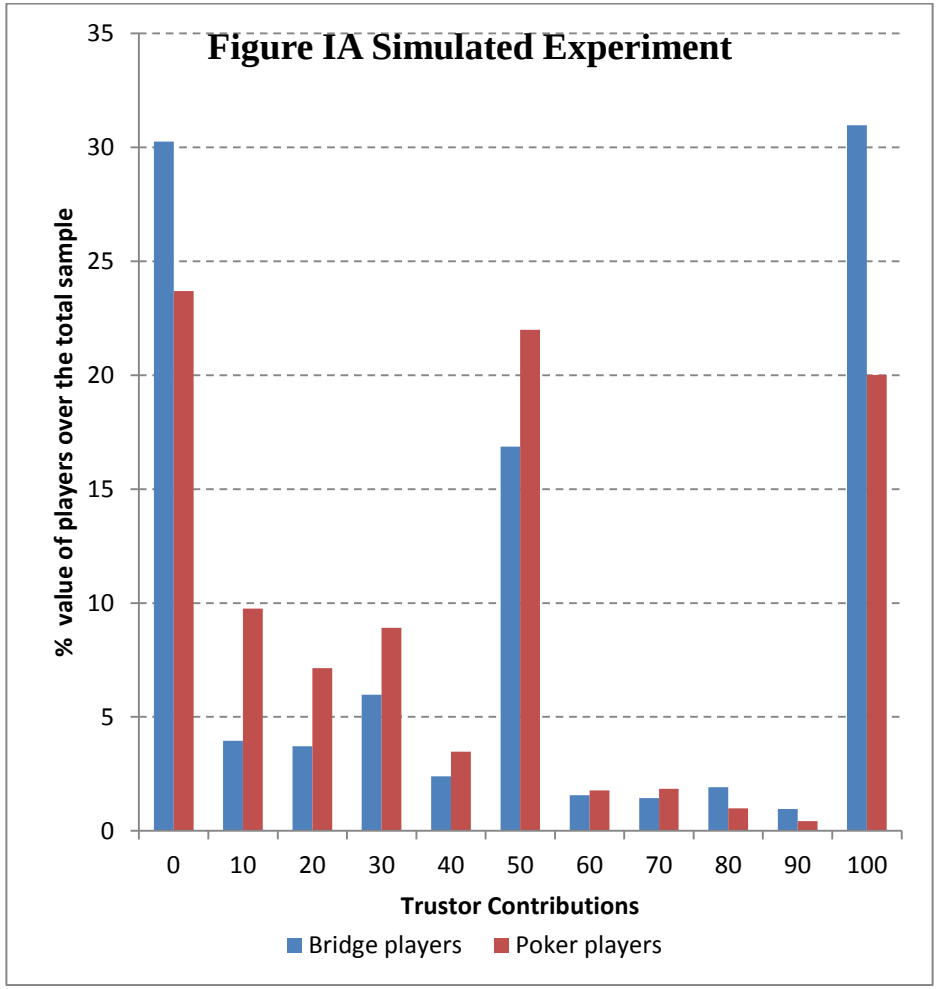
TABLE XIII.
SENSITIVITY OF THE *POLARIZED* EFFECT TO DEPARTURES FROM THE CIA ASSUMPTION ECONOMETRIC FINDINGS- INCENTIVIZED EXPERIMENTS

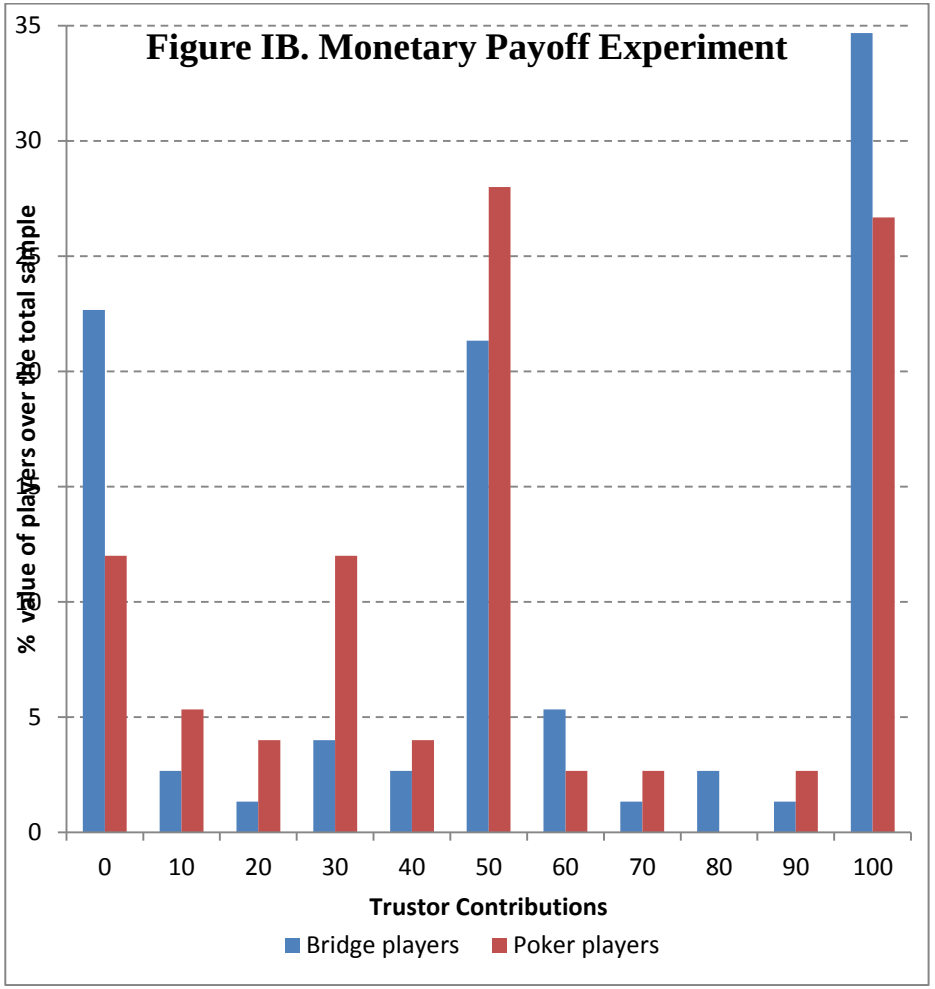
Assumptions	p_{11}	p_{10}	p_{01}	p_{00}	$p_{1.}$	$p_{0.}$	S	d_1	d_0	Bias %	ATE	Selection effect (Odds)	Outcome Effect (Odds)	WSE
Confounders calibrated on observables														
Male	0.79	0.75	0.95	0.93	0.77	0.94	-0.17	0.04	0.02	-6.95	0.200	0.241	1.444	0.098
Ageabmedian	0.82	0.82	0.41	0.32	0.82	0.35	0.47	0.00	0.09	22.46	0.145	9.258	1.659	0.106
Early response	0.70	0.66	0.50	0.56	0.68	0.54	0.14	0.04	-0.06	-4.28	0.195	1.981	0.891	0.195
Killer confounders														
Killer confounders	0.60	0.50	0.50	0.20	0.56	0.32	0.24	0.10	0.30	42.78	0.107	2.932	4.81	0.60
	0.70	0.50	0.50	0.20	0.61	0.31	0.3	0.20	0.30	51.34	0.091	3.666	4.755	0.70
	0.80	0.50	0.50	0.20	0.67	0.32	0.35	0.30	0.30	64.71	0.066	4.843	4.988	0.80
	0.60	0.40	0.50	0.20	0.51	0.32	0.19	0.20	0.30	35.29	0.121	2.449	5.010	0.60
	0.70	0.40	0.50	0.20	0.57	0.32	0.25	0.30	0.30	46.52	0.100	3.127	4.941	0.70
	0.80	0.40	0.50	0.20	0.63	0.32	0.31	0.40	0.30	56.68	0.081	3.966	4.967	0.80
	0.60	0.30	0.50	0.20	0.47	0.32	0.15	0.30	0.30	27.81	0.135	2.066	4.862	0.60
	0.70	0.30	0.50	0.20	0.53	0.32	0.21	0.40	0.30	38.50	0.115	2.568	4.947	0.70
	0.80	0.30	0.50	0.20	0.59	0.32	0.27	0.50	0.30	48.13	0.097	3.236	4.933	0.80
	0.60	0.20	0.50	0.20	0.43	0.32	0.11	0.40	0.30	20.32	0.149	1.741	4.967	0.60
	0.70	0.20	0.50	0.20	0.49	0.32	0.17	0.50	0.30	31.02	0.129	2.185	5.034	0.70
	0.80	0.20	0.50	0.20	0.54	0.32	0.22	0.60	0.30	41.18	0.110	2.735	5.036	0.80
	0.60	0.50	0.50	0.50	0.56	0.50	0.06	0.10	0.00	0.00	0.187	1.340	1.108	0.60
	0.70	0.50	0.50	0.50	0.61	0.50	0.11	0.20	0.00	0.53	0.186	1.704	1.131	0.70
	0.80	0.50	0.50	0.50	0.67	0.50	0.17	0.30	0.00	0.00	0.187	2.212	1.137	0.80
	0.60	0.50	0.50	0.40	0.56	0.44	0.12	0.10	0.10	6.42	0.175	1.703	1.711	0.60
	0.70	0.50	0.50	0.40	0.61	0.44	0.17	0.20	0.10	9.63	0.169	2.186	1.753	0.70
	0.80	0.50	0.50	0.40	0.67	0.44	0.23	0.30	0.10	12.83	0.163	2.795	1.731	0.80
	0.60	0.50	0.50	0.30	0.56	0.38	0.18	0.10	0.20	20.32	0.149	2.236	2.750	0.60
	0.70	0.50	0.50	0.30	0.61	0.38	0.23	0.20	0.20	26.74	0.137	2.859	2.706	0.70
	0.80	0.50	0.50	0.30	0.67	0.38	0.29	0.30	0.20	32.62	0.126	3.582	2.806	0.80

Note: Ageabmedian: dummy taking value 1 if age of the respondent is above sample median. Bias % = (ATE baseline-ATE)/ATE baseline - NB: Baseline ATE (no confounders) = 0. (WSE:.057, t-stat 3.272). $d_1 = p_{11} - p_{10}$ *(outcome effect of U for the treated);* $d_0 = p_{01} - p_{00}$ *(outcome effect of U for the controls);* $s = p_1 - p_0$ *(effect of U on the selection into treatment*

Selection effect (odds) = $\frac{\Pr(T=1|U=1,W)}{\Pr(T=0|U=1,W)} / \frac{\Pr(T=1|U=0,W)}{\Pr(T=0|U=0,W)}$ *ome effect (odds) =* $\frac{\Pr(Y=1|T=0,U=1,W)}{\Pr(Y=0|T=0,U=1,W)} / \frac{\Pr(Y=1|T=0,U=0,W)}{\Pr(Y=0|T=0,U=0,W)}$ *T and W being the treatment indicator and the observable set of covariates respectively.* WSE = "within-imputation standard errors". For further details see Ichino et al., (2008).

FIGURES IA-IB.
TRUSTOR GIVING FOR BRIDGE AND POKER PLAYERS





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Part II

3. The heterogeneity of wellbeing "expenditure" preferences: evidence from a simulated allocation choice on the BES indicators

For long time academicians and policymakers explicitly or implicitly considered GDP as a synthetic measure sufficient to capture also the broader concepts of wellbeing and life satisfaction. Several contributions have however recently shown that the nexus between GDP growth and wellbeing is quite complex.[35]

First, even a variable such as satisfaction in the economic domain (which should be more closely related to GDP than life satisfaction) depends more directly on disposable household income after paying taxes and fundamental public goods such as health and education. As a consequence, since it is not granted that GDP growth and disposable household income move in the same direction for each individual in a given country, GDP and wellbeing may partially diverge.[36] Second, life satisfaction also depends on "relative income", that is, on comparisons of our economic wellbeing with that of our peers, so that "treadmill effects" and rising inequality may counteract the positive impact of GDP growth on life satisfaction (see, among others, Ferrer-i-Carbonell 2005; Senik, 2004 and Jiang and Sato, 2009).[37] Third, household disposable income is neither

[35] For the debate on the relationship between income and happiness see, among others, the opposite views of Easterlin and Angelescu (2009) and Stevenson and Wolfers (2008).

[36] A relevant example being Ireland which, in the data of Bartolini et al. (2008) displays one of the largest increases in GDP in the last decade, coupled by one of the lowest changes in life satisfaction among EU countries. One of the factors which may explain this finding is that fiscal advantages led companies to set their accounting profits in Ireland, even though the economic value is actually not enjoyed in the same country.

[37] More recently Becchetti et al. (2013) show that countries, and not only individuals, may be reference groups documenting that life satisfaction is reduced by higher income in neighbouring countries in proportion to the media exposure of each individual.

a necessary nor a sufficient condition to gain access to some goods which contribute significantly to life satisfaction such as common goods, public goods and relational goods.[38]

All these considerations led many to argue that the wealth of nations is not just GDP but the stock of economic, environmental, cultural, relational and spiritual goods which a given community may enjoy. As a consequence, while GDP growth is crucially needed in order to fight unemployment and service the government debt, broader concepts of wellbeing and life satisfaction should be pursued and taken into account as well if politicians in charge want to maintain the support of their voters and win next elections.[39] This explains their growing interest on these issues.

An important recommendation to policymakers for the adoption of more articulated wellbeing indicators came from the Sen-Stiglitz commission.[40] Following this suggestion the Italian National Statistical Institute launched in 2011 a three-step process for the creation of an index of equitable and sustainable wellbeing (BES)[41] starting from

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[38] On the debate on relational goods and on their impact on wellbeing see, among others, Gui (2005), Ulhaner (1989) and Bruni and Stanca (2008). For the role of relational goods in explaining the Easterlin paradox see Bartolini et al. (2008).

[39] A divergence between per capita GDP growth and life satisfaction trends similar to that observed by Easterlin occurred in the Arab spring countries and the neglect of life satisfaction indicators may be at the root of the limited capacity of political leaders of those countries to understand and prevent social and political unrest. Domestic life satisfaction levels and their differences are currently measured and used to predict migratory flows across countries.

[40] Downloadable at http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.

[41] The BES comes last in a long history of broader wellbeing indexes such as the UNDP Human Development Index, the OECD Better Life Index, the Genuine Progress Indicator, the Ecological Footprint the Happy life Planet index. A critical survey of these indicators is beyond the scope of our paper.

consultation with a council of representative members of the different interest groups in the Italian society (CNEL).[42] In a first step CNEL members were asked to identify what were for them the most important wellbeing domains. After that in a second step, ad hoc commissions of experts started working in each domain in order to identify proper indicators. In a third step the indicators were in turn evaluated and validated again by CNEL members in a second consultation process which led to the definition of the final composite BES indicator.

The outcome of this process led to the identification of the following twelve BES domains:[43]

01. Health
02. Education and training

[42] CNEL is composed of sixty-four councillors: the members of the Council hold office for five years and may be reconfirmed. Ten experts are chosen from qualified representatives of the economic, social, and legal fields: eight of these are nominated by the President of the Republic and two are nominated by the President of the Republic after being proposed by the President of the Council of Ministers, upon deliberation of the Council of Ministers; Forty-eight members are representatives of public and private-sector producers of goods and services: twenty-two of these represent employees, three represent the public and private leaders and managers, nine represent self-employed workers; seventeen are industry representatives, nominated by a Decree of the President of the Republic, after being proposed by the President of the Council of Ministers, upon deliberation of the Council of Ministers. Six members are representatives of social service and voluntary organisations, nominated by a Decree of the President of the Republic, after being proposed by the President of the Council of Ministers, upon deliberation of the Council of Ministers. The President of CNEL is nominated, from outside of its membership, by a Decree of the President of the Republic.

[43] The complete set of 134 specific indicators falling in the 12 domains validated by CNEL members is attached in Appendix A. For additional related information on the BES see the English version of the ISTAT/BES official website http://www.misuredelbenessere.it/index.php?id=48.

03. Work and life balance

04. Economic well-being

05. Social relationship

06. Politics and Institutions

07. Safety

08. Subjective well-being

09. Natural and cultural heritage

10. Environment

11. Research and innovation

12. Quality of services

Finally, the first BES report (2013) providing a snapshot of Italy under the different wellbeing domains and indicators was officially presented the 12th March 2012.

The interesting aspect of this process is that it tries to overcome the two opposite critiques to objective and subjective wellbeing indicators that have been advanced in the literature. The main objection to objective indicators is that they do not pass the paternalism critique since, even in the more "enlightened" proposals, it is always a commission of experts which decides what is good for the society (Sugden, 2008). Subjective indicators overcome the paternalis critique but are in turn subject to the Amarthya Sen's "happy slave" critique, since there may be people who are so deprived of their rights that they do not aspire to a better life.[44] Under subjective wellbeing indicators these "happy slaves" may be more likely to accept a low level of aspirations

[44] "*The defeated and the downtrodden come to lack the courage to desire things that others more favourably treated by society desire with easy confidence"* (Sen, 1985: 15).

and their life would never improve if political decisions were based on their revealed subjective wellbeing.

The ISTAT process leading to the definition of the BES indicators contains elements which partially overcome both critiques. It is non paternalistic since it is the result of the above described three-step process started and terminated by the decisions of representative (CNEL) members of the different interest groups in the society. It overcomes the "happy slave critique" since it dedicates to subjective measures only one domain (n.8 subjective wellbeing) and uses very few subjective indicators in other domains (see Appendix A and B).[45] As shown above, the final outcome of the BES is the definition of a list of equally weighted indicators which are assumed to represent wellbeing for all individuals in the country. This is a parsimonious but unrealistic approximation of the reality where any individual has actually her/his own list with her/his own weights.

Our research aims to identify such weights in order to evaluate whether and in which direction they are affected by socio-demographic factors such as political orientation, age, gender, income, education and (characteristics of) the place of residence such as the same valules of BES indicators for a given geographical area. An advantage of our research is the direct link to a list of wellbeing indicators which has not been created ad hoc by the researcher, but represents the result of a long participated process and is adopted as a benchmark in a country such as Italy. The apparent limit may be that such benchmark is country specific. What must be however considered is that Italy is the first

[45] Note as well that, even though maximising subjective wellbeing is not advisable since subjective indicators depend too much on the heterogeneity of individual expectations, it is nonetheless crucial to measure such variable since unhappiness may have strong consequences on objective indicators such as health, social capital, political stability etc.

country to adopt this participated process stemming from the recommendation of the Sen-Stiglitz commission and that other countries may follow in the future. Hence, our empirical findings may provide relevant policy suggestions for such countries. Second and more important, it is highly likely that when this or similar processes will be repeated in other countries, the list of indicators will not be very different from that discussed in this paper. Hence, results on preference weights on the Italian indicators may provide relevant insights even for countries which do not adopt them at the moment. Again, as is well known, the search for proper weights in the aggregation of composite wellbeing indicators is a crucial issue in the literature. Our empirical contribution proposes a methodology which can be used to calculate such weights as a result of the aggregation of revealed preferences of representative samples of respondents. Last but not least, our paper aims to provide valuable and precious information to policymakers on wellbeing preferences of their citizens and on the crucial socio-demographic factors which contribute to explain their heterogeneity.

To our knowledge the proposed contribution is innovative since the empirical works investigating the determinants of political preferences have focused their attention on factors affecting support for a specific wellbeing domain (ie. environmental sustainability, redistribution), while never looking at how weights on different domains are distributed. In this respect Oswald and Powdthavee (2010) find that children gender significantly affects political preferences. The authors argue that this depends on the influence that sons and daughters have on their parents and on the impact that gender has on political preferences, since males have been shown as being primarily concerned about lower taxes, while females about the quality of health services (Campbell, 2004). These findings are somewhat consistent with the behavioural economic literature

showing that women tend to be more risk averse, less overconfident, more inequity averse and more competitive averse than men in lab experiments (Croson and Gneezy, 2009). Kuhn (2011) finds that East Germans are more oriented toward state redistribution and progressive taxation vis-à-vis West Germans. As is well known, differences in redistribution preferences may depend on the perception of vertical mobility and/or the belief that luck, birth, connections and/or corruption determine wealth (Alesina and Angeletos, 2005). Alesina and Glaeser (2004) document that such difference is wide between Americans and Europeans, with the latter declaring in a much higher proportion that the poor have to be blamed. De Silva and Pownall (2012) find that educated females are more likely to have green preferences. Note that all these papers look at just one specific aspect of political preferences (redistribution, environmental concerns) at a time. Compared with this literature an element of originality in our approach is to ask respondents to simulate the policymaker decision, that is, the dilemma of allocating scarce financial resources among alternative competing goals. As is well known, the contingent evaluation literature tells us that survey answers may be biased when respondent choices are virtual and do not imply monetary losses/gains for them (Carson et al., 2001). For instance, the risk of manipulation is very high when trying to calculate consumer surplus by asking respondents' willingness to pay for a given product since, in that case, the respondent believes that strategic answering may potentially bring monetary benefits (or avoid costs) to him. In our case the risk of manipulation is much smaller since the respondent has to decide about a virtual government (and not her own) outlay and therefore we expect that the respondent's allocation choice coincides exactly with the message that

the latter want to convey to policymakers, namely with her/his own wellbeing expenditure preferences.

The paper is divided into five sections (including introduction and conclusions). In the second section we illustrate a simple benchmark theoretical model which is the background of our analysis and helps to clarify our research framework. In the third section we illustrate the survey design. In the fourth section we present and discuss empirical findings. The fifth section concludes.

3.2 The benchmark model

The reference for our analysis is a simple theoretical framework where each individual has her/his own expectations on how one euro invested in one of the BES domains may positively affect the domain indicators and how progress in such domains may affect her/his own wellbeing.

More formally, we assume the existence of the following utility function defined over the set of the *j=1,…,J* domains for the individual *i*:

$$U_i = \left(W_{i1}(M_{i1}), W_{i2}(M_{i2}), \cdots, W_{iJ}\left(M_{iJ}\right)\right) \quad (3.1)$$

$$M_{i1} + M_{i2} + \cdots + M_{iJ} = M$$

where W_{ij} is the *j*-th wellbeing domain for the individual *i* and M_{ij} is the amount of the total sum (*M* euros) invested in the specific domain (where the same total amount, *M*, is virtually allocated to each respondent).

Any interviewed utility maximising individual should equalize with her/his allocation choices the marginal utility of investing one euro in each domain.

$$\frac{\partial U_i}{\partial W_{i1}} \cdot \frac{\partial W_{i1}}{\partial M_{i1}} = \frac{\partial U_i}{\partial W_{i2}} \cdot \frac{\partial W_{i2}}{\partial M_{i2}} = \cdots = \frac{\partial U_i}{\partial W_{iJ}} \cdot \frac{\partial W_{iJ}}{\partial M_{iJ}} \quad (3.2)$$

where the above written marginal utilities are given by the product of the marginal impact of one euro invested in the progress of the domain indicator and the marginal impact of such progress on her/his own utility.

Unfortunately, it is not possible to disentangle these two components. However the allocation decision represents in itself a good indication on how voters would like politicians to allocate resources among the different domains. And gives the possibility to evaluate how different socio-demographic factors affect such preferences. As is obvious, expectations on the marginal impacts of an euro invested in the progress of given domains may not coincide with the effective trade-off in investing resources in different domains (that is, the respondent perception of the contribution of each euro invested to the progress in a given domain may be wrong). Nonetheless, the allocation choices to the domain and the effort they would like politicians to exert in each domain coincide. To make a paradoxical example, a respondent may consider of vital importance health but she/he may have the wrong belief that government expenditure on health is totally ineffective. In such case she/he will respond zero to the amount to be invested in health. Even though being biased by her/his wrong perception on the effect of government expenditure on health, such response expresses her/his own true preference on how government expenditure should be allocated. This is why we consider more correct to define what we measure *wellbeing expenditure preferences* and not just *wellbeing preferences*. Under a more restrictive assumption we may however assume that these wrong perceptions cancel out in the aggregate and therefore wellbeing expenditure preferences grossly coincide with wellbeing preferences as well.

Based on this theoretical framework our research may contribute originally to the literature in four respects. First, we can test how much the assumption of homogeneous

weights in wellbeing domains (typical of representative consumer models, or implicit in the use of composite wellbeing indicators at national level) sacrifices about the knowledge of individual preferences. With our data and theoretical framework the hypothesis that the weights are the same for each individual or socio-demographic groups may be directly tested and accepted or rejected. Second, our empirical findings may provide precious information to policymakers and social scientists about which drivers affect (and which do not) heterogeneity in preference weights. Third, by using actual BES indicators as controls, we may test how relative abundance/scarcity of wellbeing in the specific domain at local level affect respondent preferences. Fourth, we propose a methodology which can be used to calculate such weights as a result of the aggregation of revealed preferences of representative samples of respondents.

A final remark is that, as documented in the previous section, the list of domains and the set of indicators created by groups of experts for each domain contain a few purely subjective elements (ie. subjective wellbeing among domains and, as an example, job satisfaction among indicators in specific domains). Since subjective domains are too general and make unclear what it means investing economic resources to improve them we exclude them from our empirical analysis (ie. the 8th domain of subjective wellbeing is excluded).

3.3 The research design

Our empirical analysis is based on data collected with an online survey where respondents are asked to allocate the hypothetical sum of 100 million euros to promote wellbeing improvement in one of the 11 considered BES domains (see the attached questionnaire in the Appendix B). The sub-questions which follow ask respondents to

identify, within each domain, the first five priorities (ranked in ascending order) among the indicators included in that domain.[46] The questionnaire also collects data on standard socio-demographic variables and the database is enriched with data on characteristics of the province/region in which the respondent lives including values of BES indicators at that level.

The survey has been launched on the websites of three main Italian newspapers on March 2013. The first, Messaggero, is the fifth most read Italian newspaper (excluding sport newspapers) with a reputation of being at the center-right of political orientation. The second, Avvenire, is the main Italian catholic newspaper. Its readers reflect the ideological divide of Italian believers since they are balanced between right and left wing orientation. The third, l'Unità, is more left wing oriented being the official newspaper of the Democrat Party. Beyond these three major newspapers which accepted to participate to our research, the online survey appeared as well on several minor newspapers and websites whose list is reported in the footnote below.[47]

The online questionnaire has a control check which prevents respondents from filling the form more than once from the same web address. At the end July, after five months from the start of the online survey we collected 2,605 complete questionnaires. An inevitable bias of our survey is that the sample of respondents is not representative of

[46] Note that the survey question changes when we ask preferences about subdomain specific indicators (from the simulation of an invested sum to an more general indication of priorities). This is because some of these indicators are subjective and it is not clear whether other of them may be affected by government expenditure (see Appendix B).

[47] These are Forum Nazionale Terzo Settore, FQTS, ARCI, ConVol, CSV Net, Labsus, Dignità del lavoro, Auser, Avis, Anpas, Bandiera Gialla, La perfetta letizia, Mondo alla Rovescia, Confini online, Il Metapontino.it, ARCI, Campania, Blog vitobiolchini, Domos (domotica sociale).

the Italian population and biased toward those who use the web. As we know web users tend to be relatively younger and more educated. However this weakness conceals an interesting potential: given the trend toward higher education and web use, our research may anticipate future preference trends in contemporary societies. Furthermore, we are quite confident that econometric findings where we control for all concurring factors give a representative picture of the drivers of wellbeing preferences in the overall population.

3.4 Empirical findings

In Table 1 we summarize descriptive statistics on the variables used for our empirical analysis. Note that in the case of the *economic wellbeing*, *politics and institutions*, *security* and *quality of services* domains the maximum is 100, that is, there exists for each of the four domains at least one respondent who allocates all her/his virtual sum in them. For all domains the minimum is zero implying that there is at least one respondent investing no money in them. Around 58 percent of respondents have at least a university degree, while only 8.3 percent no more than middle school. This confirms that the community of internet users who respond to our survey is imbalanced toward highly educated individuals. Looking at other variables we find that gender is quite balanced (women account for 55.5 percent of the sample), average political orientation is slightly left wing (-2.68)[48] and the average age of respondents is around 44.5 years. 56 percent of them are married or cohabiting.

[48] The political orientation variable classifies respondents in a range going from -10 (extreme left) to +10 (extreme right). The question actually asks respondents to locate themselves on a range going from 0 to 10 at the right and 0 to 10 at the left to avoid association

Descriptive evidence from Figure 1 documents that the BES domain for which the Italians are willing to pay more is the *health* domain. According to our findings, sample respondents would allocate on average 16.1 percent of their virtual sum on it. The *health* domain is followed by *education and training* (13.6 percent) and by *work and life balance* (around 10.6 percent). All the other domains are between 9.1 (*research and innovation*) and 6.6 percent (*safety*), with the exception of *politics and institutions* where we fall to 3.9 percent.[49]

The five discriminants we expect may affect preference weights are left/right wing political orientation, gender, education, income and North/South geographical location.

We start by inspecting the contribution of the political orientation variable. From a descriptive point of view we look at average weights and 95% confidence intervals for the adjoining sets of those with positive (right wing), vis-à-vis those with negative (left wing) variable values. In spite of our split criteria which do not enhance the left/right divide (we could have taken top and bottom terciles to rule out an intermediate moderate group and enhance dissimilarities between the two selected subgroups) we find many significant differences.

The most remarkable difference is in the *safety* domain where the right wing group allocates 8.38 percent of the sum against 5.73 percent of the left wing group (Figure 2a). The difference among subgroup means is significant under the normal distribution assumption since the two 95% confidence intervals do not overlap. The difference on

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between minus/plus signs and a given political orientation. We however recode the variable giving a negative sign to values at the left of the zero for obvious reasons of monotonicity of the political orientation variable.

[49] This first descriptive evidence is consistent with a preliminary descriptive inquiry run by ISTAT (2012) on BES preferences.

economic wellbeing is similarly high (9.83 percent of the money allocated by the right wing group against 7.37 percent by the left wing group) and statistically significant. The difference on *education and training* is smaller (12.8 percent of the money allocated by the right wing group against 13.92 percent by the left wing group), but still statistically significant. The left wing group also allocates significantly more in the *environment* (9.32 against 7.53 percent), in the *natural and cultural heritage* (8.34 against 7.57 percent) and in the *research and innovation* (9.49 against 8.52 percent) domains. "Large coalition domains" in which we do not register significant differences between the two political orientations are *health*, *work and life balance*, *social relationships* and *quality of services*. Based on these findings, in a hypothetic trade-off between economic growth and environmental sustainability left wing orientation seems much more supportive of sustainable wellbeing claims, given its relatively stronger orientation for the environment and natural and cultural heritage and its relatively lower orientation for the economic wellbeing domain.

What appears noteworthy is that, if we take into account the second potential discriminant (gender), we find no significant differences between males and females in any of the BES domains (Figure 2b). The same occurs for the third discriminant (income by comparing those below 30,000 euros and those above 30.000 euros) and geographic location (Figure 2c and Figure 3d).[50]

In order to investigate the role of the fourth potential discriminant (education) we compare respondents with a university degree with those who have less than a high

[50] Differences among subgroup means for the four Italian macroareas (North East, North West, Centre and South) are not significant as well. They are omitted for reasons of space and available upon request.

school qualification. The differences are in this case relevant (Figure 2e). The low education group allocates significantly more on *health* (18.42 against 15.52 percent) and *economic wellbeing* (10 against 7.24 percent), while significantly less on *education and training* (11.64 against 13.99 percent), *natural and cultural heritage* (6.97 against 8.31 percent), *environment* (7.83 against 8.96 percent) and *research and innovation* (7.68 against 9.41 percent). It seems that this group suffers from a relatively lower economic wellbeing which forces its members to rely more on public health, be less environmentally sensitive in a hypothetical trade-off between economic growth and environmental sustainability. In spite of its lower education level, the group allocates relatively less resources to *education and training* and to *research and innovation* (which is myopic and contradictory if we believe to a positive contribution of these two variables to economic wellbeing). Note that some of these differences (notably those on *health* and *education and training*) remain significant if we narrow distances between the two subgroups by comparing those with a university degree with a complementary group which includes also respondents who achieved a high school degree.

Last but not least, age discriminates on three domains when we compare those over 50es with those below 40es. A first expected difference concerns *health* where the older want to invest more (16.8 against 15.2 percent), while the younger want to invest more in *economic wellbeing* and *social relationships* (respectively 9.0 against 7.04 percent and 7.6 against 6.2) (Figure 2f).

Our final remarks are that, at least when we consider descriptive evidence on major domains, only three of the five potential discriminants matter (left/right wing political orientation, education and age). More specifically, highly educated and left wing oriented respondents result to be more inclined toward environmental sustainability,

defense of the cultural heritage, research and innovation and education, while right wing oriented respondents toward security and economic wellbeing. Domains on which all respondents have similar preferences are *quality of services*, *politics and institutions*, *work and life balance* and *social relationships*.

3.4.1 Econometric findings: OLS estimates

We check whether tendencies observed in descriptive statistics, and tests on the differences of subgroup means, are confirmed in econometric estimates where we control for the concurring effects of age and income classes, civil, family and work status, industry dummies, web source of survey compilation and other characteristics of the place of residence.

Our first econometric approximation is the following baseline OLS model

$$\begin{aligned} BESDomShare_{ij} = {} & \alpha_{0j} + \alpha_{1j}\, RightWing_{ij} + \alpha_{2j} Bachelor_{ij} + \alpha_{3j} Low/MiddleEdu_{ij} \\ & + \alpha_{4j} Female_{ij} + \sum_{g=1}^{G} \kappa_{gj}\, Macroregion_{ij,g} + \sum_{k=1}^{K} \gamma_{kj}\, DAgeClass_{ij,k} \\ & + \sum_{l=1}^{L} \delta_{lj}\, DIncomeClass_{ij,l} + \sum_{m=1}^{M} \zeta_{mj}\, DMaritalStatus_{ij,m} \\ & + \sum_{s=1}^{S} \theta_{sj}\, DFamilyStatus_{ij,s} + \sum_{q=1}^{Q} \lambda_{qj}\, DJobStatus_{ij,q} \\ & + \sum_{z=1}^{Z} \xi_{zj}\, DIndustry_{ij,z} + \sum_{v=1}^{V} \chi_{vj}\, DSource_{ij,v} + \alpha_{5j} GDP_{jr} \\ & + \alpha_{6j} MiddleSchool_{jp} + \alpha_{7j} SenateVoters_{jr} \\ & + \sum_{b=1}^{B} \varphi_{bj}\, BESIndicators_{jr,b} + \varepsilon_{ij} \end{aligned}$$

$$i = 1,2,\dots,N, \quad j = 1,2,\dots,J$$

$$r = 1,2,\dots,R \quad p = 1,2,\dots,P \quad (3.3)$$

where the dependent variable (*BESDomShare*) is the share invested by subject *i* in the *j*-th BES domain, *RightWing* is the respondent's political orientation expressed (as explained above) on a -10/+10 scale (-10 extreme left, +10 extreme right), *Bachelor* is a (0/1) dummy for those having a university degree or above, *Low/MiddleEdu* is a dummy for those having no more than Middle School degree (High School is the omitted benchmark), *Female* is a (0/1) gender dummy taking value one if the respondent is of female gender and zero otherwise. The specification includes a geographic dummy (*Macroregion*), the observation coming from the North-East, North-West or South and Islands macroregions of Italy as defined from the National Statistical Institute categories. Age is controlled for with a set of age class dummies picking up five-year age intervals starting from 25-30 and ending up with 75-80. *Under 25* and *Over 80* are two end-classes also included as age dummies in the estimate, while the 30-35 age class is the omitted benchmark. *DIncomeClass* are five income dummies which pick up income classes as included in the questionnaire (the class between 15,000 and 30,000 euros per year is the omitted benchmark). *MaritalStatus* dummies pick up the Divorced, Single, Separate and Widowed conditions (Married/Cohabitant being the omitted benchmark), *FamilyStatus* dummies pick up the following family status conditions (Living Alone, Living with my Original Family, Living with my Partner without Children, Single Parent) with Living with my Partner with Children being the omitted benchmark, *JobStatus* dummies pick up the following conditions (Fixed Term Contract, Seasonal Contract, Self/Employed, Not Working/Unemployed/Looking for a Job, Redundancy Fund Benefits, Redundancy Worker, Housewife, Student, Retired), Open-Ended contract being the omitted benchmark. Industry dummies pick up the industry in which the respondent works (Agriculture, Manufacturing, Personal Services)

with Tertiary being the omitted benchmark. *Dsource* are three dummies picking up characteristics of respondents who filled the questionnaires on the websites of the three main newspapers involved (Avvenire, Unità, Messaggero) and are presumably readers of those journals. The omitted benchmark is represented by those who filled the questionnaire from other websites. The inclusion of the *Dsource* variables is important, especially for the Avvenire newspaper since it may capture religious (beyond political) orientation in our econometric estimates.

Last but not least, we include two types of geographical variables. First, we add three proxies of local economic development, human capital and social capital such as regional per capita GDP[51] (*GDP*), the share of provincial population with no more than middle school degree (*LocalMiddleSchool*) and the percent of senate voters at regional level (*SenateVoters*). Second, we include the set of BES indicators calculated at regional level for each specific BES domain ($BESIndicators_{jr,b}$). In equation (1) the subscript p denotes provinces and the subcript r denotes regions. This last set of regressors is important to check whether respondent preferences on a given BES domain are affected by the relative scarcity/abundance of wellbeing on that given domain as measured by BES indicators. From a theoretical point of view the expected sign is not clear. There are equal reasons to expect that the relative quality of wellbeing indicators at local level should produce a negative sign (for decreasing marginal utility) or a positive sign when such quality reflects a higher weight of local preferences on that specific domain which actually created consensus for more political effort on the given indicator. Last, ε_i is an idiosyncratic error. In all estimates, errors are clustered at province level.

[51] It is measured in thousands of Euros.

Econometric estimates reported in Table 2 confirm the results from descriptive findings and subgroup mean differences commented in the previous section. Right-left wing orientation remains a strongly significant driver of allocation choices. We remember that individuals have been asked to place themselves on an algebraic segment of integers reclassified from -10 (extreme left) to +10 (extreme right). From an economic point of view we find that one integer shift toward right from average political orientation (-2.78 in our sample) leads to a reduction of 102,000 euros investment in the *education and training* domain (out of the 100 million euros to allocate). If we apply this linear effect to the two extremes of the political opinion we get a difference of around 2,040,000 euros, that is, of around 2 per cent of the overall cake.[52]

Political opinions matter even more in other domains. The effect of one integer move to the right (from sample mean political orientation) is an additional investment of 207,000 euros in the *economic wellbeing* domain (weakly significant), a reduction of 192,000 euros in the *environment* domain, an additional investment of 263,000 euros in the *safety* domain, a reduction of investment of 126,000 euros in the *natural and cultural heritage* and of 72,000 euros in the *research and innovation* domain. Overall, econometric findings confirm that the significant differences observed with simple subgroup means in Figures 2a-2f are robust to the inclusion of all the controls we introduce in the econometric estimates.

[52] In a robustness check we depart from the linear assumption and create four dummies for extreme left, left, right and extreme right respondents. We find that the difference between the extreme right and extreme left effect is not much different from what estimated under the linear assumption. Results are omitted for reasons of space and available upon request.

To sum up, respondents who classify themselves as right wing invest significantly less in *education and training*, *research and innovation*, *environment* and *natural and cultural heritage* and significantly more in *safety* and *economic wellbeing*. From a quantitative point of view the most remarkable difference is in *safety* where the application of the linear one-integer move from one to the other political extreme leads to a difference of more than 5 million euros (more than 5 percent of the total sum to be allocated).

The other factor we found as having a deep impact on welfare preferences in subgroup mean comparisons was education. In econometric findings graduate respondents invest 990,000 euros less on *health*, 605,000 less on *safety*, 539,000 more on *natural and cultural heritage* vis-à-vis the high school benchmark. Note as well that respondents with a middle school degree invest significantly less in *research and innovation* and in *environment.* In this case econometric findings are slightly different from descriptive findings since *safety* becomes significant while *education* is no more significant. Note that graduated respondents have a more leftist political orientation (-3.10 against -2.09 of the complementary group). [53]

Among other controls those filling the questionnaire from the Avvenire website invest significantly more in *education and training* (1,565,000) and *natural and cultural heritage* (570,000), while significantly less in *economic wellbeing* (-1,792,000). This finding presumably indicates that religious beliefs, net of political orientation, affect preferences in these three domains. Respondents filling the questionnaire from the Unità website (left wing) invest significantly more *in research and innovation* (2,073,000) and less in the *quality of services* (-2,328,000). Finally readers of

[53] Additional statistics available on request.

Messaggero are more concerned about investing in *natural and cultural heritage* (795,000). The lack of significance of the female dummy is confirmed in all considered domains. The pattern of significance of age dummies evidences that the elders are more concerned about *natural and cultural heritage,* while less about the *environment.* The mismatch between descriptive and econometric findings on the age effect is likely to be due to the different proxies we use.

With regard to regional and provincial controls we find that the impact of BES indicators is on the whole surprisingly not significant in many domains. We find no effect for any of the domain specific BES indicators in the *training and education, environment, health, quality of services, research and innovation.*[54] The share of temporary jobs is significant on the propensity of respondents to invest in *work and life balance,* the amount of voluntary aid affects positively the propensity to invest in *social relationships,* while the relative abundance of social cooperatives reduces it. Regional trust in justice has a strong and significant effect on the propensity to invest in *politics and institutions.* Last but not least, the relative abundance of historical buildings has a positive effect on the respondents' propensity to invest in the *natural and cultural heritage* domain.[55] Among other local controls per capita GDP at regional level is

[54] For reasons of space we report for BES controls only regressors with coefficients significant at 95%. Full results are available upon request.

[55] In the specification of this equation we eliminate per capita gdp at regional level due to its extremely high contribution to multicollinearity (variance inflation factor of 15,217) which makes coefficients and standard errors of BES indicators highly unreliable in the estimates. Significance and standard errors of our main socio-demographic factors (education and political orientation) have however negligible changes when moving from the full to the restricted specification.

inversely correlated with the propensity to invest in the *social relationships* domain, while low education at provincial level in the *politics and institutions* domain.

3.4.2 Econometric findings: Tobit system estimates

In order to evaluate the robustness of our findings we must consider at least two specific characteristics of our dependent variables. First, they are left and right censored given the 0 and 100 limit values they can achieve. More specifically on this point, individuals may have liked to go beyond the limits imposed by our questions (the 0-100 percent choice range) by actually "going short" and disinvesting resources from a domain in which they may believe that the government is overinvesting. As well, they may have decided to use some of the disinvested resources to increase above 100 percent investment in domains which they regard as essential. Second, choices on the different domains are correlated with each other since the decision to allocate one euro more in one of them implies that one euro has to be "disinvested" from the others.

We tackle both problems by estimating (1) with a system Tobit specification where standard errors are clustered at the province level. Using a left censored limit of zero a multilvariate Tobit model of the J BES domains can be expressed as

$$BESDomShare_{ij}^{*} = \boldsymbol{X}_{\mathrm{ij}}^{'}\boldsymbol{\beta}_{\mathbf{j}} + \varepsilon_{ij} \qquad i = 1,2,\dots,N, \quad j = 1,2,\dots,J$$

$$BESDomShare_{ij} = BESDomShare_{ij}^{*} \qquad if \;\; BESDomShare_{ij}^{*} > 0$$

$$BESDomShare_{ij} = 0 \qquad if \;\; BESDomShare_{ij}^{*} \leq 0 \qquad (3.3)$$

where $\boldsymbol{X}'_{\mathrm{ij}}$ denotes the vector of independent variables listed in equation (1), $\boldsymbol{\beta}_{\mathbf{j}}$ is the vector of parameters and ε_{ij} are multivariate normally and independently distributed error terms with zero mean, variance σ^2, correlation ρ, and covariance matrix

$$\Sigma_{\varepsilon_j} = \begin{pmatrix} \sigma^2_{\varepsilon_1} & \cdots & \rho_{\varepsilon_J \varepsilon_1}\sigma^2_{\varepsilon_J}\sigma^2_{\varepsilon_1} \\ \vdots & \ddots & \vdots \\ \rho_{\varepsilon_1 \varepsilon_J}\sigma^2_{\varepsilon_1}\sigma^2_{\varepsilon_J} & \cdots & \sigma^2_{\varepsilon_J} \end{pmatrix} \tag{3.4}$$

Given these error terms the density function of $BESDomShare_{ij}$ is

$$f_j\left(BESDomShare_{ij} | \boldsymbol{X}'_{ij}\boldsymbol{\beta_j}\right) = \prod_{BESDomShare_{ij}=0} \left[1 - \Phi\left(\frac{\boldsymbol{X}'_{ij}\boldsymbol{\beta_j}}{\sigma_{\varepsilon_j}}\right)\right] \prod_{BESDomShare_{ij}>0} \frac{1}{\sigma_{\varepsilon_j}}\left[\phi\left(\frac{BESDomShare_{ij} - \boldsymbol{X}'_{ij}\boldsymbol{\beta_j}}{\sigma_{\varepsilon_j}}\right)\right]$$

where Φ denotes the normal distribution function and ϕ denotes the normal density function.

Given that choices on the different domains are correlated with each other, and assuming a covariance matrix for the error terms given by Σ_{ε_j}, we use a Seemingly

Unrelated Estimation approach to estimate the (co)variance matrix of the multivariate normal distribution of the estimators for the system of Tobit equations. [56]

When comparing OLS and system Tobit estimates, reported in Table 3, we find that statistical significance is generally unchanged while magnitudes tend to be larger with the second estimation approach. The rationale is that Tobit estimates consider that border decisions (such as those of investing 0 or all the sum in a single domain) may actually be a lower bound of the true decisions, would the implicit constraint of limiting the choice in the 0-100 percent interval be removed (ie. allowing respondents to disinvest resources from a domain which they regard as overinvested to invest more than the total in a domain which they regard as underinvested).

More specifically, with regard to our new estimates, we find that the effect of one-integer move to the right of political orientation on *education and training* moves from -102,000 to -110,000, those on *economic wellbeing* and *safety* respectively from 192,000 to 252,000 and from 262,000 to 300,000. The difference in *safety* investment between the two extremes becomes now 6.000,000 euros.

Keeping into account the censored structure of our data increases also substantially magnitudes of the effect of a University degree over the high school omitted benchmark of the sample. The effect on investment moves from -899,000 to -991,000 in the *health* domain, from -605,000 to -626,000 in the *safety* domain, from 534,000 to 619,000 in the *natural and cultural heritage* domain.

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[56] To estimate the system of Tobit equation we use the SUEST command in STATA. SUEST combines the estimation results -parameter estimates and associated (co)variance matrices- into one parameter vector and simultaneous (co)variance matrix for Σ_{ε_j} of the sandwich/robust type. This (co)variance matrix is appropriate even if the estimates were obtained on the same or on overlapping data.

3.4.3 Subdomain findings

Since any respondent may indicate for each domain the five most relevant items in order of importance we estimate the impact of socio-demographics on such priorities with an ordered logit estimate in which the most important item in a given domain takes value 5, the second value 4, the third value 3, the fourth value 2 and the fifth value 1. The set of selected regressors is the same as in (1). All the remaining items not considered by the respondent among the five priorities take value zero. As is clear from the list of indicators, not all of them are suitable for improvement due to more public expenditure. This is why the type of sub-domain question changes and concerns a scale of priorities and not a simulated investment. In order to know more about the effect of left/wing political orientation on preference heterogeneity, in Table 4 we resume the results from each subdomain estimate by identifying items on which political orientation has a significant impact.[57] In the middle we report all items for which the variable is not significant. We call them again "large coalition items" since, according to our results, the relative weight to be given to them would not create conflicts in a hypothetical government coalition formed by left and right wing parties.

Subdomain findings confirm the discussed previous descriptive and econometric results with additional qualifications. Left wing oriented respondents are concerned with job stability, gender equality and gender participation in politics and have more propensity to fight crime against women even though the indicator is in the "right wing" *safety* domain. Right wing oriented respondents prioritize relatively more fight

[57] Full evidence of ordered logit estimates according to political orientation is collected in an online Appendix available upon request.

against dependencies (alcohol, smoke, obesity), family satisfaction and support to families living economic difficulties, investment in defense and institutions and access to services.

When looking at the impact of the other significant driver (education) we find that unskilled give reasonably relatively more priority to flexsecurity, the problem of irregular workers, economic dignity, fighting against degradation of urban areas, contaminated sites and emissions, reducing queues in health services and improving quality of urban transport (Table 5). [58] Overall, our findings are consistent with the fact that unskilled workers suffer more (have less resources to defend themselves) from exposure to unskilled and irregular workers, degradation of the urban environment and the inefficiency of public services (health, urban transportation).

3.5 Conclusions

The original contribution of our paper to the wellbeing literature hinges upon the analysis of the heterogeneity of individual wellbeing expenditure preferences and on the expenditure trade-offs among different wellbeing domains. More specifically, respondents to an online survey are asked to simulate the policymaker dilemma of allocating a limited sum among alternative policies aimed at increasing wellbeing in different domains. Our reference is a wellbeing indicator, the BES (Sustainable and Equitable Wellbeing) indicator, recently created and adopted as a benchmark in Italy by the National Statistical Institute (ISTAT), with the cooperation of a coalition of representatives of different interest groups of the Italian society (CNEL).

[58] Full evidence of ordered logit estimates according to gender and skilled/unskilled is collected in an Appendix available upon request.

We demonstrate that the null of equal expenditure preference weights on different welfare domains among survey respondents is rejected by our empirical analysis. We document that two main drivers of preference heterogeneity are (left/right wing) political orientation and education. On the first point we show that right wing respondents desire to invest relatively more in economic wellbeing and safety, while left wing respondents in the environment, the preservation of natural and cultural heritage, in research and innovation and education. Overall, our findings seem to suggest that sustainable wellbeing goals may more easily achieved with left wing oriented citizens who, in a hypothetic dilemma between economic growth and environmental sustainability, are relatively more inclined toward the latter.

The impact of education is also relevant and is mainly represented by the difference made by a university degree. Graduated respondents would invest significantly less in health and economic wellbeing and significantly more in the environment, the preservation of natural and cultural heritage and in research and innovation.

If we look at anecdotal evidence on declarations of Italian policymakers we find the latter extraordinarily consistent with our findings. We have in Italy plenty of right wing politician declarations which minimize the importance of culture and education[59] and declare themselves very concerned about safety problems (the Lega organized voluntary groups of citizens patrolling cities in the night ("ronde") in the last years in some municipalities of the North). The strategy of enhancing the perception of insecurity of right wing media in the last elections has been acknowledged ex post as one of the most successful. Care for the environment is, on the other hand, typically considered a left

[59] On November 22nd, 2010, the ministry of Treasury Tremonti declared: "con la cultura non si mangia" (you cannot eat culture), while Berlusconi declared that in Italy there are too many graduated individuals and too few artisans.

issue in Italy (and the Green party which actually did not have much success was clearly identified and placed itself at the left of the political spectrum).

Our findings may also provide useful hints for those who want to create large coalitions creating bridges and consensus between left and right. They suggest that it is easier to build consensus on issues such as work and life balance, social relationships, politics and institutions, health and quality of services. On the contrary, it is less easy to find bipartisan consensus on gender issues (a priority for the left but not for the right wing respondents) and on the fight against dependencies from alcohol, drugs and obesity (a priority for the right but not for the left wing respondents). Our findings also suggest that some promising directions to create bipartisan consensus. Right wing oriented voters may be convinced about the importance of investing on education, on research and innovation, and of preserving the environment and cultural and natural heritage by stressing the positive effects of investment in such domains on economic wellbeing. Fight to poverty (a priority for the left) may find consensus also on the right if oriented toward reducing debt pressure on households (a priority also for right wing respondents), while safety (a priority for the right) may become a bipartisan issue if it shown to reduce crimes against women (a priority for the left).

TABLES AND FIGURES

Table 1 Summary statistics of main variables used in the empirical analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
Economic well-being	2605	7.8107	8.1932	0	100
Social relationship	2605	6.9539	5.0338	0	44
Politic and Insitutions	2605	3.8703	3.9649	0	100
Safety	2605	6.5873	4.9276	0	100
Landscape and cultural heritage	2605	7.9808	4.6099	0	50
Environment	2605	8.7973	4.8821	0	50
Research and innovation	2605	9.1340	5.2540	0	50
Services quality	2605	8.1409	5.1963	0	100
gender	2605	0.5555	0.4970	0	1
Education_middle	2605	0.0825	0.2752	0	1
Education_bachelor	2605	0.5770	0.4941	0	1
Political orientation	2605	-2.6810	4.6507	-10	10
NorthEast	2605	0.2683	0.4432	0	1
NortWest	2605	0.1862	0.3893	0	1
SouthIsles	2605	0.2806	0.4494	0	1
Ageclass	2605	5.6434	2.9789	1	13
Sector					
Manufacturing	2605	0.1305	0.3369	0	1
Agriculture	2605	0.0196	0.1386	0	1
Tertiary	2605	0.4864	0.4999	0	1
Personal services	2605	0.2964	0.4567	0	1
doesn't know/answer	2605	0.0557	0.2293	0	1
Civil_status					
Married/cohabitant	2605	0.5574	0.4968	0	1
Single	2605	0.3585	0.4797	0	1
Separated	2605	0.0365	0.1875	0	1
Divorced	2605	0.0242	0.1537	0	1
Widower	2605	0.0119	0.1085	0	1
Work_status					
Fixed term contract	2575	0.1052	0.3069	0	1
Seasonal contract	2575	0.0136	0.1158	0	1
Independent contractor/freelancer	2575	0.1647	0.3709	0	1
Not working/unemployed/looking for a job	2575	0.1157	0.3200	0	1

Redundancy fund benefits	2575	0.0043	0.0652	0	1
Redundancy worker	2575	0.0082	0.0900	0	1
Housewife	2575	0.0148	0.1206	0	1
Student	2575	0.0404	0.1969	0	1
Retired	2575	0.1021	0.3029	0	1
Family status					
Living alone	2605	0.1655	0.3717	0	1
Living with my original family	2605	0.1965	0.3975	0	1
Living with my partner without children	2605	0.1777	0.3824	0	1
Living with my partner with children	2605	0.4115	0.4922	0	1
I am the only parent of child/children	2605	0.0372	0.1894	0	1
Income status					
Income less than € 15.000 per year	2605	0.2503	0.4333	0	1
Income between € 15.000 and € 30.000 per year	2605	0.3697	0.4828	0	1
Income between € 30.000 and € 50.000 per year	2605	0.2035	0.4026	0	1
Income between € 50.000 and € 100.000 per year	2605	0.0760	0.2651	0	1
Income higher than € 100.000 per year	2605	0.0107	0.1031	0	1
doesn't know/answer	2605	0.0783	0.2687	0	1
Per capita GDP	2578	20.3264	4.3889	12.79	26.78
People with up to the middle school degree	2512	46.9001	7.5688	31.60	65.64
Voters for Senate election	2512	80.5707	5.5728	65.26	87.50

Figure 1. a **Average investment shares (preference weights) in the different BES domains**

Legend= Health=health, Education=education and training; Job=work and life balance; Social=social relationships; Politics=politics and institutions; Culture=natural and cultural heritage; Environment=environment; Security=safety; Innovation=research and innovation; Services= quality of services

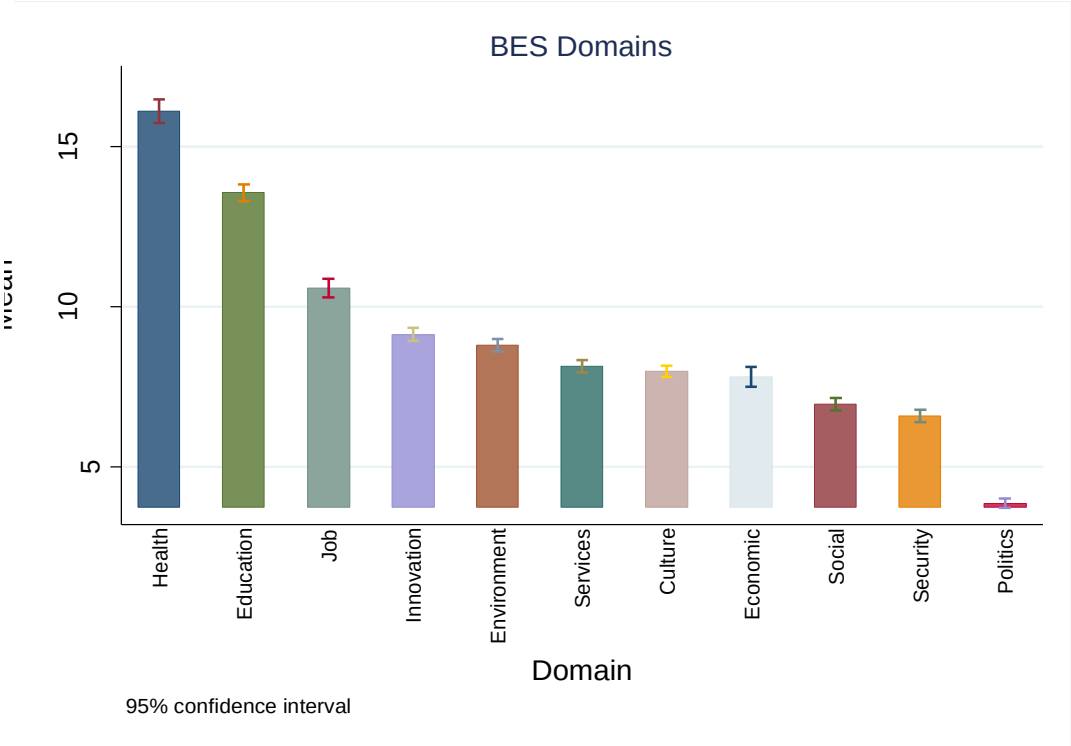

Figure 2.a **Average investment shares in the different BES domains-political orientation differences**

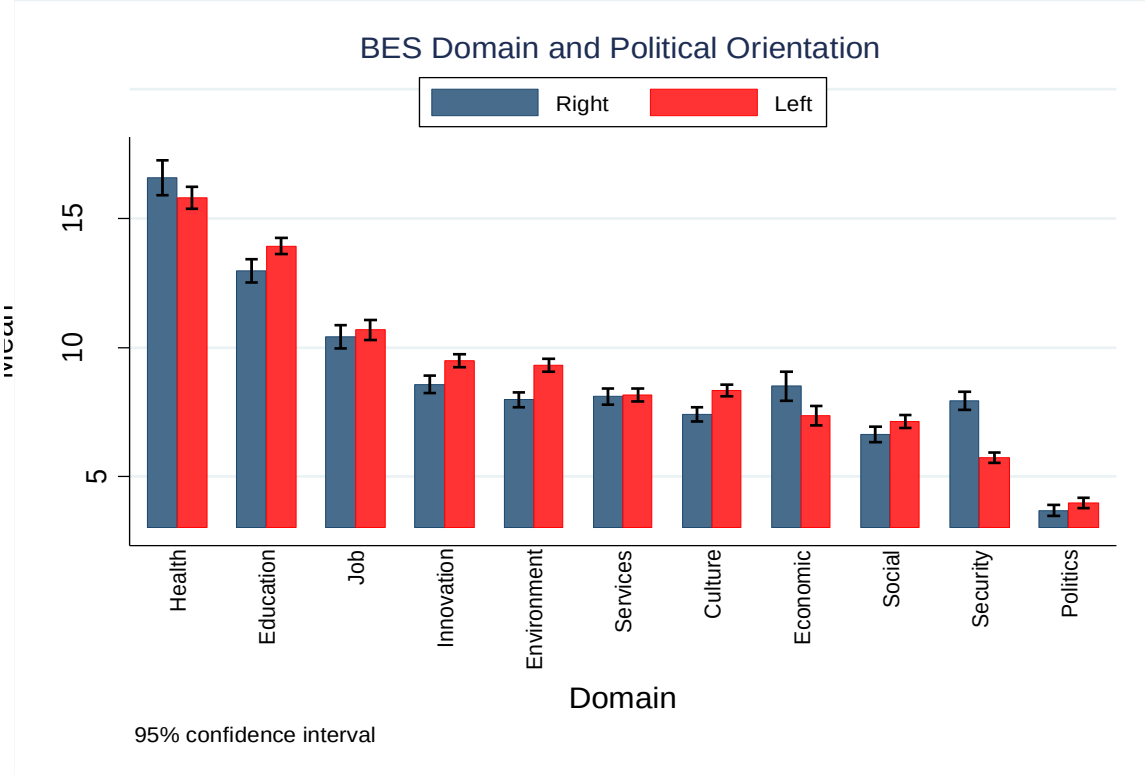

Figure 2.b **Average investment shares (preference weights) in the different BES domains – gender differences**

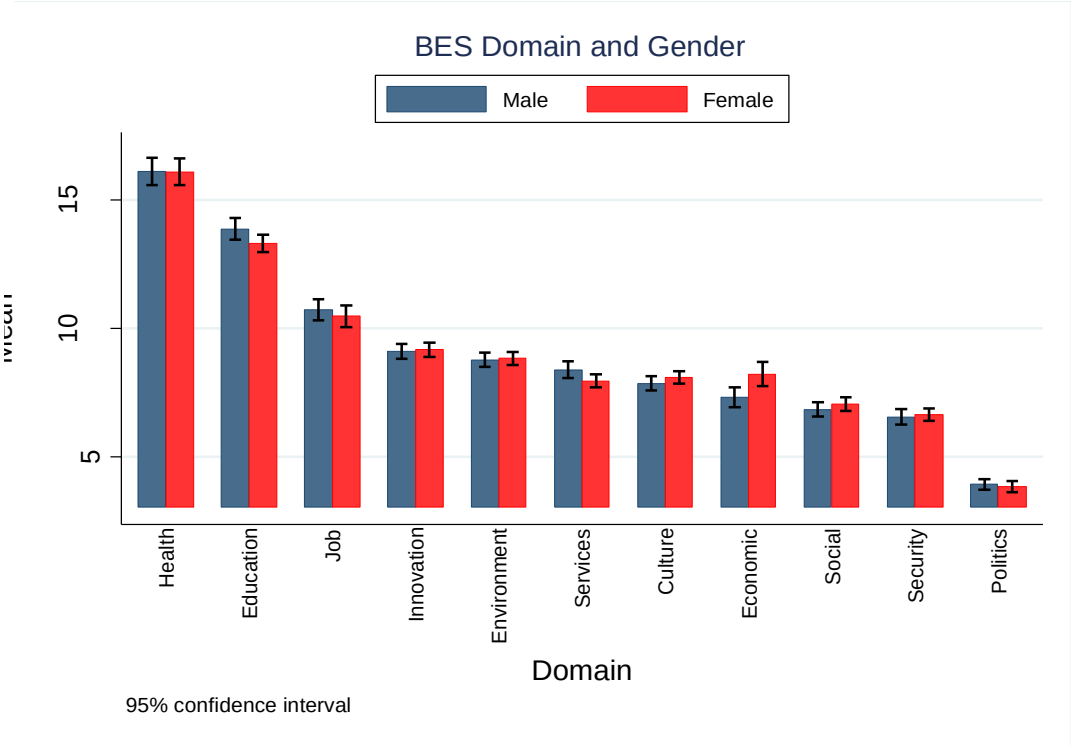

Figure 2.c **Average investment shares in the different BES domains-income differences**

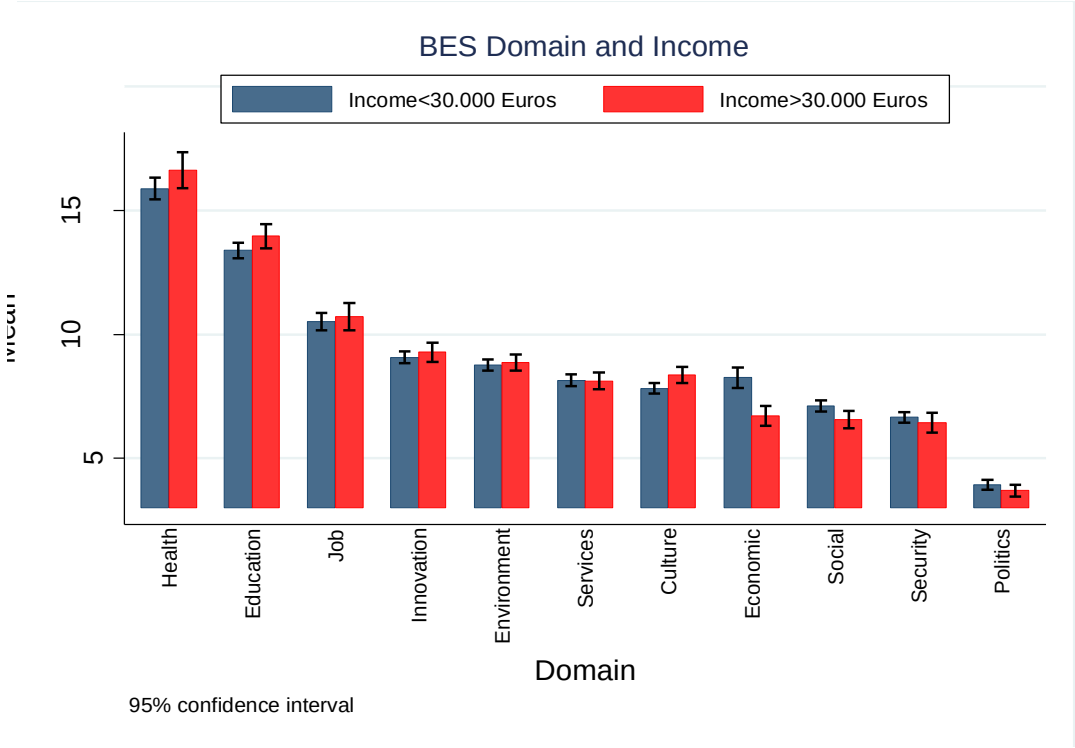

Figure 2.d **Average investment shares in the different BES domains –geographic location differences**

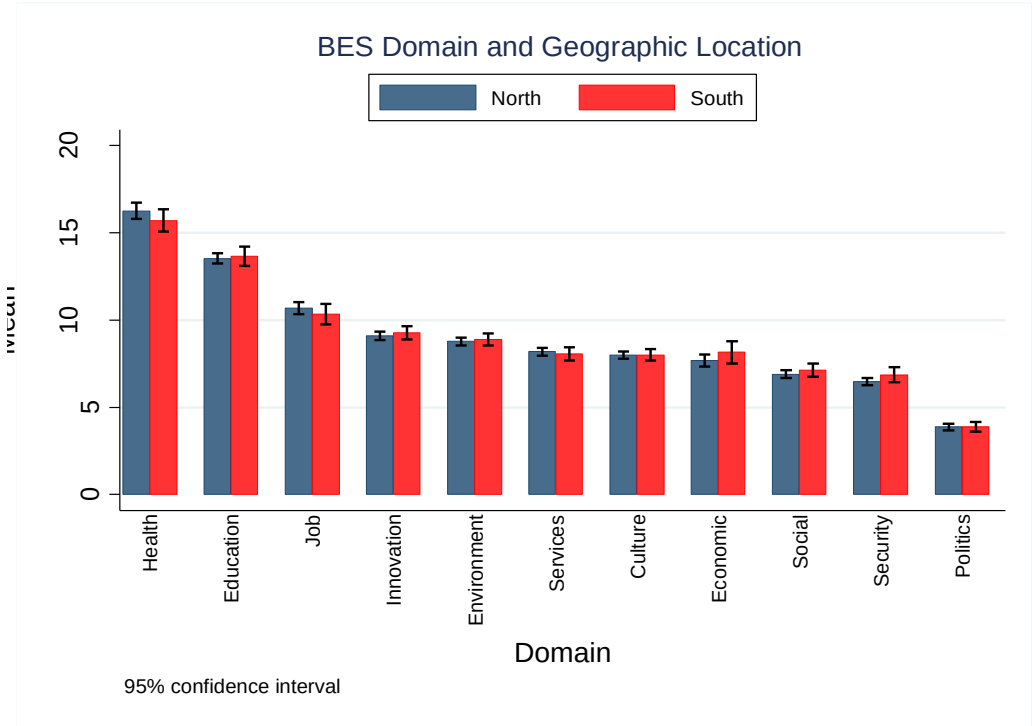

Figure 2.e **Average investment shares in the different BES domains –education differences**

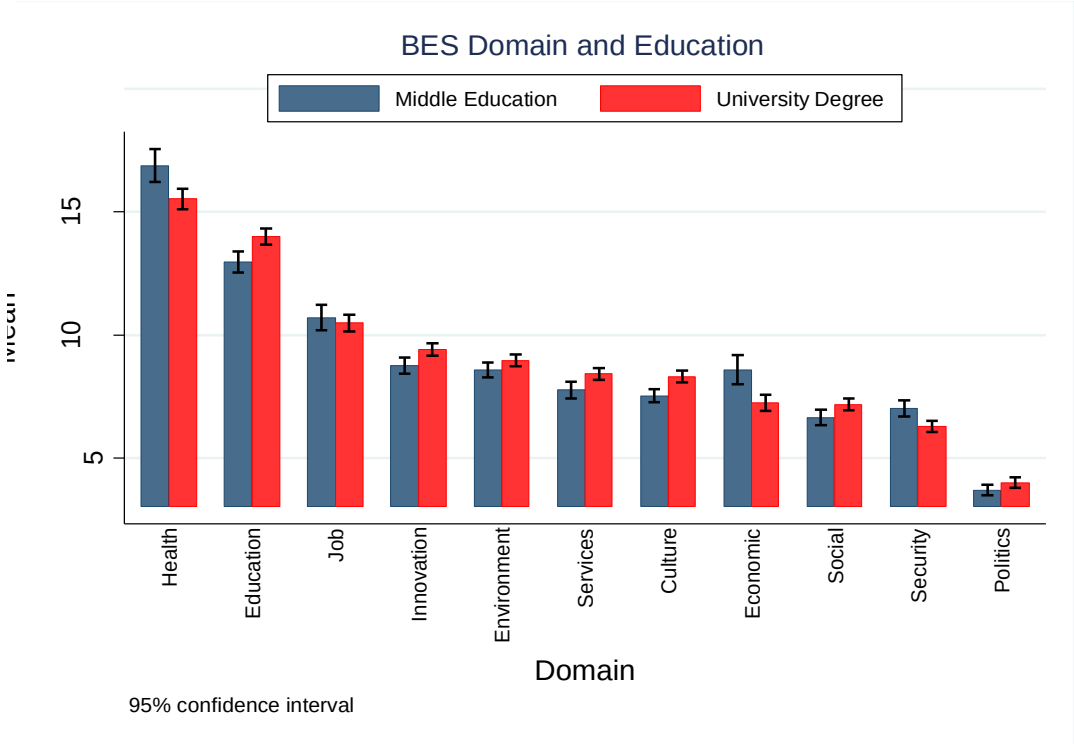

Figure 2.f **Average investment shares in the different BES domains-age differences**

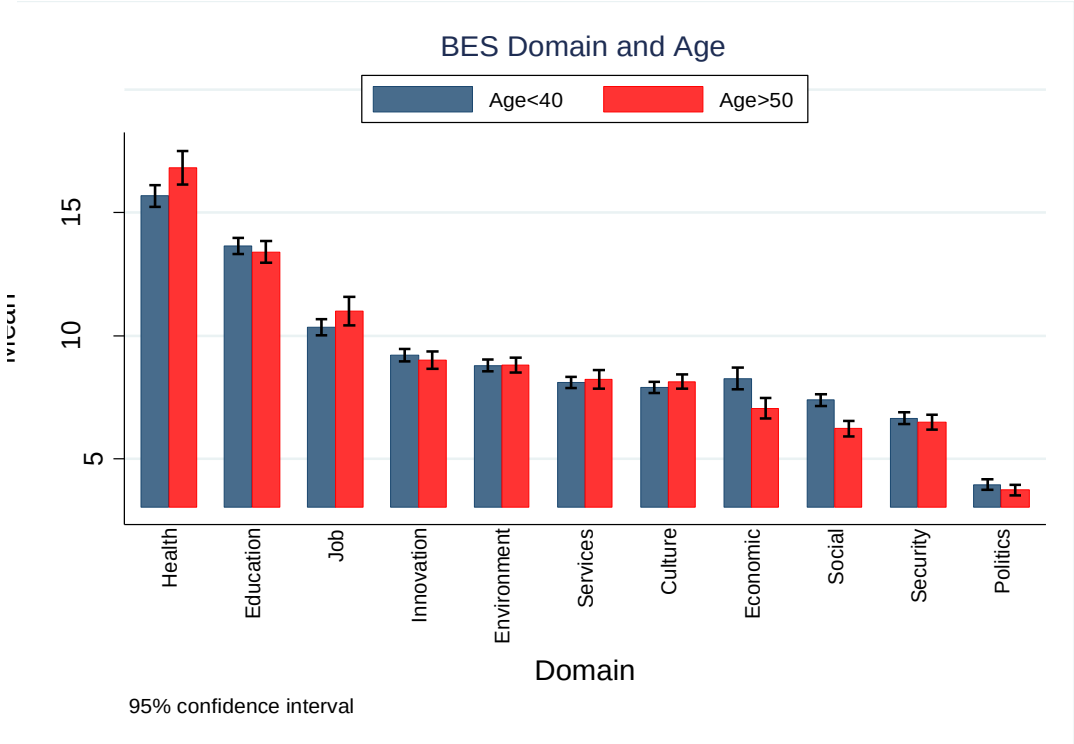

Table 2 The determinants of investment in BES domains - OLS single equation estimates

(Omitted benchmark: male in the 30-35 age class, living in the Center region with partner and children, working with an open ended contract in the tertiary sector)

	Education and training	Work and life balance	Economic wellbeing	Social relations	Politics and institutions	Environment
Gender	-0.475	-0.498	0.975	0.3	-0.013	0.186
	(-0.39)	(-0.29)	(-0.52)	(-0.21)	(-0.17)	(-0.35)
Education_middle	-0.935	-0.256	1.977	0.435	-0.047	-1.148*
	(-0.75)	(-0.95)	(-1.74)	(-0.51)	(-0.31)	(-0.57)
Education_bachelor	0.486	-0.192	-0.619	0.336	0.11	0.059
	(-0.26)	(-0.33)	(-0.37)	(-0.22)	(-0.17)	(-0.34)
Politics and institution	-0.102**	-0.06	0.207**	-0.036	-0.039	-0.192***
	(-0.04)	(-0.04)	(-0.07)	(-0.02)	(-0.02)	(-0.04)
NorthEast	0.012	-0.574	2.14	-1.016	-1.142*	-
	(-3.54)	(-1.27)	(-1.91)	(-1.16)	(-0.5)	
NorthWest	1.035	-1.455	0.048	0.011	-0.816*	-
	(-1.75)	(-1.59)	(-0.8)	(-0.96)	(-0.37)	
SouthIsles	-1.563	-1.158	5.015*	0.948	1.802**	-
	(-3.18)	(-3.93)	(-2.19)	(-0.89)	(-0.67)	
Source - Avvenire	1.565***	0.684	-1.792*	-0.332	-0.345*	0.192
	(-0.31)	(-0.45)	(-0.7)	(-0.25)	(-0.17)	(-0.38)
Source - Messaggero	-0.767	0.965	0.173	-1.488*	-0.714	0.09
	(-0.55)	(-0.85)	(-1.45)	(-0.61)	(-0.39)	(-1.53)
Source - Unità	1.096	2.329	-1.192	-0.725	0.011	1.501
	(-0.9)	(-1.51)	(-0.83)	(-0.74)	(-0.47)	(-1.25)
Manufacturing	-0.253	1.167	0.42	0.636*	-0.13	-0.291
	(-0.46	(-0.61)	(-0.74)	(-0.31)	(-0.19)	(-0.53)
Agriculture	-1.332	-1.248	2.43	2.623**	-0.256	0.016
	(-1.31)	(-1.06)	(-2.25)	(-0.92)	(-0.69)	(-1.59)
Personal services	0.22	0.122	-0.134	1.043***	0.097	-0.850*
	(-0.28)	(-0.34)	(-0.28)	(-0.26)	(-0.17)	(-0.37)
Other sectors	1.484**	-1.402**	-0.944	-0.022	-0.758*	-0.833
	(-0.55)	(-0.47)	(-0.81)	(-0.41)	(-0.32)	(-0.59)
Age - under 25	-0.647	-1.089	4.248	0.874	-0.613	-1.274*
	(-0.84)	(-0.94)	(-2.72)	(-0.61)	(-0.64)	(-0.48)
Age 25-30	-0.594	0.171	1.329	0.425	-0.512	0.082
	(-0.46)	(-0.55)	(-1.04)	(-0.43)	(-0.55)	(-0.42)
Age 35-40	0.136	-0.365	-0.119	0.373	-0.351	0.862
	(-0.58)	(-0.45)	(-0.76)	(-0.35)	(-0.43)	(-0.52)
Age 40-45	-0.517	-0.354	-0.68	0.194	-0.192	1.245*
	(-0.54)	(-0.51)	(-0.71)	(-0.41)	(-0.42)	(-0.6)
Age 45-50	0.209	0.525	-1.001	-0.348	-0.422	1.310*

	(-0.58)	(-0.54)	(-0.62)	(-0.38)	(-0.39)	(-0.57)
Age 50-55	0.265	0.149	-1.109	-0.532	-0.552	0.885*
	(-0.76)	(-0.63)	(-0.77)	(-0.43)	(-0.43)	(-0.44)
Age 55-60	-0.488	0.633	-0.617	-1.048**	-0.595	0.378
	(-0.66)	(-0.92)	(-0.66)	(-0.39)	(-0.43)	(-0.51)
Age 60-65	-0.408	0.201	-1.085	-1.151	-0.062	0.04
	(-0.69)	(-1.14)	(-0.78)	(-0.64)	(-0.55)	(-0.67)
Age 65-70	0.312	0.797	-1.04	-1.691**	0.379	0.643
	(-0.9)	(-1.12)	(-0.8)	(-0.57)	(-0.67)	(-0.8)
Age 70-75	-0.441	1.984	-2.454*	-0.43	0.376	-0.109
	(-1.12)	(-1.46)	(-1.15)	(-0.86)	(-0.7)	(-1.01)
Age 75-80	4.117	2.005	-1.796	-0.955	-0.084	0.359
	(-2.87)	(-2.43)	(-1.8)	(-0.96)	(-2.17)	(-1.22)
Age - over 80	-1.319	4.210*	0.043	-0.055	-0.255	1.142
	(-1.03)	(-1.9)	(-0.86)	(-0.94)	(-0.57)	(-0.94)
Single	-1.172	0.92	0.964	-0.44	0.249	0.623
	(-0.63)	(-0.97)	(-0.91)	(-0.39)	(-0.32)	(-0.78)
Separated	-0.918	1.135	1.715	1.086)	-0.582	-0.747
	(-0.95)	(-1.34)	(-1.06)	(-0.55)	(-0.57)	(-0.76)
Divorced	-0.77	2.917	0.24	-1.591**	-0.566	-0.666
	(-0.93)	(-1.62)	(-0.98)	(-0.56)	(-0.52)	(-0.94)
Widower	-1.86	2.911	2.032	1.079	0.011	-0.297
	(-1.7)	(-2.06)	(-1.65)	(-1.15)	(-0.72)	(-1.12)
Fixed term contract	-0.432	0.052	1.759	0.291	0.167	-0.041
	(-0.51)	(-0.51)	(-1.01)	(-0.4)	(-0.26)	(-0.44)
Seasonal contract	-0.085	0.651	6.766*	0.279	-0.697	0.332
	(-2.56)	(-1.46)	(-3.23)	(-0.76)	(-0.51)	(-1.24)
Independent contractor/freelancer	-0.708	0.199	-0.064	0.285	0.481	0.591
	(-0.38)	(-0.47)	(-0.37)	(-0.38)	(-0.25)	(-0.41)
Not working/unemployed/looking for a job	-1.182*	0.314	1.815	-0.321	0.013	0.495
	(-0.52)	(-0.94)	(-1.22)	(-0.29)	(-0.31)	(-0.53)
Redundancy fund benefits	-1.976	-0.116	5.394	0.426	1.71	-2.309
	(-1.72)	(-1.85)	(-3.8)	(-1.22)	(-0.89)	(-1.3)
Redundancy worker	-2.133	2.409	-0.08	-1.578	-1.327*	-1.37
	(-2.29)	(-4.74)	(-2.43)	(-0.88)	(-0.54)	(-1.56)
Housewife	-0.964	-1.315	-0.855	-0.319	0.217	-0.143
	(-1.04)	(-0.86)	(-0.93)	(-0.81)	(-0.54)	(-1.83)
Student	-0.753	-0.204	-1.69	-0.12	0.374	2.277**
	(-1.02)	(-1.19)	(-1.97)	(-0.67)	(-0.54)	(-0.74)
Retired	-1.363*	-0.425	0.967	0.173	0.466	0.981
	(-0.59)	(-1.12)	(-0.8)	(-0.48)	(-0.34)	(-0.86)
Living alone	0.86	-1.129	-1.840*	0.433	-0.059	-0.745

	(-0.68)	(-1.02)	(-0.81)	(-0.46)	(-0.41)	(-0.7)
Living with my original family	1.242	-0.719	-2.124*	0.407	0.511	-0.877
	(-0.76)	(-1.02)	(-0.94)	(-0.48)	(-0.53)	(-0.86)
Living with my partner without children	-0.513	-1.137*	-0.326	0.17	-0.106	-0.209
	(-0.31)	(-0.48)	(-0.44)	(-0.27)	(-0.22)	(-0.42)
I am the only parent of child/children	0.674	-1.937	1.091	-0.206	0.174	-0.426
	(-0.91)	(-1.23)	(-1.32)	(-0.64)	(-0.58)	(-0.68)
Income less than € 15.000 per year	-0.478	0.262	1.166	0.207	0.354	-0.557
	(-0.33)	(-0.42)	(-0.64)	(-0.34)	(-0.29)	(-0.4)
Income between € 30.000 and € 50.000 per year	-0.041	0.096	-0.66	-0.116	0.036	-0.227
	(-0.4)	(-0.34)	(-0.52)	(-0.28)	(-0.17)	(-0.34)
Income between € 50.000 and € 100.000 per year	0.116	0.396	0.066	-0.299	0.285	-0.646
	(-0.5)	(-0.77)	(-0.42)	(-0.43)	(-0.28)	(-0.57)
Income higher than € 100.000 per year	-0.175	0.3	-0.168	-0.604	-0.195	-0.82
	(-1.28)	(-1.47)	(-0.77)	(-0.86)	(-0.58)	(-0.68)
Don't want to declare my income class	-0.67	1.291	-0.648	-0.348	0.3	-0.439
	(-0.64)	(-0.86)	(-1.18)	(-0.44)	(-0.27)	(-0.46)
			CONTROLS			
Common controls						
Per capita GDP	-0.0033	-0.1865	-0.3318	-0.3925*	0.0351	Omitted
	(0.320)	(0.4962)	(0.2792)	(0.1719)	(0.0494)	Omitted
People with up to the middle school degree	0.027	0.055	-0.006	-0.04	-0.040*	-0.031
	(-0.03)	(-0.04)	(-0.04)	(-0.02)	(-0.02)	(-0.04)
Voters for Senate election	-0.042	0.089	0.079	0.049	-0.011	-0.103
	(-0.06)	(-0.1)	(-0.08)	(-0.05)	(-0.03)	(-0.07)
Significant BES indicators						
Employed persons with temporary jobs	-	0.363*	-	-	-	-
		(-0.17)				
Share of population who has given unpaid aid	-	-	-	0.212**	-	-
				(-0.07)		
Social cooperatives per 10,000 inhabitants	-	-	-	-1.681*	-	-
				(-0.76)		
Trust in justice	-	-	-	-	0.641***	-
					(-0.04)	
Trust in institutions other than local	-	-	-	-	2.271**	-
					(-0.84)	

Cons	33.909	-38.368	5.548	0.254	-15.683	15.590*
	(-89.03)	(-35.75)	(-6.9)	(-8.14)	(-9.13)	(-7.76)

Table 2 The determinants of investment in BES domains - OLS single equation estimates (follows)

	Health	Security	Quality of service	Landscape and cultural heritage	Research and innovation
Gender	-0.59	-0.042	-0.281	0.338	0.159
	(-0.38)	(-0.21)	(-0.24)	(-0.2)	(-0.27)
Education_middle	2.558	-0.911	-0.714	-0.537	-1.123*
	(-1.34)	(-0.49)	(-0.51)	(-0.5)	(-0.54)
Education_bachelor	-0.990*	-0.605*	0.432	0.539*	0.414
	(-0.42)	(-0.23)	(-0.26)	(-0.24)	(-0.23)
Politics and institution	0.088	0.263***	-0.008	-0.126***	-0.072*
	(-0.05)	(-0.03)	(-0.03)	(-0.03)	(-0.03)
NorthEast	6.04	-1.977	-	1.897	-0.736
	(-6.05)	(-1.33)		(-1.46)	(-1)
NorthWest	4.309	-0.844	-	2.104	-0.414
	(-4.82)	(-0.73)		(-1.11)	(-0.64)
SouthIsles	6.092	1.149	-	0.127	-0.036
	(-7.33)	(-0.73		(-1.22)	(-0.91)
Source - Avvenire	-0.282	0.015	0.18	0.570*	0.289
	(-0.58)	(-0.24)	(-0.35)	(-0.28)	(-0.27)
Source - Messaggero	0.611	0.748	-0.21	0.795*	-0.245
	(-1.46)	(-0.38)	(-0.43)	(-0.34)	(-0.41)
Source - Unità	-1.645	-0.868	-2.328**	0.529	2.073*
	(-1.19)	(-0.59)	(-0.75)	(-0.7)	(-0.82)
Manufacturing	-0.845	-0.053	0.105	-0.413	-0.025
	(-0.66)	(-0.26)	(-0.3)	(-0.31)	(-0.4)
Agriculture	-0.406	-0.223	0.063	-0.231	-2.047*
	(-1.57)	(-0.84)	(-1.15)	(-0.88)	(-0.96)
Personal services	-0.362	0.102	0.524	-0.484*	-0.526
	(-0.42)	(-0.21)	(-0.29)	(-0.23)	(-0.27)
Other sectors	1.339	0.941	-0.181	-0.132	0.23
	(-0.94)	(-0.75)	(-0.38)	(-0.46)	(-0.58)

Age - under 25	0.326	-0.012	-1.166	-0.12	-0.595
	(-1.25)	(-0.44)	(-0.63)	(-0.61)	(-0.55)
Age 25-30	-0.336	-0.537	-0.052	0.106	-0.088
	(-0.79)	(-0.42)	(-0.44)	(-0.41)	(-0.37)
Age 35-40	-0.445	-0.531	-0.418	0.708	0.035
	(-0.94)	(-0.36)	(-0.38)	(-0.45)	(-0.38)
Age 40-45	0.754	-0.686	0.285	1.368***	-0.656
	(-0.72)	(-0.38)	(-0.48)	(-0.4)	(-0.45)
Age 45-50	-0.371	-0.405	-0.342	1.007*	0.246
	(-0.81)	(-0.44)	(-0.49)	(-0.43)	(-0.42)
Age 50-55	0.237	-0.842	0.263	1.323**	0.081
	(-1.01)	(-0.5)	(-0.46)	(-0.44)	(-0.38)
Age 55-60	1.212	-0.795	0.6	1.011	-0.606
	(-1.14)	(-0.54)	(-0.68)	(-0.6)	(-0.52)
Age 60-65	-0.057	-0.348	1.464	0.79	-0.016
	(-1.16)	(-0.58)	(-0.81)	(-0.53)	(-0.78)
Age 65-70	-1.168	-0.38	0.866	0.851	-0.228
	(-1.51)	(-0.57)	(-1.11)	(-0.6)	(-0.77)
Age 70-75	-2.222	0.027	1.24	1.09	0.62
	(-1.78)	(-0.67)	(-0.83)	(-0.82)	(-0.95)
Age 75-80	-2.868	0.149	-1.607	0.527	1.025
	(-3.01)	(-2.17)	(-2.04)	(-2.2)	(-1.75)
Age - over 80	-0.115	-0.5	-0.473	-1.007*	-0.904
	(-1.24)	(-0.57)	(-0.85)	(-0.5)	(-0.86)
Single	-0.054	-0.21	0.191	-0.248	-0.096
	(-1.17)	(-0.43)	(-0.53)	(-0.45)	(-0.5)
Separated	1.059	-1.055*	-0.319	-0.07	-0.412
	(-1.8)	(-0.52)	(-0.78)	(-0.96)	(-1)
Divorced	4.006	-1.077*	-1.35	-0.351	-0.464
	(-2.67)	(-0.51)	(-1.33)	(-0.8)	(-0.8)
Widower	3.503	-2.038*	-1.536	-0.552	-1.643
	(-2.73)	(-0.97)	(-1.08)	(-0.87)	(-0.95)
Fixed term contract	-0.644	-0.438	-0.119	-0.105	-0.301
	(-0.67)	(-0.34)	(-0.3)	(-0.26)	(-0.38)
Seasonal contract	-3.487*	-1.423	-0.31	0.561	-1.688*
	(-1.64)	(-1.13)	(-0.85)	(-1)	(-0.8)
Independent contractor/freelancer	-0.582	-0.287	-0.267	0.231	0.105
	(-0.46)	(-0.27)	(-0.34)	(-0.32)	(-0.27)
Not working/unemployed/looking for a job	-0.519	-0.575	0.249	0.244	-0.143
	(-0.73)	(-0.39)	(-0.43)	(-0.55)	(-0.35)
Redundancy fund benefits	-2.675*	-0.673	-0.387	0.861	-2.173*
	(-1.18)	(-1.02)	(-0.56)	(-1.46)	(-1.02)
Redundancy worker	-1.358	-0.882	-0.83	0.27	1.565

	(-2.37)	(-0.74)	(-1)	(-1.28)	(-1.76)
Housewife	-3.532**	3.776	0.426	0.671	1.448
	(-1.33)	(-2.47)	(-0.75)	(-0.87)	(-0.91)
Student	-0.379	-0.452	1.52	0.507	0.362
	(-1.19)	(-0.51)	(-0.8)	(-0.56)	(-0.56)
Retired	0.65	0.204	-1.32	0.188	0.1
	(-1.16)	(-0.54)	(-0.79)	(-0.48)	(-0.59)
Living alone	-0.402	0.413	0.455	0.992*	0.278
	(-1.16)	(-0.45)	(-0.53)	(-0.49)	(-0.55)
Living with my original family	-1.257	0.547	-0.649	0.95	0.424
	(-0.96)	(-0.44)	(-0.48)	(-0.53)	(-0.61)
Living with my partner without children	0.124	0.256	0.582	0.857*	0.035
	(-0.52)	(-0.33)	(-0.46)	(-0.39)	(-0.27)
I am the only parent of child/children	-2.799	1.098*	1.609*	0.52	-0.443
	(-1.97)	(-0.55)	(-0.64)	(-0.89)	(-0.65)
Income less than € 15.000 per year	-0.556	-0.491	-0.16	0.212	-0.224
	(-0.52)	(-0.26)	(-0.31)	(-0.33)	(-0.31)
Income between € 30.000 and € 50.000 per year	-0.358	-0.216	-0.211	0.752*	0.256
	(-0.54)	(-0.31)	(-0.34)	(-0.33)	(-0.33)
Income between € 50.000 and € 100.000 per year	1.28	-0.54	-0.622	-0.075	-0.569
	(-0.77)	(-0.45)	(-0.4)	(-0.29)	(-0.4)
Income higher than € 100.000 per year	2.184	0.142	0.394	-0.078	-0.331
	(-2.11)	(-1.01)	(-1.04)	(-0.55)	(-0.95)
Don't want to declare my income class	-0.584	0.553	0.077	0.031	0.022
	(-0.91)	(-0.35)	(-0.7)	(-0.41)	(-0.48)
			CONTROLS		
Common controls					
Per capita GDP	-0.3966	0.0136	-0.0917	Omitted	-0.0263
	(0.7340)	(0.1713)	(0.1581)	Omitted	(0.2279)
People with up to the middle school degree	-0.001	0.034	-0.015	-0.028	0.039
	(-0.06)	(-0.02)	(-0.02)	(-0.03)	(-0.03)
Voters for Senate election	0.178	0.028	0.092	-0.164**	-0.076
	(-0.12)	(-0.03)	(-0.05)	(-0.06)	(-0.06)
Significant BES indicators					
Lifetime duration for women	8.800*	-	-	-	-

	(-4.01)				
Burglary rate	-	0.154*	-	-	-
		(-0.07)			
Sexual violence rate	-	-1.520*	-	-	-
		(-0.75)			
Conservation of historic urban fabric	-		-	0.154**	-
				(-0.05)	
Cons	-625.164	-8.476	3.412	19.133**	4.271
	(-383.28)	(-14.05)	-7.09)	(-6.41)	(-6.01)

Table 3 The determinants of investment in BES domains - Tobit system equation estimates

(Omitted benchmark: male in the 30-35 age class, living in the Center region with partner and children, working with an open ended contract in the tertiary sector)

	Education and training	Work and life balance	Economic wellbeing	Social relations	Politics and institutions	Environment
Gender	-0.521	-0.576*	1.127	0.345	-0.016	0.188
	(0.394)	(0.285)	(0.584)	(0.228)	(0.217)	(0.371)
Education_middle	-1.161	-0.484	1.874	0.359	-0.227	-1.322*
	(0.826)	(0.885)	(1.811)	(0.574)	(0.452)	(0.650)
Education_bachelor	0.532	-0.146	-0.674	0.437	0.178	0.096
	(0.274)	(0.370)	(0.432)	(0.257)	(0.220)	(0.371)
Politics and institution	-0.110**	-0.067	0.252**	-0.034	-0.058*	-0.203***
	(0.039)	(0.040)	(0.086)	(0.026)	(0.024)	(0.041)
NorthEast	0.126	-0.909	2.502	-1.233	-1.691**	1.082
	(3.645)	(1.447)	(2.066)	(1.284)	(0.598)	(1.302)
NorthWeast	1.083	-1.602	0.256	0.149	-1.277**	0.584
	(1.791)	(1.768)	(0.875)	(1.040)	(0.416)	(1.799)
SouthIslands	-1.891	-0.934	5.337*	0.870	2.615*	-1.369
	(3.190)	(4.316)	(2.343)	(1.080)	(1.109)	(1.398)
Source - Avvenire	1.673***	0.794	-2.210**	-0.365	-0.500	0.358
	(0.317)	(0.504)	(0.838)	(0.297)	(0.262)	(0.369)
Source - Messaggero	-0.648	1.363	0.119	-1.622*	-0.780	0.180
	(0.606)	(0.866)	(1.566)	(0.715)	(0.519)	(1.492)
Source - Unità	1.164	2.517	-2.133	-0.945	-0.253	1.395
	(0.920)	(1.556)	(1.236)	(0.864)	(0.689)	(1.319)
Manufacturing	-0.305	1.177*	0.396	0.643	-0.319	-0.400
	(0.481)	(0.566)	(0.814)	(0.352)	(0.281)	(0.559)
Agriculture	-1.636	-1.659	2.428	2.694**	-0.652	-0.198
	(1.432)	(1.161)	(2.304)	(1.015)	(1.005)	(1.793)
Personal services	0.255	0.190	-0.070	1.188***	0.200	-0.884*
	(0.278)	(0.361)	(0.322)	(0.284)	(0.212)	(0.398)
Other sectors	1.532**	-1.493*	-1.379	-0.082	-1.024*	-0.833
	(0.576)	(0.599)	(0.978)	(0.487)	(0.416)	(0.651)
Age - under 25	-0.759	-1.284	4.743	0.981	-0.673	-1.295*
	(0.936)	(1.058)	(2.788)	(0.623)	(0.783)	(0.536)
Age 25-30	-0.632	0.180	1.587	0.431	-0.578	0.074
	(0.498)	(0.590)	(1.075)	(0.465)	(0.447)	(0.413)
Age 35-40	0.152	-0.563	-0.285	0.397	-0.323	0.864
	(0.596)	(0.502)	(0.855)	(0.388)	(0.347)	(0.524)
Age 40-45	-0.513	-0.476	-0.730	0.210	-0.080	1.359*

	(0.550)	(0.507)	(0.791)	(0.453)	(0.382)	(0.612)
Age 45-50	0.217	0.479	-1.363	-0.416	-0.376	1.381*
	(0.586)	(0.494)	(0.712)	(0.410)	(0.438)	(0.575)
Age 50-55	0.253	0.117	-1.345	-0.647	-0.815	0.849
	(0.776)	(0.648)	(0.923)	(0.480)	(0.457)	(0.475)
Age 55-60	-0.513	0.634	-0.956	-1.302**	-0.892	0.290
	(0.666)	(0.675)	(0.804)	(0.455)	(0.535)	(0.557)
Age 60-65	-0.400	0.020	-1.658	-1.558*	-0.131	-0.057
	(0.705)	(1.174)	(1.039)	(0.725)	(0.701)	(0.757)
Age 65-70	0.337	0.697	-1.616	-2.058**	0.442	0.532
	(0.936)	(1.181)	(1.017)	(0.667)	(0.786)	(0.860)
Age 70-75	-0.359	2.183	-3.061*	-0.606	0.440	-0.343
	(1.165)	(1.498)	(1.493)	(0.974)	(0.957)	(1.090)
Age 75-80	4.302	2.245	-2.407	-1.339	-0.941	0.216
	(2.881)	(2.490)	(2.199)	(1.204)	(2.915)	(1.253)
Age - over 80	-1.565	4.076***	-0.366	-0.381	-0.509	1.066
	(1.095)	(1.116)	(1.049)	(1.062)	(0.695)	(1.017)
Single	-1.248	1.064	1.232	-0.477	0.303	0.611
	(0.667)	(1.043)	(0.990)	(0.438)	(0.424)	(0.818)
Separated	-1.103	0.920	1.761	1.196	-0.866	-0.853
	(1.033)	(1.411)	(1.123)	(0.626)	(0.822)	(0.811)
Divorced	-0.972	2.597	-0.350	-2.003**	-0.996	-0.697
	(0.992)	(1.758)	(1.323)	(0.719)	(0.762)	(1.040)
Widower	-2.108	2.982	2.561	1.069	0.179	-0.164
	(1.786)	(2.087)	(1.863)	(1.300)	(1.004)	(1.278)
Fixed term contract	-0.501	0.051	2.098	0.335	0.272	-0.137
	(0.544)	(0.426)	(1.127)	(0.427)	(0.351)	(0.465)
Seasonal contract	-0.336	0.372	7.051*	0.347	-1.119	0.123
	(2.725)	(1.576)	(3.215)	(0.800)	(0.937)	(1.470)
Independent contractor/freelancer	-0.702	0.308	0.150	0.364	0.689**	0.578
	(0.388)	(0.500)	(0.458)	(0.441)	(0.234)	(0.423)
Not working/unemployed/looking for a	-1.254*	0.307	2.176	-0.313	0.034	0.535
	(0.554)	(0.651)	(1.341)	(0.328)	(0.373)	(0.579)
Redundancy fund benefits	-2.114	-0.052	6.373	0.623	2.493*	-2.429
	(1.899)	(2.079)	(3.883)	(1.429)	(1.153)	(1.501)
Redundancy worker	-2.504	2.186	-0.285	-1.854	-2.160*	-1.949
	(2.526)	(1.719)	(2.900)	(1.204)	(1.009)	(1.902)
Housewife	-1.012	-1.608	-0.711	-0.202	0.327	-0.287
	(1.088)	(1.006)	(1.383)	(0.983)	(0.784)	(2.030)
Student	-0.707	0.012	-1.409	0.073	0.802	2.361**
	(1.105)	(1.174)	(2.000)	(0.726)	(0.697)	(0.786)
Retired	-1.364*	-0.268	1.790	0.422	0.670	1.155
	(0.626)	(1.093)	(0.951)	(0.558)	(0.500)	(0.911)
Living alone	0.979	-1.200	-2.237*	0.371	-0.120	-0.780

	(0.732)	(1.092)	(0.893)	(0.543)	(0.545)	(0.727)
Living with my original family	1.385	-0.812	-2.509*	0.434	0.540	-0.845
	(0.807)	(1.050)	(1.047)	(0.554)	(0.608)	(0.910)
Living with my partner without children	-0.559	-1.292*	-0.210	0.200	-0.143	-0.171
	(0.315)	(0.521)	(0.533)	(0.319)	(0.267)	(0.438)
I am the only parent of child/children	0.822	-1.767	1.598	-0.006	0.272	-0.299
	(0.949)	(1.266)	(1.492)	(0.776)	(0.830)	(0.754)
Income less than € 15.000 per year	-0.562	0.131	1.170	0.233	0.406	-0.583
	(0.343)	(0.455)	(0.672)	(0.372)	(0.355)	(0.435)
Income between € 30.000 and € 50.000 per year	-0.055	0.152	-0.754	-0.096	0.075	-0.246
	(0.407)	(0.376)	(0.621)	(0.319)	(0.251)	(0.362)
Income between € 50.000 and € per year	0.065	0.519	0.150	-0.268	0.516	-0.662
	(0.520)	(0.801)	(0.523)	(0.511)	(0.383)	(0.574)
Income higher than € 100.000 per year	-0.185	0.503	-0.661	-0.750	-0.269	-0.659
	(1.302)	(1.476)	(1.138)	(1.040)	(0.875)	(0.693)
Don't want to declare my income class	-0.693	1.324*	-0.733	-0.422	0.393	-0.395
	(0.677)	(0.674)	(1.296)	(0.497)	(0.337)	(0.492)
			CONTROLS			
Common controls						
Per capita GDP	-0.039	-0.321	-0.456	-0.463*	0.038	Omitted
	(0.328)	(0.549)	(0.324)	(0.193)	(0.070)	
People with up to the middle school degree	0.027	0.054	-0.001	-0.043	-0.050*	-0.024
	(0.034)	(0.047)	(0.045)	(0.027)	(0.023)	(0.041)
Voters for Senate election	-0.046	0.096	0.097	0.052	-0.014	-0.086
	(0.058)	(0.072)	(0.084)	(0.061)	(0.042)	(0.073)
Significant BES indicators						
Employed persons with temporary jobs	-	0.427*	-	-	-	-
		(0.180)				
Underpaied workers	-		-	0.237**	-	-
				(0.083)		
Persons not in regular occupation	-	-	-	-2.028*	-	-
				(0.875)		
People at risk of relative poverty	-	-	-	-	1.062***	-
					(0.065)	
People suffering poor housing conditions	-	-	-	-	3.313**	-
					(1.126)	
Cons	38.840	-44.102	4.771	-1.311	-29.558*	12.746
	(91.855)	(37.927)	(8.008)	(9.869)	(14.304)	(8.198)
σ_{ε}^{2}	6.708***	8.162***	8.918***	5.558***	4.941***	5.136***
	(0.208)	(0.146)	(1.332)	(0.189)	(0.025)	(0.370)

Table 3 The determinants of investment in BES domains - Tobit system equation estimates (follows)

	Health	Security	Quality of service	Landscape and cultural heritag	Research and innovation
Gender	-0.647	-0.054	-0.291	0.374	0.142
	(0.390)	(0.250)	(0.310)	(0.219)	(0.302)
Education_middle	2.448	-1.169*	-1.047	-0.789	-1.472*
	(1.355)	(0.514)	(0.629)	(0.584)	(0.654)
Education_bachelor	-0.991*	-0.626**	0.478	0.619*	0.479
	(0.432)	(0.228)	(0.258)	(0.260)	(0.253)
Politics and institution	0.083	0.300***	-0.007	-0.136***	-0.085*
	(0.053)	(0.032)	(0.027)	(0.028)	(0.034)
NorthEast	4.437	-2.115	-2.531	1.886	-0.982
	(3.352)	(1.605)	(2.726)	(1.634)	(1.166)
NorthWeast	2.916	-1.025	-2.025	2.256	-0.475
	(2.109)	(0.866)	(2.907)	(1.264)	(0.710)
SouthIslands	11.948	1.033	1.786	0.295	-0.385
	(7.228)	(0.803)	(2.164)	(1.305)	(0.997)
Source - Avvenire	-0.220	0.065	0.161	0.677*	0.369
	(0.586)	(0.293)	(0.377)	(0.315)	(0.313)
Source - Messaggero	0.782	0.887*	-0.015	0.907*	-0.100
	(1.593)	(0.434)	(0.458)	(0.355)	(0.463)
Source - Unità	-1.802	-1.553	-2.872**	0.496	2.142*
	(1.266)	(0.829)	(0.948)	(0.770)	(0.861)
Manufacturing	-0.884	-0.144	0.088	-0.478	-0.054
	(0.684)	(0.306)	(0.331)	(0.346)	(0.432)
Agriculture	-0.686	-0.485	-0.106	-0.317	-2.682*
	(1.625)	(1.010)	(1.251)	(1.031)	(1.279)
Personal services	-0.360	0.130	0.579	-0.497*	-0.560
	(0.426)	(0.237)	(0.355)	(0.252)	(0.294)
Other sectors	1.414	1.068*	-0.161	-0.124	0.244
	(0.937)	(0.451)	(0.460)	(0.506)	(0.649)
Age - under 25	0.248	-0.016	-1.327	-0.187	-0.723
	(1.371)	(0.489)	(0.778)	(0.706)	(0.636)
Age 25-30	-0.350	-0.608	-0.024	0.112	-0.114
	(0.832)	(0.479)	(0.474)	(0.465)	(0.398)
Age 35-40	-0.355	-0.643	-0.453	0.765	0.025
	(0.974)	(0.407)	(0.414)	(0.482)	(0.418)
Age 40-45	0.878	-0.747	0.338	1.554***	-0.648
	(0.758)	(0.421)	(0.524)	(0.430)	(0.521)
Age 45-50	-0.390	-0.487	-0.367	1.066*	0.265
	(0.846)	(0.482)	(0.569)	(0.486)	(0.444)

Age 50-55	0.291	-1.033	0.267	1.409**	0.065
	(1.039)	(0.590)	(0.508)	(0.480)	(0.424)
Age 55-60	1.229	-1.054	0.655	0.992	-0.698
	(1.186)	(0.652)	(0.584)	(0.644)	(0.576)
Age 60-65	-0.003	-0.638	1.605	0.811	-0.087
	(1.174)	(0.689)	(0.841)	(0.587)	(0.846)
Age 65-70	-1.182	-0.557	0.763	0.914	-0.224
	(1.554)	(0.712)	(1.188)	(0.656)	(0.861)
Age 70-75	-2.114	-0.081	1.484	1.183	0.697
	(1.781)	(0.849)	(0.894)	(0.889)	(1.073)
Age 75-80	-2.840	-0.226	-2.066	0.315	1.136
	(3.014)	(2.672)	(2.647)	(2.531)	(1.877)
Age - over 80	-0.133	-0.728	-0.852	-1.240*	-1.169
	(1.270)	(0.710)	(1.018)	(0.626)	(0.958)
Single	0.167	-0.181	0.271	-0.189	-0.193
	(1.199)	(0.522)	(0.604)	(0.497)	(0.568)
Separated	1.074	-1.382*	-0.539	-0.206	-0.636
	(1.766)	(0.647)	(0.927)	(1.111)	(1.222)
Divorced	4.117	-1.383*	-1.737	-0.442	-0.766
	(2.693)	(0.632)	(1.683)	(0.876)	(0.890)
Widower	3.704	-2.263	-1.811	-0.623	-1.881
	(2.735)	(1.169)	(1.304)	(1.012)	(1.113)
Fixed term contract	-0.716	-0.503	-0.056	-0.137	-0.385
	(0.704)	(0.415)	(0.334)	(0.294)	(0.444)
Seasonal contract	-4.006*	-1.977	-0.528	0.491	-2.164*
	(1.857)	(1.412)	(1.038)	(1.153)	(1.013)
Independent contractor/freelancer	-0.532	-0.256	-0.236	0.222	0.173
	(0.464)	(0.307)	(0.352)	(0.347)	(0.285)
Not working/unemployed/looking for a job	-0.505	-0.557	0.354	0.277	-0.109
	(0.755)	(0.473)	(0.448)	(0.610)	(0.395)
Redundancy fund benefits	-2.511*	-0.669	-0.371	0.949	-2.471
	(1.147)	(1.318)	(0.686)	(1.694)	(1.329)
Redundancy worker	-1.584	-1.121	-0.953	0.245	1.613
	(2.594)	(1.066)	(1.019)	(1.456)	(1.913)
Housewife	-3.714**	4.017***	0.541	0.757	1.563
	(1.374)	(0.891)	(0.735)	(0.956)	(0.956)
Student	-0.159	-0.328	1.871*	0.652	0.513
	(1.251)	(0.573)	(0.789)	(0.619)	(0.625)
Retired	0.756	0.470	-1.242	0.249	0.151
	(1.163)	(0.720)	(0.804)	(0.542)	(0.680)
Living alone	-0.556	0.386	0.377	1.006	0.399
	(1.181)	(0.557)	(0.601)	(0.531)	(0.647)

Living with my original family	-1.520	0.548	-0.768	0.974	0.583
	(0.992)	(0.525)	(0.553)	(0.578)	(0.695)
Living with my partner without children	0.103	0.330	0.617	0.920*	0.053
	(0.522)	(0.371)	(0.344)	(0.422)	(0.296)
I am the only parent of child/children	-2.950	1.453*	1.905*	0.655	-0.342
	(2.048)	(0.667)	(0.781)	(1.019)	(0.692)
Income less than € 15.000 per year	-0.647	-0.608	-0.226	0.183	-0.321
	(0.528)	(0.321)	(0.330)	(0.358)	(0.342)
Income between € 30.000 and € 50.000 per year	-0.386	-0.237	-0.238	0.805*	0.269
	(0.552)	(0.285)	(0.389)	(0.363)	(0.368)
Income between € 50.000 and € 100.000 per year	1.303	-0.601	-0.714	-0.119	-0.654
	(0.768)	(0.538)	(0.483)	(0.321)	(0.453)
Income higher than € 100.000 per year	2.367	0.263	0.394	-0.001	-0.412
	(2.120)	(1.256)	(1.087)	(0.598)	(1.023)
Don't want to declare my income class	-0.586	0.601	0.054	0.083	0.087
	(0.953)	(0.387)	(0.482)	(0.442)	(0.528)
			CONTROLS		
Common controls					
Per capita GDP	-	-0.041	-	-	0.024
		(0.200)			(0.262)
People with up to the middle school degree	-0.008	0.035	-0.012	-0.022	0.046
	(0.056)	(0.025)	(0.025)	(0.032)	(0.033)
Voters for Senate election	0.186	0.031	0.092	-0.180*	-0.095
	(0.116)	(0.038)	(0.060)	(0.071)	(0.073)
Significant BES indicators					
Life expectancy at birth_males	-9.250*	-	-	-	-
	(3.658)				
Life expectancy at birth_females	11.490*	-	-	-	-
	(5.164)				
People overweight	-1.297*	-	-	-	-
	(0.635)				
Burglary rate	-	0.180*	-	-	-
		(0.080)			
Sexual violence rate	-	-1.764*	-	-	-
		(0.841)			
Conservation of historic urban fabric	-		-	0.176**	-
				(0.061)	

People overweight	-1.297*		-	-	-
	(0.635)				
Cons	-650.832	-9.939	0.376	18.818**	4.176
	(394.313)	(16.308)	(3.732)	(7.155)	(6.760)
σ_{ε}^{2}	9.704***	5.386***	5.657***	4.947***	5.653***
	(0.412)	(0.071)	(0.072)	(0.160)	(0.198)

Table 4. Synthesis of findings on subdomain estimates according to left/right political orientation

Left priorities	Large coalition items	Right priorities
Health satifaction	Increasing healthy life expectancy at birth	Reducing cancer mortality rate (19-64 years old)
Life satisfaction	Happiness	Reducing overweight or percentage of people aged 18 years and over who are overweight or obese
Improving individual physical state	Income satisfaction	Reducing the percentage of people aged 14 years and over declaring to smoke
Improving individual psychological state	Family satisfaction	Reducing the percentage of people aged 14 years and over with at least one risk behavior in alcohol consumption
Increasing participation in early childhood education	Friendship satisfaction	Increasing the level of numeracy
Increasing the number of people with tertiary education	Sparetime satisfaction	Increasing the number of people with high level of ICT competencies
Reducing the number of early leavers from education and training	Increasing life expectancy at birth	Increasing per capita adjusted disposable income
More cultural activities	Reducing infant mortality rate	Increasing per capita net wealth
Increasing the transition rate	Reducing mortality rate for traffic accidents (initial cause)	Reducing the number of people living in financially vulnerable households
Decreasing share of employees with below 2/3 of median hourly earnings	Reducing mortality rate for dementia and related illnesses (people aged 65 and over)	Reducing subjective evaluation of economic distress
Reducing the incidence rate of fatal occupational injuries or injuries leading to permanent disability	Increasing life expectancy without activity limitations at 65 years of age	Increasing satisfaction with family relationship
Decrease the share of household work time carried out by women in a couple on the total of the household work time	Reducing the percentage of people aged 14 years and over who do not practice any physical activity	Increasing the trust in justice

Increasing disposable income inequality	Increasing the percentage of people aged 3 years and over who consume at least 4 portions of fruit and vegetables a day	
Reducing the number of people living in absolute poverty	Increasing the number of people with at least upper secondary education	Increasing the trust in police
Satisfaction with friendship relationship	Reducing the number of young not in education, employment, or training (NEET)	Reducing homicide rate
Percentage of people of 14 years and over which have relatives, friends or neighbors on which they can count	Increasing participation in long-life learning	Reducing burglary rate
Increase of the Synthetic indicator of social participation	Increasing the level of literacy	Reducing pick-pocketing rate
Social cooperatives per 10,000 inhabitants	Increasing temporary employment rate	Reducing robbery rate
		Reducing social decay (or incivilities) rate
Increasing trust in institutions	Decreasing the Non-participation rate	Increasing surfaces of marine protected areas
Increasing the percentage of women and political representation in Parliament	Decreasing the share of employed persons with temporary jobs for at least 5 years	
Increasing the percentage of women and political representation at the local level	Decreasing the share of over-qualified employed persons	More beds in health facilities
Increasing the percentage of women in decision-making bodies	Decreasing the share of employed persons not in regular occupation	Improve the regularity of the electricity service
Reducing physical violence rate	Increasing the ratio of employment rate for women 25-49 years with children	
Reducing intimate partnership violence rate	Decreasing the share of population aged 15-64 years that work over 60 hours per week	
Reducing worries of being victim of a sexual offence	Reducing the number of people at risk of relative poverty	
Reducing the erosion of farmland from urban sprawl	Reducing the number of severely materially deprived people	
Increasing current expenditure of Municipalities for the management of cultural heritage	Reducing the number of people suffering poor housing conditions	
Reducing urbanization rate of areas subject to building restrictions	Reducing the number of people living in jobless households	
Reducing material flows	Percentage of children aged 3 to 10 years who play with their parents	
Increasing use of energy from renewable sources	Provided aids: share of population aged 14 and over who in past 12 months have given unpaid aid to non-cohabiting relatives and non-relatives	
Reducing emissions of CO2 and other greenhouse gasses	More volunteer work	

Intensity of research	More association funding
Impact of knowledge workers on employment	Non-profit organizations per 10,000 inhabitants
Intensity of Internet use	Increasing confidence in the Italian Parliament
More daycare services for small children	Increasing electoral participation
	Increasing trust in political parties
	Increasing the trust in local institutions
	Increasing the percentage of women on boards of directors of companies listed in the Italian stock exchange
	Reducing the average age of the Italian Parliament
	Reducing the length of civil proceedings
	Reducing sexual violence rate
	Increasing the endowment of cultural heritage items
	Reducing areas with hydrogeological risks
	Reducing concern about landscape deterioration
	Promoting conservation of historic urban fabric
	Reducing the erosion of farmland from abandonment
	Enhancing quality assessment of Regional programmers for rural development (PSRs), with regard to the landscape protection
	Increasing the presence of Historic Parks/Gardens
	Increasing access to drinkable water
	Increasing quality of marine coastal waters
	Increasing quality of urban air
	Increasing urban green
	More municipal waste sent to landfill
	Reducing contaminated sites
	Increasing surfaces of terrestrial parks
	Reducing prison overcrowding

	Increasing surfaces of areas of special naturalistic interest
	Reducing concern for biodiversity loss
	Innovation rate of the productive system
	Innovation rate of product/service of the national productive system
	Propensity to patent
	Productive specialization in knowledge-intensive sectors
	Reducing queue in health facilities
	More home care for the elderly
	Improve the regularity of the electricity service
	Increase the household connection to nat gas
	Easing the way of getting essential services
	More stable distribution of water
	Reduction of people's time spent on transportation
	Improve the services of local public transport

Table 5. Political priorities: sub-items

Male/Female	Skilled/Unskilled
Income satisfaction	Happiness
Spare time satisfaction	Increasing life expectancy without activity limitations at 65 years of age
Reducing cancer mortality rate (19-64 years old)	Spare time satisfaction
Landscape and cultural heritage	Improving individual psychological state
Reducing mortality rate for dementia and related illnesses (people aged	Increasing the number of people with tertiary education
Reducing the percentage of people aged 14 years and over who do	Increasing participation in long-life learning
Increasing the number of people with tertiary education	Increasing the level of literacy
Reducing the number of early leavers from education and training	Increasing the transition rate
Increasing the level of literacy	Decreasing the share of over-qualified employed persons
Increasing the number of people with high level of ICT competencies	Reducing the number of people living in financially vulnerable households
More cultural activities	Decrease the share of household work time carried out by women in a couple on the total of the household work

Decreasing the share of over-qualified employed persons

Increasing the ratio of employment rate for women 25-49 years

Decrease the share of household work time carried out by women in a couple on the total of the household work time

Reducing the number of people living in financially vulnerable households

Reducing the number of people living in absolute poverty

Reducing the number of severely materially deprived people

Increasing satisfaction with family relationship

Satisfaction with friendship relationship

Percentage of people of 14 years and over which have relatives, friends or neighbors on which they can count

Increase of the Synthetic indicator of social participation

Non-profit organizations per 10,000 inhabitants

Increasing electoral participation

Increasing confidence in the Italian Parliament

Increasing trust in political parties

Increasing the percentage of women and political representation in Parliament

Increasing the percentage of women and political representation at the local level

Increasing per capita adjusted disposable income

Increase of the Synthetic indicator of social participation

Increasing the trust in justice

Non-profit organizations per 10,000 inhabitants

Increasing civic and political participation

Increasing confidence in the Italian Parliament

Increasing the trust in police

Increasing the percentage of women in decision-making bodies

Reducing the length of civil proceedings

Reducing homicide rate

Reducing pick-pocketing rate

Reducing social decay (or incivilities) rate

Promoting conservation of historic urban fabric

Increasing quality of urban air

Reducing emissions of CO2 and other greenhouse gasses

Reducing material flows

Increasing the percentage of women in decision-making bodies

Increasing the percentage of women on boards of directors of companies listed in the Italian stock exchange

Reducing the average age of the Italian Parliament

Reducing burglary rate

Reducing pick-pocketing rate

Reducing robbery rate

Reducing physical violence rate

Reducing sexual violence rate

Reducing intimate partnership violence rate

Reducing concern about landscape deterioration

Reducing the erosion of farmland from urban sprawl

Increasing use of energy from renewable sources

Intensity of research

Impact of knowledge workers on employment

Innovation rate of the productive system

More beds in health facilities

More home care for the elderly

More daycare services for small children

More municipal waste sent to landfill

Increasing the presence of Historic Parks/Gardens

Increasing surfaces of terrestrial parks

Reducing concern for biodiversity loss

Increasing use of energy from renewable sources

Propensity: to patent

Innovation rate of product/service of the national productive system

Productive specialization in knowledge-intensive sectors

Intensity of Internet use

More daycare services for small children

More home care for the elderly

Appendix A – The complete set of Indicators for each dimension of the BES composition

Environment

1 Drinkable water: Volume of drinkable 1 water supplied every day per capita
2 Quality of marine coastal waters: Percentage of bathing marine coastal waters on total coasts
3 Quality of urban air: Number of exceeding the daily limit of PM10
4 Urban parks and gardens: Square meters of urban parks and gardens per inhabitants
5 Areas with hydrogeological risks: Percentage of areas subject to landslide on total surface
6 Contaminated sites: Number and size of contaminated sites
7 Terrestrial parks: Share of the size of terrestrial parks on total surface
8 Marine protected areas: Share of the size of marine protected areas on total coastal area
9 Areas of special naturalistic interest: Share of areas of special naturalistic interest of total surface
10 Concern for biodiversity loss: Percentage of people aged 14 and over who believe that biodiversity loss is among the five most important environmental problems
11 Material flows: Quantity of materials, transformed in emissions, waste or new stocks, limited to internal material consumption
12 Energy from renewable sources: Share of energy consumptions provided by renewable sources on total internal consumptions
13 Emissions of CO2 and other greenhouse gasses: Tons of CO2 equivalent per capita

Health

1 Life expectancy at birth: Life expectancy expresses the average number of years that a child born in a given calendar year can expect to live if exposed during his whole life to the risks of death observed in the same year at different ages.
2 Healthy life expectancy at birth: It expresses the average number of years that a child born in a given calendar year can expect to live in good health on the assumption that the risks of death and perceived health conditions remain constant. It is built using the prevalence of individuals who respond positively ("well" or "very well") to the question on perceived health.
3 Physical Component Summary (PCS): Summary of the scores of each individual answering the 12 questions on the questionnaire SF12 on physical state (Physical Component Summary).
4 Mental Component Summary (MCS): Summary of the scores of each individual answering the 12 questions on the questionnaire SF12 on psychological state (Mental Component Summary).
5 Infant mortality rate: Deaths during the first year of life per 10.000 born alive.
6 Traffic accidents (15-34 years old): Mortality rate for traffic accidents (initial cause) by five year age groups for people aged 15-34 years, standardized by the Italian 2001 Census population of the same age groups.
7 Age-standardised cancer mortality rate (19-64 years old): Mortality rate for cancer (initial cause) by five year age groups for people aged 19-64 years, standardized by the Italian 2001 Census population of the same age groups.
8 Age-standardised mortality rate for dementia and related illnesses (people aged 65 and over): Mortality rate for nervous system diseases and psychical and behavioral disorders (initial cause) by five year age groups for people aged 65 years and over, standardized by the Italian 2001 Census population of the same age groups.
9 Life expectancy without activity limitations at 65 years of age: It expresses the average number of years that a person aged 65 can expect to live without suffering limitations in daily activities due to health problems, assuming that the risks of death and disability remain constant over time and equal to those observed in a specific calendar year. It is based on the prevalence of individuals who answer to be limited, for at least the past 6 months, because of a health problem in activities people usually do.
10 Overweight or obesity - Standardized percentage of people aged 18 years and over who are overweight or obese: The indicator refers to the Body Mass Index (BMI), which classifies people as overweight (25 <= BMI<30) or obese (BMI> 30) as classified by the World Health Organization (WHO). The indicator is standardized using the Italian 2001 Census population as standard population.
11 Smoking - Standardized percentage of people aged 14 years and over declaring to smoke: Proportion of people aged 14 and over who report current smoking. The indicator is standardized using the Italian 2001 Census population as standard population.
12 Alcohol consumption - Standardized percentage of people aged 14 years and over with at least one risk behaviour in alcohol consumption: Taking into account the definitions adopted by the WHO and the recommendations from INRAN, in agreement with the National Institute of Health, are identified as "at-risk consumers" all those individuals who have at least one risk behavior, exceeding the daily consumption of alcohol (according to specific thresholds for sex and age)

or concentrating on a single occasion of consumption the intake of 6 or more units of any alcoholic drink (bing drinking).
13 Sedentariness - Standardized percentage of people aged 14 years and over who do not practice any physical activity: Proportion of people aged 14 and over referring not to play sports neither continuously nor intermittently during their spare time, and people aged 14 and over referring not to perform any physical activity, such as walking at least 2 km, cycling, swimming, etc.
14 Nutrition - Standardized percentage of people aged 3 years and over who consume at least 4 portions of fruit and vegetables a day: Percentage of people aged 3 years and over who say they take every day at least 4 portions of fruit and vegetables. According to the guidelines for a healthy diet published by INRAN the recommended daily servings would be at least 5, but since the definition of portion remains a difficult concept to be standardized for the Italian eating habits, although there are objective criteria of measurement, such as the weight of the food considered, it was considered appropriate to refer to the declared consumption of at least 4 portions. Very often, for example, a portion of vegetables taken as side dish is greater in quantity compared to the amount in grams recommended. The indicator is standardized using the Italian 2001 Census population as standard population.

Economic wellbeing

1 Per capita adjusted disposable income: Ratio of adjusted household disposable income (inclusive of the value of inkind services provided by public and non-profit institutions) to the total number of residents.
2 Disposable income inequality: Ratio of total equivalised income received by the 20% of the population with the highest income to that received by the 20% of the population with the lowest income.
3 People at risk of relative poverty: Percentage of persons at risk of poverty, with an equivalised income less than or equal to 60% of the median equivalised income.
4 Per capita net wealth: Ratio of total net wealth of households to the 4 total number of residents.
People living in financially vulnerable households: Percentage of people in households with debt service greater than 30% of disposable income.
5 People living in absolute poverty: Proportion of individuals belonging to households with an overall consumption expenditure below the threshold of absolute poverty.
6 Severely materially deprived people: Proportion of people living in households with at least 4 over 9 of the problems considered
7 People suffering poor housing conditions: Proportion of people experiencing overcrowding in houses without some services and with structural problems.
8 Index of subjective evaluation of economic distress: It is a combination of three indicators: (a) share of individuals in households choosing the first answer category to the question "Considering all the available income, how does your household manage to get to the end of the month?" (With great difficulty, with difficulty, with some difficulty, with some ease, with ease, very easily); (b) proportion of individuals living in households which are unable to cope with its own resources with unexpected expenses of approximately XXX euros (the value is calculated according to the median
of the distribution of the equivalised income of the previous year); (c) share of individuals who do not consider it possible to be able to make savings in the next 12 months.
9 People living in jobless households: Proportion of individuals living in households with at least one component aged 18-59 years (with the exception of households where all members are full time students under 25 years) where nobody works or receives an occupational pension.

Education and training

1 Participation in early childhood education: Children aged 4-5 years participating in pre-primary education / children aged 4-5 years
2 Percentage of people aged 25-64 having completed at least upper secondary education: Persons aged 25-64 years having completed at least upper secondary education (ISCED level not below 3a, 3b or 3c) / persons aged 25-64 years *100
3 Percentage of people aged 30-34 having completed tertiary education (ISCED 5 o 6): Persons aged 30-34 years having completed tertiary education (ISCED 5 o 6) / Persons aged 30-34 years * 100
4 Percentage of early leavers (aged 18-24) from education and training: Persons aged 18-24 years who have achieved only lower secondary (ISCED 2) and are not included in a training program / Persons aged 18-24 years * 100
5 Percentage of people aged 15-29 not in education, employment, or training (NEET): Persons aged 15-29 years that are not in education, employment, or training / Persons aged 15-29 years * 100
6 Percentage of people aged 25-64 participating in formal or non-formal education: Persons aged 25-64 years participating in formal or non-formal education / Persons aged 25-64 years * 100
7 Level of literacy: Scores obtained in the tests of functional literacy skills of students in the II classes of upper secondary education
8 Level of numeracy: Scores obtained in the tests of numeracy skills of students in the II classes of upper secondary education

9 Percentage of people aged 16 and over with high level of ICT competencies: Persons aged 16 years and over who can perform at least 5 over the 6 listed operations on the computer / persons aged 16 years and over * 100
10 Synthetic indicator of the level of cultural participation: Based on the aggregation of the following indicators: percentage of people aged 6 and over that, in the 12 months preceding the interview, have gone at least once to: cinema, theatre, exhibitions and museums, archaeological sites, monuments, concerts of classical music, opera, concerts of other kind of music; percentage of people aged 6 and over who read the newspaper at least once a week, who read at least one book in the 12 months preceding the interview, who usually read some magazines (weekly or periodic), who watches DVDs at home.

Work and life balance

1 Employment rate of people 20-64 years old: Employed persons 1 aged 20-64 / persons aged 20-64 *100 Non-participation rate: Unemployed persons aged 15-74 + part of the potential labour force aged 15-74 (persons who are inactive not having looked for a job in the past 4 weeks but willing to work) / Labour force aged 15-74 + part of the potential labour force aged 15-74 (persons who are inactive not having looked for a job in the past 4 weeks but willing to work)
2 Transition rate (12 months time-distance) from non-standard to standard employment: Persons employed in nonstandard jobs at the time t1 (employees with temporary jobs + term-contract workers + project worker + occasional hired workers + single customer self-employed without employees) which have a standard job (permanent employees + self-employed with employees + no single customer self-employed without employees) a year later / Employed in non-standard jobs at the time t1 * 100
3 Share of employed persons with temporary jobs for at least 5 years: Temporary employees and term-contract workers who began their current job at least 5 years prior to interview / Total Temporary employees and term-contract workers * 100
4 Share of employees with below 2/3 of median hourly earning: Employees with an hourly wage of less than 2/3 of the median / Total number of employees * 100
5 Share of over-qualified employed persons: Employees with a higher qualification than that mostly held to exercise a certain profession / Total employed population * 100
6 Incidence rate of fatal occupational injuries or injuries leading to permanent disability: Number of fatal occupational injuries or injuries leading to permanent disability/ Total employed population (excluding the armed forces)*1,000
7 Share of employed persons not in regular occupation: Employees who do not comply with work, fiscal and pension laws / total employees
8 Ratio of employment rate for women 25-49 years with children under compulsory school age to the employment rate of women 25-49 years without children: Employment rate of women aged 25-49 with at least one children under compulsory school age / Employment rate of women aged 25-49 without children
9 Share of household work time carried out by women in a couple on the total of the household work time: Household work time carried out by women / household work time carried out by both partner * 100
10 Share of population aged 15-64 years that work over 60 hours per week (including paid work and household work): Population aged 15-64 years that work over 60 hours per week of paid work and household work / population aged 15-64 years
11 Share of employees covered by collective bargaining at company or district level: Employees covered by collective bargaining at company or district level / total employees in companies with more than 10 employees
12 Share of employees that work in companies where there is trade union: Employees that work in companies where there is trade union / total employees * 100
13 Share of employed persons who feel their work unsecure: Employed persons who, in the following 6 months, consider it is likely they lose their job and it is not at all or a little likely that they find another similar job / Total employed persons * 100
14 Share of employed persons who feel satisfied with their work: The indicator is built as the average level of satisfaction (eg, using a scale from 0 to 10) in more than one dimension: the type of work, earnings, prospects of career, relations with others, working conditions and environment, reconciliation with lifetimes.

Social relationships

1 Synthetic indicator of social participation: Based on the aggregation of the following indicators: People aged 14 and over who during the past 12 months have participated in meetings of associations (cultural/recreational, ecological, civil rights, for peace); People aged 14 and over who in the past 12 months have participated in meetings of trade unions and of professional associations; People aged 14 and over who during the past 12 months have attended meetings of political parties and/or have worked free for a party; People aged 14 and over who pay monthly or periodical dues for a club/sports club; People aged 14 and over who during the past 12 months have participated in meetings or activities (cultural, sporting, recreational, spiritual), organized or promoted from parishes, religious or spiritual organizations/groups.
2 Generalized trust: Share of population (aged 14 and over) who believes that most 2 of the people are trustworthy.

3 Non-profit organizations per 10,000 inhabitants: Number of non-profit organizations per 10,000 inhabitants
4 Social co-operatives per 10,000 inhabitants: Number of social co-operatives per 10,000 inhabitants
5 Volunteer work: Percentage of population aged 14 and over who in the past 12 months performed non-paid volunteer work for associations or volunteer groups.
6 Provided aids: Share of population aged 14 and over who in past 12 months have given unpaid aid to non-cohabiting relatives and non-relatives.
7 Association funding: Share of population aged 14 and over who in the past 12 months have funded associations.
8 Satisfaction with family relationship: Share of population aged 14 and over who have declared to be very satisfied with his/her family relationships.
9 Satisfaction with friendship relationship: Share of population aged 14 and over who have declared to be very satisfied with the relationship with his/her friends.
10 Percentage of people of 14 years and over which have relatives, friends or neighbours on which they can count: Based on the aggregation of the following indicators: Share of people aged 14 and over who have relatives they can count on; Share of people aged 14 and over who have friends or neighbours they can count on.
11 Percentage of children aged 3 to 10 years who play with their parents: Based on the aggregation of the following indicators: Children aged 3-10 years who every day spend some time playing with his/her father; Children aged 3-10 years who every day spend some time playing with his/her mother.

Security
1 Homicide rate: Number of homicide / population * 100.000
2 Burglary rate: Number of burglaries / households * 100
3 Pick-pocketing rate: Number of pick-pocketing / population * 100
4 Robbery rate: Number of robberies / population * 100
Physical violence rate: Percentage of people aged 16 and over who were victim of physical violence / people aged 16 and over
5 Sexual violence rate: Percentage of people aged 16 and over who were victim of sexual violence / people aged 16 and over
6 Fear of crime rate: Percentage of people aged 14 years and over feeling unsafe when walking alone in the dark in the area where they live
7 Worries of sexual crime rate: Percentage of people aged 14 years and over who are very or quite worried of suffering a sexual violence
8 Concrete fear rate: Percentage of people aged 14 years and over who are afraid of becoming concretely a victim of crime
9 Social decay (or incivilities) rate: Percentage of people aged 14 years and over who often see elements of social and environmental decay (vandalism acts, people selling drugs, drugs users, prostitute looking for clients) in the area where they live
10 Intimate partnership violence rate: Number of women who were victim of physical or sexual violence by the partner /women who have or had a partner * 100

Subjective wellbeing
1 Percentage of people aged 14 and over with a level of life satisfaction from 8 to 10: Persons aged 14 and over with a level of life satisfaction from 8 to 10 / Persons aged 14 and over * 100
2 Percentage of people aged 14 and over very satisfied of their leisure time: Persons aged 14 and over who are very satisfied with their leisure time / Persons aged 14 and over * 100
3 Percentage of people aged 14 and over which believe their personal situation will improve in the next 5 years: Persons aged 14 and over which believe their personal situation will improve in the next 5 years / Persons aged 14 and over* 100

Landscape and cultural heritage

1 Endowment of cultural heritage items: The number of archaeological sites, monuments and museums surveyed by the “Risk Map of Cultural Heritage” (an information system held by the Italian Ministry of Culture), per sq.km
2 Current expenditure of Municipalities for the management of cultural heritage (museums, libraries and art galleries) , per capita
3 Illegal building rate: Ratio of the number of unauthorised buildings to the number of building permits issued by the Municipalities
4 Urbanisation rate of areas subject to building restrictions by virtue of the Italian laws on landscape protection: Number of buildings realised after 1981 in areas subject to building restrictions by the “Galasso Law” (no. 431/1985, as integrated by the Cultural Heritage and Landscape Code – Legislative Decrees no. 42/2004, no. 157/2006 and no. 63/2008), per sq.km
4 Erosion of farmland from urban sprawl: Percentage ratio of rural areas affected by urban sprawl to the total of rural areas (“rural areas affected by urban sprawl”: rural areas with increasing population and decreasing agricultural land)
5 Erosion of farmland from abandonment: Percentage ratio of abandoned rural areas to the total of rural areas (“abandoned rural areas”: rural areas with decreasing population and decreasing agricultural land)

6 Presence of historic rural landscapes: Percentage ratio of areas classified as such by the National Inventory of Historic Rural Landscapes to the total area of the Region
7 Quality assessment of Regional programmes for rural development (PSRs), with regard to the landscape protection: Score assigned to the PSRs based on the adoption of measures of a potentially positive impact on the rural landscape, among those envisaged by the National Strategic Plan for Rural Development 2007-2013.
8 Presence of Historic Parks/Gardens and other Urban Parks recognised of significant public interest: Percentage ratio of the area of parks and gardens classified as "historic" and/or "of a significant public interest" by the Legislative Decree no. 42/2004 to the total area of the provincial capital Municipalities
9 Conservation of historic urban fabric: Share of inhabited buildings realised before 1919 and in excellent or good state on the total number of building realised before 1919
10 People that are not satisfied with the quality of landscape of the place where they live: Proportion of regional population reporting that the landscape of the place where they live is affected by evident deterioration
11 Concern about landscape deterioration: Proportion of population reporting, among the environmental problems for which they express more concern, the decay of landscape due to overbuilding

Research and innovation

1 Research intensity: Percentage of R&D expenditure on GDP
2 Patent propensity: Patent applications to the EPO per million of inhabitants (complementary, per million of euros of GDP).
3 Percentage of knowledge workers on total employment: Percentage of employees with tertiary education (ISCED 5-6) in S&T occupations (ISCO 2-3) on total employees.
4 Innovation rate of the national productive system: Percentage of enterprises with (process, product, organizational or marketing) innovation on total enterprises with 10 or more employees.
5 Percentage of product innovators: Percentage of enterprises with product innovation on total enterprises with 10 or more employees.
6 Productive specialization in high-tech and knowledge intensive sectors: Percentage of employees in high-tech and knowledge intensive services on total employees.
7 Internet use: Percentage of individuals aged 16-74 who used Internet at least once a week in the last 12 months.

Quality of services

1 Index of accessibility to hospitals with emergency room: Percentage of population living more than X minutes from an hospital with emergency room (threshold to be defined).
2 Beds in residential health care facilities: Beds in residential health care facilities per 1,000 inhabitants
3 Waiting lists: Individuals who renounced to see a specialist or to undertake a therapeutic treatment (non dental) because of the length of the waiting list.
4 Percentage of population served by natural gas: Percentage of individuals living in municipalities supplied with methane gas.
5 Separate collection of municipal waste: Percentage of municipal waste object of separate collection on total municipal waste.
6 Composite index of service accessibility: Percentage of individuals who find very difficult to reach some basic services (pharmacies, emergency, post office, police, carabinieri, municipal offices, crèches, nursery, primary and secondary school, markets and supermarkets).
7 Density of urban public transport networks: Km of urban public transport networks in provincial capitals per 100 Km2 of municipal surface.
8 Index of accessibility to transport networks: Percentage of population living more than X minutes away from a major train station (threshold to be defined).
9 Citizens who benefit from infancy services: Percentage of children aged 0-2 who benefited from infancy services (crèches, micro-crèches or supplementary and innovative services).
10 Elders who benefit from home assistance: Percentage of elders aged 65 and over who benefited from integrated home assistance services (ADI).
11 Prison density per 100 places: Percentage of prisoners in penal institutions on the 11 total capacity of penal institutions.
12 Irregularity in water supply: Percentage of families reporting irregularities in water supply.
13 Landfill of waste: Percentage of municipal waste going to landfill on total municipal waste collected.
14 Irregularity in electric power distribution: Frequency of accidental long lasting electric power cuts (cuts without notice longer than 3 minutes) (average number per consumer).
15 Time devoted to mobility: Minutes devoted to mobility on an average weekday.

Policy and institutions

1 Voter turnout: Percentage of eligible voter who cast a ballot in the last election for the European Parliament.

2 Civic and political participation: Based on the aggregation of the following indicators: Share of people aged 14 and over who talks about politics at least once a week; Share of people aged 14 and over who seek information about Italian politics at least once a week; Share of people aged 14 and over who in the past three months have taken part to online consultations or polls on civic/political issues (e.g. urban planning, signing a petition); Share of people aged 14 and over who in the past three months have read and posted on the web opinions on social/political issues.
3 Trust in the parliament: Percentage of people aged 14 and over who declared to trust the Italian Parliament.
4 Trust in judicial system: Percentage of people aged 14 and over who declared to trust the judicial system.
5 Trust in political parties: Percentage of people aged 14 and over who declared to trust political parties.
Trust in local institutions: Composite indicator based on the aggregation of the percentage of people aged 14 and over who declared to trust regional government, provincial government and municipal government.
6 Trust in other institutions: Composite indicator based on the aggregation of the percentage of people aged 14 and over who declared to trust the police and the fire brigade.

7 Women and political representation in Parliament: Share of women elected in Parliament.
8 Women and political representation at regional level: Share of women elected in regional councils.
9 Women in decision-making bodies: Share of women in position of high responsibility within the following bodies: Constitutional court, Magistrates' Governing Council, Regulatory authorities (competition, communication, privacy, securities market), Embassies.
10 Women in the boards of companies listed in stock exchange: Share of women in the boards of companies listed in stock exchange.
11 Median age of members of Parliament: Median age of members of Parliament
12 Length of civil proceedings of ordinary cognisance of first and second degree: Average time elapsed between entry and closing of proceedings.

Appendix B - What our well-being depends on?

We aim to contribute with this questionnaire to the definition of what really matters in our life to improve our well-being. We, then, kindly ask you to answer to a few easy questions about the research issue stated before.
The collected data will be managed in compliance with the laws ruling the personal data protection (d. lgs. 196/2003 - Code of ethics and conduct for the processing of personal data) and they will be used only for statistical and research purposes.
The questionnaire is divided into two sections: section 1 is about personal data while section 2 is about well-being.
Let's start asking you some pieces of information about you.

Section 1: personal data

1. Gender

M F

2. Age

Year of birth: |__||__||__||__|

3. Citizenship

Italian ☐ 1

Not Italian ☐ 2 Country _____

(if 2 in the previous question)

How many years have you spent in Italy up to now?

Less than 1 ☐ 1

From 1 to 3 years ☐ 2

From 3 to 5 years ☐ 3

More than 5 years ☐ 4

4. Residence

City of residence _____ ZIP code |__||__||__||__||__| Province |__||__|

5. Education

No titles ☐ 1

Primary school ☐ 2

Middle school ☐ 3

Technical vocational high schools (3 years) ☐ 4

Upper secondary high school ☐ 5

Bachelor degree ☐ 6

Master of arts ☐ 7

Master ☐ 8

PhD ☐ 9

6. Civil status

Married/cohabitant

Single

Separate

Divorced

Widowed

7. Job status

Open-ended contract ☐ 1

Fixed term contract ☐ 2

Seasonal contract ☐ 3

Independent contractor/freelancer ☐ 4

Not working/unemployed/looking for a job ☐ 5

Redundancy fund benefits ☐ 6

Redundancy worker ☐ 7

Housewife ☐ 8

Student ☐ 9

Retired ☐ 10

8. Working sector

Manufacturing ☐ 1

Agriculture ☐ 2

Tertiary ☐ 3

Personal services ☐ 4

9. Family status

Living alone ☐ 1

Living with my original family ☐ 2

Living with my partner without children ☐ 3

Living with my partner with children ☐ 4

I am the only parent of child/children ☐ 5

10. Income class

Less than € 15.000 per year ☐ 1

Between € 15.000 and € 30.000 per year ☐ 2

Between € 30.000 and € 50.000 per year ☐ 3

Between € 50.000 and € 100.000 per year ☐ 4

More than € 100.000 per year ☐ 5

11. Political positioning

How would you locate yourself in terms of political position between left and right wing on the following scale?

left wing right wing

10 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 10

12. How did you hear about this research?

Newspapers/magazines ☐ 1

Online newspapers ☐ 2

Social networks/blogs ☐ 3

Institutions/public entities ☐ 4

Acquaintances/friends ☐ 5

Social network/third sector/Associationism and cooperation ☐ 6

Third sector manager training program ☐ 7

Other (please specify) _____ ☐ 8

Section 2: Well-being

13. Thinking about your overall current conditions how much do you feel happy?

Completely unhappy									Completely happy
1	2	3	4	5	6	7	8	9	10

14. In particular, all in all, how much do you feel satisfied with regard to your:

	completely unsatisfied									completely satisfied
Economic condition	1	2	3	4	5	6	7	8	9	10
Health	1	2	3	4	5	6	7	8	9	10
Family members relationship	1	2	3	4	5	6	7	8	9	10
Friends relationships	1	2	3	4	5	6	7	8	9	10
Spare time	1	2	3	4	5	6	7	8	9	10
Overall life	1	2	3	4	5	6	7	8	9	10

15. Wellbeing dimensions

Below we offer 11 "dimensions of well-being," i. e. aspects of our everyday lives that have a positive or negative impact on the quality of life.
Imagine you have the responsibility of government and you have an amount equal to 100 units (eg 100 million euro) to spend and you can decide how to distribute these resources among the various items making sure, however, the total sum destined is equal to one hundred.
We realize that the "dimensions" of well-being reported are all very important, but we ask you to think carefully, to put the dimensions in relation to each other and to think about the relative importance of each of them from your point of view in order to use these resources in best way according to your point of view.

1) Health

2) Education and training

3) Work and life balance

4) Economic well-being

5) Social relations

6) Politics and institutions

7) Safety

8) Landscape and cultural heritage

9) Environment

10) Research and innovation

11) Quality of service

16. The aspects of well-being

Below we offer a range of indicators affecting the well-being of each dimension given above. On which one among these aspects within each of the 11 categories you believe that the government has to spend more energy and resources in order to determine their improvement?
Choose the five most important items in order of priority

A. Health

On which of these aspects within the category HEALTH do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[60]

1. Increasing life expectancy at birth.
2. Increasing healthy life expectancy at birth.
3. Improving individual physical state.
4. Improving individual psychological state.
5. Reducing infant mortality rate.
6. Reducing mortality rate for traffic accidents (initial cause).
7. Reducing cancer mortality rate (19-64 years old).
8. Reducing mortality rate for dementia and related illnesses (people aged 65 and over).
9. Increasing life expectancy without activity limitations at 65 years of age.
10. Reducing overweight or percentage of people aged 18 years and over who are overweight or obese.
11. Reducing the percentage of people aged 14 years and over declaring to smoke.
12. Reducing the percentage of people aged 14 years and over with at least one risk behavior in alcohol consumption.
13. Reducing the percentage of people aged 14 years and over who do not practice any physical activity.
14. Increasing the percentage of people aged 3 years and over who consume at least 4 portions of fruit and vegetables a day.

[60] For further details on each indicator see Appendix A.

B. Education and training

On which of these aspects within the category EDUCATION AND TRAINING do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[61]

1. Increasing participation in early childhood education
2. Increasing the number of people with at least upper secondary education
3. Increasing the number of people with tertiary education
4. Reducing the number of early leavers from education and training
5. Reducing the number of young not in education, employment, or training (NEET)
6. Increasing participation in long-life learning
7. Increasing the level of literacy
8. Increasing the level of numeracy
9. Increasing the number of people with high level of ICT competencies

C. Work and life balance

On which of these aspects within the category WORK AND LIFE BALANCE do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[62]

1) Increasing employment rate
2) Decreasing the Non-participation rate
3) Increasing the transition rate
4) Decreasing the share of employed persons with temporary jobs for at least 5 years
5) Decreasing share of employees with below 2/3 of median hourly earnings
6) Decreasing the share of over-qualified employed persons
7) Reducing the incidence rate of fatal occupational injuries or injuries leading to permanent disability
8) Decreasing the share of employed persons not in regular occupation
9) Increasing the ratio of employment rate for women 25-49 years with children under compulsory school age to the employment rate of women 25-49 years without children Easing work-life balance for women with young children
10) Decreasing the share of population aged 15-64 years that work over 60 hours per week

[61] For further details on each indicator see Appendix A.
[62] For further details on each indicator see Appendix A.

11) Decrease the share of household work time carried out by women in a couple on the total of the household work time.

D. Economic well-being

On which of these aspects within the category ECONOMIC WELL-BEING do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[63]

1. Increasing per capita adjusted disposable income
2. Increasing disposable income inequality
3. Reducing the number of people at risk of relative poverty
4. Increasing per capita net wealth
5. Reducing the number of people living in financially vulnerable households
6. Reducing the number of people living in absolute poverty
7. Reducing the number of severely materially deprived people
8. Reducing the number of people suffering poor housing conditions
9. Reducing subjective evaluation of economic distress
10. Reducing the number of people living in jobless households

[63] For further details on each indicator see Appendix A.

E. Social Relations

On which of these aspects within the category SOCIAL RELATIONS do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being? [64]

1. Increasing satisfaction with family relationship

2. Satisfaction with friendship relationship

3. Percentage of people of 14 years and over which have relatives, friends or neighbors on which they can count

4. Percentage of children aged 3 to 10 years who play with their parents

5. Provided aids: share of population aged 14 and over who in past 12 months have given unpaid aid to non-cohabiting relatives and non-relatives.

6. Synthetic indicator of social participation: Based on the aggregation of the following indicators: People aged 14 and over who during the past 12 months have participated in meetings of associations (cultural/recreational, ecological, civil rights, for peace); People aged 14 and over who in the past 12 months have participated in meetings of trade unions and of professional associations; People aged 14 and over who during the past 12 months have attended meetings of political parties and/or have worked free for a party; People aged 14 and over who pay monthly or periodical dues for a club/sports club; People aged 14 and over who during the past 12 months have participated in meetings or activities (cultural, sporting, recreational, spiritual), organized or promoted from parishes, religious or spiritual organizations/groups.

7. Volunteer work: Percentage of population aged 14 and over who in the past 12 months performed non- paid volunteer work for associations or volunteer groups.

8. Association funding: Share of population aged 14 and over who in the past 12 months have funded associations.

9. Non-profit organizations per 10,000 inhabitants

10. Social cooperatives per 10,000 inhabitants

11. Generalized trust: Share of population (aged 14 and over) who believes that most 2 of the people are trustworthy.

[64] For further details on each indicator see Appendix A.

F. Politics and Institutions

On which of these aspects within the category POLITICS AND INSTITUTIONS do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[65]

1. Increasing electoral participation
2. Increasing civic and political participation
3. Increasing confidence in the Italian Parliament
4. Increasing confidence in the judicial system
5. Increasing trust in political parties
6. Increasing trust in local institutions
7. Increasing trust in other types of institutions
8. Increasing the percentage of women and political representation in Parliament
9. Increasing the percentage of women and political representation at the local level
10. Increasing the percentage of women in decision-making bodies
11. Increasing the percentage of women on boards of directors of companies listed in the Italian stock exchange
12. Reducing the average age of the Italian Parliament
13. Reducing the length of civil proceedings.

[65] For further details on each indicator see Appendix A.

G. Safety

On which of these aspects within the category SAFETY do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[66]

1. Reducing homicide rate.
2. Reducing burglary rate.
3. Reducing pick-pocketing rate.
4. Reducing robbery rate
5. Reducing physical violence rate
6. Reducing sexual violence rate
7. Reducing intimate partnership violence rate.
8. Reducing worries of being victim of a sexual offence.
9. Reducing Fear of crime rate.
10. Reducing concrete fear rate.
11. Reducing social decay (or incivilities) rate.

[66] For further details on each indicator see Appendix A.

H. Landscape and cultural heritage

On which of these aspects within the category LANDSCAPE AND CULTURAL HERITAGE do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[67]

1. Increasing the endowment of cultural heritage items
2. Increasing current expenditure of Municipalities for the management of cultural heritage (museums, libraries and art galleries), per capita
3. Reducing Illegal building rate
4. Reducing urbanization rate of areas subject to building restrictions by virtue of the Italian laws on landscape protection
5. Reducing the erosion of farmland from urban sprawl
6. Reducing the erosion of farmland from abandonment
7. Increasing the presence of historic rural landscapes
8. Enhancing quality assessment of Regional programmers for rural development (PSRs), with regard to the landscape protection
9. Increasing the presence of Historic Parks/Gardens and other Urban Parks recognized of significant public interest
10. Promoting conservation of historic urban fabric
11. Reducing the number of people that are not satisfied with the quality of landscape of the place where they live
12. Reducing concern about landscape deterioration

[67] For further details on each indicator see Appendix A.

I. Environment

On which of these aspects within the category ENVIRONMENT do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[68]

1. Increasing access to drinkable water
2. Increasing quality of marine coastal waters
3. Increasing quality of urban air
4. Increasing urban green
5. Reducing areas with hydrogeological risks
6. Reducing contaminated sites
7. Increasing surfaces of terrestrial parks
8. Increasing surfaces of marine protected areas
9. Increasing surfaces of areas of special naturalistic interest
10. Reducing concern for biodiversity loss
11. Reducing material flows (*Quantity of materials, transformed in emissions, waste or new stocks, limited to internal material consumption)*
12. Increasing use of energy from renewable sources
13. Reducing emissions of CO2 and other greenhouse gasses

[68] For further details on each indicator see Appendix A.

J. Research and development

On which of these aspects within the category RESEARCH AND DEVELOPMENT do you believe that the government has to spend more energy and resources in order to determine an improvement of well-being?[69]

1. Intensity of research
2. Propensity: to patent
3. Impact of knowledge workers on employment
4. Innovation rate of the productive system
5. Innovation rate of product/service of the national productive system
6. Productive specialization in knowledge-intensive sectors
7. Intensity of Internet use

[69] For further details on each indicator see Appendix A.

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Part III

4. A dynamic price index with habit formation

Prices are everywhere in economic theory both at a micro and at a macroeconomic level. They are amongst the main determinants of consumers' choices and their dynamics has been a cornerstone for different schools of thought in macroeconomic theory. But prices are also numbers, as such they raise interesting technical issues regarding microecono- metrics (as determinants of consumers' choice), time series analysis, game theory (for their signalling role) and pure mathematics (as they ultimately are "pure" numbers).

In particular the huge strand of literature referring to the Index Number Theory has given a strong contribution in understanding the nature and the dynamics of prices especially focusing on three main issues: i) measuring the change of prices (and quantities) through time ii) highlighting the caveat to be aware of when the single entities are grouped together to become an index and iii) interpreting the results. Those issues are crucial in calculating the Consumer Price Index given the technical challenge of claiming to be tracking the general (of all goods) level of prices, nevertheless neglecting those of the not-marketed ones as well as the subjectivity in pricing intangible services (e.g. health care, security, etc.). Given these considerations we started from the question: is the Consumer Price Index the effective rate of change of the generalized level of prices[70]? As there exist different CPIs for different purposes what is the most

[70] An example of measurement error bias in the Harmonized Index of Consumer Prices See Marini Piergallini and Scaramozzino (2007), or See Adriani Marini and Scaramozzino (2009) for an example of unconventional inflation dynamics during the changeover

suitable for economic matters[71]? Which is the most correct method to use in order to have the most reliable index[72]? These are just some of the issues this paper aims to address. Its main goal is to give a contribution to the ongoing debate on index number theory and offer clear cut operative insights for the national statistical institutes in order to increase the reliability of their data.

The crucial role of prices has always been a major concern for academics as well as for regulators. Inflation, actually, is one of the main drivers for economic policies. From a fiscal point of view it drives wages, it can be seen as a form of implicit taxation (seignorage) and it indexes the real purchasing power in consumption. For the monetary policy it is the only or at least one of the most important targets to secure by the central banks. That is why the US government set up two external independent commissions (i.e. the Stigler Commission 1961 and Boskin Commission 1996) to assess the accuracy of the measures in tracking the change in prices. Especially for the latter, endorsed by the Bureau of Labour Statistics (BLS), the outcome was not so encouraging. Besides the technical shortcomings of the standard chained Laspeyres methodology[73], the commission calculated that CPIs have been structurally overstated by 1.1% on average. It was clear that the real strength of CPI was its simplicity, but it was not a measure of the cost of living and it could create automatically increasing federal benefits and cuts to the real value of the fiscal burden. In conclusion the Boskin Commission strongly

71 For a summary of the debate around the economic meaning and use of index numbers See Deaton and Muellbauer (1980)

72 For the debate about the methodology See Diewert (1992).

73 Mainly the new products, substitution bias, quality change, etc. For a deeper analysis see Boskin (1998)

encouraged the BLS to pursue more accurate measures of inflation, i.e. those aiming to measure Cost-Of-Living.

Deeply embedded in the tradition of the economic approach to the index numbers, our paper aims to contribute to the research by proposing a new algorithm producing a new index number with four major strengths:

- it is at least as reliable as the standard ones but it is also able to overcome some of their major drawbacks[74];
- it is able to disentangle the contribution of durable and nondurable goods; • it encompasses the most recent relevant developments in micro and macro economic theory,
- it has a relatively easy-to-implement set up for the statistical institutes wanting to produce it on a regular basis.

Our major result is an index that is able to offer a sound theoretical foundation for a new price index combining:

- both the temporal components of dynamical behaviours: backward looking (inertial) and forward looking;
- a stochastic framework allowing consumers to deal with uncertainty; • shed a new light on prices dynamics and their normative aftermath for the fiscal and monetary authorities.

In particular with respect to the latter aspect we propose a numeric simulation to assess the behaviour of our new index obtaining highly significant results. By comparing our measure with a standard static one there are periods in which a deflation can be detected by a standard index as a low inflation. Such a misjudgement could lead

[74] For a survey on the index properties See Section (4.3)

to policy measures at odds with the real ongoing economic dynamics resulting in amplifying rather than smoothing the economic cycle. From a monetary policy point of view the risk is even bigger given the twofold threat of misjudging the actual as well as the future rate of change in prices.

To achieve this goal we will give a brief recap of the essentials in index number theory and price change to set up the ground for our original contribution developed in the following sections.

Index numbers are useful technical tools aimed to measure the change in a manifold group of single entities and prices and quantities have been amongst their most popular applications[75]. That is why the academic literature about the index number theory and its applications is so huge and comes from manifolds research fields ranging from statistics to economics or pure mathematics. The amount of academic literature regarding prices as index numbers is externsive and heterogeneous and unfortunately this heterogeneity is maintained also in the conclusions any analysis is able to draw. As far as we know there is no unified theory of how to measure a change in the generalized level of prices. Given their different sets of assumptions there is not even a standard definition and calculation method those who are concerned with index numbers can agree upon, not to group them in a universally accepted standard taxonomy. Therefore in this section only an introduction to the main facts and theories regarding index numbers will be offered, leaving the next sections to go into the details of the economic approach.

We will group all the contributions into two main categories: the non-economic and economic approach focusing respectively on two different characteristics of the index number. The former is mainly concerned about the technical properties (i.e.

[75] They are also used in meteorology apart from being a mathematical matter per se

mathematical or statistical) of the index, while the latter hinges on its role for economic theory. The economic approach's main concern is, then, to focus on the link between consumers wellbeing and the change in the general level of prices. Within these two main cate- gories different points of view about some non-crucial theoretical or empirical aspects have given birth to the different strands of literature. The non-economic approach can be broken-up into a *(i) tabular or fixed basket approach, (ii) (pure) statistic approach* and a *(iii) test (or axiomatic) approach*. As we shall see more in detail further on, in- stead, according to Könus[76] the economic attitude can be framed into the *(i) bound (or non-parametric), (ii) exact* and *(iii) econometric approach*.

The paper develops as follows. Section 4.1 presents a brief overview of the standard index numbers literature with a focus on the economic approach section 4.2 describes the baseline model; section 4.3 unfolds a numerical simulation with a montecarlo algorithm, while in section 4.4 a micromodel simulation is performed and in section 4.5 some final conclusions are drawn.

4.1 Index numbers and their measures

Index numbers are basically about synthesizing some pieces of information widespread in an enormous amount of data points into a concise measure capturing the main features of their underlying dynamic behaviour. When used in economic theory they are mostly focused on measuring prices and quantities therefore yielding respectively price and quantity indexes. In principle the most correct way to measure the changes in prices or quantities would be by tracking any single piece of data and

[76] See Könus (1939)

somehow averaging them into a synthetic index but this is neither technically feasible nor economically convenient[77]. A sample measure is then used in order to infer the real change in the overall population of data. The above mentioned approaches have proposed different definitions of price indexes and technical solutions to deal with sample measures. Even though relying on a sample measure can hide problems like selection bias and some sample representativeness issues, the trade off between costs and reliability of the resulting index pleads in favor of this methodology[78].

This paper's aim is, then, to focus on the general level of price (specifically of consumer price, commonly known as Consumer Price Index - CPI)and the way its change is tracked relying on the relying on the excellent work of Diewert (1992). Therefore unless explicitly said, in the following sections we will address the CPI, but nothing really changes with respect to the relative quantity indexes.

4.1.1 Non-economic approach

A non-random sampling procedure has been adopted, then, in order to track only a selected bundle of goods claiming this is a feasible index of the "true" change in the general level of prices. The weighted average of the change in the price of the repre-

[77] Too costly in terms of time and resources and still biased by some of the main problems common to all the quantity/price indexes. See section 4.1.1

[78] Nevertheless there has been some attempts to go beyond the plain sample methodology to gain more representativeness in terms of sample size and updating i.e. with the scanner data. As far as we know four countries have adopted scanner data to calculate CPI i.e. Netherlands, Norway, Sweden and Switzerland, while the French statistical institute has gone through a due diligence of its adoption. The results are encouraging, but some methodological issues have been raised and different choices made in order to deal with it. For a good analysis of scanner data and price indexes See Feenstra and Shapiro (2003) while for the results of the French assessment See S´ebastien Faivre (2012)

sentative bundle was defined, therefore, as the best estimator of the change in the the change in the general level of prices. In such a framework choosing properly the goods to form the representative bundle and their relative weights are crucial elements to assess the representativeness and the reliability of the index. How often the weights and the composition of the representative bundle is updated, instead, directly affects the ability of the index to track the inherent economic dynamics.

That is what most of the indexes in the non-economic approach have in common. Dif- ferent choices with respect to the average type or the reference bundle had given birth to different approaches as well as to a great number of different indexes we will briefly recap in this section.

It is just common sense, though, noticing that in a completely reliable index a different weight should be given to the same product at the beginning and at the end of the period considered since the consumption bundle is ”continuously” changing in reality. That is obviously too costly, time consuming and not feasible when the time period is too small.

The easiest and most used approach to deal with the problem of aggregating widespread microeconomic information by the national statistical institutes has been, therefore, the so called ”fixed basket principle”. In order to overcome the difficulty of continuously updating the reference bundle its weights structure is assumed to be fixed (either in the types or in the quantities) within the reference period. This hypothesis That makes the calculation feasible even though still leaving the question of which consumption bundle to choose as a reference (either the initial or the finale). The general formulation for the fixed basket indexes is the following:

$$P_{LO} = \frac{p_1 q}{p_2 q} \quad (4.1)$$

Where $p_{1,2}$ is the price at time 1 or 2 and q is the fixed basket of goods whileP_{LO} stands for Lowe Price Index from E. Joseph Lowe the XIX century economist and statistician who is considered the main forerunner reference for the Consumer Price Index[79].

How the reference bundle of goods is chosen becomes, then, a crucial element what makes the difference between the two most diffused alternative fixed basket indexes: ”Laspeyres” and ”Paasche”[80]. The former is defined as follows:

$$P_L = \frac{\sum p_{i,t}\, q_{i,0}}{\sum p_{i,0}\, q_{i,0}} \quad (4.2)$$

where $p_{i,0}$ and $q_{i,0}$ are respectively the price and quantity of good i at time 0. According to its definition, any change in the general level of prices must be measured with respect of the benchmark quantity at time 0 (i.e. the starting point). H. Paasche, instead, proposes to take as a reference quantities at time t, the endpoint of our time span and such a choice for the benchmark quantities allows for a more reliable and updated index i.e. nearer to the real situation of the consumer. Paasche index is defined as follows:

$$P_P = \frac{\sum p_{i,t}\, q_{i,t}}{\sum p_{i,0}\, q_{i,t}} \quad (4.3)$$

[79] Though not the very first to deal with prices as index numbers in a systematic and scientific way he refers to the work of William Fleetwood. For Lowe’s index and thoughts See Lowe (1823)

[80] We refer to Laspeyres and Paasche, but there are many other contributions, e.g. Pigou. For further details see Diewert (1992)

The fixed basket approach offers an easy to understand and sound methodology to calculate the change in the general level of prices but it carries a major shortcoming due to its inner nature. Holding fixed a reference bundle (be it either the initial or the ending one) rules out any substitution in its composition. The resulting index is, therefore, affected by a ”substitution” bias whose importance is a direct function of the reference period length and of the consumers’ time preferences. That is also the main reason why the two versions of the Lowe index (Laspeyres and Paasche) respectively choosing the starting and the ending bundle as a benchmark, may notably differ from each other. In fact the following hierarchical relationship has been proven to hold between the two indexes and formed the hinge of their so called ”bound property”[81]:

$$P_L > P_P \quad (4.4)$$

According to this property Laspeyres and Paasche indexes are proven[82] to be respectively the upper and lower bound of the true index (i.e. not affected by measurement or inferential errors). Though biased, these indexes are widely used to calculate the CPI by the national statistical institutes as they best perform in the cost-benefit analysis with respect to all the others. In particular the standard way of measuring CPI in the vast majority of the national statistical institutes is the (chained[83]) Laspeyres Index since the need for almost real time quantity data to calculate the Paasche one makes it more expensive and hardly achievable in a reasonable time span.

[81] This is true assuming a negative correlation between prices and quantities, should the correlation be positive the opposite relation would the true

[82] For further readings see.ILO (2003), among the others

[83] According to the chain principle is a technical way of chaining time subsets of the same index allowing for an undate of the reference bundle, though maintaining the analytical coherence of the time series

With respect to the substitution bias affecting the fixed basket indexes the best way to fix this problem would be that of allowing for an ”instantaneous” updating of the reference bundle. That is obviously not a viable solution due to both technical and economical constraints. A second best solution has been proposed then. Given the statistical properties of any mean value (i.e. to be within the upper/lower values it comes from) it has been claimed that by averaging the initial and the final consumption bundle a new index could have been calculated analytically lying closer to the true one. In fat two different solutions have been proposed according to different averaging methods:

- Walsh index (geometric mean)
- Marshall-Edgeworth index (arithmetic mean)

Unfortunately in both of those solutions the value of the final bundle is still a crucial element for the calculation and therefore affecting their technical viability. In that respect no significant improvement has been made in order to overcome the technical feasibility of the Paasche index.

That is the main reason why, besides the fixed basket approach, a (pure) statistical measure has tried to address the problem. It considers the change in the general level of prices as a pure statistical phenomenon due to a proportional change in the quantity of money and its measure is given by an average of prices or even of two or more of the previous indexes. Different averaging methodologies will yield different measures of inflation. W. S. Jevons[84] was the first to adopt this approach proposing a geometric mean of price ratios:

[84] See Jevons (1865).

$$P_J = \prod \left(\frac{p_{i,2}}{p_{i,1}}\right)^{1/N} \quad (4.5)$$

where N is the total number of items in the fixed basket. As from the definition, Jevon's index allows for inter-temporal substitution among goods at a constant rate. It is, then, a constant elasticity of substitution index and according to Diewert[85] this is the approach to be chosen for the CPI calculation. The reason is twofold: it is easy to compute and it is also "well behaved[86]" both for the sample nature of the index and the test properties it is able to show. Jevons index is not flawless, though. It fails to pass the irrelevance of tiny commodities test[87].

Differently Tornqvist[88] suggested to add the weights to the geometric mean of the price ratios:

$$P_T = \prod \left(\frac{p_{i,2}}{p_{i,1}}\right)^{w_n} \quad (4.6)$$

where wn is the arithmetic mean of the expenditure for the n-th item. It is an improvement of Jevons index because with the geometric mean more recent changes in prices gain importance with respect to the older ones, but still it is far from being the ideal index.

Finally Fisher[89] suggests a geometric mean of 4.1 and 4.2 to have a more reliable measure of price movements:

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[85] See Diewert (1992).

[86] For a further analysis of Jevon's index number and its mathematical properties see Diewert (1992).

[87] Goods whose consumption tends to be irrelevant still maintain a role in the index calculation.

[88] See Tornqvist (1936)

$$P_F = \left[P_L P_P\right]^{1/2} \quad (4.7)$$

This is also known as Fisher's Ideal price index because by averaging Laspeyres and Paasche measures it balances (though not completely) the inner positive and negative bias of the two. Though the best feasible approximation of the ideal price index Fisher formula is still affected by a bias and its Paasche component implies a concrete limitation to its practical use.

There is, then a third major (non-economic) approach to the index numbers whose main contribution has been that of defining some indexes' properties[90]: the *axiomatic or test* approach. Its aim is not to propose a new index but to better characterize the existing ones through a list of properties (defined as tests) they are able to pass or not. This approach has been built up by the means of many contributors[91] (non of them crucial) and its main aim is to assess the reliability and the correctness of the existing measures.

Empirical evidences about the statistical properties, the dynamic behaviour and the usefulness in defining the CPI of all the cited indexes are available from the academic literature. Among the others two works looks at the empirical evidence in an original point of view: Armknecht and Silver (2012a) suggests the need for something different

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[89] See Fisher (1922)

[90] There are some new approaches gaining in the literature on index numbers, but they have not gained a remarkable consensus within the academic community yet, e.g. the stochastic approach, See Diewert (2005)

[91] Among the others See Edgeworth (1896) for the *base invariance test*, Pierson (1896) for the invari- ance and the time reversal test and Fisher (1922) as the most prominent contribution to the overall approach. For a detailed focus on the test approach Diewert (1992)

and new with respect of the standard (chained) Laspeyres index. Elliott et al.[92], instead, deal with the choice of the elementary aggregates in measuring CPI from a stochastic, sampling perspective. Starting from the three methods used by the English Statistical Institute (a mix of geometric and arithmetic means mostly related to the Jevons/Carli approach) they offer a comprehensive comparative assessment of the empirical evidences regarding the other indexes.

4.1.2 Economic approach

Inflation has always been a central issue in economic theory given the crucial role it plays at a micro level it affecting the the individual agent total welfare and at a macro level as one of the main driver of economic policies design. Although inflation is an index measuring the change in the generalized level of consumption prices those approaches addressing it as a mere statistical issue have proven to be not completely stisfactory[93] both from a theoretical and practical point of view. A sounder economic background was needed in order to cope with peculiar concepts such as consumption, savings and welfare. In particular what the statistical approaches were neglecting was the possibility to allow for *(i)* differentiated effects with respect to heterogeneous consumers; *(ii)* a reaction of heterogeneous consumers through different combinations of goods in their optimal bundle. Inflation was, then, detached from the main features of consumption theory and a great pressure to go beyond the mere application of the

[92] See D. Elliott and Sanderson (2012)

[93] See, among the others, Armknecht and Silver (2012b)

statistical theory gave the input to work for a new ”*economic*” approach to the index numbers.

This approach mainly aimed to fill these gaps by focusing on consumption theory and prices becoming an excellent tool to address the link between prices and consumers’ living standards[94]. In order to focus on how a change in prices can affect the overall consumers’ satisfaction there was a shift in the paradigm: from a Cost-of-Goods (COGS) perspective the to a Cost-Of-Living (COLI) one. Analytically an economic index number can be obtained, then, with both a direct and an indirect process. The former refers to the comparison between the highest standard of living attainable by consumers in two different price situations (Real Consumption Index). The latter, instead, refers to the difference in the cost of getting a given standard of living (Cost of Living Index). The two procedures are equivalent and, as in the standard consumption theory, they can be regarded as the two steps, of a maximization process, i.e. substitution and income effect.

Before briefly discussing the main contributions of the economic approach to the index numbers theory it is worth to notice that this new approach makes a large use of consumption theory in that borrowing its capacity to deal with consumers’ satisfaction as well as its analytical shortcomings (e.g. the main assumptions on preferences and rationality).

From a technical viewpoint an economic index is the result of an optimization problem[95] and its properties, reliability and dynamic behaviour will strictly depend upon

[94] See Deaton and Muellbauer (1980)

[95] We will focus on the consumer’s perspective, but the results are general as stated by virtue of the Duality theory.

them. Nevertheless it is possible to draw some general conclusions about the structure and some general characteristics an economic index number will have.

Any index number has the same standard analytical structure as the following:

$$P_g = \sum_{i=1}^{N} p_i^t \cdot q_i^t = P^t Q^t \quad for\ t = 1,2, \dots T \quad (4.8)$$

It is, then, worth verifying whether or not this characteristic is shared also by those indexes derived with the economic approach. That, by definition, are the results of an optimization problem framed as the following cost minimization process[96]:

$$min\{p^t \cdot x: f(x) \geq u^t\} = c(p^t) f(x^t) \ \ for\ t = 1,2, \dots T \quad (4.9)$$

where $c(p^t)$ is the unit cost function and $f(x^t)$ is the utility yielded to the consumer by the optimal bundle x^t. Therefore given both the comparability between[97]:

- the unit cost function and the general level of prices;
- the utility function and the quantity vector;

even the economic indexes share the same general analytical framework of all the others. But the economic theory has offered a wide range of alternative definitions for the new type of indexes based on the concept of cost function.

A seminal contribution in this sense has been given by A. A. Könus[98]. He defined a change in the general level of prices between period 1 and 2 by the means of the following index addressed with his name:

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[96] This is a cost minimization process but, by duality, it can be framed equivalently as a utility maximization problem

[97] 8these relationships has been proven to hold given some properties of f as the linear homogeneity. For an analytical discussion See Diewert (2005)

$$P_K(p^1, p^2, \bar{u}) = \frac{C^*(p^2, \bar{u})}{C^*(p^1, \bar{u})} \quad (4.10)$$

where $C^*(p^t, \bar{u}) = C^*(p^2, 1)\bar{u} \equiv (p^t\bar{u})$ Due to the nature of its components the Konu¨s index has been defined ideal (i.e. impossible to compute). As in standard consumption theory, in fact, utility functions are hardly quantifiable in numerical terms and their role is basically to order different alternatives. The Konu¨s formulation has been used, then, mainly as a benchmark for other kinds of economic indexes.

Starting from the Konu¨s index the enormous amount of literature about the economic index numbers can be grouped into the following three categories[99]:

1. *Bound (or Non-parametric) theory*;

2. *Exact indexes*;

3. *Econometric indexes*;

whose main results will be briefly discussed in this section.

The main contribution of the Bound approach has been to prove that the ideal (uncom- putable) Konu¨s price index is upper/lower bounded. That is a result of great impor- tance to let the economic approach out of the mere theoretical fence. Respectively its upper/lower bounds are represented by the (computable) Laspeyres/Paasche formula- tion whose importance has been proved once again. A further strand of research, then, focused on the best feasible combination (e.g. symmetric, or asymmetric average) of the two indexes in order to get a measure of inflation as near as possible to the ideal index.

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[98] Könus (1939)

[99] See Diewert (2005)

The econometric approach, on the other hand, aimed to estimate the unknown parameters of the cost function in order to get at least an approximated, estimated value of the Konu¨s index. This implied two major shortcomings. From a technical point of view the estimation complexity is bound to exponentially grow with the number of unknown parameters. From a theoretical point of view, instead, to estimate the unknown parameters a specific functional form had to be assumed. That is a crucial assumption since different functional forms were yielding completely different results which were, then, biased and highly subjective.

Finally, somehow in the middle with respect to bound and econometric approaches, there is the exact index number formulation. It is the result of an empirical estimation assuming a wide general category of functional form for the cost function: it must be concave and positive, with just one positive eigenvalue[100]. Provided these properties the exact index number has been proved to coincide with the Konu¨s formulation and therefore there is no need to estimate the matrix of unknown parameters in order to get the price rate of change[101].

A further refinement of the exact index numbers are the superlative ones. When a flexible functional form is assumed for the cost function[102] an exact index number is also superlative. This is useful to simplify the algebra in calculating the index and generalizes the results for a wide category of cost functions.

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[100] It is the condition for the utility function to be displayed in a regularity region and thus yielding an index number that is exactly coinciding with the true index. For further details see Diewert and Hill (2009)

[101] See Diewert (1992)

[102] A flexible functional form is a function providing a second order approximation for any linearly homogeneous function

4.1.3 Dynamic approach

As pointed out both in academic and regulatory literature (e.g.Armknecht and Silver (2012b) and the Boskin Commission Report) the fixed basket approach to calculate inflation is not completely satisfactory even in its most recent chained versions. It has been proven to be structurally biased because it neglects some crucial aspects of prices as economic variables and consumers as rational economic agents. That is why economic theory tried to propose the above mentioned new approaches to measure inflation. The economic approach basically aimed to fill the gap between mere statistical index numbers and inflation making consumption theory a strong support for index numbers to build new indexes of Cost-Of-Living. Nevertheless these new indexes had proven to have their limits too: the assumptions needed to perform the optimization process did influence the final result (therefore there is not a unique price index) and the way in which the consumption theory has been considered often resulted na¨ıve and too simplistic to be realistic. Even considering the possibility to smooth the effect of a change in price by substituting their optimal bundle consumers could hardly be thought of as living in a static framework. While standard consumption theory had moved forward in understanding the dynamics of economic choices at a micro level index number theory stood still. Dynamic optimization, expectations and stochastic environment were the standard models setup both at a micro and macro level. As a consequence in the last few decades a new strand of literature rose, trying to combine the main features of the economic approach within a dynamic and more realistic framework.

From the “hump saving” described by Fisher (1930) and Harrod (1948) onward economic theories of intertemporal consumption have had a deep impact on

macroeconomic models. During the 1970s, for the first time, the Fisherian intertemporal trade-off in consumption was embedded in a context of price indices by Alchian and Klein (1973). They claimed that modern inflation measures were inaccurate to the extent that they were not considering asset prices and their attitude to allocate wealth and consumption over time. According to what they have written any measure of a change in prices should have considered also what consumers were to pay for future consumption as a crucial ele- ment affecting their present welfare function. Neglecting the current cash prices of future consumption was a major shortfall causing a structural bias in the inflation index due to its incompleteness. Nevertheless not all the goods and services had observable future prices. They claimed, though, that the overall consumers' wealth could be represented by the whole assets market and, therefore, the current vector of assets prices could be thought of as a proxy of prices for future consumption. As they stated, the incomplete- ness of future market prices was still an operational concern for their constant utility price index even if it was to fix a major bias in the standard static indexes. Alakian and Klei seminal contribution had the crucial role of focusing the academic attention to the absence of time in measuring inflation even if their dynamic modelling had some shortcomings. They addressed the consumption dynamics as if it were a discounted cashflow problem, a different approach with respect to what consumption theory was stating. Consumers' choice was still static in that they were just considering the dis- counted value of future prices. There was no room for expectations, for uncertainty, nor for an optimal path of consumption through time reshaping dynamically the optimal consumption bundle.

Later in the 1990s Shibuya (1992) tried to go further introducing a dynamic framework. He, thus, defined a dynamic measure of inflation called DEPI (Dynamic

Equilibrium Price Index) as an exponential average between the result of an intertemporal opti- mization with a no arbitrage equilibrium condition regarding goods and assets. This new index was able to consider both the change in the static allocation of consumption among goods and the modifications in its intertemporal structure, but still missed uncer- tainty and expectations. A further improvement was proposed by Aoki and Kitahara[103] focusing on the role of assets by assuming Epstein-Zin preferences and dealing with the total wealth rather than durable goods. Brown and Ying-Lee[104], instead, tried a differ- ent approach turning to the Almost Ideal Demand System framework and proposing a chain price index approach as further step towards the Cost-Of-Living ideal price index. Finally a major contribution to fill the gap of between consumption and index numbers theory has been given by Reis[105] with the introduction of a dynamic price index (DPI) in the more realistic case of incomplete insurance market. He built a dynamic stochas- tic general equilibrium model of consumption with asset prices and durable goods and inferred the dynamic measure of inflation as a function of the optimal dynamic consump- tion bundle. Uncertainty, dynamic framework and expectations were all concurring to determine the final inflation measure. According to our opinion Reis gave a major con- tribution to the economic approach to the index numbers, but the main purpose of our paper is to go even further. Our aim is to focus on the consumption theory backing the construction of the dynamic price index. In particular our concern is to go even further in the construction of a dynamic price index able to encompass the inertial driver of consumption that have been proven so important in explaining its dynamics.

[103] See Aoki and Kitahara (2010)

[104] See Brown and Lee (2012)

[105] See Reis (2005)

We agree on assessing the crucial role of consumption theory in the definition of a True Cost of Living Index, as taught from the standard literature, but what we claim is that the way of introducing it may be refined into a more realistic model by considering its inertial component, as claimed, amongst others, by E. T. Brown[106]. What we claim is that consumers are mainly concerned about their relative consumption (rather than its absolute level) and the most recent economic literature has accounted for it by introducing inertial models i.e. with habits a key element in consumers' utility and one of the drivers determining the highest attainable utility level for the representative consumer.

From an analytical point of view a static price index can be defined as the logarithmic difference between the prices at two different points in time, while in a dynamic frame- work it is the scalar allowing the consumer to maintain the same level of indirect utility while price are changing. The latter approach is an improvement with respect to the former because it takes into account both the uncertainty of the future and the time variation of the optimal bundle composition to smooth the effects of a price change. Nev- ertheless it looks too simplistic in neglecting the inertial component in the consumption model, that is why we propose a new Dynamic Inertial Price Index (DIPI) bridging this gap. Formally the DIPI index is the scalar π solving the following difference equation:

$$V(\pi_t W_{t-1}, \boldsymbol{p}^t, \boldsymbol{q}_t) = V(W_{t-1}, \boldsymbol{p}^{t-1}, \boldsymbol{q}_{t-1}) \quad (4.11)$$

Where $\boldsymbol{p}^t$ is the vector of prices and $\boldsymbol{q}_t$ is the asset price vector.

[106] He proved that lagged variables have an important explanatory role in consumption dynamics; See Brown (1952)

4.2 The baseline model

There is not a unique straightforward way to introduce habits in a consumption model and habits themselves can be defined in different ways. Following the standard literature habits are at least of two types: between groups of consumers (what Abel defines as ”catching up with Jones” utility functions[107]) and within the same group across time. But even focusing only on the ”within” component, according to Mueallbauer[108] habits can be introduced in a consumption model at least in two main ways: as a rational or a myopic element characterizing the consumers’ utility function. Both the techniques are plausible from a theoretical point of view but rational habits assert an impact of past consumption on all the future economic agent’s consumption path, that is affected, on the contrary, just by the previous consumption level in the myopic version of the habit formation. From an economic point of view the difference is in the awareness of the consumer about the effect of this inertial component on her utility level through time and that is why in this paper we are assuming a rational habit framework in order to build up a new Dynamic Price Index. Given the strong empirical evidence on peak consumption on the actual one[109] and the crucial role of the demand component in driving inflation dynamics[110] we are trying to model the effect of the inertial component in determining the dynamic path of the general price level. We assume, then the following instantaneous utility function:

$$U\left(C_{j,t}, C_{j,t-1}R_{j,t}, R_{j,t-1}\right) \quad (4.12)$$

[107] See Abel (1990)

[108] See Muellbauer (1988)

[109] See Brown (1952)

[110] See, among the others, Barth and Bennett (1975) for an empirical analysis of the cost-push versus a demand-pull inflation in aggregate terms

Where $C_{j,t}$,t is a non durable consumption good and $S_{j,t}$ is a durable one. As Reis does in his 2005 paper, we assume assume a log utility function like the following:

$$U(C_{j,t}, C_{j,t-1}R_{j,t}, R_{j,t-1}) = \sum_{j=1}^{N} \alpha_{1,j} ln(C_{j,t}) - \gamma \sum_{j=1}^{N} \alpha_{1,j} ln(C_{j,t-1}) + \sum_{j=1}^{D} \alpha_{2,j} ln(S_{j,t}) - \gamma \sum_{j=1}^{D} \alpha_{2,j} ln(S_{j,t-1}) \quad (4.13)$$

Where γ is the parameter measuring the importance of habit in consumers' utility and α is the elasticity of substitution among goods. When dealing with models of intertemporal choice is always a problem to disentangle the effect of the relative risk aversion coefficient from that of elasticity of intertemporal substitution, that is why we decide to assume a log utility function. Without loss of generality it has the twofold quality of a low number of parameters to be estimated as well as a constant coefficient of relative risk aversion that is coinciding with the elasticity of intertemporal substitution both equal to one.

With the help of this new dynamic approach in tackling price dynamics we are also able to disentangle the contribution of two different types of goods: non durable and durable. This is particularly interesting given the importance of the latter for the business cycle[111] and their twofold nature of consumption and value reserve goods. To model such a composite nature without enhancing the overall complexity of the model we assume the following definition for the user's cost of durables as in Reis (2005):

$$u_{j,t+1} = R_{j,t} - \frac{(1-\delta_j)R_{j,t+1}}{I_{t+1}^{M}} \quad (4.14)$$

Holding a durable good for one period requires, then, paying Ri,t for it at date t and then selling what is left over after the depreciation, for $R_{j,t+1}$ at date $t+1$. The

[111] See, among the others, Baxter (1996)

opportunity cost of investing a sum equal to $t+1$ dollar in durables is $\frac{1}{I_{t+1}^{M}} t+1$ dollars at date t, where $\frac{1}{I_{t+1}^{M}}$ is the performance yielded by an asset portfolio.

The maximization problem, then, can be stated as follows:

$$V(W_t; p_t) = \sum_{j=1}^{N} \alpha_{1,j} \ln(C_{j,t}) - \gamma \sum_{j=1}^{N} \alpha_{1,j} \ln(C_{j,t-1}) + \sum_{j=1}^{D} \alpha_{2,j} \ln(S_{j,t}) + \\ -\gamma \sum_{j=1}^{D} \alpha_{2,j} \ln(S_{j,t-1}) + \beta E_t[V(W_{t+1}; p_{t+1})] \quad (4.15)$$

$$\sum_{j=1}^{N} P_{j,t} C_{j,t} + \sum_{j=1}^{D} R_{j,t} S_{j,t} + \sum_{j \in \{B,E\}} Q_{j,t} B_{j,t} \quad (4.16)$$

$$W_t = \sum_{j \in \{B,E\}} D_{j,t} B_{j,t} + \sum_{j=1}^{D} R_{j,t+1}(1-\delta_t) S_{j,t} + \quad (4.17)$$

$$W_t \geq 0, \quad C_{j,t} \geq 0 \quad S_{j,t} \geq 0 \quad (4.18)$$

The consumer simply allocates optimally its wealth to durables, non-durables and financial assets, Bj,t that can be either equity or bonds and are traded at a vector price Qj,t. The maximization problem has to satisfy a standard budget constraint, (4.16) and a resource constraint as in (4.17). It states that the amount of wealth At the consumer is endowed with at the beginning of the period can be increased just in two ways: by the payoff the financial assets are going to produce, Dj,t and by reselling the durables after depreciation. The third constraint, (4.18), is just a nonnegativity condition ruling out Ponzi games and securing a positive level of consumption at any period.

As in Reis (2005) we assume prices of durables, non-durables and assets as the only source of uncertainty. They constitute a random vector Pt following, by assumption, a Markov process so to be a sufficient statistics to form expectations. Finally we assume consumers know everything about the quality of goods and their own tastes so the can

optimally choose their level of consumption just looking at prices. The resulting index won't be affected by anything else. It will be, then, a true price index. The dual formulation of the maximization problem can be stated, then, in terms of the indirect utility function[112] $V(W_t; p_t)$. From 4.11 the DIPI price index will have the following analytic formulation[113]:

$$ln(\pi_t) = \frac{(1-\beta)}{(1-\gamma)}\left[T\left(ln(P_{j,t-1}), ln(R_{j,t-1})\right) - T\left(ln(P_{j,t}), ln(R_{j,t})\right)\right] \quad (4.19)$$

Where $T\left(ln(P_{j,t}), ln(R_{j,t})\right)$ is a function of the past and actual goods prices. The DIPI index is, then, the natural outcome of a dynamic stochastic optimization and that marks a strong difference with the static index made only by the logarithmic difference of the prices. But it marks also a novelty with respect to the dynamic index proposed by Reis(2005). The main difference is the inertial component of the index $\frac{1}{(1-\gamma)}$ measuring the role of habit in consumers' utility. Furthermore, assuming also that all goods prices dynamics follow a random walk and that the asset payoff are i.i.d. we are able to definitize the difference equation arriving to a closed form formulation of the DIPI. In this case the index will be:

$$ln(\pi_t) = \frac{1}{(1-\gamma)}\left\{\sum_{j=1}^{N} \alpha_{1,j}\, \Delta\ln(P_{j,t}) - \gamma \sum_{j=1}^{N} \alpha_{1,j} \ln(P_{j,t-1}) + \sum_{j=1}^{D} \alpha_{2,j} \ln(R_{j,t}) - \gamma \sum_{j=1}^{D} \alpha_{2,j} \ln(R_{j,t-1}) + \right\} \quad (4.20)$$

A crucial role in this analytic formulation is played by the coefficient γ: the higher this coefficient the more important habit becomes in determining the consumers' utility. The simple Dynamic Price Index becomes, then, a special case of the DIPI when γ = 0

[112] For further reference on duality and indirect utility function See Deaton and Muellbauer (1980)

[113] For further details about the derivation of DIPI and its components See Appendix A

and no role is played by the habit formation in the definition of consumers' satisfaction[114]. Conversely, when γ is a positive scalar, habit formation gains importance in the definition of consumers' utility and it has a twofold effect. It boosts the level of the overall index (by the means of the coefficient $\frac{1}{(1-\gamma)}$) be smoothing the effects of a price change with respect of the standard static measure of inflation. Of course γ = 1 is a limit value in which the DIPI has an infinite value being any difference with the past consumption structure so high to prevent consumers from managing the di-sutility of a change in price. γ is, then, the inertial coefficient that giving rigidity to the system limits the possibility of the consumers to manage price changes varying the composition of their optimal bundle of goods.

4.3 DIPI properties

As shown by Reis (Reis (2005)) for his Dynamic Price Index, the DIPI maintains some interesting analytical properties as listed below:

Lemma 4.1. Given positive and finite prices and wealth, the DIPI exists and it is unique.

Proof. A consumption problem has a solution as long as the value function is monoton- ically increasing with its aguments. With respect to the DIPI definition in 4.11 π goes from 0 to +∞, the left hand side of the equation, then, increases monotonically from −∞ to +∞. Given positive wealth and prices, the right hand side is a finite number and therefore the solution to the overall problem exists and it is unique.

Lemma 4.2. With a homothetic utility function U(·) the DIPI is independent from wealth At

[114] In this case the index is also coincident with the static CPI

Proof. Using Carroll's terminology[115] we have adopted a "subtractive habit" way of mod- elling inertia in consumption. As in Bossi and Gomis-Porqueiras[116] modelling persistence in a subtractive way does not compromise the possibility of homothetic preferences over consumption. From a plain algebraic manipulation of the 4.11 this lemma is, then, proven.

Lemma 4.3. The DIPI is proportional to any strictly positive scalar a.

Proof. The proof comes directly as in Reis(2005). From the definition of DIPI in 4.11 the following transformation can be applied $\left\{\left\{W_t, p_t, D_t\right\} \rightarrow \left\{aW_t, ap_t, MD_t\right\}\pi_t\right\} = a$. The transformation doesn't affect the feasibility set of the maximization problem nor the objective function and the value function as well.

Lemma 4.4. With homothetic utility function the DIPI is a superlative index.

Proof. The superlative indexes are, by definition, *exact*[117] for an aggregator with a flexible functional form[118]. If a homothetic utility function is assumed the index number resulting from its optimization process would be also locally optimizing any of its (second order) approximations. The resulting DIPI index will, then, be superlative too.

It is extremely important that the DIPI index has proven to have the above properties both from a theoretical and practical point of view. In order to be a reliable tool for economic policies as well as a sound theoretical foundation for macro and

[115] See Carroll et al. (1995)

[116] See Gomis-Porqueras and Bossi (2005)

[117] i.e. from the indirect approach to consumer's choices it can be calculated as the change in the expenditure function due to a change in relative prices. In this case it is exactly the Cost-Of-Living Index

[118] i.e. functions able to be a second order approximation for a large class of function in particular for any linearly homogeneous function

microeconomic analysis having a unique measure is useful to prevent equilibrium selection and characterization problems. It must exist (and be available for the calculation) everywhere in the price domain. As a measure of the generalized level of consumption price the proportionality with any strictly positive scalar the index allows also for a generalized shock to be not-distortive by only offsetting the its level. Finally, as a further improvement to obtain the True Economic Price Index being a superlative index at least for a specific (though very large and used in economic theory) class of function is very valuable.

4.4 A micro model simulation

In order to focus on the quantitative aspects of the new price index we propose a numerical simulation of a simplified model made of only two goods and one financial asset through which the representative consumer can shift her consumption over time. As in the general case we assume a logarithmic utility function as the following:

$$U\left(C_{j,t}, C_{j,t-1}, S_{j,t}, S_{j,t-1},\right) = \alpha_1 ln\left(C_{j,t}\right) - \gamma\alpha_1 ln\left(C_{j,t-1}\right) + \alpha_2 ln\left(S_{j,t}\right) - \gamma\alpha_2 ln\left(S_{j,t-1}\right) \quad (4.21)$$

To undertake the simulation we choose to perform a Monte Carlo simulation because of a two reasons. First because it is a standard and well known technique for financial and economic simulations. Second because through its iterative method it offers a robust sampling procedure within a considerable amount of (simulated) data points. We also make some assumptions in order to both simplify the process and focus just on its main characteristics. Following Startz (1989) we assume a random walk for the goods price. At any point in time, then, price are independent from their previous values and they are also identically distributed (i.i.d. hypothesis). Then we assume i.i.d. payoff distribution

for financial assets to neutralize any concern about portfolio allocation and risk diversification in order both to be coherent with the choice of a log-utility function (in which the coefficient of relative risk aversion is constant and equal to one) and to enhance the analytical tractability of the model. Finally, following Verhelst and Poel (2012) we assume a standard calibration for the parameters setting $\alpha_1 = \alpha_2 = 0.5$ and $\gamma = 0.269$.

We have run the simulation of the DIPI for 500 periods dropping the first 50 observations to focus on the long run relationships and the resulting dynamics, as opposed to the static index, is shown in Figure 4.1:

Even though the DIPI has a very similar dynamics with respect to the static index it has a higher variance and deeper changes due to the habit coefficient. It is also worth noticing that the DIPI seems able to anticipate the static CPI dynamics mostly because of its intrinsic forward looking nature. The following table shows some comparative summary statistics with different habit coefficient.

From the simulation analysis some interesting consideration arise. The standard deviation of the DIPI is always higher with respect to the static CPI and it increases with the increase of the inertial parameter γ. This is mostly due to the increasing rigidity of the model. The pairwise correlation, instead, decreases with higher γ because the habit component of the model gains importance and marks deeper differences with the static index. Finally the last line of the table shows the values of DIPI corresponding to a 1% change in Static CPI. It can be seen how DIPI is increasingly lower with respect to the static CPI as long as γ tends to its unit value.

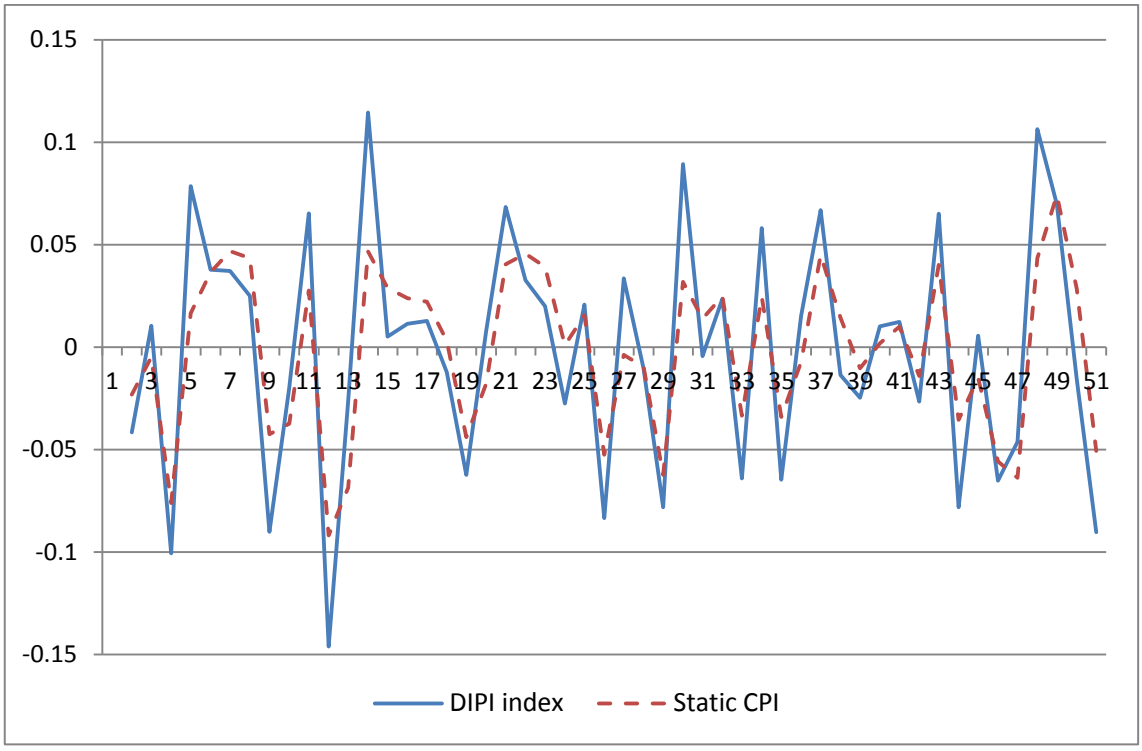

Fig. 4.1: DIPI Simulation

Table 4.1: Simulation sensitivity analysis

	Static CPI	DIPI			
	γ = 0	γ = 0.269	γ = 0.4	γ = 0.6	γ = 0.8
Mean	$-7.59 \cdot 10^{6}$	$1.30 \cdot 10^{4}$	$3.01 \cdot 10^{4}$	$8.15 \cdot 10^{4}$	$6.81 \cdot 10^{5}$
Std. Dev.	0.0402	0.0671	0.0933	0.1708	0.4099
Variance	0.0016	0.0045	0.0087	0.0292	0.1680
Skewness	-0.0141	0.0288	0.0265	0.0177	0.0103
Kurtosis	2.8680	3.1284	3.1550	3.1215	3.0691
Corr static CPI	1.0000	0.9014	0.8255	0.7203	0.6370
1% CPI	0.0100	0.0033	0.0033	-0.0050	-0.0300

Nevertheless it is interesting to see how the interaction between the inertial coefficient and the other parameters in the logarithmic utility function can transform a static 1% increase in prices in a DIPI decrement of a 3%. This is mostly due to the

relative importance of the inertial coefficient partially offsetting the forward looking component of the index.

4.5 Conclusions

The most recent developments of the economic approach to the index numbers have been able to consider two crucial aspects of consumption (and therefore of the way a change in the general level of prices affects consumers welfare): its dynamic and its stochastic dimension. Consumers are forward looking and the world is not deterministic, these were the reasons calling for a new, more reliable index. But consumers are also backward looking and their welfare depends on past consumption as well as on the present and expected one. This is what the most recent microeconomic theory has proven and this was also our starting point looking at price dynamics. We thought there was a need for a new inflation measure accounting for this inertial dimension of consumption as a further improvement towards the true Cost-Of-Living measure. We therefore propose a new price index, we name DIPI (Dynamic Inertial Price Index) based on a consumption model that is:

- Dynamic (there is a role, then, for intertemporal substitution; the resulting index has a forward looking component apart from the classical backward looking one)
- Stochastic (uncertainty plays a role not only through financial assets payoff, but also directly affecting prices dynamics)
- Inertial (consumption enhances the agents utility in a twofold way: directly and through the comparison with the level of consumption in the previous period, the so called internal habit component).

Nevertheless there is still plenty of room for further research mostly regarding the fol- lowing three drivers according to our opinion:

- the role of non-marketed goods (i.e. public goods like health care accounting for a large portion of the public expenditure especially in some European countries as Italy France and Scandinavia);
- consumers heterogeneity (different effects for different consumers' clusters); • different technical choices[119];

From the model simulation, then, we infer highly significant insight into the "new" effect of price dynamics. As the Boskin Commission certified[120], fixed basket indexes overstates inflation, according to their calculation, by 1.1% on average. Our results go in the same direction but make a stronger point. Our index has been able to register a major mismatch between what the standard measure would have registered: there are periods in which, according to our measure, there is a deflation instead of a standard registered weak inflation. That is a crucial concern because it could lead to economic policies amplifying the cycle more than smoothing it. Of course even the structural upper bias by the standard measures does have also an impact on fiscal policies, resulting in a structural automatic annual real tax cut, in higher indexed transfers and in a biased perception of the real purchasing power. From a monetary policy point of view it could result in an inappropriate tightening of the monetary aggregates, killing any chance of a smooth recovery from an economic downturn.

This gives us the possibility to construct an index that is able to capture both the smoothing activity of consumers that adjusting their optimal bundle try to react to a

[119] i.e. assuming external as well as internal habits for the inertial component, borrowing or cash-in- advance constraints, different

[120] Confirmed by later similar sudies Gordon (2006)

change in price and the structural rigidity of utility function built on relative consumption more than on its absolute level. The characteristics of the index are strongly dependent on its structural parameters as the utility function explicit form, the elasticity of substitution between goods, the stochastic dynamics assumed for prices and assets' payoffs and the inertial coefficient. We can state that assuming a standard calibration and a log utility function the final result is an index with higher variance with respect to the static measure of inflation, with a similar dynamics, but that is also able to anticipate the turning points thanks to the interactions between the forward looking and the inertial component. Moreover thanks to its analytical structure, the DIPI is also an excellent tool to study the different contributions of the durable and non-durable goods to the inflation dynamics. Moreover, through the differentiation of its structural parameters, the internal dynamics of any component can be focused as well as on the role of the inertial component itself.

APPENDIX A – Mathematical tools for a DIPI calculation

The dynamic programming problem as in (4.15) can be solved by expressing the starting model in "intensive" form by substituting the following expressions: ˜

$$\tilde{C}_{j,t} = \frac{P_{j,t}C_{j,t}}{W_t};\ \tilde{S}_{j,t} = \frac{R_{j,t}S_{j,t}}{W_t};\ \tilde{C}_{j,t-1} = \frac{P_{j,t-1}C_{j,t-1}}{W_t};\ \tilde{S}_{j,t-1} = \frac{R_{j,t-1}S_{j,t-1}}{W_t};\ \tilde{u}_{j,t+1} = \frac{u_{j,t+1}}{R_{j,t}};$$

The representative consumer's maximization problem becomes, then:

$$V\left(W_t; ln(P_{j,t}); ln(P_{j,t-1}); ln(R_{j,t}); ln(R_{j,t-1})\right)$$

$$= \max_{\{\tilde{C}_{j,t},\tilde{S}_{j,t},B_{j,t}\}} \left\{ \begin{array}{c} \sum_{j=1}^{N} \alpha_{1,j} \ln\left(\frac{W_t\tilde{C}_{j,t}}{P_{j,t}}\right) - \gamma \sum_{j=1}^{N} \alpha_{1,j} \ln\left(\frac{W_t\tilde{C}_{j,t-1}}{P_{j,t-1}}\right) \\ + \sum_{j=1}^{D} \alpha_{2,j} \ln\left(\frac{W_t\tilde{S}_{j,t}}{R_{j,t}}\right) - \gamma \sum_{j=1}^{N} \alpha_{2,j} \ln\left(\frac{W_t\tilde{S}_{j,t-1}}{R_{j,t-1}}\right) + \beta W_t E_t\left[V_W\left(W_{t+1}, P_{j,t+1}\right)\right] \end{array} \right\} \quad (A.1.1)$$

subject to:

$$W_t = I_{t+1}^M W_t\left(1 - \sum_{j=1}^{N} \tilde{C}_{j,t} - \sum_{j=1}^{D} \tilde{S}_{j,t}\, \tilde{u}_{j,t+1}\right) \quad (A.1.2)$$

$$I_{t+1}^M = \frac{b_t D_{E,t+1}}{Q_{E,t}} + \frac{(1-b_t)D_{B,t+1}}{Q_{B,t}} \quad (A.1.3)$$

$$V(W_t; \boldsymbol{p}^t)$$

$$= \max_{\{\tilde{C}_{j,t},\tilde{S}_{j,t},B_{j,t}\}} \left\{ \begin{array}{c} \sum_{j=1}^{N} \alpha_{1,j} ln\left(\tilde{C}_{j,t}\right) + \sum_{j=1}^{D} \alpha_{2,j} ln\left(\tilde{S}_{j,t}\right) + \\ -\gamma \sum_{j=1}^{N} \alpha_{1,j} ln\left(\tilde{C}_{j,t-1}\right) - \gamma ln(W_t) + ln(W_t) + \\ -\gamma \sum_{j=1}^{D} \alpha_{2,j} ln\left(\tilde{S}_{j,t-1}\right) - \sum_{j=1}^{N} \alpha_{1,j} ln\left(P_{j,t}\right) + \gamma \sum_{j=1}^{N} \alpha_{1,j} ln\left(P_{j,t-1}\right) + \\ + \sum_{j=1}^{D} \alpha_{2,j} ln\left(\tilde{R}_{j,t}\right) - \gamma \sum_{j=1}^{N} \alpha_{2,j} ln\left(\tilde{R}_{j,t-1}\right) + \\ +\beta E_t\left[V\left(W_{t+1}, ln\left(P_{j,t+1}\right), ln\left(\tilde{R}_{j,t+1}\right), ln\left(P_{j,t}\right), ln\left(\tilde{R}_{j,t}\right)\right)\right] \end{array} \right\} \quad (A.1.4)$$

subject to:

$$W_t = I_{t+1}^M W_t\left(1 - \sum_{j=1}^{N} \tilde{C}_{j,t} - \sum_{j=1}^{D} \tilde{S}_{j,t}\, \tilde{u}_{j,t+1}\right) \quad (A.1.5)$$

$$I_{t+1}^M = \frac{b_t D_{E,t+1}}{Q_{E,t}} + \frac{(1-b_t)D_{B,t+1}}{Q_{B,t}} \quad (A.1.6)$$

The envelope condition with respect to the wealth states that:

$$V_W(W_t,\cdot) = \frac{(1-\gamma)}{W_t} + \beta E_t\left[\frac{V_W(W_{t+1},\cdot)W_{t+1}}{W_t}\right]$$

Where $V_W(W_t,\cdot) = \frac{\partial V(\cdot)}{\partial W}$. This implies that:

$$W_t V_W(W_t,\cdot) = \frac{(1-\gamma)}{(1-\beta)_t}$$

If we integrate then, it becomes:

$$V_W(W_t,\cdot) = \frac{(1-\gamma)}{(1-\beta)_t} ln(W_t) + T\left[ln\left(P_{j,t}\right), ln\left(R_{j,t}\right)\right]$$

Where T[·] is an unknown function.

A.1 - Dynamic Inertial Price Index

The definition of dynamic price index states that:

$$V(\pi_t W_{t-1}, \boldsymbol{p}^t, \boldsymbol{q}_t) = V(W_{t-1}, \boldsymbol{p}^{t-1}, \boldsymbol{q}_{t-1}) \quad (A.1.7)$$

and it follows from the definition that the Dynamic Inertial Price Index will be:

$$ln(\pi_t) = \frac{(1-\beta)}{(1-\gamma)}\left[T\left(ln(P_{j,t-1}), ln(R_{j,t-1})\right) - T\left(ln(P_{j,t}), ln(R_{j,t})\right)\right] \quad (A.1.8)$$

In the specific case of a logarithmic utility function it can be seen what (A.1.7) looks like by log-linearizing the maximization problem around its non-stochastic steady state, given the following first order conditions:

$$\frac{\alpha_{j,t}}{\tilde{C}_{j,t}} = \beta W_t E_t[I_{t+1}^M V_W(W_{t+1},\cdot)] = \beta W_t E_t\left[\frac{W_{t+1}}{W_t\left(1-\sum_{j=1}^N \tilde{C}_{j,t} - \sum_{j=1}^D \tilde{S}_{j,t}\,\tilde{u}_{j,t+1}\right)} V_W(W_{t+1},\cdot)\right]$$

and then:

$$\frac{\alpha_{j,t}}{\tilde{C}_{j,t}} = \frac{\beta(1-\gamma)}{(1-\beta)} E_t\left[\frac{1}{1-\sum_{j=1}^N \tilde{C}_{j,t} - \sum_{j=1}^D \tilde{S}_{j,t}\,\tilde{u}_{j,t+1}{}_t}\right]$$

Similarly for the durables:

$$\frac{\alpha_{j,t}}{\tilde{S}_{j,t}} = \beta W_t E_t[I_{t+1}^M V_W(W_{t+1},\cdot)] = \beta W_t E_t\left[\frac{\tilde{u}_{j,t+1} W_{t+1}}{W_t\left(1-\sum_{j=1}^N \tilde{C}_{j,t} - \sum_{j=1}^D \tilde{S}_{j,t}\,\tilde{u}_{j,t+1}\right)} V_W(W_{t+1},\cdot)\right]$$

and then:

$$\frac{\alpha_{j,t}}{\tilde{S}_{j,t}} = \frac{\beta(1-\gamma)}{(1-\beta)} E_t\left[\frac{\tilde{u}_{j,t+1}}{1-\sum_{j=1}^N \tilde{C}_{j,t} - \sum_{j=1}^D \tilde{S}_{j,t}\,\tilde{u}_{j,t+1}}_t\right]$$

By solving the system above we are able to calculate the non-stochastic steady states of the system as follows:

$$\begin{cases} \frac{\alpha_{j,t}}{\tilde{C}_{j,t}} = \frac{\beta(1-\gamma)}{(1-\beta)} E_t\left[\frac{1}{1-\sum_{j=1}^N \tilde{C}_{j,t} - \sum_{j=1}^D \tilde{S}_{j,t}\,\tilde{u}_{j,t+1}}_t\right] \\ \frac{\alpha_{j,t}}{\tilde{S}_{j,t}} = \frac{\beta(1-\gamma)}{(1-\beta)} E_t\left[\frac{\tilde{u}_{j,t+1}}{1-\sum_{j=1}^N \tilde{C}_{j,t} - \sum_{j=1}^D \tilde{S}_{j,t}\,\tilde{u}_{j,t+1}}_t\right] \end{cases}$$

From the theory we know that $I = \frac{1}{\beta}$ and from (A.1.5) we infer that:

$$W = IW\left(1-\sum_{j=1}^N \bar{C}_{j,t} - \sum_{j=1}^D \bar{S}_{j,t}\,\bar{u}_{j,t}\right) \Rightarrow 1-\sum_{j=1}^N \bar{C}_{j,t} - \sum_{j=1}^D \bar{S}_{j,t}\,\bar{u}_{j,t} = \beta I$$

where the bar-variables indicate the state state levels. Therefore the steady states are:

$$\begin{cases} \overline{W} = \beta I \\ \overline{C} = \alpha \frac{1}{\frac{\beta(1-\gamma)}{(1-\beta)}\,\frac{1}{\beta}} = \frac{\acute{a}(1-\beta)}{(1-\gamma)} \\ \overline{S}\overline{u} = \alpha \frac{1}{\frac{\beta(1-\gamma)}{(1-\beta)}\,\frac{1}{\beta}} = \frac{\alpha(1-\beta)}{(1-\gamma)} \end{cases}$$

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