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Income Distribution and Social Tolerance

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Abstract Social tolerance, i.e. the tolerance for the intrinsic diversity of large social groups, can be viewed as a synergic effect of the features of both individuals and socio-economic environment. This paper proposes a twofold contribution to the literature. First, it advances a conceptual framework in which tolerance at individual levels is explained by social polarization—in the form of income distribution—and the perceived quality of the social relationships and structures. Second, the regression analysis—involving micro-data from World Values Survey covering a time span between 2010 and 2014, for 48 countries—provides robust evidences for a non-linear impact of income distribution on social tolerance. This impact appears to be U-shaped and displays a pronounced degree of asymmetry. Also, labour market position, education, class self-identification, gender, age, marital status, levels of individuals' personal security and sharing of post-materialist values matter in explaining social tolerance. The same main determinants contribute to the formation of both social tolerance and social capital. The differences are related to the amplitude as well as to the degree of symmetry for the corresponding non-linear transmission channels.

Keywords Social tolerance · Income distribution · Social capital · World values survey

JEL Classification D31 · Z13

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1 Introduction

Society is a complex web of interactions among its members. In order to facilitate and mediate such interactions, the members build up evolutionary institutions and mechanisms, establish a set of common rules, elaborate cultural paradigms as tools to value and justify the societal goals and design the architecture of the social environment. During the corresponding processes, individuals tackle and share their distinctive views, ideas, beliefs, habits and intrinsic behavioural patterns. The constitutive features of such elements might be significantly divergent. However, these features may display a substantial degree of complementarity. Hence, the sustainable social development critically depends on the persistent synergy of the distinctive individual capabilities. A key condition for such synergy is the acceptance of individuals' distinctiveness as not only tolerable, but also normal and desirable.

As a social phenomenon, tolerance can impact various economic-growth related processes and it might influence the component features of economic and social design. As Lee (2014) argues, tolerance represents a core element of a democratic political culture and an indicator of social cohesion.

Social tolerance can be viewed as the by-product of social and political environment's specificities. The democratic status, the societal institutions and mechanisms involved in individuals and social groups' interactions, the norms, rules and shared values are specifically modulating the interactions between society members. A certain level of tolerance can be transmitted via inter-generational learning and acquired through individuals' education and life experiences.

Meanwhile, the specific level of tolerance is impacted by the complex relationships established between individuals during the economic activity and related social processes. Such activity does not provide only the material support for the existence of a society, but influences as well the social dynamics and social design configuration. As a consequence, the economic status of a society is linked to how its members are interconnected.

Overall, social tolerance tends to increase in conjunction with economic development: "Although there is not a necessary link between economic resources and performance on these components, high income countries significantly outperform low and middle income countries." (Porter et al. 2015: 73).

Still, what matters, in terms of tolerance-income linkage, is not exclusively the absolute level of income. Rather, the income distribution can be viewed as a key variable for the social interactions between individuals and social groups. The perceived levels of inequalities (individuals' perception about the inequalities between various social strata) are sometimes more important than the de facto inequality (objective estimates of income gaps). The self-assessed position in the distribution processes can influence how individuals identify themselves and act in respect to others. It also may influence their attitudes towards individuals or groups identified as being 'different' (in terms of gender, ethnicity, culture, religion or even behaviours and shared values).

However, the subjective evaluation of inequality does not necessarily impact social tolerance in a linear fashion. Up to a certain threshold, this inequality can contribute to an increase in social mobility and, thus, to the emergence of more flexible frontiers between social groups and more active exchanges of their intrinsic values, norms and attitudes. Beyond such threshold, the competition for social resources' distribution and control may antagonize the rapports between groups placed in different income categories and increase intolerance and social exclusion processes.

Hence, various architectures of income distribution can lead to a greater level of social competition (for jobs, social benefits, healthcare, access to better education and living conditions) or even confrontation (for higher social status and societal dominant positions). Opposite, it may underwrite an enhancement in social cohesion.

Based on such arguments, this paper proposes a twofold contribution. First, it advances a theoretical framework in which tolerance at individual levels is explained by social polarization—in the form of income distribution—and the perceived quality of social relationships and structures. Second, it tests a multivariate model of tolerance determinants derived from the respective framework, by using micro-data from the 2010–2014 wave of World Values Survey, for 48 countries.

The next sections describe the theoretical framework, present the international data and report the results of the different models involved as well the robustness checks. Moreover, some policy implications are derived. Last section concludes.

2 Theoretical Framework

Florida (2003: 10) defines tolerance as: "openness, inclusiveness, and diversity to all ethnicities, races, and walks of life", while for Corneo and Jeanne (2009: 691) this signifies "respect for diversity" and a "distinctive feature of modern western societies, one that clearly differentiates them from traditional ones". As Berggren and Nilsson (2013) argue, a broader definition of tolerance should account for the cases in which individuals might display a tolerant attitude, while they dislike certain characteristics of those to whom this attitude is extended. A distinction important for this paper is that between *individual* and, respectively, *social* tolerance. The first type is specific for interpersonal relations of individuals in respect to family members, friends and acquaintances. Someone can be tolerant to such 'close neighbours', but intolerant in respect to their social inclusion groups. The second type is related to individuals' attitudes regarding large social groups and it is manifested as a social attitude. Our analysis deals with the latter type, which we label as *social tolerance*. Also, one might distinguish between *inherited* tolerance—as an outcome of an inter-generational learning process—and *acquired* tolerance—determined by features of both individuals and social, political, cultural and economic mechanisms. One might show intolerance, even if her/his familial environment is characterised by 'usual' (or even high) levels of tolerance.

Thus, our working definition views tolerance as a social display related to individuals' overall attitudes toward different societal components and which emerges under the influence of personal features, life history and the specificities of social and economic environment.

This approach follows a stream of literature, which usually associates tolerance with long-lasting factors. For instance, Hazama (2011) finds that individual-level determinants, such as authoritarianism, education and contact and threat perception are exercising robust effects on tolerance. Bobo and Licari (1989) document strong positive effects of education on a multiple target group tolerance scale that includes both left-wing and right-wing groups, while a substantial fraction of the education effect on tolerance is mediated by cognitive sophistication. Mokyr (1990: 12) argues that "innovation requires diversity and tolerance". Furthermore, tolerance can be related to globalization processes: "Places that are open and possess *low entry barriers* for people gain creativity advantage from their ability to attract people from a wide range of backgrounds" (Florida 2003: 11). Also, there

is recent literature supporting the existence of bi-univocal connections between the social dimension of tolerance and economic growth (Florida 2003; Ottaviani and Peri 2006; Bjørnskov 2006). Antecol et al. (2008) explore two alternative explanations for the sexual orientation wage gap: occupational sorting and human capital differences. By using data from the 2000 US Census, the estimates of Charles and Guryan (2008) suggest that one-quarter of the racial wage gap is due to prejudice, with nontrivial consequences for black lifetime earnings.

A very interesting study of the impact exercised by economic freedom and tolerance is Berggren and Nilsson (2013). It reveals that economic freedom is positively related to tolerance toward homosexuals, especially on long run, while tolerance toward people of a different race and the willingness to teach tolerance to kids are not strongly affected by how free the markets are. However, only a limited number of papers use survey-based measures of tolerance and a cross-country design (for instance, Berggren and Elinder 2012) or deal with micro-data—as those provided by individuals' answers in World Values Survey waves (such as Paas and Halapuu 2012).

Considering such a broad definition, we construct an explanatory framework for the formation of tolerance based on comparison theory. More exactly, our starting point is the observation that, in order to deal with the complexity of social life, individuals engage themselves in various comparison processes. The purpose of such processes is to set referential standards and to develop decisional routines. As Corcoran et al. (2011: 127) resumes: "To gain accurate self-knowledge, people use similar others as comparison standards, because only people who are similar to themselves provide diagnostic information for the self-evaluation. If people rather strive to self-enhance, they do not want accurate information about themselves but rather want to maintain a positive self-image. To do so, they look out for inferior others, because in light of such downward comparisons the self appears to be positive. Finally, if the comparison serves the goal to self-improve, superior others seem to be the perfect standards, because upward comparisons might be motivating and helpful to improve".

The information acquired in the elaboration of such comparison standards refers to a complex set, including variables that can be quantified in terms of monetary gains. In building up the comparative standards, an individual will assess such gains in absolute and (perhaps mainly) relative terms. For a self-positioning in the social field, it is important not only how much you gain, but also how much you gain compared to your neighbours.

Such line of argumentation might be involved so as to support the idea that what matters in explaining the individual utility is not so much the *absolute*, but rather the *relative* level of income. In other words, what is important in a self-assessment of the utility is not how much an individual gains—as these gains can be quantified in monetary terms—but how this individual evaluates her/his income in respect to that of comparison group's members. This statement should be carefully weighed, as it does not imply that the absolute income does not matter at all. It simply postulates that, in the same range of income, individuals might perceive a distinctive utility for it, due to social comparison processes. Below or above a certain income threshold, such processes can lead to different valuations. The main testable consequence is that income and individuals' utility are linked in a non-linear fashion. Furthermore, other key elements are the configuration of societal structures and the complexity of societal segmentation. These elements influence the comparison standards set by individuals and induce a specific perception of their own placement in social environment. Hence, a synergy effect between the valuation of individuals' monetary gains and the assessment of social conditions can appear.

In addition, monetary gains count only for some of the psychological and operational mechanisms requiring the appeal to social referential. Other non-material variables are equally important, such as decisional and behavioural determinants. Among these, one can identify: the quality of human interactions, family, friends and social networks, social groups' inclusion, the cooperation or hierarchical relations characteristic to the distribution of societal power, social mobility and openness, the system of entrustments, interdictions and social taboos or the quality of social norms, rules and institutions.

Individual utility's estimation implies the continuous selection and combination of material and non-material expected outcomes of decision-making processes.

Taking into account all the above, an individual i specific utility function at a certain moment can be formally described as:

$$U^i: \alpha_1 g_i^2 - \alpha_2 g_i + \beta_1 s_i^2 - \beta_2 s_i + \chi_1 g_i^2 s_i^2 - \chi_2 g_i s_i + \delta_1 \psi_i^2 - \delta_2 \psi_i \quad (1)$$

Here g_i captures the self-positioning in an income group for individual i, s_i is an evaluation of the quality of the social environment, the $g_i s_i$ term reflects the mentioned synergy between income comparison and the perceived quality of the social relationships and structures, while ψ_i is a vector of other potential determinants of utility such as the overall social and political environment, distinctive personal characteristics, societal position, occupational status or the shared values.

This utility function describes the non-linear effects induced by the comparison of income and, respectively, by the assessment of the social conditions concerning individuals' living environment.

A critical step in the development of our model is represented by the task of explaining the s_i variable. We view that variable as a weighted combination of the competition and conflicts in which the individual is engaged and, respectively, her/his degree of tolerance in respect to other individuals/social groups. The first component can be explained by involving the realistic group conflict theory (Sherif 1967; LeVine and Campbell 1972; Sidanius and Pratto 1999; Duckitt 1992, 2010; Schneider 2008), according to which intergroup discrimination and prejudice are the outcomes of social groups being locked in the logic of zero-sum competition over material or symbolic resources. Such conflicts serve to maintain a group's status position and societal prerogatives as well as group's identity and values. Self-displacement, beliefs' dissimilarities, social categorization and identification or conformity pressure are some of the psychological determinants of the involved processes.

The second component may be viewed as describing the extent to which individuals accept as natural the racial, sexual, religious, cultural and behavioural diversity into society. One possible psychological explanation for this tolerance can be advanced based on a version of strong reciprocity theory. As Fehr and Gintis (2007: 45) explain: "Strong reciprocity is the behavioural predisposition to cooperate conditionally on others' cooperation and to punish violations of cooperative norms even at a net cost to the punisher". Similarly, *strong tolerance* can be defined as the behavioural predisposition to accept individual differences conditionally on others' acceptance of self -characteristics and to penalize others' intolerance.

Beliefs' similarities, social mobility or low conformity pressure can be seen as determinants of associated mental patterns.

Hence:

$$s_i = \omega_1 tol^i - \omega_2 c^i \tag{2}$$

In this relation, tol^i stands for the degree of social tolerance in the case of individual *i,* while c^i describes her/his predisposition for social competition and conflict.

What does relation (2) actually describe? One possible explanation is that an individual does not display the same level of tolerance in respect to *all* other individuals/social groups. While *some* differences might be perceived by an individual as natural and acceptable, others might be seen as representing intolerable divergences from the personal beliefs, norms and/or as a reaction to her/his positions or to those of the inclusion groups. Such individual might be tolerant in respect to one specific ethnic group, but might prove intolerant to another; she/he might view some sexual practices as socially acceptable, but might find others as inacceptable. Also, she/he might accept equal gender social opportunities, but might act in private life in a gender discrimination manner. Hence, s_i values reflect in fact a 'balance of tolerance/competition and confrontation' attitudes and behaviours.

By substituting (2) in (1), an individual utility function can be rewritten as:

$$\begin{aligned} U^i: \alpha_1 g_i^2 - \alpha_2 g_i + \beta_1 \left[\omega_1 tol^i + \omega_2 c^i\right]^2 - \beta_2 \left[\omega_1 tol^i + \omega_2 c^i\right] \\ + \chi_1 g_i^2 \left[\omega_1 tol^i + \omega_2 c^i\right]^2 - \chi_2 g_i \left[\omega_1 tol^i + \omega_2 c^i\right] + \delta_1 \psi_i^2 - \delta_2 \psi_i \end{aligned} \tag{3}$$

The optimal level of social tolerance, which maximizes the individual utility, can be estimated by imposing $\frac{\partial U^i}{\partial tol^i} = 0$:

$$2\beta_1 \omega_1^2 tol^i + 2\beta_1 \omega_1 \omega_2 c^i - \beta_2 \omega_1 + 2\chi_1 \omega_1^2 g_i^2 tol^i + 2\chi_1 \omega_1 \omega_2 c^i g_i^2 - \chi_2 \omega_1 g_i = 0 \tag{4}$$

Thus, the optimal level of social tolerance, $tol^{i^{opt}}$, is:

$$tol^{i^{opt}} = \frac{\beta_2 \omega_1 + \chi_2 g_i \omega_1 - 2\omega_1 \omega_2 \left(\beta_1 c^i + \chi_1 g_i^2\right)}{2\omega_1^2 \beta_1 (1 + \omega_1 \omega_2 c^i + \chi_1 g_i^2)} \tag{5}$$

According to relation (5), the self-assesment of income inequality influences the optimal level of social tolerance in a non-linear fashion. This impact is modulated by:

- The relative importance for the 'balance of tolerance/competition and confrontation' in the individual' utility function (as reflected by parameters β_1 and β_2);
- The structure of such balance—as reflected by the predisposition for tolerance, the individual tendency to engage in social competition and conflicts as well as by the intensity of such tendency (parameters ω_1, ω_2, c^i);
- The relative importance in the utility function for the self-assesment of income inequality—as described by χ_1 and χ_2.

Some 'pathological' cases can be identified here. For individuals with very low relative importance of non-material values in the utility function (β_1, β_2, χ_1, $\chi_2 \to 0$), the optimal level of social tolerance will be undetermined. For individuals with high relative importance of non-material values in the utility function (β_1, β_2, χ_1, $\chi_2 \geq 1$), the optimal social tolerance will strongly depend on the 'balance of tolerance/competition and confrontation' structure. For individuals with intermediate levels of non-material values' relative importance, the social tolerance is determined by a mix of material and non-material

values. In such case, the extent to which an individual is characterized by a 'strong tolerance' (in the mentioned sense) predisposition plays a critical role.

Several features can be added in order to enhance the explanatory power of this conceptual framework. For instance, one might argue that the perceived income inequality depends on: the redistributive effects of fiscal policy (as this policy is described by the matrix of relevant parameters, $\Im$); and the information available on an individual related to the income earned by the referential social group (Ω^i):

$$g_i = g_i\left(\Im; \Omega^i\right) \tag{6}$$

Moreover, the predisposition for tolerance and, respectively, for confrontation can be explained by individual life history, education, cultural biases, inter-generational transmitted behaviours, feeling of personal security or 'neighbourhood' (micro social environment). Along such variables, objective determinants of tolerance/social competition and conflict might emerge from the macro-social environment. For instance, some studies of the attitudes towards immigrants argue that these depend on the relative size of the immigrant population (see Scheve and Slaughter 2001). However, McLaren (2003) finds that, even after controls for the perceived threat are included in the model, intimate contact with members of minority groups, in the form of friendships, can reduce the willingness to expel legal immigrants from the country. The cultural marginality approach argues that attitudes towards immigrants are more tolerant, when autochthonous individuals are exposed to immigrants' culture and, thus, these individuals can better understand their motivations and behaviours (Paas and Halapuu 2012). Hence, the action of macro factors is still modulated by micro societal conditions.

Thus, the predisposition for social competition and confrontation is the outcome of a mix of objective (o) and subjective (ϑ^i) factors:

$$c^i = c^i\left(o; \vartheta^i\right) \tag{7}$$

By substituting (6) and (7) in (5) the optimal level of social tolerance can be rewritten as:

$$tol^{iopt} = \frac{\beta_2\omega_1 + \chi_2 g_i\left(\Im; \Omega^i\right)\omega_1 - 2\omega_1\omega_2\left(\beta_1 c^i\left(o; \vartheta^i\right) + \chi_1 g_i^2\right)}{2\omega_1^2\beta_1\left(1 + \omega_1\omega_2 c^i + \chi_1 g_i^2\right)} \tag{8}$$

Relation (8) shows that beyond the already mentioned determinants, the individual social tolerance is influenced by: the redistributive effects of economic policies; individuals' information about the nature and scale of such effects; as well as by a complex of objective and subjective variables at macro and micro social strata. This relation encapsulates several alternative explanations for social tolerance preferences. It shares with collective threat explanation the argument that the attitudes toward some social groups—potentially subjected to various types of prejudice—depend on some scale effects exercised by these. Furthermore, it explains, as in personal contact and cultural marginality approaches, that such scale effects are translated at individual levels and conditioned by personal experiences with members of vulnerable and marginal groups. Finally, it considers a complex of social and cultural factors at individual level.

Resuming, the logic of this model implies that: (1) there is a choice in the individual utility function between material gains (in relative terms) and, respectively, the non-material values as reflected by social environment quality; and (2) there is a 'balance of tolerance/competition and confrontation'. As an outcome of these variables' impact, the level of social tolerance, appearing to be optimal from an individual standpoint, will depend on the

relative income. We argue that such conclusion can be derived for any type of group viewed as marginal in terms of race, ethnicity, religion, sex or culture. We further search for empirical evidences of this thesis based on data from World Values Survey 2010–2014 wave.

3 Data

A first task for the empirical assessment of the linkage between relative income and social tolerance consists in an adequate choice of social tolerance descriptors. Such descriptors may be related to, as a minimum, the following dimensions: (1) religious tolerance, (2) ethnic and racial tolerance and, respectively, (3) gender and sexual tolerance. In order to obtain estimators for these dimensions, we use data from World Values Survey covering the 2010–2014 wave. We estimated cross-section regression models based on data from 67,003 respondents from 48 countries. From the possible descriptors of religious tolerance, we considered variables dealing with: the proximity with members of a different religion, the 'acceptability' of other religions, the public taught of religion and the recognition of other religions ethical foundations. For ethnic and racial tolerance, the implied variables are related to attitudes toward proximity with members of other racial or linguistic groups or with immigrants. For gender and sexual tolerance, the considered variables describe attitudes towards homosexuality, prostitution, abortion and marital status. Details about variables and their codification are provided in "Appendix".

We implemented the principal components analysis (PCA) method in order to build an aggregate estimator of social tolerance. Thus, all the variables had been considered collectively, without grouping them along the mentioned variables. The main argument for this approach is that several of the variables might be viewed as actually being 'border' variables between different possible dimensions. For instance, an anti-abortion attitude might be determined by a laic 'pro-life' ethics. Also, it might be the result of a religious or ethnic cultural taboo. Hence, in order to minimize the potential biases induced by an arbitrary classification of variables, in more or less clearly defined dimensions, their joint contribution to social tolerance formation is considered.

PCA aims to find unit-length linear combinations of the variables, with the greatest variance. Hence, the first principal component will have a maximal overall variance, while second principal component will reach a maximal variance among all unit length linear combinations, which are uncorrelated to the first principal component and so on. The explained variance by the first three components is reported in Table 1.

Eigenvalues indicate the amount of variance explained by each principal component or each factor. The corresponding eigenvalue of the first principal component is equal to 3.419, being 1.6 times larger than the eigenvalue of the second component. Hence, we

Table 1 Explained variance by components for the variables included in the social tolerance indicator

Components	Eigenvalue	Proportion	Standard error of proportion	Cumulative proportion	Standard error of cumulative proportion	Bias
Principal component 1	3.419	0.263	0.001	0.263	0.001	0.000
Principal component 2	2.122	0.163	0.001	0.426	0.001	0.000
Principal component 3	1.264	0.097	0.001	0.523	0.001	0.000

retain this first principal component for the construction of the social tolerance indicator. The results are presented in Table 2. The values of LR tests for independence and sphericity, as well as the Kaiser–Meyer–Olkin measure of sampling adequacy, suggest that overall the variables have enough in common to warrant a PCA. Using the Kaiser (1974) characterization of Kaiser–Meyer–Olkin values, one can consider this value as very good.

Negative values denote low levels of social tolerance, while positive values reflect the opposite/the higher ones. Average values of social tolerance are pointed out by indicator values of around zero. This indicator lies between −10.11 and 10.11 with 16,875 (around 25 %) positive values.

Our measure of social tolerance is different in several aspects from other indexes, such as the *Global Tolerance Index* (Das et al. 2008; Berggren and Nilsson 2013). First, it

Table 2 Principal components analysis: loadings for the social tolerance indicator

Variable	WV6-questionairre codification	Loadings (overall index)
Religious tolerance		
Would not like to have as neighbours-people of a different religion	V41	0.023
The only acceptable religion is my religion	V154	0.109
All religions should be taught in our public schools	V155	0.002
People who belong to different religions are probably just as moral as those who belong to mine	V156	0.018
Ethnic tolerance		
Would not like to have as neighbours-people of a different race	V37	0.019
Would not like to have as neighbours-immigrants/foreign workers	V39	0.016
Would not like to have as neighbours-people who speak a different language	V44	0.015
Gender/sexual tolerance		
Would not like to have as neighbours-homosexuals	V40	0.070
Would not like to have as neighbours-unmarried couples living together	V43	0.046
Never be justified-homosexuality	V203	0.549
Never be justified-prostitution	V203A	0.303
Never be justified-abortion	V204	0.509
Never be justified-divorce	V205	0.572
LR test for independence	$\chi^2 = 201{,}465.41$ $(p = 0.000)$	
LR test for sphericity	$\chi^2 = 798{,}406.01$ $(p = 0.000)$	
Kaiser–Meyer–Olkin measure of sampling adequacy	0.994	

Estimation method: Principal Components Analysis calculated for the covariance matrix. This method is meaningful since the variables are expressed in the same units. The principal components are normed to the associated eigenvalues and not to 1. Inference on the eigenvalues and eigenvectors of a covariance matrix is based on two assumptions: (1) The variables are multivariate normal distributed and, respectively, (2) The variance–covariance matrix of the observations has all distinct and strictly positive eigenvalues. The likelihood-ratio χ^2-test of independence and sphericity (Basilevsky 1994: 187, 192) are applied. Using Kaiser (1974) characterization of Kaiser–Meyer–Olkin measure of sampling adequacy values, a value of 0.994 is very good

includes: a larger set of descriptors accounting not only for tolerance in respect to homosexuality or race; broader definitions of gender, sexual, ethnic and racial tolerance; as well as a completely neglected dimension i.e. religious tolerance. Second, it does not view tolerance as a necessarily inherited value, object to inter-generational learning. Rather, it accounts for present attitudes and views that can be labelled as 'tolerant' due to the fact that these emerge from the entire individual life history and experiences. Third, it is not estimated at country-level, but at individual-level. Fourth, it is not constructed by averaging the values of the involved variables, but by the orthogonal transformation specific to PCA—aiming to convert the set of observations of possibly correlated descriptive variables into a set of values of linearly uncorrelated variables.

Figure 1 displays countries' average values for the social tolerance indicator computed as the first principal component. At least three groups of countries can be identified at dataset level. There are countries such as Pakistan, Ghana, Armenia, Azerbaijan, Libya, Nigeria, Uzbekistan or Kirgizstan with significant low averages of individual social tolerance. At the opposite end of the spectrum, individuals from countries like Sweden, Netherlands, Spain, Australia or Slovenia display high levels of tolerance.

Finally, for countries such as Uruguay, New Zealand, Germany, United States or Japan, there are average values of tolerance with substantial variance between individuals.

One possible explanation for these differences may be related to the degree in which these societies share post-materialistic values: "Post-materialism also involves greater tolerance of abortion, divorce, euthanasia, sexual minorities, single parents and minority groups" (Newton and van Deth 2010: 177). For the first mentioned group of countries, the average period level of post-materialism index is equal to 1.595, while for the second group, it is almost 1.2 times larger (1.873). The median tolerance countries display interim values of post-materialism.

Still, countries with higher levels of both tolerance and post-materialism are not characterized by uniform economic development. Moreover, these countries do not share a common history, long-run societal trends, dominant religious denominations or geographical/political proximity. Thus, a deeper analysis is required, as neither post-materialism nor the mentioned factors provide a full explanation. In addition, there seems to be room for the action of other determinants. Our central argument is that income distribution is a significant example of such determinants.

However, what matters is the important potential for dependent variable heterogeneity to be accounted for by the estimation techniques.

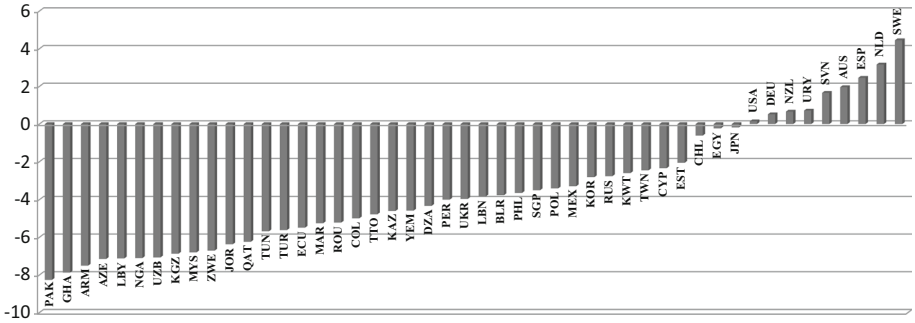

Fig. 1 Countries average values of social tolerance indicator

Furthermore, information about household income is coded from "1" (lowest decile) to "10" (highest decile). It is based on the individual self-assessment and not on an objective evaluation. The kernel (*Epanechnikov*) fit for income and social tolerance indicator from Fig. 2 suggests a U-shaped relation between this income classification and the proposed indicator. This observation is consistent with the theoretical framework resumed by relation (8).

We consider several control variables. First, it is considered a scale of economy and society effect, by country of residence. It reflects the historical and political background of a country (the long-run path dependence) as well as the specific cultural paradigm. Second, there are four variables related to individuals' characteristics (gender, age, education and marital status). Third, a variable related to the self-designed class inclusion is taken into account. Beyond the standard model of three-stratum model, the recent literature emphasizes more the subjective and intersectional nature of the social class (Rubin et al. 2014). Hence, the self-designed identification with a specific social class might occur in an autonomous manner in respect to the individual position in income distribution. Fourth, we control for type of employment and occupational status. The position in the labour market (as full or part time employed, self-employed or unemployed, private or public sector employees), the competition in job searching or the perspectives of the current job (in terms or career path or job security) strongly influence the attitude toward members of different social groups (especially those which possess distinctive skills or a better education, immigrants or people with a distinctive work ethic). Fifth, the 4-items post-materialist index (developed by Inglehart 1971, 1977, 1981, 1990, 1997, 2008) is involved as to reflect cultural and behavioural factors. The index relies on "the most important in the long-run" social priorities, focused on: (a) maintaining the order, (b) public involvement in government' decisions, (c) fighting inflation and, respectively, (d) protecting freedom of speech.

This 4-items index is constructed based on the next rule: for questions on "the first and the second most important national priorities", respondents selecting both "maintaining order in the nation" and "fighting rising prices" are classified as "materialists"; while those selecting both "giving people more say in decisions on the government" and "protecting freedom of speech" are classified as "post-materialists". Those selecting both a "materialist" and a "post-materialist" item are classified as "mixed". We argue that individuals from societies with a dominant post-materialist component tend to display higher levels of social tolerance, as they focus more on non-material values.

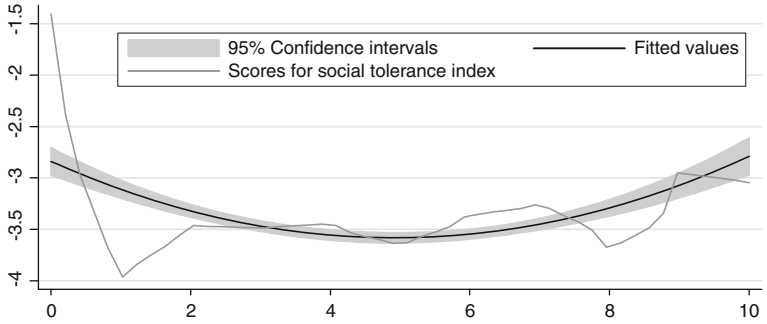

Fig. 2 Kernel (Epanechnikov) fit for income and social tolerance indicator

Finally, we consider an indicator of personal security. For instance, Chandler and Tsai (2001) find a weak positive relationship between the feeling of safety and the attitude towards immigration. The "feeling of safety when walking in the neighbourhood when it's dark" (Paas and Halapuu 2012) is estimated based on World Values Survey questions related to an assessment of personal safety as well as to the occurrence of violent acts in individuals' social proximity and the personal experience with such acts. The related variables are combined in a principal components analysis and a synthetic estimator of personal security is produced.

All these variables are included in an integrated interdisciplinary framework, seeking to explain the determinants of people's attitudes towards social groups that are potentially subject to prejudice.

4 Results and Comments

4.1 Quantile Regressions

In order to test the explanatory capacity of the considered determinants of individuals social tolerance, we preliminary run a baseline OLS regression. The results are reported in column (1) of Table 3.

Several aspects of these results can be highlighted. First, it appears that the self-estimated position in income distribution exercises a *U-shape* impact on the individual levels of social tolerance, which is statistically significant at 1 %. However, such effect is clearly asymmetric: the inhibiting effect of a better placement in distribution is compensated, only above a certain threshold, for individuals included in upper income groups. Hence, it seems that two groups of people display, for distinctive reasons, high levels of social tolerance: the (very) poor and, respectively, the (very) rich. One possible explanation, for the first group, might be linked to their dependence on formal and informal social networks, in order to address issues related to poverty. These social networks can play an active role in national policy development on issues such as poverty, inequality and human rights (Afridi 2011). A key distinction in the description of these social networks is that between 'weak bonds' and 'strong bonds' networks (Granovetter 1973; Afridi 2011). If the 'strong bonds' networks are mostly associated with family and friends, the 'weak bonds' are related to more distant contacts and acquaintances and include individuals with different ethnicity, gender, religion and beliefs. In some conditions, there are social networks consisting of 'weak bonds' and having a significant potential to deliver various types of long-run material gains, such as employment opportunities (Calvo-Armengol and Jackson 2004; Afridi 2011).

At the opposite side of the spectrum, higher levels of income allow individuals to live in more homogenous and secure communities. Moreover, such income supports a better personal mobility, which fosters contacts with people of different culture and ethnicity.

From the control variables the most important effects are exercised by shared values, labour market status, education and sex. Individuals sharing post-materialist values tend to display higher levels of tolerance. The same applies for individuals with high levels of education, having full-time jobs in the private sector. A possible explanation for the higher degree of tolerance exhibited by such individuals, in comparison with those working as public servants, is linked to the fact that labour in private sector involves a superior ability to face job competition and, so, a higher professional and personal flexibility, an 'openness

Table 3 Determinants of the social tolerance: quantile regression analysis

	OLS	Quantile regressions		
	(1)	20-th Quantile (2)	50-th Quantile (3)	80-th Quantile (4)
Income group	−0.358***	−0.046	−0.481***	−0.516***
	(0.031)	(0.038)	(0.039)	(0.057)
Income group squares	0.026***	−0.004	0.033***	0.043***
	(0.003)	(0.003)	(0.004)	(0.006)
Country	0.014***	0.016***	0.010***	0.012***
	(0.001)	(0.001)	(0.002)	(0.002)
Female	−0.689***	−0.360***	−0.832***	−1.050***
	(0.040)	(0.039)	(0.064)	(0.071)
(Log) respondent's age	3.556***	2.147***	4.100***	4.348***
	(0.134)	(0.140)	(0.166)	(0.215)
Respondent's education	0.274***	0.166***	0.335***	0.318***
	(0.007)	(0.007)	(0.010)	(0.012)
Married	0.188***	0.097***	0.215***	0.256***
	(0.008)	(0.008)	(0.012)	(0.015)
Class self-designation	0.169***	0.102***	0.156***	0.254***
	(0.021)	(0.016)	(0.029)	(0.034)
Employment	0.587***	0.264***	0.491***	0.872***
	(0.052)	(0.057)	(0.070)	(0.089)
Employment squares	−0.070***	−0.031***	−0.059***	−0.105***
	(0.006)	(0.007)	(0.008)	(0.011)
Type of work	1.138***	0.642***	1.203***	1.424***
	(0.069)	(0.065)	(0.103)	(0.124)
Type of work squares	−0.188***	−0.142***	−0.163***	−0.234***
	(0.027)	(0.027)	(0.043)	(0.045)
Post-materialist index (4-items)	−1.947***	−2.258***	−2.902***	−1.912***
	(0.087)	(0.142)	(0.128)	(0.143)
Post-materialist index (4-items) squares	0.840***	0.730***	1.130***	1.042***
	(0.028)	(0.046)	(0.043)	(0.046)
Personal security index	−0.065***	−0.048***	−0.126***	−0.101***
	(0.015)	(0.015)	(0.021)	(0.027)
Personal security index squares	0.043***	0.014***	0.036***	0.078***
	(0.004)	(0.004)	(0.006)	(0.008)
Constant	−9.831***	−11.176***	−9.891***	−7.623***
	(0.286)	(0.319)	(0.352)	(0.443)
(Pseudo) R^2	0.089	0.024	0.052	0.070
Number of observations	67,003	67,003	67,003	67,003

Dependent variable: factor scores of the aggregated indicator for individuals' degree of tolerance; Robust OLS estimators; for quantile regressions: The number of bootstrap replications to be used to obtain an estimate of the variance–covariance matrix of the estimators (standard errors): 100

***, **, * −1, 5, 10 % significance levels

to the new' and a capacity to adapt to various labour environments. Also, it requires better aptitudes for teamwork and personal interactions. Thus, individuals from the private sector have better chances for learning to accept members of different social, ethnic or religious groups, as they might be their co-workers, clients or business partners. The 'you cannot be

intolerant with those with whom you do or you might do business in the future' attitude is supported by higher levels of education, leading to higher levels of tolerance reached through a long-run learning process.

In addition, women are more tolerant than men: higher levels of tolerance are achieved in societies with predominant 'feminine' values. Societies in which such values are dominant show a preference for cooperation, being largely more consensus oriented, and place more value on relationships and quality of life (Hofstede 2001).

In OLS estimations, a lower impact is exercised by marital status, self-designed class inclusion and personal security. However, the effects exercised by these variables are all statistically significant at 1 %. Finally, some influence is exercised by the macro economic and social environment, but this is less substantial than the individual characteristics.

Furthermore, one can argue that the impact of changes in income distribution on social tolerance may differ for low and, respectively, high income groups. Hence, a different behaviour of the various sub-groups should be expected in terms of the linkage between these two variables. Such distinctive behaviour can be reflected by the quantile regression approach. This approach has several advantages, such as: generating robust estimates, particularly for the misspecification errors related to heteroskedasticity, non-normality and other error term misspecification. It deals as well with error measurement problems. Starting with the seminal work of Koenker and Basset (1978), respectively Basset and Koenker (1978), an extensive literature has studied the asymptotic behaviour of the quantile regression (see, for instance, Weiss 1990; Portnoy 1991; Knight 2008).

The results of such quantile regression are reported in columns (2), (3) and (4) of Table 2. The income group variable does not appear to be statistically significant for the *20-th* quantile, while the sign of the income group squares displays the 'wrong' sign. Hence, at low levels of self-assessed income, individuals are less influenced by their relative societal status in exhibiting a certain level of social tolerance. One possible explanation may be related to the role played by the mutual support social networks: the 'good neighbour' argument might overcome, in some cases, gender, race, ethnicity or religious prejudices. Conversely, intolerance might occur in other cases, as a compensation mechanism for individual and social group frustrations: 'somebody must be blamed for all what is going wrong' attitude prevails in such cases. The 'net' effect is non-robust and it largely depends on several other particular factors.

However, this variable impacts the social tolerance with a statistical significance of 1 % for both levels and squares in the cases of *50-th* and, respectively, *80-th* quantiles. For the last two quantiles, the induced effects display a *U-shape* form. Individuals who perceive themselves as poor are less sensitive to their relative position in the lower income groups, in terms of social tolerance. Contrary, rich individuals tend to display a greater degree of tolerance as their relative position in higher income groups improves.

The involved *U-shape* is highly asymmetric for both average and upper quantiles. A relatively better position in income distribution starts to positively impact social tolerance, only after it reaches a certain threshold. Taking into account such non-linear effects is critical in order to avoid a 'micro-level' paradox, since there are areas in which a better position in income distribution is associated with lower levels of social tolerance.

These findings can be combined with the self-designed class inclusion: social tolerance increases with the shift from lower to upper income class, although the amplitude of this effect is smaller than the net effect of income inequality. Also, there appear to be enhancing effects of higher education, which are more than two times larger in medium and upper quantiles, than in lower quantiles: individuals with university-level education are more tolerant than individuals without or with incomplete primary education.

The position on labour market exercises a *reverse U-shape* impact on the degree of tolerance, for all quantiles. People less active on labour market tend to be more tolerant, as they perceive a lower competition pressure from groups like immigrants, women or people with a different work ethic. Also, individuals with more secure or more flexible part-time jobs tend to be more tolerant than self-employed persons. This result diverges from other findings in literature. For instance, in Paas and Halapuu (2012) analysis of attitudes toward immigrants, the attitudes of employed and unemployed people show no significant statistical difference from those of people out of the labour force. However, when non-linear effects are considered, this is no longer the case.

The *U-shape* effect of shifting from "materialist" to "post-materialist" values is preserved across all quantiles. Still, its amplitude is somehow lower for upper *80-th* quantile. In other words, after a certain threshold, the shift is less able (in relative terms) to induce an increase in social tolerance. The individuals' feeling of personal security plays a clear *U-shaped* role across all quantiles. However, it is interesting to note that the "net" effect is asymmetric. The maximum level of such asymmetry is reached for the *50-th* quantile. Thus, for people "afraid to walk around their neighbourhood in the dark" (Paas and Halapuu 2012) in an endemic violent micro-environment, as well as, for people benefiting from high levels of personal security, a perceived relative difference in personal security is less able to explain their social tolerance. For instance, a dangerous neighbourhood will stimulate people to blame immigrants for criminal activity and violence (Paas and Halapuu 2012), while the opportunities to benefit from a safe neighbourhood will permit individuals to be more tolerant.

Finally, the extent to which individuals share post-materialist values is significant at 1 % and U-shaped for all quantiles. However, the "net" effect is close to zero for upper quantiles: there is a significantly symmetric effect of the differences in the individuals' values at high levels of social tolerance. Some partial explanation for such outcome can be found in the cultural proximity theory. As an example, the cultural affinity hypothesis states that individuals with close cultural ties to their home country would be more likely to favour liberal immigration policies (Espenshade and Hempstead 1995). Broadly, as individuals from different social groups share common values and beliefs, they will tend to show more mutual tolerance.

4.2 Robustness Check

As our previous results show, there are significant country effects in the formation of social tolerance. One possible explanation might be country-scale related, while another can be linked to the consequences of societal participation for globalization processes. For instance, Berggren and Nilsson (2014) find that globalization enhances the willingness to transmit tolerance. More precisely, only economic and social globalization has such an effect, as shown by the use of KOF Index of Globalization in cross-sectional and panel-data regression analyses of up to 66 countries.

Hence, in order to assess the robustness of our results, in respect to considered estimation methodology, we further consider a multi-level analytical framework. Multi-level models are particularly appropriate for research designs, in which participants' data are organized at more than one level (i.e. *nested data*) (Tabachnick and Fidell 2012). More exactly, the Hierarchical Linear Modeling (HLM) is an approach aiming to fit a multilevel structure of the data. It is important to note that linear mixed models contain both fixed and random effects. In greater details, this method is applied in two steps. In the first step, an individual-level analysis for each of the involved groups is considered. In the second step,

the estimation outcomes from the first step are regressed through the group levels. The critical aspect to fitting mixed models lies in estimating the variance components. For instance, imposing an independent covariance structure should be considered with caution, since the correlation between random effects is not invariant to model translations, which would otherwise generate equivalent results in more standard regression models. Hence, a choice between *independent*, *unstructured*, *identity* and *exchangeable* structures of covariance should be considered, explicitly mentioned and augmented and the robustness of results, in respect to such choice, should be evaluated. Also, one might specify multiple random-effects equations at the same level, in which case, the mentioned covariance types can be combined to form more complex blocked-diagonal covariance structures. The most used methods for the estimation of variance' components are maximum likelihood (ML) and restricted maximum likelihood (REML). We involve the last mentioned method. The basic idea behind REML is that one can obtain a set of linear constraints for the response, which does not depend on the fixed effects, but instead depends only on the variance components to be estimated.

We consider the independent impacts of the country-level effects on social tolerance. The results are reported in Table 4.

All the main previously obtained results are preserved by HLM analysis. Firstly, the *U-shaped* impact exercised by income distribution is statistically significant at 1 % and the level of the "net" effect is comparable with that from quantile regressions. Also, the asymmetry of the corresponding non-linear shape is clearly maintained. Secondly, all the control variables are significant at 1 % and the same types of influence, evidenced by quantile analysis, can still be highlighted, alongside a similar relative importance.

In addition, we consider a conceptual construct that can be seen as commutual to that of social tolerance, i.e. 'social capital'. The basic intuition behind this resides in the idea that a social environment, characterized by a genuinely high level of social tolerance, cannot exist without a reciprocal trust between individuals. Hence, social trust and social capital can be seen as, at least to some extent, mutual substitutable concepts.

An extensive literature deals with a multi-criteria approach to social capital. As Sánchez Pérez (2007: 4) notes: "Theories about social capital determinants can also be classified in group-based and individual analyses. Works that consider social capital a historical residue can be included in the first group because they consider social capital formation sociological phenomena, while studies that focus their attention in economic determinants tend to assume an individual definition of social capital that stresses the importance of private incentives."

Parts (2013:4) explain the components of social capital, as follows: "The elements of social interaction can be divided into two parts: structural aspect, which facilitates social interaction, and cognitive aspect, which predisposes people to act in a socially beneficial way. The structural aspect includes civic and social participation, while the cognitive aspect contains different types of trust and civic norms, also referred to as trustworthiness."

Nevertheless, as Glaeser (2001) argues, there is no inner conflict between an individual-based and a community-based view of social capital. Instead, individual social capital may be viewed as a prerequisite for thinking about the formation of community social capital.

An example of individual-level definition can be found in Glaeser et al. (2002: F438), where the social capital is: "a person social characteristics- including social skills, charisma, and the size of his Rolodex—which enables him to reap market and non-market returns from interactions with others…We assume that individual social capital includes both intrinsic abilities…and the results of social capital investments…We lump of social

Table 4 Determinants of the social tolerance: hierarchical linear modeling analysis

Income group	−0.349*** (0.029)
Income group squares	0.025*** (0.003)
Female	−0.684*** (0.040)
(Log) respondent's age	3.549*** (0.137)
Respondent's education	0.275*** (0.008)
Married	0.186*** (0.008)
Class self-designation	0.164*** (0.021)
Employment	0.589*** (0.052)
Employment squares	−0.070*** (0.006)
Type of work	1.101*** (0.070)
Type of work squares	−0.175*** (0.027)
Post-materialist index (4-items)	−1.919*** (0.089)
Post-materialist index (4-items) squares	0.831*** (0.027)
Personal security index	−0.060*** (0.015)
Personal security index squares	0.044*** (0.004)
Constant	−9.482*** (0.284)
Number of observations	66,870
Random-effects parameters -Standard deviation (residual)	4.923 (0.013)
Log restricted-likelihood	−201,517.43

Dependent variable: factor scores of the aggregated indicator for individuals' degree of tolerance. The structure of the covariance matrix for the random effects is specified so that it allows for all variances and co-variances to be distinct (*unstructured*). The model is fitted by using restricted (residuals) maximum likelihood (REML)

***, **, * −1, 5, 10 % significance levels

capital together because they are practically indistinguishable". If such a definition covers the micro-level elements, a critical issue that remains is the clarification of the aggregation mechanisms (Glaeser 2001). This issue is quite puzzling. Clearly, the individuals' characteristics influence their capacity to maximize the outcome of social interactions. In the meantime, there are evidences in literature that social capital investment is, for the most part, strongly driven by education levels and the degree of community homogeneity

(Glaeser 2001). For instance, Alesina and La Ferrara (2000) find that, after controlling for many individual characteristics, participation in social activities is significantly lower in more unequal and racially or ethnically fragmented localities. They also find that individuals who express views against racial mixing are less prone to participate in groups, more racially heterogeneous their community is.

Another environmental determinant of social capital is education. Educational variance is a key source of disparity in individual social capital outcomes, being one of the important predictor of political and social engagement (Helliwell and Putnam 1999). Education generates higher returns for men than for women, on both dimensions of individual social capital: social trust and social participation (Huang 2010).

The economic conditions are shaping the social capital as well. Among these, the most important ones are labour market long-trends. As an example, the intensification of labour market participation and the pressure for two-career households negatively impact social capital (Huang 2010). Moreover, the membership of voluntary groups is a significant reflection of social participation and an important indicator of an improvement in social capital (Putnam 2000). A particularly interesting result for our paper can be found in Bjørnskov (2006), which suggests that social polarization, in the form of income inequality and ethnic diversity, reduces trust.

More generally speaking, social capital is largely the product of the political, legal and institutional environment, as are these supported by social networks as well as norms, conventions and social preferences (Glaeser et al. 2002). Still, a consistent explanation of social capital formation should solve at least two issues: (a) to account for the micro-foundations of societal macro-structures that are driving the emergence of an aggregate social capital, at the level of large communities; (b) to explain how the aggregation of individual characteristics leads to the formation of social capital, at the scale of the entire society. A clear understanding of individual social capital is a necessary, but not a sufficient condition, as to explain *community capital*.

For the purposes of our analysis, we adopt a perspective on social capital, placed at micro-level and simply understood as the degree of trust placed by individuals in their reciprocal interactions. More exactly, it is constructed based on the individual answers to the following World Values Survey' question: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people" with possible answers: "1—Most people can be trusted/0—Need to be very careful".

Such narrow definition of social capital might allow us to compare its determinants with those specific to social tolerance. With such definition in mind, one can view social trust and social capital as interrelated concepts, reflecting paired descriptors for the quality of interpersonal relations.

In testing the impact exercised by the determinants of social trust on social capital, we face the issue of the dependent trust variable being a binary one ('trust/no trust'). In a similar case, as Benoit and Van den Poel (2012) note, quantile regression is not an obvious choice, since the dependent does not yield continuous quantiles to be modelled. Hence, there might be important inference problems. However, recent approaches—such as those proposed by Benoit and Van den Poel (2012) and Al-Hamzawi et al. (2012)—deal with this issue by involving a parametric Bayesian framework with an asymmetric Laplace distribution (ALD). It avoids the difficulties of other semi-parametric methods for binary quantile regression, requiring complex choices of prior distributions and prior (hyper-) parameters. Also, this approach allows the examination of the relationship between a set of covariates and the different parts of the response variable distribution. So, it is useful

especially for discrete choice applications, where the heterogeneity of covariates is an issue. We use the implementation of this method from the R package 'bayesQR' (Benoit et al. 2014). The results are reported in Column 1 to Column 3 of Table 5.

The main outcome is related to the *U-shaped* impact of income distribution on the involved measure of social capital. This impact is quite/reasonable stable across quantiles. It seems to be somehow larger than that exercised on the degree of tolerance, by increasing with the shift from lower to upper quantiles. Among the controls, age, education, marital status, class self-designation and personal security appear to exercise similar type of effects as in the case of tolerance. For employment status, work type and post-materialist values, the impact is less symmetric and robust crosswise quantiles. Overall, these findings suggest that the same variables impact both tolerance and social capital, but the transmission channels are specifically modulated.

For checking the robustness of the results, we apply the same HLM methodology as previously. The corresponding results for social capital are reported in Column 4 of Table 5.

The income distribution affects trust in the same *U-shaped* fashion, as it impacts social tolerance, with a statistical significance of 1 %. However, the amplitude of this impact appears to be lower and more symmetrical than the one exercised on social tolerance. This outcome may be correlated with other findings from the literature. As Parts (2013: 5–6) notes: "Empirical evidence shows that higher levels of income and education coincide with a strong probability for group membership and interpersonal trust from the part of individual…For example, trust could be a product of optimism … generated by high or growing income". However, it cannot be hypnotised on *ex ante* basis that the propagation of such effect of income distribution on personal trust is linear. For instance, if the improvement in income is associated, for individuals, with a more competitive position on labour market, their degree of trust in personal interaction with other social agents, perceived as competitors, might actually decrease. Opposite, if an improvement in the relative position attained by individuals in income distribution processes is able to provide them, above a certain threshold, more financial and personal security, then such improvement might lead to higher levels of trust in the interactions amongst them. For instance, if 'generosity' and 'reciprocity' are seen as luxury (normal) goods, then it can be argued that, greater their income, people will tend to "consume" more (Bornhorst et al. 2004). However, such argument of pure economic effects of income on trust should be considered with caution, as personal trust is rather a non-marketable good (as well as social trust) and is 'produced' in a personal and social-sensitive context.

As for social trust, the self-designed class membership exercises the same type of impact as income distribution. Individuals identifying themselves with the "upper class" tend to display a higher degree of personal trust. The same applies for individuals benefiting from better education. This last outcome is supported by other findings from the literature. Guiso et al. (2004: 545) support this idea and show "Is trust simply an equilibrium outcome of a society where nonlegal mechanisms force people to behave cooperatively … or is there an inherited component, imprinted with education? Our fixed effects results already suggest the existence of an inherited component".

Not surprisingly, the homogeneity of values and beliefs supports higher levels of personal trust, as shown by the extremes of the "materialist/post-materialist" spectrum.

Work type exercises the same *reverted U-shape* effect on personal trust as for social tolerance. Still, the position on labour market does not significantly appear to affect trust.

Table 5 Determinants of social capital

	Bayesian binary quantile regressions			Hierarchical linear modelling analysis
	20-th Quantile (1)	50-th Quantile (2)	80-th Quantile (3)	(4)
Income group	−0.584 [−4.353;−0.013]	−0.801 [−4.188;−0.024]	−0.889 [−3.579;−0.052]	−0.041*** (0.005)
Income group squares	0.055 [0.001;0.417]	0.079 [0.002;0.459]	0.087 [0.006;0.394]	0.005*** (0.001)
Female	0.245 [−0.658;5.760]	0.231 [−0.700;6.611]	0.167 [−0.470;4.731]	−0.007 (0.007)
(Log) respondent's age	5.660 [0.958;19.046]	4.724 [0.638;18.954]	3.637 [0.917;14.181]	0.413*** (0.023)
Respondent's education	0.052 [0.006;0.257]	0.051 [0.004;0.360]	0.104 [0.084;0.244]	0.036*** (0.001)
Married	0.118 [0.017;0.512]	0.125 [0.008;0.569]	0.096 [0.012;0.452]	0.004*** (0.001)
Class self-designation	0.278 [0.024;1.182]	0.234 [−0.063;1.201]	0.209 [0.026;0.810]	0.030*** (0.003)
Employment	0.311 [−3.212;0.953]	0.006 [−3.812;0.675]	−0.235 [−3.098;0.291]	0.003 (0.008)
Employment squares	−0.019 [−0.106;0.429]	0.0145 [−0.074;0.459]	0.032 [−0.032;0.341]	−0.001 (0.001)
Type of work	−0.100 [−0.377;0.655]	−0.228 [−1.319;0.931]	0.217 [−0.702;0.745]	0.084*** (0.012)
Type of work squares	0.054 [−0.290;0.133]	0.091 [−0.296;0.419]	−0.043 [−0.307;0.221]	−0.014*** (0.005)
Post-materialist index (4-items)	5.344 [3.088;10.146]	2.541 [0.114; 9.726]	1.185 [−0.146;6.282]	−0.130*** (0.015)
Post-materialist index (4-items) squares	−1.509 [−2.338;−0.974]	−0.646 [−2.251; −0.028]	−0.291 [−1.472;0.050]	0.052*** (0.005)
Personal security index	−0.022 [−0.522;0.015]	−0.013 [−0.400;0.024]	0.043 [−0.475;0.099]	0.021*** (0.002)
Personal security index squares	0.029 [0.002;0.315]	0.029 [0.001;0.330]	0.021 [−0.000;0.206]	0.005*** (0.001)
Constant	−16.268 [−44.141;−5.594]	−10.345 [−34.643;−2.491]	−5.277 [−18.545;−1.786]	−1.334*** (0.048)
Number of observations	66,870	66,870	66,870	66,870
Random-effects parameters -standard deviation (residual)				0.829 (0.002)
Log restricted-likelihood				−82,430.2

Dependent variable: trust variable. For Bayesian binary quantile regressions: reported values—Bayes estimates. Lower/upper estimated betas are also presented in []. Lasso technique variable selection. Number of retained draws: 5000. Lower credible bound: 0.025; Upper credible bound: 0.975. For Hierarchical Linear Modelling analysis: The structure of the covariance matrix for the random effects is specified so that it allows for all variances and co-variances to be distinct (*unstructured*). The model is fitted by using restricted (residuals) maximum likelihood (REML)

***, **, * −1, 5, 10 % significance levels

Furthermore, individuals enjoying higher levels of personal security tend to display greater levels of personal trust. This is the case of older people and people living together. Finally, in our results, there is no statistically significant gender effect on trust.

Overall, our results indicate that the same main determinants contribute to the formation of both social tolerance and personal trust. The differences are related to the amplitude and degree of symmetry for the corresponding non-linear transmission channels.

A possible use of such findings might be an extension of the concept of *social capital* in order to account for both 'tolerance' and 'trust'. Perhaps such definition can be formulated as: social capital is the combined outcome of social agents' characteristics (like education, gender, labour market status or beliefs) and the architecture of the social and economic environment (including the level of economic development, income distribution mechanisms and institutions, rules, norms and shared values), which emerges at a given level of interpersonal trust and of social tolerance and is critical for achieving a certain quality of social relations.

5 Policy Implications

Several policy implications can be derived from our results. First, it can be argued that any policy aiming to reduce the income gap might have as a secondary outcome an increase in the level of social tolerance. One can notice that better chances to attain such effects are related, especially, to policies covering the differences not only between lower and upper income quantiles, but also between medium to high income groups. A 'run to top' process in income distribution might be correlated with an improvement in the inter-groups relations and can reduce the tendencies to prejudice the marginals. The same positive impact is exercised on trust between individuals. For lower income groups, the policies, aiming to directly address the issues related to social intolerance prevention, might be less effective, if they are not accompanied (or even forego) by policies pointing towards satisfying the basic needs, increasing the absolute levels of income and improving the life standards and the liveability of their communities (see also Baumann 2000).

Overall, lower inequality between upper income groups can enhance the quality of social capital, because this is seen as reflecting both tolerance and trust.

Second, any policy aiming to promote flexibility and stability on labour market can contribute to greater tolerance. The same result can be achieved by sustaining the development of private business or industry. A special attention should be paid to the effectiveness of different types of cohesion policies with respect to convergence of economic and social areas.

Third, education is of paramount importance for more tolerance between individuals. Hence, any policy sustaining civic education, the spread of fundamental democratic values and the struggle against gender, racial, ethnic or religious intolerance is critical for achieving and maintaining high levels of social capital. However, such policy should provide general quality standards and suitable flexibility in meeting the requirements of individual communities and/or social groups.

Fourth, an effective policy for sustainable economic development can lead to fulfilling basic individual needs and spreading post-materialist values, with beneficial effects on both tolerance and trust among the society members. As individuals meet such basic needs, their personal social mobility increases and they become less vulnerable to economic and social

pressures. Furthermore, their dependence to mutual support social networks might decrease. In such conditions, the probability of intolerant and prejudicial attitudes might decrease.

Fifth, policies correcting the negative consequences of aging might support a better status of tolerance, too.

Sixth, policies promoting gender equality in labour market and in social and political life can hold back intolerance.

Perhaps the main idea that can be drawn, based on our results, is that there is no 'one fit all' policy in order to promote tolerance and trust between members of different social groups and to avoid prejudices against marginals. Instead, a coherent set of policies able to reach a full spectrum of economic and social issues is required.

6 Conclusions

Social tolerance is the synergic effect of the features of both individual and socio-economic environment. It is also a facet of social capital, alongside trust among society members.

Gnoseologically, this paper argues that individuals systematically choose between material gains—that can be grasped from social competition, as these are reflected by an improvement in relative income—and, respectively, non-material values—as reflected by the quality of the social environment. Also, they systematically evaluate their 'balance of tolerance/competition and confrontation'. The optimal level of social tolerance will be set by combining these two distinctive types of referential. The key assumption in this conceptual framework is the existence of a synergic combination between the material gains obtained by individuals from their social interactions and the non-material ones (including tolerance) related to the worth of social life.

We further explore the empirical evidences for 48 countries based on World Values Survey data covering the 2010–2014 time span. We find robust evidences of a non-linear impact of income distribution on social tolerance. This impact appears to be *U-shaped* and displays a pronounced degree of asymmetry. Our results show that individuals with more secure and flexible positions on labour market, with better education, identifying themselves as "upper class", with less formal marital status and sharing post-materialist values tend to display a greater degree of social tolerance. Women and older people seem to be more tolerant. The same applies for individuals benefiting of higher levels of personal security. Based on these findings, some policy implications are derived.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest. No third part is related in a financial or non-financial way with this paper. All the used data are from public available sources and these sources are indicated in the references section.

Appendix

See Table 6.

Table 6 World values surveys and variables coding

Question	WVS variable	Coding
Social tolerance variables		
On this list are various groups of people. Could you please mention any that you would not like to have asneighbors? People of a different religion	V41	−1: Mentioned; 1: not mentioned; 0: non available/not answered
Please tell us if you strongly agree, agree, disagree, or strongly disagree with the following statements: the only acceptable religion is my religion	V154	−2: Strongly agree; −1: agree; 1: disagree; 2: strongly disagree; 0: non available/not answered
Please tell us if you strongly agree, agree, disagree, or strongly disagree with the following statements: all religions should be taught in our public schools	V155	2: Strongly agree; 1: agree; −1: disagree;−2: strongly disagree; 0: non available/not answered
Please tell us if you strongly agree, agree, disagree, or strongly disagree with the following statements: people who belong to different religions are probably just as moral as those who belong to mine	V156	2: Strongly agree; 1: agree;−1: disagree;−2: strongly disagree; 0: non available/not answered
On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? People of a different race	V37	−1: Mentioned; 1: not mentioned; 0: non available/not answered
On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? Immigrants/foreign workers	V39	1: Mentioned; 1: not mentioned; 0: non available/not answered
On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? People who speak a different language	V44	1: Mentioned; 1: not mentioned; 0: non available/not answered
On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? Homosexuals	V40	1: Mentioned; 1: not mentioned; 0: non available/not answered
On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? Unmarried couples living together	V43	1: Mentioned; 1: not mentioned; 0: non available/not answered
Please tell me for each of the following actions whether you think it can always be justified, never be justified, or something in between—homosexuality	V203	'Never justifiable': −5; 2:−4; 3:−3; 4:−2; 5:−1; 6:1; 7:2; 8:3; 9:4; 'always justifiable':5 0: non available/not answered
Please tell me for each of the following actions whether you think it can always be justified, never be justified, or something in between—prostitution	V203A	'Never justifiable': −5; 2:−4; 3:−3; 4:−2; 5:−1; 6:1; 7:2; 8:3; 9:4; 'always justifiable':5; 0: non available/not answered
Please tell me for each of the following actions whether you think it can always be justified, never be justified, or something in between—abortion	V204	'Never justifiable': −5; 2:−4; 3:−3; 4:−2; 5:−1; 6:1; 7:2; 8:3; 9:4; 'always justifiable':5; 0: non available/not answered

Table 6 continued

Question	WVS variable	Coding
Please tell me for each of the following actions whether you think it can always be justified, never be justified, or something in between—divorce	V205	'Never justifiable':−5; 2:−4; 3:−3; 4:−2; 5:−1; 6:1; 7:2; 8:3; 9:4; 'always justifiable':5; 0: non available/not answered
Trust		
Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?	V24	'Need to be very careful':−1; most people can be trusted:1; 0: non available/not answered
Explanatory variables		
On this card is an income scale on which 1 indicates the lowest income group and 10 the highest income group in your country. We would like to know in what group your household is. Please, specify the appropriate number, counting all wages, salaries, pensions and other income that come in	V239	'Lower step': 1; 'second step': 2; 'third step': 3; 'fourth step': 4; 'fifth step': 5; 'sixth step': 6; 'seventh step': 7; 'eight step': 8; 'ninth step': 9; 'tenth step': 10; 0: non available/not answered
Country code	V2	Countries coded in alphabetic order
Code respondent's sex by observation	V240	'Male': 2; 'Female': 1
Age in two digits	V242	Logarithm of age
What is the highest educational level that you have attained? [NOTE: if respondent indicates to be a student, code highest level s/he expects to complete]	V248	'No formal education':−4; 'incomplete primary school': −3; 'complete primary school': −2 'incomplete secondary school: technical/vocational type': −1; 'complete secondary school: technical/vocational type': 1; 'incomplete secondary school: university-preparatory type': 2; 'complete secondary school: university-preparatory type': 3; 'some university-level education, without degree': 4; 'university-level education, with degree': 5; 0: non available/not answered
Marital status	V57	'Married':−3; 'separate':−2; 'divorced':−1; 'widowed': 1; 'living together as married': 2 'single': 3; 0: non available/not answered
People sometimes describe themselves as belonging to the working class, the middle class, or the upper or lower class. Would you describe yourself as belonging to	V238	'Lower class' :1; 'working class': 2; 'lower middle class': 3; 'upper middle class': 4 'upper class': 5; 0: non available/not answered
Are you employed now or not? If yes, about how many hours a week? If more than one job: only for the main job	V229	'Retired': 1; 'housewife not otherwise employed': 2; 'student': 3; 'unemployed': 4; 'part time': 5; 'full time': 6; 'self-employed' :7; 'other': 8; 0: non available/not answered
Are you working for the government or public institution, for private business or industry, or for a private non-profit organization? If you do not work currently, characterize your major work in the past! Do you or did you work	V230	'Government or public institution': 1; 'private business or industry': 2; 'private non-profit organization': 3; 0: non available/not answered

Table 6 continued

Question	WVS variable	Coding
Post-materialist index (4-items): for the questions on the first and the second most important national priorities, respondents selecting both "maintaining order in the nation" (A) and "fighting rising prices" (C) are classified as materialists, while those selecting both "giving people more say in decisions on the government" (B) and "protecting freedom of speech" (D) are classified as post-materialists. Those selecting both a "materialist" and a "post-materialist" item are classified as mixed	Y002	−5: Other missing; −4: question not asked; −3: not applicable; −2: no answer; −1: don't know; 1: materialist; 2: mixed; 3: post-materialist
Personal security index variables		
Could you tell me how secure do you feel these days in your neighbourhood?	V170	'Not at all secure':−2; 'not very secure':−1; 'quite secure': 1; 'very secure': 2; 0: non available/not answered
How frequently do the following things occur in your neighbourhood? Robberies	V171	''Not at all secure':−2; 'not very secure':−1; 'quite secure': 1; 'very secure': 2; 0: non available/not answered
How frequently do the following things occur in your neighbourhood? Alcohol consumption in the streets	V172	'Not at all secure':−2; 'not very secure':−1; 'quite secure': 1; 'very secure': 2; 0: non available/not answered
How frequently do the following things occur in your neighbourhood? Police or military interfere with people's private life	V173	'Not at all secure':−2; 'Not very secure':−1;'Quite secure':1;'Very secure':2;0: non available/not answered
How frequently do the following things occur in your neighbourhood? Racist behaviour	V174	'Not at all secure':−2; 'not very secure':−1; 'quite secure': 1; 'very secure': 2; 0: non available/not answered
How frequently do the following things occur in your neighbourhood? Drug sale in streets	V175	'Not at all secure':−2; 'not very secure':−1; 'quite secure': 1; 'very secure': 2; 0: non available/not answered
Which of the following things have you done for reasons of security? Didn't carry much money	V176	'Yes':−1; 'No': 1; 0: non available/not answered
Which of the following things have you done for reasons of security? Preferred not to go out at night	V177	'Yes':−1; 'No': 1; 0: non available/not answered
Which of the following things have you done for reasons of security? Carried a knife, gun or other weapon	V178	'Yes':−1; 'No': 1; 0: non available/not answered
Have you been the victim of a crime during the past year?	V179	'Yes':−1; 'No': 1; 0: non available/not answered
And what about your immediate family-has someone in your family been the victim of a crime during the last year?	V180	'Yes':−1; 'No': 1; 0: non available/not answered
To what degree are you worried about the following situations? A terrorist attack	V184	'A great deal':−2; 'very much':−1; 'not much': 1; 'not at all': 2; 0: non available/not answered

Source of data: World Values Survey Association (2014)

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