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Research Article

Social Capital and National Innovativeness – The Influence of Trust and Tolerance on the National Capacity to Innovate

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Carsten Deckert[1], **Rahel Schomaker**[2,3], **Philipp Albiez**[1]

1. Hochschule Düsseldorf University of Applied Sciences, Düsseldorf, Germany; 2. FH Kärnten - Carinthia University of Applied Sciences, Austria; 3. German Research Institute for Public Administration, Speyer, Germany

While national innovativeness is of pivotal relevance for economic development, so far, relatively little attention has been paid to the social drivers of innovativeness. Thus, the role of social norms and values as drivers of innovativeness is somewhat blurry. Tackling this gap, the article at hand reflects on the concepts of social capital, trust, and tolerance, before a model of social capital and innovativeness is developed and tested empirically, followed by the presentation and discussion of the results and a brief conclusion.

Correspondence: papers@team.qeios.com — Qeios will forward to the authors

Introduction

In times of crisis and against the backdrop of increased competition between countries and regions worldwide, national innovativeness as one of the most relevant locational factors becomes more important than ever. Consequently, the drivers of high national innovativeness or successful national innovation systems have been researched extensively. One research direction focuses on the impact of cultural dimensions on innovativeness[1]. Nonetheless, the role of social norms and values as drivers of innovativeness is somewhat unclear.

This article taps into the question of social drivers of innovativeness. Existing literature on national innovativeness and innovation systems mainly focuses on companies and/or the role of public policies in supporting processes and solutions that are innovative. Nelson and Rosberg[2], e.g., understand public policy in the sense of "techno-nationalism" – which describes the increasing competitiveness of nations through the technological capabilities of the country's companies – as pivotal. The Organisation for Economic Co-operation and Development[3] takes up this approach, defining national innovation systems as an interconnection between different actors involved in the innovation process that can increase the technological performance of a nation. In this context, innovation results from the interaction of various actors in a complex network and the diffusion of knowledge within this system. This approach underpins that the innovative capacity of a country can be understood as the ability to produce innovations. The human dimension, i.e., individuals, the company's employees, or societal actors, can be seen as a central element in producing innovations that operate in a complex socio-technological system. Scrutinizing this relevance of the human dimension, not only individual characteristics or education but also social interactions between single actors in the sense of networks, relationships, or binding norms in the sense of "social capital" seem to be relevant. These "networks together with shared norms, values and understandings that facilitate co-operation within or among groups"[4] seem to have a high explanatory power for innovativeness due to their nature of being future-oriented, based on collaboration and exchange. Thus, the social mechanisms behind

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these interactions are put center stage in this article, aiming to carve out their impact on national innovativeness.

The rest of the article proceeds as follows. After this introduction, the concepts of social capital, trust, and tolerance are reflected upon against the backdrop of the existing literature, before a model of social capital and innovativeness is developed and tested empirically. This is followed by the presentation and discussion of the results and a brief conclusion.

Literature Review

Social Capital

In research on social interaction, the concept of social capital has enjoyed great popularity with increasing citations over time[5]. The frequent use of the term, unfortunately, leads to a blurring of the conceptual definition as "the success of the notion of social capital is matched only by its increasing ambiguity"[6]. The term "social capital" emerged several times in history independently of one another. The current notion, however, is usually traced back to Hanifan[7] who describes social capital as "goodwill, fellowship, mutual sympathy and social intercourse among a group of individuals". The main meaning of social capital is to enable cooperation. Thus, the OECD defines social capital as "networks together with shared norms, values and understandings that facilitate co-operation within or among groups"[4].

Although social networks are a core ingredient of most definitions of social capital[8], the existing research on social capital can be divided into two groups, one focusing on network aspects (such as the position of an actor in a network) and the other using an attitudinal approach, i.e., the norms fostering cooperation. Another distinction is between research on social interaction and institutions[6]. Our approach combines the attitudinal approach and the idea of social interaction, drawing back to Robert Putnam and Francis Fukuyama as its main representatives. In line with the basic notion of an attitudinal approach, their definitions for social capital are

- "features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions"[9] and
- "an instantiated informal norm that promotes cooperation between two or more individuals"[10] or
- "a capability that arises from the prevalence of trust in a society or in certain parts of it"[11].

In whichever way social capital is defined, indeed, trust seems to be a core element of the attitudinal definition of social capital[12].

Trust

Gambetta[13] describes trust as "a particular level of the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action". Thus, trust is a three-part relation in the form of "A trusts B to do X"[12]. That implies that trust not only depends on the trustee B, but also on the expected action X. Trust relations are characterized by uncertainty and vulnerability. The problem of uncertainty can be addressed through information on the trustee, respectively his or her reputation; the problem of vulnerability by compensation of losses (e.g., insurance) or by the spreading of trust onto several trustees or more generally by higher distrust[14].

However, trust is a multifaceted concept. Marková et al.[15] distinguish between micro-social trust, i.e., trust between individuals, and macro-social trust, i.e., trust involving groups, institutions, and society. Furthermore, they differentiate between primary, taken-for-granted trust, and reflective trust based on rational considerations. According to Hardin[12] trust is a relational concept that depends on the context of the trusting relationship. The trusted person has an incentive to be trustworthy to maintain a trusting relationship in the future. Hence, trust can be understood as encapsulated interest, i.e., the trusted person has an incentive to take the interest of the person who trusts into account. This understanding seems to be a form of micro-social reflective trust according to the categorization of Marková et al.[15]. Another form of trust is called generalized trust; it takes the form of a two-part relation "A trusts B" or simply "A trusts"[12]. Generalized trust is a form of macro-social primary trust according to Marková et al.[15]. Based on the definitions of Putnam[16] and Fukuyama[11] we can derive that social capital is based on a generalized form of trust which is taken for granted and is extended to unspecified others. This form of trust can be seen as a proxy for the trustworthiness of a society.

A main distinction of trust is between bonding trust and bridging trust. Bonding trust is the trust one has for one's in-group, also called thick trust, while

bridging trust is the trust one has for an out-group, also called thin trust[12][4][17][16]. Research in social psychology and experimental studies demonstrates that trust is usually reserved for people of one`s in-group, while people from out-groups are treated with distrust, leading to in-group favoritism and the exploitation of outsiders[18][19]. This leads to a dilemma of trust: "Strong moral bounds within a group in some cases may actually serve to decrease the degree to which members of that group are able to trust outsiders and work effectively with them"[20]. In other words: "In-group solidarity reduces the ability of group members to co-operate with outsiders"[10]. Thus, thick trust can lead to a fragmentation of society into kinship groups, a phenomenon called familism or clanism.

Granovetter[21] argues that weak ties between groups are important for the diffusion of knowledge and the integration into a community. They are, thus, a force that limits the fragmentation of strong ties within groups. Fukuyama[11] draws to a radius of trust of a group that can have positive spillover effects into society and may overlap with the radius of other groups in the form of weak links. In this context, trust can be divided into trust in close people (e.g., family), trust in remote people (e.g., strangers), or trust in unspecified others[22]. To solve the trust dilemma, Putnam[16] proposes a combination of social capital in the form of trust and high levels of tolerance to form a truly civic community ("Salem without witches," as he calls it) in contrast to a sectarian community with high social capital but low tolerance ("Salem with witches").

Tolerance

Tolerance can be defined as "intentional self-restraint in the face of something one dislikes, objects to, finds threatening, or otherwise has a negative attitude toward – usually in order to maintain a social or political group or to promote harmony in a group"[23] or – in other words – as "putting up with something you do not like – often in order to get along better with others"[23]. From this definition, the paradoxical nature of tolerance can be derived: "accepting the things one rejects or objects"[24]. Tolerance, thus, is less than full agreement or sympathy, as it includes negative affect and cognition, but more than indifference, as it only comprises differences that are in some form important for the tolerant person[24][25]. Studies show that there typically is a discrepancy between the general principle of tolerance people hold and the practice of tolerance people support for specific issues[26].

Vogt[23] distinguishes three forms of tolerance: political tolerance, moral tolerance, and social tolerance. Political tolerance includes civil liberties, i.e., "tolerance of acts in the public sphere, such as giving speeches, demonstrating, distributing leaflets, organizing meetings, and so on"[23]. This form includes the democratic values of a society, e.g., openly disagreeing with the government. Moral tolerance, on the other hand, is defined as "tolerance of acts in the private sphere"[23]. This includes but is not limited to the sexual conduct of people. Finally, social tolerance is "tolerance of people's state of being – that is, of characteristics people have at birth (such as skin color) or as a result of early socialization (such as language)"[23]. This form includes the tolerance of ethnicity and upbringing, and intolerance in this regard corresponds to racism or xenophobia. Although the three forms are not free from overlap, they can be seen as distinct categories of tolerated objects. Tolerance can be seen as a proxy for toleration, i.e., the institutional implementation of tolerance in a country[26].

Model of Social Capital

Life in a society is sometimes viewed as a competitive zero-sum game in which the gain of one person is the loss of another. This might be true in some instances, but research on social dilemmas supposes that there are also nonzero-sum games in which participants can gain an advantage through cooperation. Central elements determining the level of cooperation in this regard are trust, reciprocity, and reputation. Trust is influenced, among others, by cultural variables[27] as is the willingness for cooperation[28].

We propose an attitudinal model of social capital that looks at the circle of trust of an individual – as proposed by Fukuyama[11] – and combines the different forms of trust. As the circle of trust widens, trust moves from thick trust that provides strong links and bonding with an in-group, e.g., a family, to thin trust that enables bridging to out-groups via weak links. In this model, tolerance is seen as a force to widen the circle of trust. Additionally, the model incorporates the mechanisms underlying the different forms of trust. Thick trust is based on kinship altruism, which relies on the number of shared genes as shown by Hamilton[29][30].

Thin trust is based on norms of reciprocity or "the willingness to return a favor for a favor or a harm for a harm"[20]. In small groups, direct reciprocity[1] is the underlying mechanism for cooperation[31][32]. In his

famous computer tournament, Axelrod[33] finds that the strategy "Tit-for-Tat" is most successful in playing the Iterated Prisoner's Dilemma (IPD)[2]. Although it doesn't win a single round, "Tit-for-Tat" wins the tournament, as it is a "nice" strategy, i.e., it offers initial cooperation and encourages cooperation from other "nice" strategies such as "Always Cooperate". In subsequent rounds, it reciprocates the behavior of the other partner. That means it punishes defection but switches back to cooperation as soon as the partner switches back, i.e., it is retaliatory but shows forgiveness[34]. A subsequent analysis of Amnon Rapoport et al.[35] shows that "nice" strategies offering initial cooperation are among the most successful strategies of the IPD.[3] Nevertheless, in real life, children seem to learn a form of Tit-for-Tat after they initially show a more unconditional form of altruism[36].

In bigger groups, a different mechanism of cooperation is indirect reciprocity[4] based on the reputation of the partners, leading to such diverse phenomena as punishment of free riders, refusing to help free riders, and gossip[37]. In large societies, a form of general reciprocity in which only the outcomes of interactions regardless of the partner are tracked[38] is at work, backed up by institutions incentivizing cooperation.[5]

Tolerance, in our model, widens the circle of trust to include also partners with objectionable opinions or behavior. This means it increases the diversity of our social network. Furthermore, it enables one to handle conflict constructively, as it enables one to put up with something one doesn't like[23] which can be seen as a fundamental prerequisite for conversation and discussion with partners of out-groups. A combination of trust and tolerance is also a prerequisite for a truly civic society, according to Putnam[16].

In short, we propose a novel approach, viz., to include tolerance in the definition of social capital alongside trust, as it broadens the circle of trust (fig. 1). Why trust? "Trust helps overcome the initial aversion to risk caused by the uncertainty associated with future reciprocation"[38]. Why tolerance? "[...] tolerance provides procedural minima for dealing with diversity and conflict that do not violate other fundamental values, such as justice, liberty, and equality"[23].

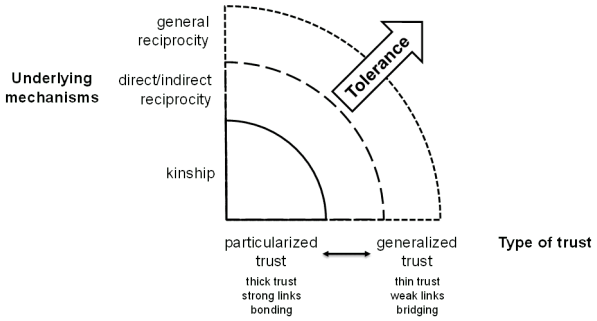

Figure 1. Attitudinal model of social capital as a circle of trust
Source: Own elaboration

Social Capital and Innovativeness

Innovativeness can be defined in the sense of innovative capability as "the need to be created for a system to continuously – not just intermittently – induce innovations"[39]. In this sense, national innovativeness can be defined as "a country's potential [...] to produce a stream of commercially relevant innovations"[40] or "the ability of a country to produce and commercialize a flow of innovative technology over the long term"[41]. This not only includes the sheer volume of realized innovations but also "the fundamental conditions, investments, and policy choices that create the environment for innovation in a particular location"[40].

The measurability of innovation poses a challenge as it is not a scientific parameter but a humanly created concept. Nevertheless, various indicators can be derived that can provide conclusions about the innovative capacity of a country. A common approach is to combine these indicators in an index. This usually involves calculating sub-indices, which are ultimately incorporated into the index with different weights. The index formation ultimately creates comparability and the possibility of a ranking. Frequently used indices are the Global Innovation Index (GII), the European Innovation Scoreboard (EIS), and the German Innovation Indicator[42][43].

Links of trust to innovation

The philosopher Georg Simmel[44] writes in his seminal *Philosophy of Money* that "Without the general trust that people have in each other, society itself would disintegrate, for very few relationships are based entirely upon what is known with certainty about

another person, and very few relationships would endure if trust were not as strong as, or stronger than, rational proof or personal observation". General trust is the lubricant for everyday economic activities, but even more so for innovative activities. Key characteristics of an innovation are novelty, complexity, and uncertainty in the sense of Knight[45]. These characteristics – especially the uncertainty of innovations – lead to a negative bias against creativity, which interferes with the ability to recognize creative ideas worthy of innovation[46]. This shows that more trust in an innovator is needed than for someone with whom one does a usual business transaction such as buying and selling established products. For creative teams, this means that team members need "participatory safety" where each team member feels safe expressing unusual or strange ideas without risking criticism or ridicule. Participatory safety can be achieved by familiarity and trust in a team[47].

Another link between trust and the creation of innovations is that innovation activity usually is a cooperative effort in which innovators or entrepreneurs use existing networks of acquaintances to execute and commercialize their business ideas[48]. As social capital reduces the transaction costs for coordination and cooperation[10], more trust – especially in the form of bridging trust – enables innovators to utilize a larger network with more diverse capabilities, making the success of an innovative endeavor more likely.

The diffusion of innovation among organizations is strongly affected by "inter-firm relationships"[49] and usually takes place via durable relationships with strong ties and thick trust[50]. According to Rogers[51] one characteristic of innovations conducive to diffusion is observability, especially in the later stages of the diffusion process. Under uncertain and ambiguous conditions, organizations tend to emulate "structurally equivalent actors"[50], a mechanism also called "mimetic process"[52]. This means that under uncertainty, the diffusion among similar organizations is easier, as organizations use similarity as a proxy for the probability that the innovation fits them – a phenomenon similar to the preference of members of an in-group in individuals. However, new information is rather diffused by weak ties and thin trust[21], as weak ties widen the circle of trust and offer a broader set of possible solutions. This points to a tension in the diffusion of radical innovations between strong ties and thick trust on the one hand, and weak ties and thin trust on the other hand.

Links of tolerance to innovation

The philosopher John Stuart Mill[53] writes in his seminal essay *On Liberty* that "the amount of eccentricity in a society has generally been proportional to the amount of genius, mental vigor, and moral courage which it contained" and thus that "it is important to give the freest scope possible to uncustomary things, so that it may in time appear which of these are fit to be converted into customs". This requires a certain amount of tolerance in a society to cope with eccentric behavior which could lead to a creative solution.

Breakthrough ideas often emerge when concepts from different, far-away fields are combined or when a concept from one field is introduced into a completely different field. Koestler[54] calls this phenomenon "bisociation" to describe the "creative act, which [...] always operates on more than one plane", i.e., context. The probability of such an encounter is increased if people from different cultural and socio-economic backgrounds intermingle[55]. On a regional or country level, tolerance attracts talents that act innovatively[56]. As Florida[57] shows, a combination of talent, technology, and tolerance in a region is conducive to creativity and innovation. Thus, tolerance fosters „talent attraction; diverse knowledge and diverse perspectives of thinking; and increased communication and knowledge spillovers"[56].

Cognitive diversity in a team is seen as conducive to creative problem-solving under most circumstances and often even trumps ability[58]. This can partly be seen in empirical research on creative teams. Functional diversity relevant to the task is related to enhanced creativity of a team. However, demographic diversity seems to have no demonstrable effect[59][60]. Cultural diversity shows some positive effects on team creativity in a limited number of studies, but not on team performance in general[61]. As team diversity also increases the potential for personal conflict in a team, it needs to be balanced with participatory safety[62][63].

In the diffusion of innovation, tolerance is needed for the first adoption of a novel solution. The first adopter categories in the diffusion of innovation are innovators and early adopters, who are seen as venturesome and enterprising, taking on non-established approaches. Especially, early adopters are important, as they are respected as opinion leaders[51]. With regard to the characteristics of an innovation, compatibility with the existing values and beliefs, as well as with previously

introduced ideas, is conducive to diffusion[51]. Creative products, however, are often unconventional to a certain extent to offer new functionality and design. Therefore, the risk of incompatibility and rejection increases[64]. Research shows that early adopters of incompatible innovations are “marginal men”, “fringe players”, and “peripheral firms”[50] pointing to a tension between trust and respect for early adopters as opinion leaders and the tolerance of early adopters as mavericks and misfits. Some of these might be potential “lead users”, individuals or companies, who are “at the leading edge of the market with respect to important market trends”[65].

Scrutinizing these considerations, we derive the following hypothesis about the relation of innovativeness and social capital with its two sub-hypotheses regarding trust and tolerance:

- H1: A high level of social capital has a positive relation to national innovativeness.
- H1.1: A high level of trust has a positive relation to national innovativeness.
- H1.2: A high level of tolerance has a positive relation to national innovativeness.

Data and Methodology

In principle, social capital can be measured by associability (i.e., number, duration, and intensity of memberships in associations), trust, and attention to social relations and civic norms. Thus, previous studies apply different combinations and measurements for these parameters of social capital[66][67]. There are also differences in measurement between the main representatives of the attitudinal approach: While Putnam uses membership in associations as a measure for social capital in Italian regions[9] and in the United States[16], Fukuyama uses generalized trust to divide nations into high-trust and low-trust countries[11].

We chose to measure social capital as an index including trust and tolerance (see fig. 2). While surely each measure comes without limitations, we decided not to include associability, as we consider the use of associability problematic: associability is difficult to measure, different associations have distinct characteristics (e.g., coherence)[10] and newer forms of association such as social networks are typically not included. Furthermore, associability is just one channel to further trust and is usually linked to thick trust of an in-group. Additionally, we include tolerance in our model to account for the broadening of the circle of trust. This supports the novelty of our approach, as although almost all previous studies use measures for trust, none to our knowledge has yet included tolerance. Attention to civic norms is not explicitly included in our index, as it is implicitly included as the civil liberties in the measure of political tolerance.

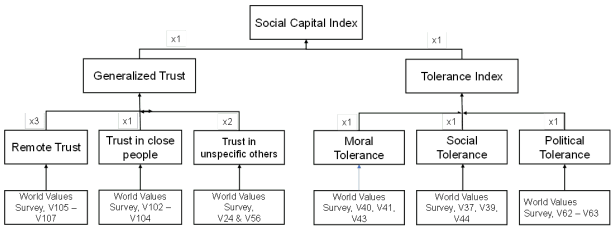

Figure 2. Social capital index
Source: Own elaboration

To measure trust, we use an index for generalized trust developed by Welzel[22] including measures for close, unspecific, and remote trust from the World Values Survey (WVS; www.wordvaluessurvey.org). The measurement is described in the online appendix of Welzel[22] under www.cambridge.org/welzel. The index uses weights to emphasize the importance of weak links. For tolerance, we use the division of Vogt[23] into moral, social, and political tolerance using equal weights for the three categories. We chose items from the World Values Survey for tolerance that address specific issues with highly emotional content. The constituent questions taken from the World Values Survey to measure trust and tolerance can be found in the appendix of this paper.

The World Values Survey (WVS) is an international study that examines social, political, economic, religious, and cultural values. The aim is to identify the mechanisms and drivers that influence the political, social, and economic development of nations and societies. The WVS is conducted in waves every 5 years, comprising more than 120 nations and thus covering 94.5% of the entire world population; the questionnaire is revised in a rolling process for each wave. The WVS wave 6 from 2010-2014 forms the basis for the creation of the independent variables[68]. A total of 16 WVS values were included in the Social Capital Index that was constructed for analytical purposes; the two sub-indices "Generalized Trust" and "Tolerance" are covered.

For the measurement of innovativeness, we chose the Global Innovation Index (GII). The GII has by far the

widest scope in its investigations and thus examines the most nations. In addition, the GII includes the most individual indicators[43]. This enables a more differentiated view of the innovation performance of the nations examined in comparison to the other indices. Furthermore, the GII is subject to a similar understanding of innovation and innovation capability as stated above. The GII is constructed as a cascade and consists of two sub-indices in total, the Innovation Input Sub-Index and the Innovation Output Sub-Index. The Input Sub-Index includes five elements of the economy at the national level that measure the potential enablers of innovation. The Output Sub-Index is based on two benchmarks that measure the outcomes of innovative activities within a national economy. The GII for the year 2020, as well as the arithmetic mean from 2017 to 2020, were used as the dependent variable to measure the innovative capacity of nations. The 2020 GII model includes data from 131 countries, covering approximately 93.5% of the world's population[69]. The time lag between the WVS, which provides data for the independent variable, and the measures for innovativeness ensures that there is no bias due to reverse causality.

Following the nature of the data, different approaches were chosen for the analysis. In the first step, a correlation analysis is used to analyze the relationship between two variables, providing information about the link, but not the causality, of two variables. Beyond a traditional correlation, Spearman's rank correlation was used to adjust to the structure of the data as an index. Additionally, regression models with one or more predictors were run (multiple linear regression) to carve out a potential linear causal relationship between the independent variables and the dependent variable.

Results

As can be seen from Table 1, most indicators tested depict a relatively high and significant level of correlation.

	Average GII	GII 2020	Generalized Trust	Tolerance	Social Capital
Average GII	1	,995***	,549***	,449***	,604***
GII 2020	,995***	1	,533***	,444***	,592***
Generalized Trust	,549***	,533***	1	,254	,664***
Tolerance	,449***	,444***	,254	1	,892***
Social Capital	,604***	,592***	,664***	,892***	1

Table 1. *Correlation analysis results*

**** Significant at 1% level, N = 48*
Source: Own elaboration

The results indicate a positive linear relationship between Social Capital and the GII, with a correlation coefficient of 0.592 for GII 2020, and a correlation coefficient of 0.604 for the average GII. The correlation of generalized trust and the GII 2020 is r =0.533. This gives some credit to the Social Capital Index as the arithmetic mean of generalized trust and tolerance, which is more strongly related to the GII. The correlation coefficient of generalized trust and the average GII is 0.549, thus not significantly different from the GII 2020. The correlation coefficient between the sub-index "tolerance" and the GII 2020 is 0.444, while "tolerance" correlates with the average GII with a value of 0.449. The correlations in the estimation with the rank correlation coefficient that was tested for a robustness check are slightly lower compared to the Pearson correlation, but do not differ significantly.

Based on these results that indicate a strong relationship between the different indicators, regression models were estimated. The results of the different regression models can be drawn from table 2.

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	I	II	III	IV
Variable	**GII 2020**		**Average GII**	
Constant	-12,255 (9,746)	-16,650 (9,970)	-9,857 (9,340)	-14,370 (9,515)
Social Capital	91,589 (18,376) ***		90,413 (17,611) ***	
Generalized Trust		74,347 (19,999) ***	74,527 (19,085) ***	
Tolerance		32,960 (12,081) ***	32,027 (11,529) ***	
R^2	,351	,386	,364	,404

Table 2. *Regression results*

**** Significant at 1% level, ** 5 %, * 10%*
Source: Own elaboration

Testing for causal relationships, in Model I, a positive influence of "Social capital" on the "GII 2020" was found. Model II was used to investigate the impact of the individual predictors on the GII 2020. Both generalized trust and tolerance display a significant influence on innovativeness, with "generalized trust" having a greater influence than "tolerance" on the "GII 2020". If the respective independent variable tested for, the index for “social capital”, “generalized trust”, or “tolerance”, respectively, takes the value 1 instead of 0, the value of the GII 2020 would increase substantially.

To test for robustness, the “average GII” was also used as the independent variable. As for the influence of social capital, the positive impact can be supported (Model III); the same applies to the two sub-indices (Model IV), both coefficients have a statistically significant impact. Even if interpreted with caution, the divergence in the standardized coefficients indicates that generalized trust has a higher influence than tolerance.

Discussion

Applying econometric techniques, our research shows a positive relationship between social capital, including its components – trust and tolerance – and national innovativeness. This finding basically supports previous research in the field. In general, there is a positive relation between social capital, as measured by trust and civic cooperation, and aggregate economic activity[70]. Concerning innovation activities, Akcomak and Wel[71] find a positive relation to social capital, as measured by trust in unspecific others, which ultimately leads to increases in per capita income. Doh and Acs[66] also find a positive relation to social capital, although they use different measures for social capital, including institutional trust, associational activity, and corruption perception.

Admittedly, Florida et al.[72] find a negative relation between social capital and the innovativeness of regions, but only because they define social capital as thick trust without tolerance. In the end, creative regions are the ones that can “balance openness and tolerance against a strong sense of community”[72].

A positive relation between innovativeness and individualism has been firmly established[73][74] as well as a negative relation to in-group collectivism[1][75][76]. This clearly shows the negative consequences of clanism and familism on innovation. Thick trust leads to the favoritism of insiders and the exploitation of outsiders. In societies with high in-group collectivism, the circle of trust shrinks to kinship relations and relations of direct reciprocity. There is thus less

opportunity for cooperation on innovative projects, as outsiders are not trusted.

Focusing on openness and tolerance, a negative relationship between national innovativeness and cultural tightness can be found[77]. Tight societies have stricter rules and a lower tolerance for deviations from rules and norms of behavior. Thus, they are less creative and innovative, as their focus is on prevention and adaptation rather than on promotion and novelty[78]. And it is precisely the cultural looseness in the form of the diversity of opinion and tolerance – as e.g., measured by Uz[79] – that increases the innovativeness of a nation[77]. The importance of tolerance for creativity and innovation has been further highlighted by Florida[57] who finds a mix of talent, technology, and tolerance to be conducive to higher levels of creativity in urban areas. As tolerance – however measured – increases the diversity of opinion that is pivotal for innovation activities, it is also supported by the finding that consensual decision-making as a cultural trait is conducive to national innovativeness[80]. Anecdotal evidence from single-country cases supports these findings, which are mainly based on large-N studies: Scrutinizing the most innovative countries worldwide, e.g., Sweden, the Netherlands, or Denmark, we also find high values for trust and tolerance – while the least innovative countries, such as Uganda or Zimbabwe, display low levels of trust and tolerance. Moreover, we „observe vibrant startup scenes across the globe, such as in Austin, Nashville, Tel Aviv, Berlin, Moscow, Copenhagen, or Leipzig“[81] – cities that are characterized by vibrant subcultures and a high level of tolerance. This effect does not seem to be a phenomenon of modern times, as it is substantiated by historical evidence. For example, tolerance, specifically religious tolerance, has been proven to have a positive impact on innovativeness in Prussia during the second industrial revolution[82].

Surely, no study comes without limitations due to methodological or content-related issues. The country selection for the empirical analysis resulted from data availability. As the sample of 48 countries in our study is relatively small, the generalizability of the results can be questioned: Scrutinizing the countries where no data was available, we find that GDP per capita is relatively low, indicating developing countries that in many cases display a very weak institutional framework. As there is some evidence that the effect of tolerance and trust on innovation performance depends on the overall level of economic development, the link substantiated by our study may not hold for “failed states”[83]. Moreover, the sample sizes of the nations surveyed by the WVS differ considerably from one another and vary between 1000 and 2000 respondents, depending on the nation, increasing the risk of bias.

Conclusion

For our analysis of the relation between social capital and the innovativeness of a nation, we propose a model that includes trust and tolerance as measures of social capital. Testing this model empirically, we find a strong relationship between social capital and innovativeness, and also a strong relationship between its single components – trust and tolerance – and innovativeness. However, it is thin trust rather than thick trust that promotes innovation, as thick trust can lead to familism or clanism – or “Salem with witches” as Putnam[16] puts it.

When interpreting the results, the following caveats need to be considered: Social capital is not only a prerequisite for innovative activities but also for doing business in general. Hence, it is hard to untangle the direct positive effects of social capital on innovativeness, as a substantial part of its influence might be an indirect spillover effect in providing a stable background for business activities in general.

In our model, trust is a proxy for trustworthiness and is based on uncertainty and vulnerability. Societies can be stuck in a vicious cycle of untrustworthiness and distrust. Under such conditions, in an environment of constant untrustworthiness, it can be rational for individuals to use a strategy of distrust to protect themselves and become less vulnerable. Nonetheless, societies need a virtuous cycle of trust and trustworthiness to maintain a high level of innovativeness and economic performance. Thus, our model is not a guideline for individual actors but for politics affecting society as a whole.

A similar argument can be made for tolerance, as Inglehart[84] shows that a threat to the security of a country can lead to tighter social norms and less tolerance towards individual choices. One way to foster tolerance is to increase diversity. However, this can backfire. As Vogt[23] observes, there is a “paradox of diversity”: Diversity can lead to tolerance as well as conflict. This can also be observed in creative teams, as diversity only increases creativity if there is diversity as well as participatory safety and a common goal[63]. On a societal level, the question – in the terms of Sen[85] – is how we can achieve “multiculturalism” with cultural liberty and interaction between cultures within a

society that will lead to the necessary weak links to foster innovation instead of "plural monoculturalism of faith-based separatism" which will lead to isolated bonding in families and clans, inhibiting innovation. The results also have current political implications, as Western democracies are increasingly plagued by political polarization and populism, leading to an erosion of forbearance, trust, and tolerance among the population[86][87][88]. Politicians are called upon to unite a country under a common vision with goals shared by the majority of the population while simultaneously keeping intact the diversity of opinions and perspectives of individual people that foster creativity.

For a multiculturalism of interaction, societies need to foster trust and tolerance. This is easier said than done, as "social capital cannot be so easily created or shaped by public policy"[10]. Thus, the practical implications of our findings are manifold but probably hard to realize in the short run, as "the long time horizons over which trust develops stand in conflict with the shorter time horizons of current policy making"[89]. Nonetheless, fostering trust and tolerance, e.g., by supporting exchange between individuals and groups in special educational programs and through social policies, seems to be a suitable approach to increase social capital. One necessary precondition in this context is the awareness of such links; policymakers should be aware that investment in social measures also has economic implications, as this may serve as a justification for public spending on such measures: "A country should not regret forgoing some increase in GDP this year for the sake of investments that will contribute to human and/or social capital"[90]. Moreover, on a meso level, relevant for managers within organizations and institutions, similar methods may create more short-term effects due to the smaller group size that facilitates adaptation.

Main limitations of our research are addressed by the criticism of aggregate studies on social capital. This criticism includes aspects of methodology and measurement. Methodological issues – such as the choice of control variables or parameter heterogeneity[91] – are features that plague many econometric research activities. The main rationale in this regard – apart from abandoning the research approach altogether – is to see results as an ongoing endeavor – a piece in a larger puzzle or a larger mosaic – and to only draw tentative conclusions from individual studies. The criticism concerning measurement – the "absence of any strong theory of aggregate social capital determination"[91] respectively the issue that "social capital has become definitionally chaotic, as it is imbued with so many different variables, approaches and applications"[92] – is a feature that often distinguishes definitions in the social sciences from definitions in the natural sciences. Concepts in the social sciences are often less well defined, as they typically are human constructs and not phenomena found in the physical world. With regard to innovativeness, researchers have indeed used diverse measures for social capital, viz., trust, associability, civic norms, and others (e.g., corruption perception). Concerning trust, different measurements have been applied, such as thick trust, trust in unspecific others, as well as institutional trust[71][66][72]. However, the main components in the line of research of the attitudinal approach and social interaction seem to be clear (social norms fostering cooperation); only the specifics differ. This means that results can have fruitful outcomes but have to be interpreted and compared cautiously with definitional differences in mind.

Scrutinizing the limitations of our study as delineated above, our findings provide leeway for further research. Firstly, a larger data sample could be tested once data availability is given. Moreover, due to multicollinearity in the data applied, no control variables were included in our study; this may be done in future work. As Doh and Acs[66] find that in addition to social capital, institutions such as associational activities and norms of civil behavior have a positive impact on innovativeness, for future studies, these research results could be combined with the results of our study and summarized in a model. Moreover, Doh and Acs[66] find that there is a positive relationship between human capital, entrepreneurship, and R&D spending with innovativeness. For future research, these factors should be included as control variables in the models so that the actual impact of social capital on innovativeness can be studied more closely. Scrutinizing the findings of Audresch et al.[83] and Bischoff et al.[89], it also may be a fruitful endeavor to test specifically for the effects in less developed or low-trust countries, but also to focus on outliers that depict high levels of innovativeness but display relatively low levels of trust and tolerance, or vice versa.

Appendix

List of Countries (in alphabetical order)

Algeria, Argentina, Armenia, Australia, Azerbaijan, Brazil, Belarus, Chile, China, Colombia, Cyprus, Ecuador, Estonia, Georgia, Germany, Hong Kong, India, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon, Malaysia, Mexico, Morocco, Netherlands, Nigeria, Pakistan, Peru, Philippines, Poland, Qatar, Romania, Russia, Rwanda, Singapore, Slovenia, South Africa, Spain, Sweden, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Uruguay, USA, Zimbabwe

Index Input Data for Generalized Trust (World Values Survey Wave 6: 2010-2014)

doi.org/10.32388/646CQI.2

Index	Column	Question	Answers	Number
Generalized Trust	Trust in unspecific others	(1) Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?	1 Most people can be trusted. 2 Need to be very careful.	V24
		(2) Do you think most people would try to take advantage of you if they got a chance, or would they tryto be fair?	10 point scale: 0: Most people try to take advantage of you 10: Most people try to be fair	V56
	Trust in close people	How much you trust your: (1) family (2) Your neighbors (3) People you know personally	1. Trust Completely 2. Trust somewhat 3. Do not trust very much 4. Do not trust at all	V102-104
	Remote Trust	How much you trust your: (1) people you meet for the first time (2) people of another religion (3) people of another nationality	1. Trust Completely 2. Trust somewhat 3. Do not trust very much 4. Do not trust at all	V105-107

Source: Own illustration based on data from Inglehart et al. [68]

Index Input Data for Tolerance (World Values Survey Wave 6: 2010-2014)

doi.org/10.32388/646CQI.2

Index	Column	Question	Answers	Number
Tolerance	Moral tolerance	On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? (1) Homosexuals (2) Unmarried couples living together (3) People of a different religion	1 Mentioned 2. Not mentioned	V40, V41, V43
	Social tolerance	On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? (1) People who speak a different language (2) People of a different race (3) Immigrants/ foreign workers	1 Mentioned 2. Not mentioned	V37, V39, V44
	Political tolerance	If you had to choose, which one of the things on this card would you say is most important? (1) Maintaining order in the nation (2) Giving people more say in important government decisions (3) Fighting rising prices (4) Protecting freedom of speech	First choice: Code one answer only	V62
		And which would be the next most important? (1) Maintaining order in the nation (2) Giving people more say in important government decisions (3) Fighting rising prices (4) Protecting freedom of speech	Second choice: Code one answer only	V63

Source: Own illustration based on data from Inglehart et al. [68]

Statements and Declarations

Availability of Data and Materials

The datasets analysed during the current study are freely available from the World Values Survey (https://www.worldvaluessurvey.org/WVSDocumentationWV6.jsp) and the World Intellectual Property Organization (Global Innovation Index (GII): https://www.wipo.int/publications/en/series/index.jsp?id=129).

Footnotes

[1] Direct reciprocity according to Stevens and Duque[38] describes „[...] situations in which the reciprocal exchange occurs between two individuals“.

[2] The IPD is a classic economic game played in game theory where two players face the choice of cooperation and defection in each round. For a further description of the game, see e.g. Anatol Rapoport and Chammah[93].

[3] The question of which strategy is most successful from an evolutionary perspective is hotly debated. Other contenders are the strategies “Pavlov” (also called “Win-Stay, Lose-Shift”)[94][95] and “Generous Tit-for-Tat”[96]. All of them are “nice” strategies offering cooperation. None of them seems to be evolutionarily stable in simulations, though[97].

[4] Indirect reciprocity according to Stevens and Duque[38] describes „[...] situations in which a third party tracks interactions between individuals [...] If, for example, individual C observes that individual A helps individual B, then C would help A in a future interaction“.

[5] Basing our model on reciprocity doesn’t exclude pure altruism, i.e., unselfish altruism not expecting any returns. As Adam Smith[98] writes in *The Theory of Moral Sentiments*: “How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it”. Our model just doesn’t make it a central part of our considerations.

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