The Impact of Social Capital on Innovation in Selected Countries

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Abstract

Using panel data method, this study examines the effects of different dimensions of social capital on innovation at the societal level across 21 countries (19 Asian countries plus Russia and Egypt) for the period 1995-2011. Dimensions of social capital that have been considered in this study include generalized trust, trust toward friends, institutional trust, civic participation, and norms of civic behavior. We use Fully Modified OLS (FMOLS) method to estimate the model. Our empirical findings suggest that in Asian countries some aspects of social capital such as trust toward friends, generalized trust and norms of civic behavior have a positive and significant effect on innovation. But civic participation and institutional trust have no significant impact on innovation. Moreover, we find that human capital and R & D expenditure have a positive effect on innovation in these countries.

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1. Introduction

Social capital is a broad concept and includes the quantity and quality of relations between individuals, groups, organizations and institutions that increase cooperation among people. Putnam defines social capital as "features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions" (Putnam et al., 1993: 167).

According to the literature, social capital has a large impact on many economic indicators including innovation. Innovation is a systematic process during which new ideas are converted into new or improved products or new or improved production processes. Innovation is one of the most important factors in economic development. According to Schumpeter (1974) industries must constantly revolutionize the economic structure from within, that is innovate with better or more effective processes and products to maintain their advantages over time. Aghion and Howitt (1998) see innovation as a main source of technological progress and as a key factor in economic growth.

Social capital facilitates cooperation among individuals and as Tjosvold (1988) has mentioned, the cooperation is directly correlated to the innovation. The impact of social capital on innovation among countries and regions has been investigated in some studies. The positive impact of social capital on innovation in European countries has been approved (Akcomak and ter Weel, 2009; Kassa, 2009). Given the social and cultural characteristics of Asian countries, the question arises whether such a relationship exists in Asian countries. This study examines the effect of different dimensions of social capital on innovation in Asian countries.[1]

In Section 2 we review the literature on the social capital and innovation and the factors that affect the innovation. In Section 3 we explain about data and sample. The hypotheses are explained in Section 4. Estimation results are explained in section 5 and ultimately Section 6 is devoted to the conclusions.

2. Review of the literature

Innovation is a very important factor determining economic growth. The relationship between innovation and economic growth has been investigated in several studies (such as Griliches, 1980; Mansfield, 1980; Nadiri, 1980; Scherer, 1982; and Terleckyj, 1974). According to their results innovation is a main factor affecting the economic growth.

A number of studies have investigated the impact of innovation on firm performance. According to Georghiou (1986) and Baily and Chakrabarti (1985) there is a positive relationship between innovation and productivity of firms, and innovation depends on R & D spending. Geroski et al. (1993) conducted another study on 721 UK firms. This study showed that innovative firms had higher profit margins in downturns, larger market shares and were less sensitive to downturns than the non-innovative firms.

Various factors can contribute to the innovation. According to Shane (1992) individualistic and non-hierarchical societies are more inventive than other societies. Also according to Shane (1995) societies that are more willing to accept uncertainty may be more innovative than uncertainty-avoiding societies. Thus cultural and social characteristics of societies affect innovation (Dakhli and de Clercq, 2004).

Considering the results of studies on innovation we can say that investment in research and development, human capital and social capital are major factors affecting innovation (Dakhli and de Clercq, 2004; Akcomak and ter Weel, 2009; Kassa, 2009). We now examine the impact of these factors on innovation. Research and development refer to research activities done in industrial enterprises in order to achieve better production methods and products. So investment in research and development is a decisive factor for innovation.

Human capital is the individuals' general ability and skills in terms of education, physical condition and overall economic well-being. The positive impact of human capital on economic performance has been confirmed in several studies such as Coleman (1988), Gimeno et al. (1997), Pennings et al. (1998), Maskell and Malmberg (1999). Black and Lynch (1996) argued that investment in human capital through on-the-job training and education increases the productivity and competitiveness at the organizational level. According to Cannon (2000) human capital raises overall productivity at the societal level because it increases effectiveness of the human's physical and intellectual efforts. Dakhli and

de Clercq (2004) consider the role of human capital as a catalyst for innovation (Dakhli and de Clercq, 2004).

From a theoretical viewpoint, social capital is one of the determinants of innovation in a society. The newest and most important theories about innovation are technological network theory and social network theory. Technological network theory emphasizes the importance of information sources that are outside the firm such as customers, suppliers, government agencies, government laboratories, academic researchers and others. The stronger relationships between firms and sources of information outside the firm, the more information firms use for innovation. According to social network theory, the knowledge is embodied in networks and communities and social capital is considered as a determining factor in creating innovations (Landry et al., 2002).

Different levels of social capital exist. At micro level, social capital consists of relations between individuals. This level of social capital is divided into two types: trust toward friends and trust toward strangers. The second type is called generalized trust considered as the most important indicator of social capital. Mezzo-level social capital contains relationships between organizations and groups. Finally, macro level is the most pervasive aspect of social capital that includes the most formal relations and institutional structures. The important index of social capital in this level is the trust in government and different institutions that is called institutional trust.

On the other hand, social capital is divided into two types: Cognitive social capital and Structural social capital. Cognitive social capital includes the quality of relationships between human beings and refers to the values, norms, and beliefs that influence relations between individuals. Trust is the most important characteristic of the quality of relationships between people. Therefore generalized trust is the most important indicator of cognitive social capital. Moreover, some of the social norms that affect the quality of relationships between people are considered as a kind of cognitive social capital and are called norms of civic behavior.

Structural social capital based on the definition of Kassa (2009) consists of formal and informal social networks. Informal social networks consist of relationships between family, friends or neighbors and formal social networks include voluntary participation in groups and

organizations that is called civic participation. In social capital literature, structural social capital is usually considered as the size of formal social networks that relationships are formed within these networks but in general, relationships in informal networks such as the network of friendship and the network of neighborhood relations are considered as a part of structural social capital too. Civic participation (voluntary activities in social groups) is considered as an indicator of structural social capital.

Overall, we can say that generalized trust, institutional trust, civic participation (activity in voluntary organizations), relationship between friends (trust toward friends) and social norms (norms of civic behavior) are different dimensions of social capital.

Among these indicators, generalized trust is the most important indicator of social capital and its major impact on the economic performance and development of countries has been confirmed in many studies. For example, we can refer to the following studies: Kormendi and Meguire (1985), Grier and Tullock (1989), Fukuyama (1995), Knack and Keefer (1995,1997), Gratano et al. (1996), La Porta et al. (1997), Brunetti et al. (1997), Hall and Jones (1999), Clague et al. (1999), Zak and Knack (2001), Raiser et al. (2001), Barro (2001), Knack (2002), Grootaert and Bastelaert (2002), Chou (2006), Bjørnskov and Méon (2010), Guiso et al. (2010). In Section 4 we examine the impact of different dimensions of social capital on innovation.

3. Data and sample

The number of patents is used as innovation index in cross-country studies (Akcomak and ter Weel, 2009; Kassa, 2009). The measure of innovation in this study that is the number of resident patent filings per million of population, came from the World Intellectual Property Organization (2012). We obtained the population of countries in different years from United Nations web (United Nations, 2012) and used it to calculate the measures of innovation.

The measures of social capital were taken from two databases: World Values Survey (2014) and Global Barometer Survey (2009). These measures are: generalized trust, trust toward friends, civic participation, Putnam index, institutional trust, and lack of norms of civic behavior. The measures of generalized trust and trust toward friends were calculated using the responses given to some of the questions of above

surveys.

Civic participation was defined as the average percentage of people that are active members in the following voluntary organizations: 1) Church or religious organizations, 2) Sport or recreation organizations, 3) Art, music and educational organizations, 4) Labor union, 5) Political party, 6) Environmental organizations, 7) Professional association, 8) Charitable organizations. Among these groups, sport or recreation organizations, art, music and educational organizations, environmental organizations, and charitable organizations are called Putnam groups. Active membership in Putnam groups is expected to have greater impact on increasing social capital and development (Knack and Keefer, 1997). Hence, in this study Putnam index is calculated as the average percentage of active membership in Putnam groups and is another indicator for civic participation.

We consider institutional trust as the average of seven indicators of confidence in government, parliament, army, press, police, television and political parties. These institutions were chosen because there was enough information (more data) about them. Finally the average of indexes of three abnormalities was considered as measure of lack of norms of civic behavior[2]: Avoiding a fare on public transport, cheating on taxes, and accepting a bribe.

We define human capital as the mean years of schooling for people between 15 and 64 years. This indicator was obtained from data collected by Barro and Lee (2012) which is provided in the World Bank web (World Bank, 2012a). The measure of R & D expenditure (investment in research and development) for each country was defined as the ratio of R & D expenditure to gross domestic product (GDP) and obtained from World Bank web (World Bank, 2012b).

In this study we use panel data method. Data were available for 21 countries including Iran, Japan, South Korea, Armenia, China, India, Pakistan, Philippines, Russia, Turkey, Egypt, Indonesia, Jordan, Kyrgyzstan, Saudi Arabia, Singapore, Vietnam, Malaysia, Hong Kong, Thailand, and Mongolia[3], from 1995 to 2011. In some cases the method of linear interpolation or extrapolation was used.

4. The model

In order to evaluate the effects of different indicators of social capital and other factors on innovation, we follow like Dakhli and de Clercq (2004)

estimate the following linear model:

$$Pat_{i,t} = \alpha_0 + \alpha_1 SC_{i,t} + \alpha_2 GERD_{i,t} + \alpha_3 HC_{i,t} , \tag{1}$$

In which Pat is the innovation index, SC is the index of social capital, GERD is R & D expenditure index and HC is the index of human capital. The subscript i denotes an observation for the i-th country and the subscript t denotes an observation for the t-th year. In this study the effect of each index of social capital on innovation is examined in a separate estimation.

As was mentioned earlier positive effects of R & D expenditure (investment in research and development) and human capital on innovation have been confirmed in several studies. With the increase in human capital, people have more knowledge and a better understanding of the various issues and they have more creativity and innovation. In addition higher human capital leads to more profitability of innovation that encourages the private sector to allocate more resources for research and development. Also investment in research and development can lead to numerous and valuable innovations. Then we expect these two factors (R & D expenditure and human capital) to have significant positive impact on innovation.

But the issue is more complicated in the case of social capital. Dakhli and de Clercq (2004) examined the determinants of innovation at the societal level across 59 different countries and found strong support for the positive relationship between human capital and innovation and partial support for the positive effect of trust and associational activity (civic participation) on innovation. Akcomak and ter Weel (2009) in an empirical investigation of 102 European regions showed that social capital (trust) affects per capita income growth indirectly by fostering innovation. Also according to Kassa (2009) important indicators of social capital such as civic participation, general trust and institutional trust have a significant positive impact on innovation. According to Kassa (2009) dimensions of social capital (trust, social norms, and civic participation) can have different effects on innovation.

In the literature of social capital the most important component of social capital is trust. For trust we consider three indicators: generalized trust, institutional trust, and trust toward friends. Whenever trust is at a higher level, there will be less need to control the behavior of others. In such circumstances people are not afraid of taking advantage of others

and thus they are more willing to exchange information, knowledge and other resources, and this is an important factor in creating innovations. In addition, higher trust enables firms to spend more time and finances on innovative activity and so generalized trust reduces the risk of investments in R&D projects and innovative activities (Kassa, 2009). Furthermore financing risky innovative projects requires trust relationship between researchers and investors (Akcomak and ter Weel, 2009).

The trust in institutions like the government and legal system is another effective factor on innovation. If there is a high level of trust in institutions, the innovators will feel that the results of their activity and R&D expenditure are protected and they can expect their activity to pay off (Dakhli and de Clercq, 2004). We expect the trust indicators (generalized trust, institutional trust, and trust toward friends) to have significant positive impact on innovation.

Another component of social capital is the norms of civic behavior (social norms). These norms are part of the moral norms and values that influence communication between people. The norms of civic behavior support the diffusion of ideas and information, and then innovative activities that are largely dependent on knowledge transfer, can be done more (Dakhli and de Clercq, 2004; Kassa, 2009). Index of norms of civic behavior in this study is defined as the lack of norms of civic behavior and therefore we expect to have a negative relationship with innovation.

Civic participation (activity in voluntary organizations) has conflicting influences on innovation. On the one hand the diversity of business and social circles to which one belongs provides the opportunity to access multiple domains that may provide unique sources for information, financial funding, and political support that increase the propensity for innovation. On the other hand many associations may work as special interest groups that lobby for preferential policies and protection of the status quo and therefore hamper risky innovative activities (Dakhli and de Clercq, 2004). So the impact of civic participation on innovation is ambiguous. In this study, two different indicators of civic participation are defined. We expect these two indicators to have no significant impact on innovation.

5. Empirical results
In this study the effect of each index of social capital on innovation is

examined in a separate estimation. Every time one of the indexes of social capital is entered into the regression equation and its impact on the innovation is examined.

In this study we use panel data method. Neglecting cross section dependence in panel data regression models can lead to biased estimates (Chudik et al., 2011). Cross sectional dependence is tested by Pesaran's cross-sectional dependence (CD) test and Friedman's cross-sectional dependence (CD) test (Pesaran, 2004; Friedman, 1937). The statistics and probabilities related to these tests in different cases are presented in table 1. Because six indicators for social capital are used and each time one of them inters the equation, we test for cross-sectional dependence in these different cases. In Table 1 the probabilities in different cases are greater than 0.05 which indicate that there is cross-sectional independence in all cases.

Table 1: Cross-Sectional Dependence Test

Social capital indicator	Pesaran CD test		Friedman test	
	Statistic	Prob.	Chi-square	Prob.
Generalized trust	-1.884576	0.0595	7.002801	0.9732
Civic participation	-1.218657	0.2230	9.288515	0.9011
Institutional trust	-1.243310	0.2138	10.86088	0.8180
Norms of civic behavior	-1.676149	0.0937	9.064426	0.9107
Trust toward friends	-1.278599	0.2010	9.833800	0.8752
Putnam Index	-1.387961	0.1651	8.556489	0.9305

Using Phillipse-Perron Fisher Unit Root Test (Maddala and Wu, 1999; Choi, 2001) the stationary of variables was evaluated. The results are presented in Table 2. Based on the results presented in Table 2, all variables are non-stationary. So we should test for co-integration.

As it was explained, six indicators for social capital are used. Then we test for co-integration in six different cases that in any case, this test includes all the variables exists in the regression equation. We use Kao test (Kao, 1999) and the results that are presented in Table 3 show that co-integration exists in all cases and we can estimate the model in all these cases.

Table 2: The Unit Root Test (Stationarity Test)

VARIABLES	Fisher Chi-square statistics	Choi Z- statistics
Generalized trust	28.5892 (0.8056)	1.81203 (0.9650)
Civic participation	30.5126 (0.2469)	1.54661 (0.9390)
Putnam Index	15.0632 (0.9562)	2.34456 (0.9905)
Institutional trust	10.0933 (0.9999)	3.39148 (0.9997)
Norms of civic behavior	12.2062 (0.9984)	3.26379 (0.9995)
Trust toward friends	18.4206 (0.9864)	2.74726 (0.9970)
Innovation	9.20144 (1.0000)	3.91035 (1.0000)

Note: P-values are in parentheses.

Table 3: Co-Integration Test

Social capital indicator	t- statistics	Prob.
Generalized trust	-4.836744	0.0000
Civic participation	-5.788568	0.0000
Putnam Index	-5.658682	0.0000
Institutional trust	-4.489923	0.0000
Norms of civic behavior	-5.537024	0.0000
Trust toward friends	-5.520185	0.0000

Note: P-values are in parentheses.

We use Fully Modified OLS (FMOLS) method (Pedroni, 2000) to estimate the cointegrating vector in different cases. The estimation results in different cases are presented in Table 4.

Coefficient of R & D expenditure, as expected, is positive and significant in all cases. Therefore we conclude that R & D expenditure has a positive and significant impact on innovation. Coefficient of human capital in all cases is positive and in some cases, as expected, is significant. So we can conclude that human capital has a positive and significant impact on innovation. Also coefficients of generalized trust and trust toward friends in the cases that these indicators enter into the model, as expected, are positive and significant.

We come to the conclusion that generalized trust and trust toward friends have positive and significant impacts on innovation. Results also indicate that unlike the theoretical expectation, institutional trust has a negative and significant impact on innovation.

Table 4: Results of Estimation of the Model

VARIABLES	Social capital indicator		
	Generalized trust	Civic participation	Putnam Index
R & D expenditure	1.751104***	1.675774**	1.824119**
	(0.048786)	(0.820046)	(0.826415)
Human capital	0.952162***	3.051447	4.480775
	(0.058557)	(4.634834)	(4.692971)
Social capital	1.548200***	-1.367530	-0.302785
	(0.039914)	(1.006108)	(0.411856)
Observations	320	208	208
R-squared	0.993110	0.992758	0.992609
Adjusted R-squared	0.992008	0.991130	0.990947
VARIABLES	Social capital indicator		
	Generalized trust	Civic participation	Putnam Index
R & D expenditure	1.759011***	6.741200***	1.725116***
	(0.647375)	(0.632559)	(0.049131)
Human capital	3.326564	4.918606**	0.930988***
	(3.653552)	(2.345279)	(0.058472)
Social capital	-10.89897	-3.232994***	0.078739*
	(9.543441)	(0.760415)	(0.043941)
Observations	288	224	320
R-squared	0.992991	0.779258	0.993083
Adjusted R-squared	0.991790	0.777260	0.992034

Notes: Robust standard errors are in parentheses.
 *** p<0.01, ** p<0.05, * p<0.1.

Coefficients of indicators of civic participation and Putnam index (another index for civic participation) in the cases where these indicators enter into the model are negative, but as expected, none of these coefficients are significant. Therefore we conclude that civic participation has no significant effect on innovation

Also the coefficient of norms of civic behavior, as expected, is negative and significant. Again we remind that index of norms of civic behavior is defined as the lake of norms of civic behavior and therefore we expect to have a negative relationship with innovation. According to Table 4 there is a negative and significant relationship between lake of

norms of civic behavior and innovation. Therefore, we conclude that norms of civic behavior have a positive and significant impact on innovation.

6. Conclusion

Positive and significant impact of R&D expenditure and human capital on innovation can be easily explained. Inventions and innovations are often the results of R&D Activity. According to Schumpeter (1974) innovation covers the whole range of activities that are needed to translate a new idea into commercial practice for the first time, so the positive association between R&D expenditure and innovation is consistent with theoretical expectation. Also human capital refers to knowledge, abilities and skills of the individuals that can be used in the activities that stimulate innovation and economic growth.

The relationship between social capital and innovation is complicated. Social capital is a multi-dimension concept and as pointed out by Kassa (2009) various dimensions of social capital have different effects on innovation. While some indicators of social capital have a positive impact on innovation, there are others that negatively affect it, although this negative impact is not significant.

The regression results confirm the positive and significant impact of some indicators of social capital such as generalized trust, trust toward friends and norms of civic behavior on innovation and this result approved the theory of Guiso et al. (2010, 5-13). They offer a new definition of social capital as civic capital that is a set of values and beliefs that help cooperation. The norms of civic behavior refer to the values that are effective on cooperation and then the indicator of norms of civic behavior is considered as the first indicator of civic capital. Also generalized trust as the most important belief of people that affects their cooperation is considered as the second civic capital indicator. Our results confirm the positive impact of these two indicators of civic capital on innovation in selected countries.

Trust in people leads to a better exchange of information, knowledge and other resources and reduces the risk of investments in R&D projects and innovative activities and thereby increases the innovation. Also the norms of civic behavior support the diffusion of ideas and information and then have a positive effect on innovation.

Based on results of this research, in Asian countries institutional trust

has no significant effect on innovation. It can be due to low levels of institutional trust in most Asian countries. It may also be due to social and cultural characteristics of Asian countries. Existence of different customs and religions and also historical events in these countries lead to certain social and political structures in which people may sometimes advocate some institutions while they are not satisfied with the performance of those institutions and then institutional trust is not a good indicator of the people's satisfaction about the performance of institutions. In such circumstances institutional trust has no significant effect on innovation. This issue needs more investigation.

As previously explained, civic participation has two conflicting influences on innovation and economic performance and the impact of civic participation on innovation is ambiguous. In this research, indexes of civic participation have a negative and non-significant impact on innovation. Thus civic participation doesn't significantly have an effect on innovation and this result confirms the ambiguity of the impact of civic participation on the innovation and economic performance.

It should be noted that as Guiso et al. (2010, 6-12) and many researchers believe, generalized trust and norms of civic behavior are the most important indicators of social capital and from the positive impact of these indicators on innovation, we can conclude that on the whole social capital has a significant positive impact on innovation. While societies with high levels of social capital may facilitate a structure in which it is easier to implement policies to foster innovation and stimulate the economic growth, other societies cannot improve fast in terms of innovation and economic growth.

Altogether we can say that in Asian countries, important indexes of social capital (generalized trust, trust toward friends and norms of civic behavior), human capital and R & D expenditure have a positive impact on innovation. However some dimensions and indexes of social capital such as civic participation and institutional trust have no significant influence on innovation.

Innovation is an essential determinant to the economic growth and development, which can be achieved only by those countries with a high level of human and social capital. Also investment in research and development plays an important role in increasing the number of innovations. Therefore to increase innovation, governments should design and implement programs to increase social capital, human capital

and R & D expenditure. In the case of the human capital, one method of improving its level would be stopping the migration of the talents, problem that the majority of the developing countries confront with.

Based on technological network theory and social network theory, creation and strengthening the relations between economic enterprises, government agencies, universities, research centers, and other organizations associated with the transfer of information, knowledge and technology are the most important things that should be considered in planning for increasing innovation. Due to the impact of social capital on innovation and other components of development, governments should pay special attention to social capital in designing and implementing of development programs. This requires extensive and practical studies of social capital in different parts of the country.

Endnotes

1. Due to the lack of data for some Asian countries, we added Egypt and Russia, two countries that are close to the Asian continent.
2. The existing indicators for norms of civic behavior are the amount of social abnormalities. So we use the lack of norms of civic behavior as an index for norms of civic behavior. Whatever the status of norms of civic behavior is better, the index number is smaller and vice versa.
3. We selected these countries because there was insufficient data for other Asian countries.

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