The Effect of Innovation Performance on Dimensions of the Globalization

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ABSTRACT
Developments such as deployment of local and nationalistic perspectives to a broader outlook of an interconnected and interdependent world with free transfer of capital, goods, and services across national frontiers are associated with Globalization phenomenon. Although globalization is not new it is used more commonly and associated with a new subject every day. Globalization is frequently associated with economic growth via expanding international trade, cross-border transfer of financial resources, increased foreign investments, growing multinational enterprises and joint ventures. However this new world of globalization resulted in greater international competition for the countries and obliged them to be innovative in order to remain at the forefront in the global competition environment. It is generally accepted that there is a strong relationship between innovation and globalization. However globalization doesn’t influence high income and low income countries same way. Furthermore different dimensions of globalization is affected by the innovation in a different way. In this paper innovation performance of the countries and the relationship between the dimension of globalization is investigated. The data is extracted from INSEAD Innovation Indexes and KOF Globalization Index and tested using panel regression analysis. The results have shown that except political globalization the relation connection between innovation and economic and social dimensions of globalization is significant and positive.

Keywords: innovation; innovation index, dimensions of globalization, economic globalization, political globalization, social globalization

JEL-Clasification: O10, O30, C33, F60, F62

İnovasyon Performansının Küreselleşmenin Boyutlarına Etkisi

ÖZET
Yerel ve milliyetçi bakış açlarının ulusal sınırları aşan sermaye, mal ve hizmetlerin serbest transferiyle birlikte birbirine bağlı ve bağımlı dünyayı içeren daha geniş bir bakış açısı geliştirilmesi gibi gelişmeler küreselleşme oğrusu ile ilişkilidir. Küreselleşme yeni bir kavram olmasa da daha yaygın olarak kullanılmaktakta ve her geçen gün yeni bir konu ile ilişkilendirilmektedir. Küreselleşme sıkça genişleyen uluslararası ticaret, finansal kaynakların sınır ötesi transferi, artan yabancı yatırımlar, çoküslü işletmeler ve ortak girişimlerin büyümési aracılığıyla ekonomik büyüme ile ilişkilendirilmektedir. Ancak küreselleşen bu yeni dünya ülkeler için daha sıkı bir uluslararası rekabete neden olmaktakta ve onları Küresel rekabet ortamında ön planda kalabilmesi için yenilikçi olmaya mecbur etmektedir. İnovasyon ve
The Effect of Innovation Performance on Dimensions of the Globalization

1. Introduction

Globalization term states the development of economic social and political relations between the countries, better recognition of the beliefs and expectations of different societies and cultures and interrelated issues such as the intensification of international relations. As a result of the new structures and relationships formed by globalization business decisions and actions in one part of the world have significant consequences in other places. Underlying and reinforcing these globalization trends is the rapidly changing technological environment, particularly in information processing, and telecommunications (Muhammad et. al, 2010:66). By facilitating the free movement of capital and increase foreign investment, globalization is considered to contribute to economic development. Although globalization is not a new issue it is clear that its use increased enormously covering many fields of study including economic, social and political ones which also form the dimensions of globalization. Either social or economic, innovation is widely accepted to be at the centre of the growth of output and productivity and it is clear that globalization has increased access to information and new markets for firms and this process resulted in greater international competition and in new organisational forms in order to manage global supply chains. This new competition environment on the other hand put forth a connection between innovation and globalization.

In this context, the relationship between innovation performance of the countries and the dimensions of globalization is examined in this study. Globalization data is extracted from KOF Globalization Index and data of innovation is from INSEAD reports on innovation. There are many claims on the interrelation of innovation and globalization in the literature. However the global figures of innovation and globalization shown in this study don’t present a similar result. In this regards more detailed figures including the dimension level globalization indexes are studied in the following sections. Both economic and social globalization trend seem to be accordance with innovation trend in high income countries and it’s clear that social dimension of globalization is in a closer relationship with innovation. For middle income countries, both social and economic dimensions of globalization seem to unison with innovation figures. And finally economic globalization is more prominent in lower income countries and is more interconnected with innovation. However the connection of innovation and political globalization seems to be insignificant.

2. Dimensions of Globalization

Globalization implies the opening of local and nationalistic perspectives to a broader outlook of an interconnected and interdependent world with free transfer of capital, goods, and services across national frontiers (Business dictionary, 2015). The tendency of investment funds and businesses to

Anahtar Kelimeler: inovasyon; inovasyon endeksi, küreselleşmenin boyutları, ekonomik küreselleşme, siyasal küreselleşme, sosyal küreselleşme
move beyond domestic and national markets to other markets around the globe, increasing the interconnectedness of different markets. Globalization has had the effect of markedly increasing not only international trade, but also cultural exchange (Investopedia, 2015). Although globalization term came into question just in 1960s by Marshall McLuhan's idea of the global village, introduced in his book Explorations in Communication During the second half of the 1980s its use increased enormously, so much so that it is virtually impossible to trace the patterns of its contemporary diffusion across a large number of areas of contemporary life in different parts of the world (Robertson, 1992: 8). Some researchers start the process from the past and argue that globalization has existed for centuries and that the recent developments only change the scale and scope of it. Studying the term with the perspective of today, globalization is the major force underlying the rapid, widespread social, political and economic changes that are currently reshaping and reconstituting modern societies and the world order (Dreher, et.al., 2008: 5).

The globalization term is frequently used in the literature however it is hard to limit it with a single definition. Scholte (2005) compiled these various usages under five notions as follows;

- Internationalization: Cross-border relations between countries, and globalization designates a growth of international exchange and interdependence.
- Liberalization: Process of removing state-imposed restrictions on movements between countries in order to create an open, borderless world economy.
- Universalization: Process of spreading various objects and experiences to people at all corners of the earth.
- Modernization: Westernization or a dynamic whereby the social structures of modernity are spread the world over.
- Respatialization: Reconfiguration of social geography with increased transplanetary connections between people.

The list of Scholte can be carried on further regarding the fact that globalization is not only characterized by the growth of the international trade, but also the political and social linkages accompanying growing economic integration. Seemingly, the driving forces help administrative barriers in international trade and transportation and communication costs to fall down fragmentation of production processes and the development in information and communication technology (Gaston and Khalid, 2010: 3).

In this regards instead of extending the list it would be wise to regroup it under common titles covering different fields.

One of the most eligible classifications of globalization term has been done in KOF Globalization Index which handles globalization under the three dimensions. These dimensions are as follows (ETH Zürich. (2015: 1);

- Economic Globalization; characterized as long distance flows of goods, capital and services as well as information and perceptions that accompany market exchanges;
- Political Globalization; characterized by a diffusion of government policies;
- Social Globalization, expressed as the spread of ideas, information, images and people.

In this study we will deal with both dimensions of the globalization. When the primary effects of globalization is considered it is clear that economic side of the term comes first. Globalization in economic point of view cites the increasing interdependence of world economies as a result of increase in cross-border trade of commodities and services, flow of international capital and wide and rapid spread of technologies. It reflects the ongoing expansion and mutual integration of market boundaries,
and is an irreversible trend for the economic development in all over the world. The rapid growing significance of information in all types of productive activities and mercerization are the two major driving forces for economic globalization (Shanguan, 2000: 2).

Capitalist production, trade, and market relations are driving forces of contemporary globalization. While globalization cannot be reduced to its economic dimension as some economists have been prone to do, there is no doubt about the central importance of exchange and production in the extension of social relations across world-space (James and Gills, 2007: 23). Therefore the social dimension of globalization refers to the impact of globalization on the life and work of people, on their families, and their societies. Concerns and issues are often raised about the impact of globalization on employment, working conditions, income and social protection. Beyond the world of work, the social dimension encompasses security, culture and identity, inclusion or exclusion and the cohesiveness of families and communities (ILO, 2003) which is also within the scope of political globalization defined as the diffusion of government policies internationally.

Either economic, social or political, globalization is generally associated with innovation and factors influencing one considered to influence the others as well. In this framework, the connection between these three phenomenon is reviewed in the following part.

3. The Connection between Innovation and Globalization

Globalization led to major increases in trade and exchanges all over the world and allowed formation of an open, integrated, and borderless international economy. Along with the development of globalization there has been remarkable growth in trade and exchanges, not only in traditional international trade in goods and services, but also in exchanges of currencies, in capital movements, in technology transfer, in people moving through international travel and migration, and in international flows of information and ideas (Intriligator, 2003:2). In this framework innovation is widely accepted to be at the centre of the growth of output and productivity. As the world economy evolves, the process of innovation evolves the same way. It is clear that globalization has increased access to information and new markets for firms and this process resulted in greater international competition and in new organisational forms in order to manage global supply chains. Owing to advances in technologies and greater flows of information, knowledge is more and more viewed as a central driver of economic growth and innovation (European Commission, 2005: 10).

Whereas considerable attention has been paid to the effects of globalization on productivity of firms in emerging market economies, the literature has only recently begun to be concerned with the effects of globalization on innovation by the local firms (Gorodnichenko, 2008: 1) Taking the topic more globally however the relations between globalization, innovation and productivity has been discussed long before. Many economists such as Schumpeter and Arrow were good examples who mentioned innovation and firm connection. Arrow (1962), argued that competition is good for an economy by providing incentives for efficient organization of production, putting downward pressure on costs, and motivating innovation and Schumpeter (1943) asserted that large firms operating in concentrated markets are the most powerful engine of progress and the most likely to innovate because they can more easily appropriate the returns from inventive activity.

From today’s perspective the rapid increase in the investment in information and communication technologies and the impact of these investments on productivity is one of the most important factors that show the role of technology on economy. However considering the recent growth performance of OECD countries, the new role of innovation is seen as quite beyond of information and communication technologies and it is regarded as the essence of economic activities. In this framework
the companies from all sectors have to be innovative in order to meet the needs of conscious consumers and to remain at the forefront in the global competition environment (Pilat, 2004: 3). The economic application of new ideas and knowledge is not only technical but it can also be organizational, managerial, and institutional. In this regards the new general purpose technologies such as ICTs, biotechnology, new materials have intensify the science-technology interface and to be associated with the complex processes of organizational, institutional and infrastructural change (Archibugi and Iammarino, 2002: 99) which assure the firms to have a superior competitive position with lower operating costs, to gain greater numbers of products, services and consumers. This approach to competition is gained via diversification of resources, the creation and development of new investment opportunities by opening up additional markets, and accessing new raw materials and resources (Investopedia, 2012).

When taking this new competition environment into account the connection between innovation and globalization becomes inevitable. However scope and dimensions of this connection is arguable. The Connection between Innovation and Globalization covering the 2007 - 2014 period is visualized in Figure 1 below. The figure covers global innovation and globalization figures extracted from INSEAD Innovation indexes and KOF Globalization Index.

**Figure 1. Globalization and Innovation Trend in the World, 2007-2014**


Figure 1 clearly shows that taken globally, globalization index isn’t in a stable trend and fluctuate year by year. The Financial Crisis of 2008 seems to have negative effect on the figures of the period 2007-2009. Although it started recovering the following years it couldn't remained it long. Regarding the current economic recession globally, the trend can be considered normal. Innovation index on the
other hand is more stable and it is generally in a rising trend. Just as the globalization figures 2008 crisis has hit innovation index too however it got over quickly. Although the shortness of the data set limits further interpretation, this scheme demonstrates no clear connection between innovation and globalization. In this context it would be beneficial to review more detailed figures including the income level of the countries and dimension level globalization indexes.

Innovation is varied and includes a spectrum starting from simple incremental improvements to novel technologies which can disrupt the pattern of competitive advantage in whole industries. The nature of innovation varies significantly across sectors and differences between countries in the sectoral composition of output and the position of domestic firms in international supply chains can lead to significant variances in national patterns of innovation (OECD, 2005: 8). From a macro perspective globalization is affective on countries intensely and it is increasing substantially and is creating new opportunities for both developed and developing countries. However developed and developing countries basically have different expectations in this process.

In advanced industrial countries, globalization means increase of the rate of industrialization and innovation and taking advantage of scientific discoveries is regarded as the main source of long-run economic growth and social well-being (Incekara and Savruk, 2013:3). In the future, the innovation performance of a country is likely to be even more crucial to its economic and social progress. Countries whose firms fail to innovate will increasingly find themselves in direct competition with newly industrialising countries with lower labour costs and an increasing mastery of existing technologies and business methods (OECD, 2005: 7).

Additionally low income countries may not have the same highly-accentuated beneficial effect from globalization as the countries with high income levels and the globalization phenomenon may led to both positive and negative effects such as increased standard of living, access to new markets, widening disparity in incomes, decreased employment. Although favourable circumstances of international trade is enhanced by free trade for smaller companies which isn’t able to compete globally the chance of risk of failure increases with it. Additionally, free trade may also raise production and labour costs, including higher wages for more skilled workforce. Domestic industries in some countries may be endangered due to comparative or absolute advantage of other countries in specific industries. Overusing and abusing natural resources to meet new higher demands in the production of goods may expose another possible danger and harmful impact (Incekara and Savruk, 2012: 24).

When considered together, these factors put forth a great variance across developed and developing countries. Countries are handled in three income levels based on the criterions of the World Bank. While globalization data is extracted from KOF Globalization Index, data of innovation is from INSEAD reports on innovation. The data is regrouped and arranged in the mentioned criterions by the authors. Innovation level of the high income countries is in a rising trend and except the 2008-2010 periods which is clearly related with the adverse effects of 2008 Financial Crisis. The figures of innovation has risen more than 20% percent. Economic and social globalization trends look in accordance with each other, the social one having better values. As expected the crisis affected economic globalization worse. Both globalization trends also seem to be accordance with innovation trend too. When considered collectively it’s clear that social dimension of globalization is in a closer relationship with innovation.

Innovation trend of middle income countries expose a similar scheme with the high income ones. Although these countries have lower values of innovation performance general trend is just the same and somehow it is in a rising trend. Globalization figures on the other hand offer a different picture. In
contrast to developed countries social dimension of the globalization has slightly lower values than the economic one. The effect of crisis also affected the trend in a different way. Social innovation seems to be affected by the Financial Crisis of 2008 more severely. The figures looks consistent and in accordance after 2011. The general picture shows that in middle income countries, both social and economic dimensions of globalization are in unison with innovation figures.

As well as the innovation performance of the low income countries being low as expected, the trend isn’t stable and fluctuates year by year. It is obvious that innovation structures of these countries are more fragile and more reactive to the 2008 Crisis and current economic condition. Globalization trends of low income countries have unique trends. Social dimension seems stable yet it hardly shows presence, economic globalization on the other hand is a lot more in accordance with innovation. The overall scheme indicates that economic globalization is more prominent in lower income countries and is more interconnected with innovation.

4. Literature Review

Although limited in quantitative, due to the globalization and innovation terms becoming relatively recent subjects of interest in economic studies a number of literature can be found on the subject. In their study which they regard globalization and innovation as a zip between the increased international integration of economic activities and the raising importance of knowledge in economic processes, Archibugi and Iammarino (2002) defined three different components of the globalization. The empirical evidences of their study presented that despite being at a different pace for each of the three components, globalization is affecting innovation significantly.

Chesnais, Ietto-Gillies, and Simonetti (2003) mentioned in their study that the dimensions of globalization summarized in the taxonomy have not affected the various world regions at the same time and with the same intensity. However they asserted that especially in developed countries the expansion of globalization is effective on economic and innovative activities.

Sun, et.al. (2007) investigated the relation between innovation and globalization through the activities of multinational corporations. They studied Chinese case in their study and argued that R&D facilities of the multinational corporations operating in China helped China to become one major attraction for such R&D facilities and get advantage in global economic and technological competition.

Moncada-Paternò-Castello, et.al. (2011) investigated globalization of R&D activities through internationalization of corporate R&D. The findings of their study presents that globalized firms tend to innovate more than purely domestic firms. However drivers and impacts of the internationalization of R&D activities highly depend on the assumed typology of firms in terms such as size, sectoral belonging, and financial constraints.

Gorodnichenko, et.al. (2010) studied the connection between globalization and innovation in emerging markets investigating the impact of foreign competition. They used the data of over 11,500 firms in 27 transition economies. Findings of their study shows that foreign direct investment and international trade enhance domestic welfare through greater innovative activities of domestic firms. The study also indicate that there isn't any inverted U relationship between innovation and foreign competition and the relationship between globalization and innovation does not differ across the manufacturing and service sectors.
5. Model

The study utilize innovation and globalization data of 93 countries covering 2007-2014 period. The countries from all over the world including all income levels are included in the study and only the ones with missing data set are excluded from the analysis. The data is collected from INSEAD Innovation Indexes and KOF Globalization Index. The analysis is formed of 4 variables; innovation performance of the countries is indicated by INNO, economic globalization by ECOG, political globalization by POLG and social globalization by SOCG.

This study aims to analyze both time dimension with cross-sectional dimensions of various countries. Due to the presence of time and cross-sectional dimensions of the data set covered in the study, use of panel regression analysis is found eligible for the study.

In order to avoid spurious relationships between the variables, the variables used in the study should be stationary. Stationary of the variables has been tested with common unit root process developed by Levin, Lin and Chu (LLC) (2002) and assume individual unit root process developed by Im, Pesaran and Shin (IPS) (2003) are performed. The results are summarized in Table 1.

**Table 1. Panel Unit Root Test**

<table>
<thead>
<tr>
<th>Method</th>
<th>Variable</th>
<th>INNO</th>
<th>ECOG</th>
<th>POLG</th>
<th>SOCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levin, Lin &amp; Chu</td>
<td>stat</td>
<td>-11.8478</td>
<td>-22.3029</td>
<td>-1108.33</td>
<td>-318.278</td>
</tr>
<tr>
<td>p-value</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Im, Pesaran &amp; Shin</td>
<td>stat</td>
<td>-8.26316</td>
<td>-4.35089</td>
<td>-102.242</td>
<td>-109.697</td>
</tr>
<tr>
<td>p-value</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

The results of LLC and IPS tests show that displayed that first difference of variables are stationary at 1% significance level and they can be used in panel data analysis. Panel data has both cross section and period dimensions and countries form the cross section dimension while years are the period dimension. Individual effects of both countries and the years should be estimated. These effects are summarized in equation below in which “i” units are individual and “t” are the periods.

\[
INNO_{it} = \beta_1 ECOG_{it} + \beta_2 POLG_{it} + \beta_3 SOCG_{it}
\]  

(1)

**Table 2. Estimation Tests**

<table>
<thead>
<tr>
<th>Test</th>
<th>Statistic</th>
<th>d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundant Fixed Effects Test</td>
<td>4.304788</td>
<td>(92,648)</td>
<td>0.0000</td>
</tr>
<tr>
<td>Hausman Test</td>
<td>80.773955</td>
<td>3</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

The equation is estimated using Redundant Fixed Effects and Hausman Tests respectively to determine the appropriate model. As seen in Table 2. Because of the prob. values in both FE and the Hausman
Tests smaller than 0.5 fixed effects model is found to be appropriate for the data set and it is analysed with Panel EGLS Fixed Effects Regression Model.

Table 3. Fixed Effects within Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECOG</td>
<td>3.98E-07</td>
<td>1.60E-07</td>
<td>2.488533</td>
<td>0.0131</td>
</tr>
<tr>
<td>POLG</td>
<td>-9.05E-08</td>
<td>1.56E-07</td>
<td>-0.579828</td>
<td>0.5622</td>
</tr>
<tr>
<td>SOCG</td>
<td>5.62E-07</td>
<td>2.30E-07</td>
<td>2.447321</td>
<td>0.0147</td>
</tr>
<tr>
<td>C</td>
<td>58.10123</td>
<td>2.013732</td>
<td>28.85252</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Cross-section fixed (dummy variables)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Mean dependent var</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>R-squared</td>
<td>0.543024</td>
<td>63.15262</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.476029</td>
<td>15.10457</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>10.93357</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>8.105453</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.000000</td>
<td></td>
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</tbody>
</table>

The test results shown in Table 3 indicate that the overall results produced by the analysis are significant however the individual examination of the variables shows that while connection between innovation performance of the countries and economic and social globalization are significant and have a positive relationship with the dependent variable political globalization is found to be insignificant and have a negative relation. Finally reliability of the results have been tested.

Table 4. Correlation and Heteroskedasticity Tests

<p>| | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Wooldridge Test for Autocorrelation</td>
<td>F(1,92)</td>
<td>0.0418</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prob &gt; F</td>
<td>0.5194</td>
<td></td>
</tr>
<tr>
<td>Modified Wald Test for Heteroskedasticity</td>
<td>Wald chi2(93)</td>
<td>115</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prob &gt; chi2</td>
<td>0.0607</td>
<td></td>
</tr>
</tbody>
</table>

Wooldridge Test for Autocorrelation and Modified Wald Test for Heteroskedasticity are performed respectively to check variance and autocorrelation problems. The tests rejected both heteroskedasticity and autocorrelation problems and proved that the results produced by the study are reliable.

6. Conclusion

Globalization term is explained with the developments such as deployment of local and nationalistic perspectives to a broader outlook of an interconnected and interdependent world with free transfer of capital, goods, and services across national frontiers. It includes development of economic social and political relations between the countries, better recognition of the beliefs and expectations of different societies and cultures and interrelated issues such as the intensification of international relations.

Globalization is not a new issue; some researchers take 1960s or 1980s as the starting date for the globalization and some goes to even earlier times. Although the beginning date of the subject is
controversial it is clear that its use increased enormously covering many fields of study including economic, social and political ones which also form the dimensions of globalization. Either social, political or economic, innovation is widely accepted to be at the centre of the growth of output and productivity and it is clear that globalization has increased access to information and new markets for firms and this process resulted in greater international competition and in new organisational forms in order to manage global supply chains.

Although it is generally accepted that there is a strong relationship between innovation and globalization the global figures of innovation and globalization shown in this study don’t present a similar result. In this regards a more detailed analysis is including the dimension level globalization indexes considered necessary. In this framework this study investigates the relationship between globalization and innovation performance of the countries. In the empirical part of the study innovation and globalization data of 93 countries covering 2007-2014 period are used. The results of test used in the study exhibit that while connection between innovation performance of the countries and economic and social globalization are significant and have a positive relationship with the dependent variable political globalization is found to be insignificant and have a negative relation.

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