THE ROLE OF NATIONAL INNOVATION SYSTEMS ON FDI: A LONGITUDINAL DATA ANALYSIS ON DUNNING'S INVESTMENT DEVELOPMENT PATH

by

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ABSTRACT OF THE DISSERTATION

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The aim of this dissertation is to examine the role of National Innovation Systems on the international investment patterns of the countries from different levels of development. Dunning's Investment Development Path (IDP), a country level application of the Eclectic Paradigm of international production, is used as the basis of the study.

The empirical analysis covers 75 countries with thirty years' time span from 1985 to 2014. In measurement of National Innovations Systems, explanatory factor analysis method for 15 indicators is used and four factors are identified. The fixed effects longitudinal data analysis is applied to test interaction of these factors with the Net Outward Investment positions of the countries. The effects of factors of National Innovation System on the location and ownership advantages for the countries in different development stages are discussed.

The findings of the study indicates that regardless of the countries' development level, innovation systems are shown to have particular importance to attract inward direct investment. In addition, institutions and policy are key to push outward FDI for the developed countries.

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CHAPTER 1: INTRODUCTION

The transformations after the Second World War toward liberalization, deregulation and market system gave rise to the internationalization of the firms, but nothing could be more significant for the globalization of markets than the advances in communication, transportation and technologies boosted in the last two decades. In recent globalization era, the number of the countries and regions benefiting from the advantages of internationalization has expanded sharply. As a result, the stocks and flows of the Foreign Direct Investment have reached very high levels in all around the world both in developed and developing countries. According to UNCTAD reports (2014), global FDI flows has risen to $1.6 trillion in 2014 and turned back the record levels before the global crisis in 2007-8. During this time, developing countries began to maintain their lead in FDI shares. The share of FDI flows into developing countries reached 54% of global inflows, which emphasizes the striking role, and the importance of the emerging economies for hosting FDI in recent years.

What makes some developing countries more attractive for FDI? What's the role of the host country government's policies in this trend? Can FDI explain the rapid growth rates in those countries? Does the role of the developed countries remain same, while competition at the global level is now much intense? These are some of the questions raised in the last two decades by scholars focusing on development and the foreign investment and they begin to adopt a more comprehensive approach across countries. In this regard, Dunning's Investment Development Path Theory (IDP) has been introduced

in the late 1980s. It is an integrated model to examine the interrelation between the foreign investment and the country level development through Eclectic Paradigm framework of the International Business. Since then, there have been several applications of the IDP theory that proved the strength of the theory. But the main findings from the recent empirical applications is the idiosyncratic nature of the curve which stems from the countries' peculiar characteristics in terms of policies, institutions, geography and politics. Furthermore, the need for further research that effects the position of the NOI curve is emphasized in the empirical literature.

In the field of economics, new growth theorists have focused on technology and innovation as the driving force of development. It has been emphasized that countries that fail to develop appropriate technological capabilities cannot succeed technological catching up and the development (Fagerberg, 2008). In this regard, "innovations systems" approach, which has been conceptualized by Lundvall (1992) and Nelson (1993), focuses on these aspects of policy in relation to the development. But the conceptual and empirical work in this area is often scarce and the instrumental use of the concept within the business theories is very limited.

In this regard, the main determinant in our cross-country IDP model is the "National Innovations Systems" (NIS) of the countries and we will identify NIS through explanatory factor analysis of 18 relevant national indicators of the countries.
Thus, in this research our main contribution is to provide relevant explanation for the cross- country IDP differences from an innovation policy perspective. Drawing on the

dynamic aspects of the OLI configurations the study aims to analyze the role of national innovation systems on net outward investment across the countries in different stages of the IDP.

These are the kind of the questions that the dissertation seeks to answer. In particular, it has following objectives;

i. Using the concept of investment development path to show cross-country interaction of investment and development over broad time period from 1985 to 2014, and to expand the analysis for 75 countries around the world.
ii. Using the Eclectic Paradigm, to depict changing configuration of the OLI advantages of the countries.
iii. Using wide variety of constructs, to introduce a broader concept of National Innovation Systems (NIS). In doing so, it introduces a capability approach to the existing National Innovation Systems literature through factor analysis methods.
iv. Using capabilities approach to the NIS, to identify the interaction between NIS and countries' Net Outward Investments. In particular, the dissertation aims to identify how distinctive capabilities might possibly change the IDP, and how the factors affecting OLI can be distinguished. In doing so, this study uses a longitudinal data and a fixed effect analysis to test proposed hypotheses.

In this research our main contribution is to provide relevant explanation for the cross-country IDP differences through,

- expanding the time span of the analysis.
- covering a large set of countries across the world that include several unvisited nations.
- using a fixed effect panel data method for IDP models
- introducing first time, national innovation system (NIS) factors to the model.
- expanding measurement of NIS to include capabilities approach.
- suggesting a new understanding on the roles of innovation policy and institutions on FDI levels of the countries.

Chapter 2 explains the recent context in which global economy operates and the changing perspectives of economists on innovation and growth. Secondly, in the chapter a summary of the Eclectic Paradigm, the basic IB framework that this study based on, and its country-level dynamic application, the so-called "the Investment-Development Path (IDP)" concept are presented. Related literature review depicts how the theory is applied in various contexts and how it is evolved over time absorbing the idiosyncratic conditions of the countries.

Chapter 3 describes the concept of National Innovation Systems. The discussion on the concept shows how understanding from governments' innovation policy shifted away from a narrow stand point of direct involvement to the innovation to a broader

concept that includes a complex system of institutions, infrastructure, human resources and the policy. Using this concept, in the last section of the chapter the determinants of the national innovation system of the countries are discussed and the literature for different capabilities related to the system are identified.

By making use of the capabilities approach of the NIS, chapter 4 develops new hypotheses on IDP curve. The hypotheses try to link the innovative capabilities of the countries to the future FDI levels of these countries.

In chapter 5, sample data and methodology are explained and results on panel data analysis are presented. Findings are discussed in the light of the theoretical foundations developed in the second and third chapters.

Conclusion section summarizes main contributions of the dissertation with its limitations and discusses future research directions.

CHAPTER 2: THEORETICAL FOUNDATIONS ON ENDOGENOUS GROWTH AND FDI

New Theories of Growth and Technology Relationship

As the era of globalization increased the level of competitiveness across the world, the studies on competitiveness has increasingly emphasized on the role of innovation. In the efforts to understand wide disparities in income levels among the nations, technological differences become a major part of the analysis. Apparently, recognition of the technology as a mean of the growth and appreciation of the innovation for competition might have a long history in research but no one can claim that technology has ever given enough respect as the source of growth in traditional economic theories up to this time.

The relationship between technology and growth needs a complex and integrated analysis. However, traditional growth theorists has treated technology as an external factor to growth and sought the role of price-based factors to the competition such as growth in exchange rates, costs and so on.

The classical economists in the early 19th century were not so optimistic about the economic growth and were dealing with cycles for population growth and food shortages (Thomas Malthus) or the expansion of production (Adam Smith and David Ricardo) for a sustainable growth theory. In the 20th century, neoclassical economists defined factors of production as the engines of growth (Maurseth, 2001). But, the empirical works of Robert Solow in the 1950s demonstrated that the growth theory of the neoclassical model based on the level of capital and labor inputs has a huge missing part

to explain growth rates in US per capita income in the second half of the 20th century. He defined this unexplained missing portion of the growth as "Solow Residual" (Solow, 1956). According to him, the mystery of growth lays behind this residual portion that he attempted to explain it as technological change and the improvements in production processes. The model, which is known as “exogenous growth theory”, treated technology as a public good and the production of knowledge is not included.

The decades after Solow, growth theorists focused on technological change in addition to the capital and labor accumulation. In the 1960s, studies focused on extensions of Solow model, only a few studies adopted Schumpeterian approach to the growth in which growth is seen as a function of innovation cycles (Fagerberg, 1994). In all of these studies, technological change was treated as an outsider for the market system. Technological change was assumed to be exogenous to the economic growth as if it was occurred in an abstract isolated world. Indeed, labeling technological change as the residual is a sign to see how little Solow and his followers knew about the relationship between technology and economic growth.

In the application of the Solovian theory, as a result of explaining growth through capital and labor, it is predicted that over time there will be convergence of per capita income across the nations. However, the data proved just the opposite that over time the gap across nations persisted or the divergence became sharper. Capital accumulated in capital-abundant areas and labor moved towards highly populated urban areas. Due to the abnormality in the international data, growth theorists put more attention on residual side of the story and New Growth Theory emerged to resolve problems regarding the unexplained components of the theory. The New Growth Theory attempted to explain the

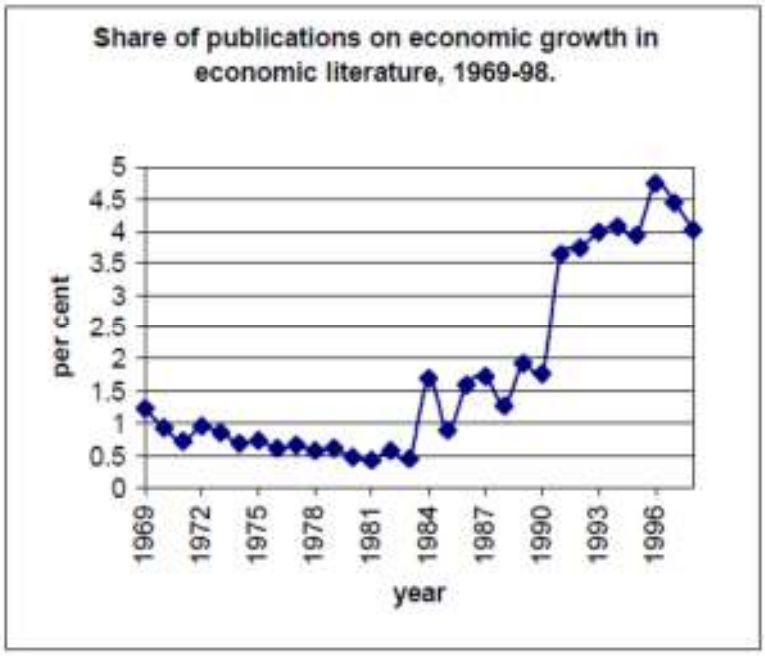
role of technology for growth within the model 'endogenously' rather that assuming it as an unexplained residual.

Early attempts to endogenize technological change as a source of growth can be traced back to Schmookler (Fagerberg, 2007). He first time argued bidirectional causality of technology to growth. Haavelmo in 1960 first time analyzed education level of society as related to the physical capital investment level of the country. Kaldor and Mirrles in 1962 and Arrow in1962 subsequently added know-how and learning by doing concepts to the endogenous technological change. Yet these first attempts remained limited in the 1960s and 70s (Maurseth, 2001).

In the 1980s, Romer (1986) and Lucas (1988), the leading figures of the theory, attempted to endogenize knowledge and focused on treatment of production of knowledge as an intentional outcome of the investments, not as an externality. Both argued that there should be some additional in the economic growth that would make already-productive economies even more productive. This additional element is defined as technology or human capital or knowledge. In his Nobel-winner article Romer said: “The main conclusions are that the stock of human capital determines the rate of growth that too little human capital devoted to research and very little increase in international trade will increase growth rate.” (Romer, 1988) Thus, endogenous growth economists believe that improvements in productivity can be linked to a faster pace of innovation and extra investment in human capital. Investment into human capital such as education and training of the workforce has started to be seen as an essential factor of growth. Therefore, the governments and private sector institutions that support innovation, the

expansion of education and individuals with innovative ideas as well as physical technological development has become more crucial.

Figure 1: The Share of publications on economic growth



Source: Maurseth (2001)

With the rise of the endogenous growth theory and introduction of the technology into the models, as seen in Figure 1, academic interest into the growth has increased. This was also a result of the changing global environment. While theory was evolving with the contributions of the several economists, at the same time the international context for the national economies was changing. The liberalization of trade and investment regimes worldwide has served to sharpen competition in the regions of global competition. And recently, international competition became more knowledge based. While international rivalry has reached at a very high level, the endogenous model emphasized the potential

for *increasing return* from private investment. According to the new growth theory, when investment takes place in an economic environment with increasing returns to scale, the marginal product of capital does not decline over time to the level of the discount rate. Then the incentive to accumulate capital may persist indefinitely, and long-run growth in per capita income can be sustained (Romer, 1986) .That means private investment in R&D is potentially profitable and actually is central source of technical process. In addition, the theory described 'knowledge' as a different element from the regular economic inputs. It is particularly productive because it can be used more than once without any cost and as a public good it can be freely copied. This means that any knowledge that can cause technological change can provide high productivity while output expands and income grows. Thus, if the relatively wealthier economy is able to extract or create more knowledge, then that means for the richer economy to grow faster.

One would see the limitations of the endogenous growth theory, or in general the limitations of the growth theories in economics under the context of the integrated and interdependent global markets. In a world, in which FDI flows becomes the significant share of the world investment and Multinationals and government policies have become central to the innovation, economists were late to integrate the role of MNCs in knowledge creation and could not expand the theory to address policy and institutions. At this point, International Business as a field provided significant theories and tools to address broad complexity of the new global economy as well as the changing roles of MNEs and the governments in creation of innovation. Following section briefly explains how IB scholars contribute to expand understandings on the relationship between growth and FDI.

IB Perspectives on Endogenous Growth and FDI

In endogenous growth theory knowledge is seen key to overcome the forces of diminishing returns. The theory identified endogenous 'growth-stimulating' factors such as "R&D", human capital, learning, and knowledge spillovers. Thus, in addition to the roles of governments for knowledge creation and transmission, the firms, particularly the multinational firms, have been recognized as the prominent institutions for knowledge transfers and creation. However, the economists could not integrate the process of knowledge creation into the their models (Ozawa & Castello, 2003), in particular the role of the firm's organizational structure and strategies for R&D development and profit growth. These topics were among the main interests of the IB scholars.

According to Ozawa and Castello (2003), dynamic interaction between MNCs and government policies for technology creation and transfer for economic growth, as he calls it "MNC-cum-government driven endogenous growth" is the main IB perspective on the growth discussions. As briefly discussed in the next section, IB scholars provided rich perspectives and a vast literature on the topic, while the new growth theory literature is still lacking to address the dynamic interaction between MNCs and the host country government policies.

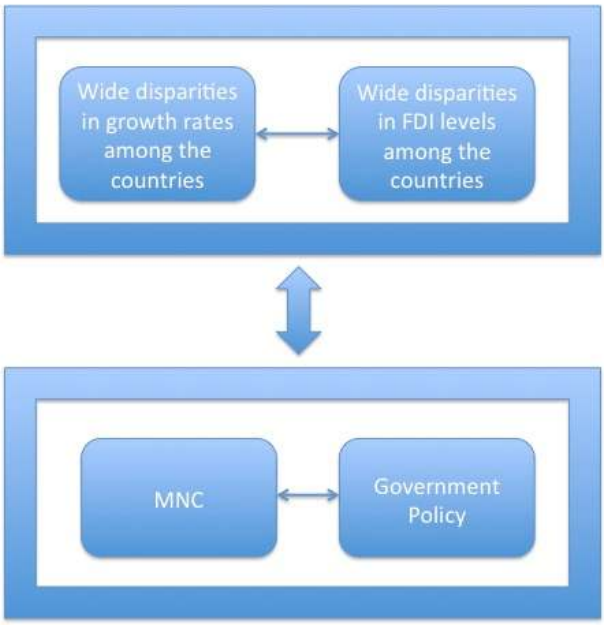
Among the following factors that offered by the endogenous growth theory as main elements of the knowledge creation,

- learning by doing
- skills of workers
- education and training (human capital formation)
- research and development
- knowledge spillovers
- infrastructure and public goods
- trade liberalization/deregularization

the first five are directly related with MNC activities. Thus, although economists some how contributed to the research on the roles of Multinational Corporations in cross-border knowledge transfer or in a separate wave of institutional economics literature, the institutional environment and infrastructure necessary for knowledge creation and diffusion discussed, the relationship of MNEs and the governments as depicted in Figure 2 is not well-addressed. In the mainstream economic approach, Barro's infrastructure and public good goods approach and Rivera-Batiz and Romers' trade liberalization and deregulation (1991) implies the roles of the governments in economic growth. However, limited studies could expand to the 'policy' component as well as knowledge creation efforts on the interaction between governments and the MNCs.

According to IB scholars, wide disparities among the countries in terms of their growth rates can be attributed to the key institutions channeling governments to MNCs in order to facilitate growth. Secondly, disparities in FDI levels which a country receive or invest is also analyzed in relation to the growth as well as a part of the government-MNE collaborations. These two addresses the key links that IB scholars contributed to link between Government and the growth and FDI levels.

Figure 2: MNEs and Governments



Similarly, IB literature provides very rich perspectives in integration of policy and institutions into the endogenous growth theory. In recent years, the roles of MNCs and the host governments on local economies through knowledge transfer is linked to the notion of endogenous growth as "MNC-cum-government-driven endogenous growth". Thus, the overwhelming IB literature not only embraced the idea of endogenous growth, but goes beyond it.

As an extension, Dunning proposed Dynamic evolutionary theory of OLI (Dunning 1981; 1986; with Narula, 1993; 1996) In this theory inter-temporal and dynamic relationship between FDI and development level of a country is analyzed by GDP or GDP per capita.

On the discussions of limitations of growth, standard economy literature identifies saving gaps, deficits in capital accounts, and scarcity of skilled labor, and institutional and organizational weaknesses as main source. For these constraints, MNCs and FDI itself provide different channels to overcome. For instance, MNC's can bring capital to remove investment-saving gaps, pro-trade FDI, in the export-oriented growth countries stimulates trade-led endogenous growth. In addition, particularly in catch-up economies, through training and skill formation within the company, MNCs take role in human development process. At the institutional level, the country that wants to attract FDI would facilitate reforms more eagerly. Thus, through accelerating adaptation into the global market, FDI also contributes to the change of rule of law in the counties.

The Eclectic Paradigm: OLI

Growth economists and international economy analysts have long studied the relationship between economic development and international investment. In international business theory, Vernon's Product Life Cycle theory (PCM) focused on the relationship between Outward FDI and exports by relating the nature of the product and the development status of the country (Vernon, 1966). Vernon identified three stages for product development: new product, maturing product and standardized product. These stages of the products are associated with the country level development; respectively to the most developed countries, developed countries and developing countries.

Relying on the basis of the PCM, Hirsch in 1976 in his International Trade and Development Theory focused on the firm specific dimension of international production for revenue producing. He confined the importance of firm specific activities through

information, communication and transaction costs that would form firm's decisions in international trade and investment.

In the early 1980s, John Dunning introduced Investment Development Path Theory (IDP) within the Eclectic Paradigm (1981). Dunning and several others subsequently revised the IDP theory, but it still preserves the original idea of theory. (Dunning 1986, 1988, 1993, Dunning and Narula 1996, Duran and Ubeda 2001, 2005) The original IDP theory is based on the Eclectic paradigm of the international production theories which is one of the most important analytical framework among the recent IB theories to analyze multinationals and FDI.

The eclectic paradigm synthesized components from the market power theories (Hymer, 1960, 1976) and the transaction cost theory (Hennart 1977, 1982) of the multinational firm in its relation with the international production. Hymer in 1960 argued that FDI is a tool for the monopolists to safeguard their market power. Thus, MNCs exist to internalize externalities emerged by structural market imperfections such as government intervention and barriers to entry. Transaction cost theory on the other hand, focused on the natural market imperfections that stems from the agents in the market. Thus, internalization occurs when the market exchange rents are lower than the in-firm organization of the transactions. Dunning's theory of Eclectic Paradigm incorporated the studies of market power and Transaction cost theories and MNCs are explained by a comparative efficiency analysis of the firms and the markets when engaged to the international transactions. Thus, as a synthesis, the Eclectic Paradigm (EP) is one of the

pioneering explanations for the growth of multinational activity over the past two decades. In general, EP is a framework "for analyzing the determinants of international production rather than a predictive theory of the MNC" (Dunning, 2003). It provides an analytical and comparative tool to identify the relationships in the different levels of analysis and different theories within the international business (Cantwell and Narula, 2001). The most distinguishable feature of the paradigm is its dynamic and flexible nature to be adapted changing global environment.

The eclectic paradigm, or the OLI (Ownership-Location-Internationalization) explains the existing of the multinationals and the FDI through the satisfactory conditions, These conditions are unique configurations of three sets of forces in different time and geographies; namely interactions of the firm specific advantages (ownership advantages), the host country specific advantages (location advantages) and the role of imperfect external market conditions that makes internationalization an advantage for the firms.

OLI is a holistic approach to understand the existence and the growth of the MNEs, but at the same time it is time and context-specific. Its generality and limitations to explain specific types of the international production and firm strategies also addressed by Dunning himself. It is argued that the applicability of EP depends on the context, the level of analysis; region, country, industry, firm; the type of the activities, or the motivations for the FDI (Dunning, 2001).

Ownership Advantages

Ownership advantages that sometimes called as 'competitive' or 'monopolistic advantages' are essential for the investing firms to compete and take advantage of domestic firms when investing in an unfamiliar environment.

Two types of ownership advantages can be distinguished.

- *Firm-specific Ownership advantages* arise from the intangible assets of the firms such as patents/ intellectual property. The firms can absorb these intangible advantages from abroad through accessing knowledge of new firms and markets, new resources and to broader human capital. Ownership of ability to control and coordinate cross border activities and exploitation of the new technologies are among the firm specific ownership advantages.
- *Location-related Ownership advantages* arise from the supporting systems and networks of the home country. In early stages, the generation of the ownership advantages is more nested with location advantages. Intra multinational networking would exceed the role of location specific advantages in large multinationals of advanced economies.

According to Dunning (1995) outward investment of a firm might be a decision to acquire ownership advantages as well as exploitation of it. So, the multinationals can generate created assets through internally but also through alliances with foreign companies. Strategic asset or capability seeking FDI also exemplifies shift from exploiting O-advantages to the managing O assets. O-advantage does not arise only from

links between MNE and the domestic firms in the host country but also with other MNCs in the location. Also critical in understanding the dynamic nature of ownership advantage through exploration.

Institutional ownership advantages which are related with the institutional infrastructure of a country such as 'formal and informal incentive structures and enforcement mechanisms.' (Eden and Dai, 2010) Thus, there are imprints of environment and location attributes that affects the development of the ownership advantages.

Location Advantages

Location specific advantages are critical in investment decision, that host country conditions would make foreign investment more desirable or less attractive. If there were no relative advantages of potential host country over home country, then it would be normal for the firms not to engage in international investment activities.
MNEs will invest abroad if they believe the combination of their home country specific factors with at least some foreign country-specific immobile factors creates benefit for their company. Geopolitical factors, factor endowments and availability, government interventions in resource allocations, patent system, tax, innovation and exchange rate policies are some of the factors that a firm would consider before their location decision for their investments.

Internalization Advantages

Internationalization advantages explain how transactions costs and externalities make internalizing the activities important in the case of imperfection of the markets (Coase, 1937). It arises when a coordinated integrated firm's cost and returns of

management of cross border activities are greater than the costs of other complex networks such as licensing.

The Dynamic Nature of the OLI Model

The globalization and the increased interdependence of the global economy have intensified the interactive dynamics among the O-L-I factors, at every levels of analysis. While the global society is increasingly knowledge-based, the value of intangible assets of the firms and its continual augmentation became more critical. Thus, greater cross-border competition requires stronger interaction and complex interdependence in between ownership and location advantages. In addition, globalization affected the organizational structure of the MNCs in their cross-border operations.

Recognizing the role of the strategy and the institutional theory, Dunning revised his framework and pointed out the dynamic nature of the model. He argues a continuous and iterative interplay between OLI configurations over time. The model includes the effects of the current OLI configuration on the other factors such as firm strategies, the changing institutional, organizational, technological policies and so on from one period to a successive time period. The way in which exogenous and endogenous variables interact is an important factor determining the movement toward a new OLI configuration as formulized in the following model.

$$OLI_{t1} = f(OLI_{t0} \Delta EN_{t0 \to t1} \Delta EX_{t0 \to t1})$$

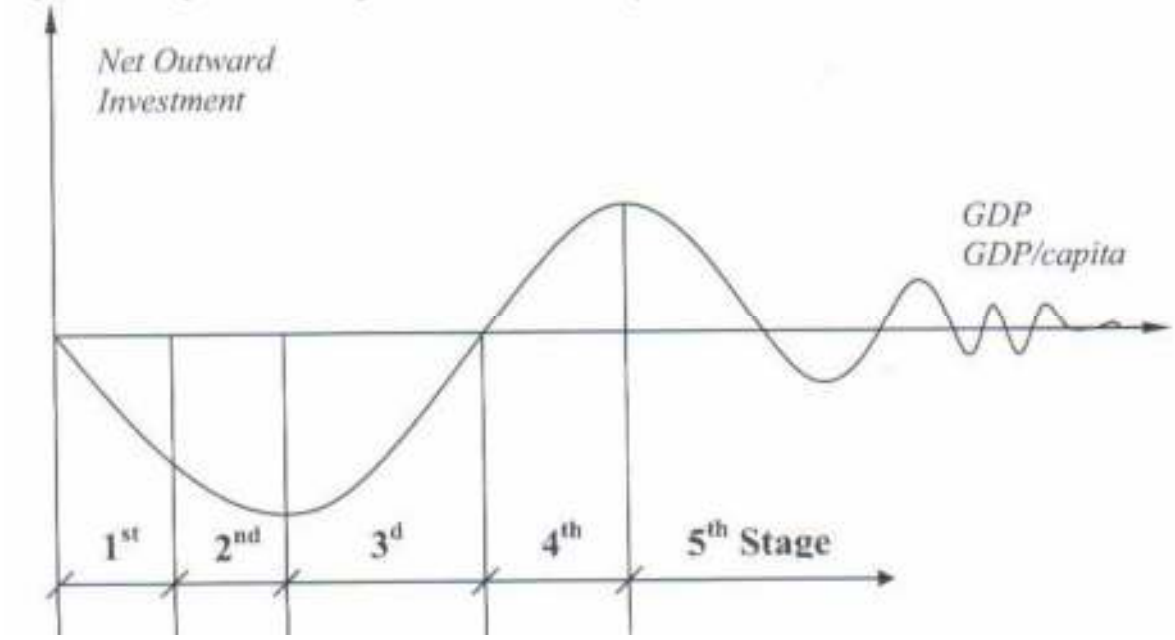
The endogenous factors can be exemplified as firms' strategic responses, changes in composition of senior management, increases in labor productivity, new marketing techniques, Technological and Organizational Innovations. The exogenous factors are similar to the change in populations, raw material prices and exchange rates or national government policies, or actions of international agents and so on.

This model also provides evidence to comprehend the concept "MNC-cum-government driven endogenous growth" which is offered by Ozawa. The term's emphasis on the cooperation of the governments and multinationals for growth can be analyzed from the shift from initial configuration of the OLI to its subsequent positions. For the L-advantage and location-specific ownership advantages, local governments take significant roles. Beyond the inputs such as labor (population) and natural resources, human capital and industrial infrastructure and incentive structures are all expected to be developed by the host country governments. Similarly rule of law in the market and the competitiveness and overall general macro-economic environment are all related to the host government policies (Ozawa and Castello, 2003). The research in this study is based on the dynamic interplay OLI model with a focus on the interaction between government policies and the MNE.

Theory of Investment Development Path: A Country Level Application of the Eclectic Paradigm

Investment Development Path (Dunning, 1981), a dynamic combination of the OLI (Eclectic Paradigm), is a holistic approach to understand national development and FDI together. The theory links foreign direct investment to the country level development in the basis of the investment related expansions in the OLI structures within the host country firms. According to Dunning the difference between inward and outward foreign direct investment (Net Outward Investment) position is a function of country's level of development. Thus, in a dynamic approach the countries follow five stages of development.

Figure 3: Stages of Development in IDP Theory



Source: Dunning and Narula (1996)

Stage 1

In the first stage of development, in a country Net Outward Investment is around zero because of the absence of both inward and outward investment. Insufficient location advantages do not attract foreign investment into the country in addition to the absence of local firms with ownership advantage to invest abroad. Only natural-resource-seeking inward FDI can be observed in these economies.

The deficiency of the L-advantage reveals poor demand conditions, unfavorable economic and market conditions, insufficient infrastructure, transportation and communication capacity for the country. Thus, during stage 1, governments should provide basic infrastructure and schooling and training for human development. In addition, governments should focus on development of the markets through reforms for elimination of barriers and protectionist policies. Thus, it can be concluded that from in upgrading from stage one to stage two, creation of government-driven location advantages are very critical.

Stage 2

At the second stage, a greater growth of inward FDI compared to the GDP growth can be observed with the existence of standard location advantages such as cheap labor, natural resources (L). However, the domestic firms are still in the lack of country-specific ownership advantages (O) resulting in a negligible level of outward FDI. Thus, NOI position is increasingly negative in this level of development.

In stage 2, local markets grow both in size and demand. Foreign firms contribute to the local production initially to the production of the natural resources and primary commodities with labor-intensive sectors. Once transportation, communication and the skills in the labor force expands, so do the location-advantage that the host country might offer, foreign firms start to invest other export-oriented industries that require higher skill and technological capabilities.

Through technological accumulation, during this stage, ownership advantages of the local firms will also rise. The ability of the host government to provide infrastructure and incentives for the generation of the O-advantage and the exploitation capability of the local firms to benefit from the support industries around will create a vicious cycle of technological accumulation.

For the local firms at this stage, the role of home country governments go beyond support development of the market through infrastructure and inward FDI attraction to support local firms in their first moves to the cross-border activities. Government can provide 'push' factors (Dunning, 1993) for OFDI decisions particularly at the latter parts of the stage.

Stage 3

Third stage countries experience the decrease in the rate of growth of inward FDI while the country cannot sustain location advantages in labor-intensive sectors. But, at the same time, asset-creating location advantages began to be created. Thus, domestic firms that are owner of the capital and knowledge to invest abroad provide higher growth

of ownership advantages. In result, the rate of negative NOI slows down. In these countries, we observe still negative but increasing NOI.

The location advantages improve while the technological capability of the country and the demand in the consumer market reach higher levels. Local and the foreign firms in the country produce higher quality products and standardized goods and can compete in the global market with a comparative advantage in labor-intensive sectors. Education and training activities expands all around the country with the effects of scale economies, technological accumulation and the experience curve, local firms became more competitive and generate more O-advantage with possession of the intangible knowledge. Growing innovative capacity would also stimulate L-advantages.

Starting from this stage, government driven action in generation of the local firms' O-advantage shifts from a direct support for the infrastructure or basic education towards more complex and cooperative process in between governments and the firms. For the firms O-advantages needs to be expanded in more techno-intensive sectors, and governments incentives for a coordinated knowledge creation and asset-seeking investment strategies of the firms are both increasingly important.

Stage 4

The main characteristic of the fourth stage is the increase in the rate of growth of outward FDI as a result of the significance of the firm-specific ownership advantages of the domestic firms. In this stage countries generic location advantages disappears while

the entire location advantages are based on asset-creation. Thus, outward FDI level is superior over the inward FDI level and a positive NOI is expected.

At this stage, capital-intensive production techniques and skilled labor describe the nature of the market with a strong demand structure. Thus, the country attracts market and asset-seeking IFDI, while the local firms are competitive in the global market that increasingly prefers to internalize their production. As a result, the government takes the role to maintain competition, to manage adjustment of resources and technological accumulation and promote virtuous cycles for strategic sectors within the market.

Stage 5

At the fifth stage in which we observe the most developed countries, theoretically an unstable equilibrium around zero is expected. Once the countries converged to a competitive advantage level, there would be evenly balanced investment level for these countries. In other words, the relationship between investment and development is no longer significant at this level, countries' ability to attract more FDI or their local firms' success in cross border activities depend more on their efficiency in organization and management of the asset creation.

Dunning (1993) argues that with the globalized firms at this level nationalities are so significant and MNEs from those leading advanced countries are no longer operates for their home country. Through fast internalization, MNEs have multiple locations for their operations, for asset creation and exploitation. Thus, location attractiveness of the

fifth stage countries depend more on the firm's own created assets and capabilities, since country specific characteristics are more or less similar.

Table 1: Stages in IDP

1st Stage: NOI= 0 negligible
• Insufficient locational advantages – Limited domestic market (low per capita income) – Unskilled workforce – Inappropriate infrastructure – Political and economic instability • Almost no country specific ownership advantage.
2nd Stage: NOI= Increasingly Negative
• As country develops, locational advantage improves and inflow of FDI increases, while OFDI remains low. • IFDI: primary commodities, labor-intensive industries • Through foreign investment, construction of more and better infrastructure • Creation or Upgrade of Local firm's Ownership Adv; – Training of local work – Emergence of national industries – Increased integration of local firms in MNE's production chain. → Learning-by-doing, know-how transmission – OFDI, mostly market-seeking
3rd Stage: NOI= Negative, but growing
• Increased rate of growth of OFDI and a gradual slowdown in IFDI→ Growing NOI position • O :Diffusion of the O-adv of the foreign firms into the local industries. • Acceleration of industrialization and demand • Higher competition in local market • L-adv: need incentives to attract in activities where local companies do not have competitive adv.
4th Stage: NOI= Positive
• OFDI Stocks exceed IFDI stocks • Local firms' O-adv: compete with foreign firms locally and start to compete globally. (Efficiency-seeking FDI & Strategic-asset seeking FDI) • Traditional L-adv diminishes, created-asset based would start to increase.
5th Stage: NOI= unstable eqm. around 0
• The most advanced countries: USA, Japan, UK • High levels of IFDI and OFDI, NOI fluctuates around zero • FDI depends more on localization strategies of the MNEs. Internalization of the transaction costs inside the multinationals. • Duran & Ubeda (2001, 2005) – Ireland & New Zealand – 4th→5th Stage: knowledge-intensiveness

Empirical Literature for IDP

Early works on IDP focused on testing the theory empirically. Thus, Several empirical estimations using the theory have been carried out to analyze if the relationship between investment and the development can be confirmed and if so, what stages can be validated for the sample countries. Dunning himself also analyzed his theory for several countries from 1967 to 1978 (Dunning, 1986) A summary of the empirical estimations are given in the Table 2 below.

The studies found strong evidence to support the theory but also the limitations of the theories are argued (Iacovoiu, Panait, 2014). Tolentino (1993) emphasizing macroeconomic structural changes of the countries argues the necessity of the revision of the theory. The change in the shape of the IDP curve since 1980s has also been discussed while in some studies J-shaped curve inverted to L-shaped one in empirical findings (Narula, 1996). According to Narula, these findings stems from the use of investment flows instead of the stock data. His work on developing countries from1975 to 1988 confirms the J-shape of the Net Outward Investment curve. Problems related to the NOI as an indicator are solved Duran and Ubeda (2001) by using separate analysis of OFDI and IFDI.

Table 2: IDP: Literature Review

IDP Estimation Chronology Table		
Year	**Author(s)**	**Details**
1986	Dunning	25 countries
1989	Pichl	18 countries
1993	Narula	6 countries
1993	Narula	Japan-US
1993	Tolentino	30 countries
1994	Dunning, Narula	US-Japan
1996	Dunning, Narula	88 countries
1996	Narula	40 countries
1996	Ozawa	Japan
1996	Zhang, Van den Bulke	China
1997	Dunning, Hoesel, Narula	Korea, Taiwan
1998	Buckley, Castro	Portugal
1998	Yeung	Malaysia, Singapore
2000	Bellak	Austria
2000	Twomey	Canada
2001	Dunning et al.	Korea, Taiwan
2001	Duran, Ubeda	74 countries
2003	Barry, Gorg & McDowell	Ireland-US
2004	Boudier-Bensebaa	CIS & CEE
2004	Bevan, Estrin, Meyer	Transition economies
2004	Castro	Portugal
2005	Scott-Kennel, Enderwick	Theoretical
2006	Vavilov	44 countries
2007	Gorynia, Nowak, Wolniak	Poland
2007	Galan, Gonzalez, Zuniga	Spain
2007	Fonseca, Mendonca, Passos	Portugal
2008	Sathye	India
2009	Dong, Haijian, Xiaoming	China
2009	Kayam, Hisarciklilar	16 countries
2010	Kun	China
2010	Narula, Guimon	Eastern Europe
2011	Stoian	CEE
2014	Iacovoiu, Panait	EU
2014	Liu, Buck, Yu	Japan, Korea, China

After the early applications of the theory, in 1990s the idiosyncratic nature of countries began to be argued by the authors. (Dunning and Narula, 1996; Ozawa, 1996) For instance, with regard to the market size, it has been argued that time-series analysis of the small countries did not yield significant relationship between the variables or the significance of inward FDI should be analyzed separately in a small market economies. (Ozawa, 1996, Buckley and Castro, 1999) Vavilov (2006) empirically tested that there is less support for IDP theory in natural-resource rich countries conflicting with the results of the energy importer countries. Thus, an industry level IDP estimation argued as critical.

In the midst of the era of rapid globalization that increased the role of the FDI in all around the world, the IDP framework has been applied to several new emerging markets in recent years. New market economies in Europe and Central Asia (CEE, CIS) and recently the fast growing East Asian countries China, India, Korea are examined in terms of their development foreign investment relationship. (Table 2)

New stream of studies and their findings underlined the necessity of the revision of the theory (Dunning and Narula, 1996) particularly in confirmation of the IDP's idiosyncratic nature. In addition, it is also argued that the IDP theory lacks to realize industry specific analysis in which each country has specific features that moderates the interactions of FDI and the investment. Likewise, GDP per capita is not a sufficient indicator for economic development and country-specific idiosyncratic elements as well as new variables need to be added to the model.

Along with the 'revised' IDP theory, the idiosyncratic nature of the countries is accepted widely when IDP framework has been applied. It is important to recognize that each country has its own peculiar IDP reflecting their macroeconomic, institutional and political economic disparities. The lack of institutional differences, the changes towards deregulations, government policies towards foreign investment, market size, population, natural resource endowments, human capital level are all exogenously determines the idiosyncratic IDP of the countries.

Finally, in the literature the problems related with the econometric model often discussed. Not a single model is adopted in the hypothesis testing. Cross-sectional analysis widely used in application which gives rise to the heteroscedasticity problems. In addition, the model lost its dynamic nature when applied for a single year. Likewise, time series analyses were limited to provide a country level assessment at the global scale. The model to be used in this study, the panel data, is only used in one previous work by Fonseca. (2007)

Concluding Remarks

In this chapter, we have discussed how development, FDI and technology are related in economic and international business theories. The emergence of the endogenous growth theory provided important justifications for policy focusing on high technology. Similarly, the eclectic paradigm, particularly its country level implication IDP theory, explains how countries expand their location advantages over time to attract FDI while local firms generates firm-specific advantages to be more competitive.

The main implication of the endogenous growth theory is its embracement of growth-inducing policies such as openness, competition and innovation. When endogenous growth theory respected technology as an endogenous component, in the policy area its reflection has seen in more systematic innovation policies. Likewise, as suggested by the temporal and dynamic OLI model, innovation policy is one of the significant endogenous factors affecting the change in the existing OLI configuration of a country.

Following chapter focuses on the national innovation policies and their measurement in order to see their effects on the IDP model.

CHAPTER 3: THEORETICAL FOUNDATIONS ON NATIONAL INNOVATION SYSTEMS

Increasingly interconnectedness of the world in the 21st century expanded the scale of competition and improved the prominence of the knowledge and research, and innovative power of the world economies. While the knowledge intensive economies became the source of global competitiveness, the focus on government and innovation relationship also intensified. In this context this chapter explores changing understanding for innovation policies and will use a model based on capability approach to the broad definition of the national innovation systems.

The Origins of National Innovation System (NIS) Approach

Since the Industrial Revolution at the end of the 19th century technology has always been recognized as a driver for development at the country-level analysis. Particularly, the rivalry between countries before and after the World Wars made governments to be involved in technology development. During this time, economists developed 'The Theory of Market Failure' and also appreciated direct involvement of governments in basic science. In this perspective, basic science should be supported through public subsidy. According to market failure approach, although firms are principals in market economies, a competitive market will invest less than the optimum in basic research. (Nelson, 1959) Similarly, welfare economists pointed out the lack of Pareto optimal conditions for a sufficient resource allocation for research. To this argument, social returns from investing in basic research are significant and higher than

private returns of the same activity. The reason behind the argument lies in uncertainties related to basic research. A profit-seeking firm can never be sure of capturing all the benefits of its sponsorship due to the environmental factors that affect its ability to capture all profits created by an innovation. (Appropriability problem) In addition, there is always a risk from imitators' side to gain more by investing less. Having considered that firms are risk-averse and take short-term decisions for their resource allocation, they would not invest sufficient resources for the technology development. In other words, market incentives for research investment are insufficient. (Rosenberg, 1990)

In the 1950s and the 60s, the proponent of the Linear model of innovation argued a progressive approach that basic science is the main source of new ideas and innovation output can be obtained by large investments in R& D among the industrialized countries.

All these arguments were the basis for the belief that market equilibriums fail to provide sufficient funds for basic science. Thus, scientific research should be supported through public subsidy. As a result of this common perspective, government direct funding on R&D was so significant throughout the first half of the 20th century. On the other hand, in real world the recent story has been realized differently. Since the mid-1960s, it is observed that civilian R&D has grown rapidly in the industrialized area, both in real terms and as a percentage of GDP. In addition, the notion of strategic organizations of the firms opened new roads for the economies.

On the other hand, Schumpeterian criticism to the linear model underlines the belief that innovation is the “economic application of a new idea” The creation of innovation

depends on how the knowledge and the learning process are managed. So, the innovativeness of a national economy cannot be explained by linear model and found dependent more on the capabilities of a firm or a nation to make use of knowledge instead of introduction of radical innovation and high R&D investments into basic science. According to Cantwell (1999), the problem for creating technology development is not market failure for the knowledge and skills created by R&D, but a lack of the tacit capability that is needed to exploit such knowledge. In other words market failure would not be a relevant argument for the firms that are capable of exploiting the returns from the R&D investment. Recent opportunities in cross-border activities justify the new perspective for the significance of firm level innovation in the global economy.

Thus, in the late 1980s, the innovation system approach became increasingly popular. The ultra national institutions such as World Bank, UNCTAD, EU, OECD all adopted the broad definition of the innovation system approach in their analysis. Opposing to the neoclassical paradigm, innovation system approach argues the tacit component of the innovation that knowledge, which is critical for innovation and results in national growth, is localized and cannot be transferred easily.

As we discussed in previous section, New Growth Theory also provided theoretical justification for the new understanding for private sector's involvement in innovation. The theory argued the existence of potential increasing returns from higher levels of capital investment that would provide private firm to gain from innovative investment.

According to Romer, “Growth in this model is driven by technological change that arises from international investment decisions made by profit-maximizing agents.” (Romer, 1988) From a micro-level perspective, knowledge has become the principal weapon in competition for profits and corporate survival. Due to the fact that modern economy is a “knowledge-based economy”, the sharply rising knowledge intensity made business strategy makers to learn more on how to attain that knowledge while governments were changing their roles. In addition, it is obvious that under the changing determinants of the international business environment, the role of the governments as a public research subsidizer has to be revised.

It is certain that with recent theoretical extensions, there is more room for private investment, but it is obvious that even in the new growth theory the role of the governments and management, organization and strategies of the private agents are neglected. Teece argues how markets and economic organizations complement each other for innovation. Managers have critical roles to play inside the organization and they can also shape the evolution of technologies and markets themselves. (Augier and Teece, 2009) and, governments can facilitate innovative activities by taking roles in the socio-economic organization for the process. To sum up, although new growth theory provides theoretical grounds for many implications of the recent innovative systems, for a better understanding of economic performance of the countries, a more complete understanding of the role of management and entrepreneurship in enterprise performance, and of enterprise performance in economic development and growth is necessary. In this regard,

in the following section, a more detailed analysis of the national systems of innovation will be discussed.

Towards a broader Perspective for the National Innovation Systems

The discussions on national innovation systems can be seen in the lights of the theories that put knowledge into the production recipe and describe it through an environmental context in which the firms are embedded.

The narrow definition of the national innovation has focused on science and technology relationship and measured it through direct public investments for the basic research. However, in the last three decades, while the global market, its rules, volume, and structure have changed dramatically, correspondingly, the understandings of the national system of innovations and the roles of governments in these systems have transformed, broadened and diversified. Thus, the main weakness of the narrow approach has been seen in its limitation to explain varieties of innovation across sectors, countries, firms and their institutions. (Cantwell,1999) For instance, at the institutional level, each country has variety of capabilities, different levels of technological capability accumulation that affect their patterns of in NIS. But, the linear model of innovation that involves direct government involvement to the innovative activities are not enough to address such diversities. In other words, when the countries differ in their technological capital accumulation, absorptive capabilities, infrastructure and institutions, their

capabilities for generation of location and firm-specific advantages also differ. But, the conventional definition for the innovation lacks evaluates such progresses.

Knowledge and Spillovers

The advances in national innovation system enable us to understand the complexity of technology creation. Technology development is a complex procedure that includes the relationships among the actors of the system such as firms, universities and government research institutes. These interactions among the technology-involved actors and institutions are keys to comprehend the innovative performance of the countries. In other words, in today's world two main characteristics of NIS are knowledge generation and transmission.

Knowledge is shared and distributed, and its transmission through learning is essential for such a society to make effective use of it. In this regard, networks and linkages that provide spillovers recently undertake significant roles in knowledge creation and diffusion. The integrated networked corporations with absorptive capacity create the necessary knowledge for competition using these channels. Thus, for our argument of the existence of a reverse relation, the key foundation actually lays at the fact that internal R&D is necessary but not sufficient for innovation. In recent years, several studies emphasized the role of ‘spillover effect' for innovation and growth. Since spillovers suggests the unintended nature of the knowledge flow from the point of view of the individual actor undertaking research, it is logical to argue the higher intensity of spillover is probably in more knowledge based and intensive innovative systems. Spillovers suggest the transfer of knowledge frequently takes the form of non-market

interaction. In fact, the more knowledge intensive an activity is, the more it depends on non-market interaction. As a result, clustering of activity, both geographically and in terms of inter-industry linkages is common in many industries, particularly in high-tech sectors such as biotechnology, electronics and computers, and software. Clustering facilitates the sharing and transfer of knowledge, competence, and skills. Thus, a well-established innovation mechanism is the driver for innovation creation especially for the developed nations where their main industries are knowledge-intensive.

It is also significant that countries with persistent growth show sectoral diversity in their production portfolio towards more capital and techno-intensive sectors. (Vertova, 1995) High intensity of knowledge within a sector/country means more spillover externalities within that country's national innovation system to be shared and collaborated by the firms located within the system. In turn, that would promote the rate of innovation positively.

Analyzing innovation within an economic system is certainly an idea firstly adopted by Schumpeter. In his studies on long-run economic and social change, he focused in particularly on the crucial role played by innovation and the factors influencing it. Schumpeter broadened the perspective from focusing only on cost reducing new machinery to include other types of innovation as well such as product innovation, organizational innovation. (Mokyr, 2003) He defined innovation as “new combinations” of new or existing knowledge, resources, equipment and so on (Schumpeter, 1934). He also pointed out the difference of innovation from invention "the original idea for a new product or process" in a way that innovation is a specific social activity carried out within the economic environment and conversed into a commercial

product, while inventions in principle can be carried out everywhere and without any intent of commercialisation. He was emphasizing the dynamic nature of the economic system instead of stationary processes of neoclassical theories.

Freeman by quoting from Schumpeter points out that innovation constantly revolutionizes the economic structure and that 'this process of creative destruction is the essential fact about capitalism' (1990, quoting from Schumpeter 1943). Freeman developed his theory in a broader direction and "multiple sources of information inputs from within and outside the innovating organization and the importance of a 'national system of innovation' as the supporting network of scientific and technical institutions, the infrastructure, and the social environment." (Freeman, 1990)

Recently, following the belief in 'Innovation is the basis of profit', firms are more actively involved in the innovation process. The role of the governments in the innovative performance of their country shifted to a broader capability creation such as institution and network building, and maintaining local infrastructure. In other words, in today's world two main characteristics of NIS are knowledge generation and transmission through several channels. The system helps to provide ground to the users and producers of knowledge and also enables institutional arrangements for an efficiently functioning system. In other words, the roles of governments grow out as an agent that facilitate the creation of tacit capability which is required for innovativeness. In order to compete or imitate each country must have its own tacit capability for knowledge transmission. Therefore, a well functioning government would help to lower the costs by actively joining the capability and institution building process.

Nelson conceptualized National Innovation Systems as '*a set of institutions whose interactions determine the innovative performance ... of national firms.'* (Nelson, R. (ed.), 1993) In his approach, institutions and actors of specific industries play decisive roles and create diversity of innovation approaches in different countries. To Pavitt and Patel, NIS are "the national institutions, their incentive structures and their competencies that determine the rate and direction of technological learning in a country." (Patel, P. and Pavitt, K.L.R.,1994) The national institutions refer basically to business firms, universities, public and private institutions that generate general education and vocational training. The incentive structures can be exemplified as government support for basic research, monopoly profits gained for innovation, the pressure for imitation, intellectual policy protection, and the competitiveness stems from international differences. (Nelson and Rosenberg, 1994) Finally, international technology gaps, inter-firm differences in competence are the competencies of NIS. These definitions address three main components: First, having peculiar characteristic of the national borders: 'locality'; second, historical perspective for innovation referring to the roles of individual firms and other actors: 'institutional setting of the country'; and third, having different patterns of 'learning' across nations as an extension from the first two elements. In this broader environmental perspective of innovative system of a country the central role of R &D manpower and the need for a strong technological base at national level are strongly emphasized. But, national spending on R & D relatively diminishes and government begins to contribute to instructional "capabilities" to absorb and promote innovation through maintaining local infrastructure and institution buildings, network buildings and

through joining human capital creative activities such as supporting research universities and training programs. Another function of the government might be to appeal FDI into their country in order to benefit from spill-over technology effects.

In brief, NIS analysis throughout this thesis tries to address all the main components of its broad concept and explores country-specific capabilities related to the system.

Capabilities Approach in NIS Literature

Incorporation of technology into a systematic policy analysis is not easy to to conceptualize and measure. Therefore, to address embeddedness of the process several works used 'capabilities' approaches.

Social capability, as a word introduced by Ohkawa and Rosovsky (1974) has seen as a key component for the strength of the national innovation and growth. Nations that have the capability in adapting best practice technology and economic organization are expected to have technical competence. Level of education, experience in the organization and management of the large scale enterprises, financial institutions and markets capability of mobilizing capital on a large scale and trust in business life are characteristics of the social capability. (Abramovitz, 1986) However, due to the ambiguity of these properties, measurement of social capability reduced to a form of measurement of educational attainment that is a very limited element to address the concept of the 'social capability' of Abramovitz.

At the firm level, Cohen and Levinthal (1990) argued 'absorptive capacity' to understand "knowledge creating companies" and explained it as 'ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends."

In recent years, newly industrializing countries have brought new perspectives on the dynamics of the global economy in terms of openness and advances in technological capabilities. From Korea, 'technological capability' of Linsu Kim has become popular and is used as a composite term for production capability, innovation capability and the investment capabilities of a nation. The word is conceptualized as "ability to make effective use of technological knowledge in efforts to assimilate, use, adapt and change existing technologies." (Kim, 1997)

So, the concept addressed broader perspective that the organized R&D for technology development but also exploitation capability.

These terms has emerged as the aspects of technology development and suggested and empirically analyzed in recent years in the innovation literature. Fagerberg (2007) used explanatory variables in identification of the NIS and emphasized social capabilities and the political system in addition to the innovation related indicators for a NIS. He found a big overlap in these capability related concepts and addressed the weakness of the empirical work in the area.

As discussed in the previous literature, the most significant weakness of the research on the national innovation and development related empirical work is the lack of

the appropriate data. Nevertheless, following the innovation system discussions (Lundvall, 1992; Nelson, 1993; Edquist, 1997) in recent years, the research focus and subsequently the availability and the quality of the data on national innovation have improved. Particularly for the developed countries, thanks to the wide recognition of the significance of innovation, data construction to measure innovation-related indicators is widely supported. Scholars also developed ideas to find for easiness of the measurements. Table 3 summarizes how some capabilities are defined in the literature of NIS and which indicators are suggested to measure those capabilities. These efforts for the measurement of the NIS might increase our understanding for the role of the national innovation policy differences in development and FDI.

Table 3: Capabilities and related data used in the Literature

National Innovation System	**Related Data**
Innovation Capability	• R&D Expenditure • Number of Patents Granted • Number of Articles Published • Citations • University Rankings
ICT Infrastructure	• Personal Computers • Internet users • Fixed/ Mobile phone subscribers
Production Capability (Kim, 1997)	• ISO9001
Openness	• Trade • FDI
Social Capability (education) Baumol et al.(1989)	• T/pupil ratio in primary schools • Rates of enrollment in secondary and tertiary • Number of engineers/ natural scientists
Social Capability (Abramovitz, 1986)	• Law and order • Independence of courts • Property rights • Business Regulation • Corruption • Degree of democracy • Checks and Balances in Politics • Political and civil liberties
Financial Capability (Kim, 1997)	• The amount of credit (to private sector) • Capitalization of companies listed in domestic capital market
Historical Process *For inference	• Language • Religion • Ethnic Divisions • Colonial Legacy

CHAPTER 4: HYPOTHESES DEVELOPMENT: IDP AND NIS

In this chapter, we aimed to explain our hypotheses for the effect of national innovation system on Investment Development Path. In doing so, we integrate the capability approach to NIS and make use of the changes in dynamic OLI structure of a country in the hypotheses development.

From the previous theoretical discussions, it is evident that firms engage in FDI whenever they observe that they possess certain firm-specific advantages over their competitors, which are best exploited internally from a foreign location. Once multinationals invest abroad, they would bring several advantages to the host countries such as capital, resources, employment, competitiveness and technology transfer. Therefore, for our analysis, multinationals are critical in establishment of the infrastructure and country-specific advantages for the host country. Similarly, MNEs in addition to their activities in the country would also bring institutional, cultural and innovatory aspects of their home countries and contribute to the development of the national innovation systems of the host countries. (Dunning, 1987) We will apply these arguments into our stage-by-stage analysis.

In the higher stages of development, as a result of the intense competition in the local and global market, multinationals significantly contributes to the growth the ownership advantages of the local firms of the host country. In addition, following the dynamic view of competition, competition in Eclectic Paradigm is seen as a process rather than a market structure and ownership advantages principally are accepted as competitive weapons. Thus, larger MNEs with stronger ownership advantages which is

built into the context of internalization would contribute strength into both location and ownership advantages at both industry and country level. (Dunning, 1993)

Likewise, when a country has significant preconditions such as human capital to absorb knowledge, technology and strong interaction between business sector and research institutions and universities, and strong intellectual property rights, the increase in the growth of OFDI in addition to the IFDI will be observed.

*Outward investment as an innovation policy***:**

In recent years, strategic asset seeking FDI to developed countries also used as the means of accession to knowledge and technology, and has increased dramatically in fast growing BRIC countries. (UNCTAD annual investment reports, 2010-2015) Bendersen (2008) showed how Chinese government actively encouraged strategic asset seeking OFDI into industrialized countries since year 2000 for knowledge, know-how and technology. Chinese MNEs sought merger and acquisitions in mainly R&D based locations across the world.

It is very critical to understand that the likelihood of OFDI to be a significant knowledge creative strategy is related with the preconditions of a country. What are the preconditions to better absorb innovative capacity through OFDI? The answer to this question at the country level would be related with the existing national innovation system of the countries that we will argue how strong institutional arrangements and

incentive government policies would provoke OFDI or will attract strategic asset-seeking investment into their countries.

On the other hand, OFDI from local firms would also result in change in home country institutional structure. For example, Bendersen (2008) argues in the context of China (stage 2-3) that the reformation of the political system and industrial policies in recent years is very related to the innovative role of OFDI. National innovation system capabilities approach developed in chapter 3 would provide tools to assess all these arguments related with the interaction of the host country policies and both inward and outward FDI into and from those countries.

Pool Data Analysis

Based on the capabilities identified in the literature, we developed our hypotheses for the four factors of National Innovation System. We expect all the factors; human and production capacity, macro institutional capability, innovation capability, and liberal structure to have negative impact on NOI position. In other words, we argued that for each of these four factors of NIS, the stronger the factor, higher inward FDI compared to the OFDI. The very basic argument here is we expect the overall effect of the factors of NIS on location advantage would exceed the advantages related with the ownership of the local firms. Thus, the following hypotheses are developed for all countries data.

Hypothesis 1a: In all countries data, Human and Production Capacity will have a negative impact on NOI.

Hypothesis 1b: In all countries data, Macro Institutional Capability will have a negative impact on NOI.

Hypothesis 1c: In all countries data, Innovation Capability will have a negative impact on NOI.

Hypothesis 1d: In all countries data, Liberal Structure will have a negative impact on NOI.

Stage-Segmented Data Analysis:

In our IDP Model, stages are categorized using real GNI per capita following Dunning & Narula's 1993 work, and based on World Bank *Atlas* method data (2014).

- *Stage 1*: Low-income economies are defined those with a GNI per capita of $1,045 or less in 2015 and reflects stage 1 countries in our analysis.
- *Stage 2*: Lower middle-income economies are those with a GNI per capita of more than $1,045 but less than $4,125 named as stage 2 countries in IDP curve.
- *Stage 3*: Upper middle-income countries as stage 3 in IDP curve have a GNI per capita of more than $4125 but less than $12736.
- *Stage 4*: Moderate high-income economies that we classified as stage 4 in IDP analysis are those with a GNI per capita of with a GNI per capita of more than $12735 but less than $25000.

- *Stage 5*: Finally advanced high-income countries are classified with GNI per capita $25000 or more[1].

First Stage Countries:

First stage countries are the countries with no locational and ownership advantages. The poor infrastructure and education level, unskilled labor and inadequate demand describes the market. There is very limited inward FDI for natural resource-seeking and virtually no OFDI. Any investment for human development and infrastructure would increase location attractiveness of the country. Therefore, marginal effect of NIS in generation of location advantage would be very significant in this stage.

Second Stage countries:

In this stage, domestic firms have the ability to produce low-cost, standardized products or those based on natural resources of home country. Growing presence of market seeking FDI that is attracted by labor-intensive manufacturing is the general characteristics of the inward MNE activities at this stage. Education, R&D investments and infrastructure are all limited that make the marginal effect of the national innovation system in generation of location advantages significant. In this regard, for this stage we argue that factors of NIS will have negative impact on NOI position for the second stage countries. For the second stage countries stronger innovation system means higher attractiveness for FDI through building infrastructure, human capital etc. that would lead stronger location advantage for the country and would attract more IFDI. In addition, the

[1] For fifth stage per capita income, we used 1990 USA per capita income as the base year. The countries that have reached that level are categorized as fifth stage.

speed of increase in the location advantages would surpass the increase in the ownership advantages that means relatively lower rate of growth in OFDI flows and of generation of ownership advantages.

Third Stage countries:

At this stage along with manufacturing, services sector begins to grow. Firm's investment in R&D, creativity and human capital, networking channels for spillover externalities and in turn, overall national technologic performance nurture. In addition, more sophisticated markets, increasing entrepreneurship, and increasing role of MNE networks mainly shape the location advantage of those countries. As a result, there is a mutual benefit from foreign investment into these countries from both home and host country firm's perspectives.

While the countries continue to develop, innovation activities promote general development in industries. The higher level of innovation activities and government policies for this purpose, the more inward FDI a sector attracts. The level of innovation activities reflects the level of technological progress. A higher level of investment in innovation and higher capability in absorption of the innovative activities should promote FDI across sectors. Thus, the innovation has a positive effect on both labor and capital-intensive FDI.

Integrating this argument into local firms of the third stage countries where the countries often enforce competitive markets we argue that at this stage along with the location advantages, local firm's ownership advantages expand rapidly and for the higher

innovative countries the growth of outward FDI flows would be higher than the inward flows. Our hypotheses summarize these arguments for the third stage.

Fourth Stage Countries

The general features of the stage 4 countries are strong created-asset location advantages, increasing importance of supply capabilities and support services. Governments take the supporting role for innovation and foster the economic restructuring. MNEs extensively manage the external networking to make use of available assets abroad. Through learning process, the countries that develop domestic capabilities to benefit from knowledge flows and for attracting higher value adding FDI would progress over the IDP. (Narula and Guimon, 2010)

For stage 4 countries, it is key to achieve restructuring the economy around knowledge-intensive innovative sectors that would foster local and global competitiveness of the country. Thus, the countries that have reached to transform their economy as a hub for the innovative activities has stronger location advantage together with rapidly growing ownership advantage of their firms. Thus, a country with stronger innovation policy in stage 4 attracts higher strategic asset seeking FDI. But, still the local multinationals would continue to internalize opportunities abroad for natural resource seeking, market-seeking or efficiency-seeking purposes. Thus, in our hypotheses we empathized the role of OFDI in these countries and attempted to identify the impacts of the components of national innovation systems.

Fifth Stage countries

Fifth stage countries possess two main characteristics. First, multinationals engaged in cross-border activities increasingly through internalization within the MNEs, not the markets. (Dunning and Narula, 1993) Secondly, since the countries at this stage converge in their technological and human skills, international investment of these countries is balanced. Ownership advantages are more firm-specific and less room for location-specific ownership advantages for the domestic multinationals at this stage. MNEs from these countries adopt more transnational integration strategies and seek for efficiency in their investment decisions. Inward investment into these countries will come from lower developed countries particularly for knowledge seeking. For the generation, diffusion and transfer of the O-advantages from fifth stage or into the fifth stage countries' multinationals depends heavily on the industry level analysis. (Cantwell, 1989) For the government policy to stimulate knowledge-based attractiveness of their country, macro-organizational and strategic oligopolistic approaches are key for the competitiveness of the country. (Dunning and Narula, 1993) our hypotheses in this study will reflect this points for stage 5.

Now, after we explained the OLI conditions of the stages and how NIS might influence the reconfiguration of the OLI stricture, we can developed our hypotheses for the IDP and NIS using the capabilities approach to the NIS.

Human and Production Capacity:

Input prices, quality and productivity, transportation and communication facilities and skilled labor are very critical for countries attractiveness as receivers of FDI and these features have strong impact on location specific advantages of the countries. (Dunning, 1988) That makes us believe that 'human and production capacity' has stronger influence on the expansion of L-advantages than O-advantages. As a result, with stronger human and production capacity, there would be higher IFDI compared to OFDI in all the first four stage. Thus, it is reasonable to expect negative slope for first factor of NIS. For the fifth stage countries, it is argued that the main distinguishing factor would be knowledge base of the country. (Ubeda and Duran, 2001) Therefore, for the fifth stage, we expect human and production capacity to contribute the growth of OFDI.

The very basic assumption of the IDP curve is regardless of the direction of NOI, for higher stages we assume higher FDI for the countries both inward and outward. Since the factor under discussion is very related to the ICT infrastructure and human capital, and location-specific advantages and subsequently O-advantages, we also argue that policies to improve these advantages of the countries will result in higher FDI and with higher FDI, the impact of the factor will strengthen.

Hypothesis 2a: In the first stage of IDP, the Human and Production Capacity has a negative impact on NOI.

Hypothesis 2b: In the second stage of IDP, the Human and Production Capacity has a negative impact on NOI.

Hypothesis 2c: In the third stage of IDP, the Human and Production Capacity has a negative impact on NOI.

Hypothesis 2d: In the fourth stage of IDP, the Human and Production Capacity has a negative impact on NOI.

Hypothesis 2e: In the fifth stage of IDP, the Human and Production Capacity has a positive impact on NOI.

Macro Institutional Capability:

With the globalization, when a country develops, the level of its FDI inward and outward increases. In this regard, if the institutional framework of the country creates more favorable environment and if investment incentives and credit availability are in favor of the multinationals, then this country would be able to attract more FDI. Thus H3 explains the relationship between the macro institutional capability and the NOI.

Hypotheses H3d and H3e are based on the arguments that multinationals originally from stage 4 and 5 countries as a result of their strength in location-specific-ownership advantages increasingly look for market seeking and efficiency seeking FDI opportunities in foreign locations. As a result, we can argue that the effect of stronger macro institutional capability would result higher impact on OFDI in stage 4 and 5 countries, while it help the countries attractiveness to receive FDI in the early three stage and strengthen the location advantages. These arguments are summarized in our hypotheses.

Hypothesis 3a: In the first stage of IDP, the Macro Institutional Capability has a negative impact on NOI.

Hypothesis 3b: In the second stage of IDP, the Macro Institutional Capability has a negative impact on NOI.

Hypothesis 3c: In the third stage of IDP, the Macro Institutional Capability has a negative impact on NOI.

Hypothesis 3d: In the fourth stage of IDP, the Macro Institutional Capability has a positive impact on NOI.

Hypothesis 3e: In the fifth stage of IDP, the Macro Institutional Capability has a positive impact on NOI.

Innovation Capability:

Innovation capability is one of the most significant components of the national innovation system analysis. The factor is not consist of the new product invention but includes R&D expenditures. Therefore, it represents a broad innovation analysis for the country. Considering the improvements in the income levels and the growth of competitive advantages of the local firms by stages, we would expect the impact of the innovation capability on NOI to strengthen its slope. Therefore, we expect higher growth in both IFDI and OFDI.

Considering that innovation capability would strengthen the direction of NOI, Hypothesis 4 argues that innovation capacity is negatively related with NOI in the first two stages and positively related to NOI in the last three stages. In other words, the growth of IFDI, which is higher than the growth of OFDI in the first two stages, is

strengthened by the third factor of NIS. Reversely, the growth of OFDI, which is higher than the growth of IFDI in the last three stages, is strengthened by the third factor of NIS. This is because, it is expected that with the innovation capability once the ownership advantages are developed, firms will be more focused on internalizing opportunities abroad through exploitation and exploration of the assets. Hypotheses 4 proposes these arguments.

Hypothesis 4a: In the first stage of IDP, the Innovation Capability has a negative impact on NOI.

Hypothesis 4b: In the second stage of IDP, the Innovation Capability has a negative impact on NOI.

Hypothesis 4c: In the third stage of IDP, the Innovation Capability has a positive impact on NOI.

Hypothesis 4d: In the fourth stage of IDP, the Innovation Capability has a positive impact on NOI.

Hypothesis 4e: In the fifth stage of IDP, the Innovation Capability has a positive impact on NOI.

Liberal Structure:

Liberal structure factor has components related with the level of government intervention and the size of its tax and spending burdens. Thus, the factor is critical to understand liberal governance of the government. If the burden of the government in a market economy is limited, that means higher liberal structure score, then, we expect

more integrated economies. That is why H5 propose that a more liberal structure in a country would lead to higher growth in both IFDI and OFDI, thus would have a strong impact on NOI.

Considering that institutions and policy are main determinants for shift from stage 4 to stage 5, and the attractiveness of the country would be higher when there is a limited government intervention and burden on the economy we can argue that in all the stages of the development, the liberal structure would have a complementary role for location advantages rather than ownership advantages. Thus, we expect this factor to have negative impact on NOI.

Hypothesis 5a: In the first stage of IDP, the Liberal Structure has a negative impact on NOI.

Hypothesis 5b: In the second stage of IDP, the Liberal Structure has a negative impact on NOI.

Hypothesis 5c: In the third stage of IDP, the Liberal Structure has a negative impact on NOI.

Hypothesis 5d: In the fourth stage of IDP, the Liberal Structure has a negative impact on NOI.

Hypothesis 5e: In the fifth stage of IDP, the Liberal Structure has a negative impact on NOI.

In chapter 5, we will explain our methods to test these hypotheses and test and analyze our results.

CHAPTER 5: DATA, METHODOLOGY AND RESULTS

Datasets and Variables

The unit of analysis in this study is the nation states. The study aims to examine 75 countries across the world in the era of rapid globalization after the 1985. During this period, all several economies have experienced rapid growth rates in their total GDP and GDP per capita. Hence, the sample period covers the last 30 years of each of these countries from 1985 to 2014.

The data to be used in this analysis, collected from several sources. [2] Dataset for the country level investment were collected from the United Nations for Cooperation on Trade and Development (UNCTAD)'s Foreign Investment Database and the data for National Accounts are gathered from World Bank's World Development Indicators Database. (WDI, 2015) In all analysis, the aggregated national level data has been used and for the real numbers GDP Deflator (2005=100) has been applied.

Although initially 200 countries and 27 relevant indicators are collected, for the problems of missing data, 75 countries and 21 indicators are included to the EFA analysis. We aimed to optimize the longest time period and widest country coverage. Likewise, during EFA analysis, four of the indicators are excluded for cross-loading problems.

In order to deal with problems related to time and country sizes, constant numbers are used and per capita measurement is preferred. The data is structures as panel data and covers 30 years from 1985 to 2014. Since we still have a missing data for many countries

[2] See Appendix A for details of data.

for some indicators, the total number of observations is 1789 and EFA scores obtained for the 15 indicators.

Based on the IDP theory, Net Outward Investment level (NOI) which has been defined as the difference between Gross Outward Foreign Direct Investment Stock (OFDI) and Gross Inward Foreign Direct Investment Stock (IFDI) was chosen as the main dependent variable while GDP per capita and its orders are the independent variables of the model. In the literature, for theoretical analysis, FDI stocks are believed to have greater validity and explanatory power than the flows (Lei et. Al, 2014). On the other hand, due to the lack of the IDP model in explaining the interaction between the inward and outward FDI levels, separate analysis of inward and outward flows would provide greater inference on FDI behaviors of the countries.

Determinants of National Innovative Capacity

Since two main characteristics of NIS are knowledge generation and transmission, technology development would differ from one country to another. “How one country can be better than another in technology development?” is the very basic question, which our capability approach for national innovation systems basically asks and tries to measure country performances for science, technology and innovation. However, it is not easy to measure how a nation can take advantage of basic research papers or commercial good ideas or spillovers around the system. Thus, innovation system approach deals with how knowledge is managed, transferred and utilized in order to result in innovative output. That’s why learning and diffusion of knowledge in innovative activities (Lundvall, 2007) are very central in NIS approach.

Thus, in our understanding of the National Innovation Systems, innovation policy can be measured with several components. For an accurate measurement different approaches are adopted and social, institutional, technological and macroeconomic aspects of the systems are included to the analysis.

In the previous studies, all analyses are basically focused on some key components; first what a nation spends on R&D and human capital of the country. We also followed that approach and used these independent variables.

Research and Development expenditures show resources to be used in innovation processes. Public R&D expenditures are not only direct support for research, but also expenditures for universities and government research programs. In addition R&D expenditures are not limited to public sector. As discussed in chapter 3, private agents spend increasingly more resources for research. But, due to the limitation of data in this study, government R&D expenditures as a share of GDP is included to our analysis.

Human capital is integral to a nation's capacity of innovation and it competitiveness in global rivalry. Governments around the world provide increasing access to tertiary or higher level education for their populations, as science and engineering skills have become core to the development.

Populations are empowered with better access to information via advances in technology and wider education at tertiary level. Skilled workforce is key to the knowledge intensive production. Thus, schooling components are significant and since Baumol et al. (1989) enrollment and schooling rates broadly included to the NIS measurements. Following the literature, this analysis also includes gross tertiary enrollment rates of all ages and both sexes as a percentage of total population at tertiary school.

How many students are enrolled in science and technology disciplines has significant importance however we have little data on it. Despite the lack of proper data for each country for science-based education and their quality, it is known that access to higher education has increased in all around the world and high skill workers has higher mobility in global market.

Quality of the scientific research in a country can be measured through examining research-strength of its universities and the citation rates of the scientific publications from that country. Although in the last decade several private agents such as Shanghai University Rankings and Times Education Rankings annually publish university rankings and indexes for quality of publications, we could not use these data. Since our analysis starts from year 1985 and covers a vast range of countries, and most of the available data are published only after 2004 and focuses on the top universities across the world, we excluded these data from our country level analysis.

Ability to access communication is also a key component for increasing integration to the world and contributes to the improvement of human capital through providing faster access to the information. That is why information and communication technologies (ICT) and related infrastructure of a country widely accepted as part of the innovation system of a country.

Quality standardization is an additional indicator for understanding a country's production capability. ISO 9001 certification as a high quality standardization for the firms is added to the analysis.

Although several innovations are not registered, number of Patents applied and granted by the inventor originated by a country is widely accepted reliable data to measure 'innovation capability' of a country. (Kim, 1997) Thus, patent counts are one of the important determinants of the NIS.

As part of the broad NIS tradition, supportive national environment is key to understand social and institutional aspects of the system. Property Rights and freedom from corruption are qualitative assessments to address rule of law in a country. The property rights measures to what extent a country's laws protect private ownership and how strong the law enforcement is. A country with a stronger legal system and protection of the private ownership is expected to be more efficient for innovation since returns from private investment on R&D would be secured. Likewise, corruption, which reduces

trust into the market, is negatively correlated with innovation. (De Soto, 1989) Thus, freedom from corruption is recognized as a significant indicator for NIS.

Fiscal Freedom is a component to address regulatory aspects of the government policies and their efficiency. The indicator is a composite measure of the level of taxation and demonstrates the burden of tax on individuals and firms. Likewise, government spending is a variable to be added to understand the size of the government consumption and burden as share of GDP. Although there is no ideal level for government expenditures, high budget deficits and excessive public debt is a burden for the society and results in inefficiency and the lack of further innovative investment.

Investment freedom evaluates incentives or restrictions for both foreign and domestic investment. Less restrictions on payments, transfers and transactions would stimulate investment rates and supports innovation systems. Similarly, monetary freedom is an indicator for price stability and inflation. Higher freedom would mean market efficiency.

Financial freedom explores the level of independence of the banking system. Higher financial freedom means lower public banks and less intervention to the financial institutions. If the banks, domestic or foreign, are free in their operations such as crediting, foreign exchange, then higher competition in capital markets and regulatory efficiency can be expected. Likewise, domestic credits provided to private sector as percentages of the GDP and market value of the domestic firms on the country's stock exchange market are added to the model to measure the efficiency of the financial sector,

but due to the correlated factor loading results in EFA analysis, later dropped for the strength of the model.

Several other determinants might be considered, but our main concern was measurability and data availability. Developed countries have abundance of data particularly in science field. On the other hand, developing countries data are limited in several useful indicators. Since our study covers 75 countries, we considered first the data availability for those countries.

Explanatory Factor Analysis as a methodological approach for NIS

Innovation, due to its complex and peculiar nature is hard to measure and compare in comparative analysis. Across the firms, industries, countries, and regions we have seen the variety of innovative activities and the complexity of the nature of technological accumulation. Nevertheless, desire for a better understanding of the innovation systems provided progress in our conceptualization and better data collection in recent years.[3]

First, we need to address problems in measurement of national innovations systems since NISs are very complex and in a cross-country analysis it is very heterogeneous. That's why a broad number of indicators are used in the analysis that makes "Factor Analysis" method critical as a methodology.

[3] For a deeper analysis of the various measures can be reviewed extensively in the works of Freeman 1987, Grilliches, 1990, Patel and Pavitt 1994, van Raan, 1988

In order to measure development of technological environment over time Factor analysis helps us to work with several variables that we can limit their information and convert non-observable hypothetical variables. A set of correlated variables as we call them factors, address to the specific aspects of the innovation systems.

When the data has relatively large number of indicators, one of the most widely used approaches for the construction of composite variables is the so-called “factor analysis”. The simple idea behind the method is that similar indicators will be correlated and this fact can be used to reduce complexity of the large datasets. (Basilevsky, 1994)

In application of the factor analysis to our indicators, we will use the explanatory factor analysis model and varimax method. The results of factor loadings will help to identify capabilities related to the National Innovation System.

The IDP Model

In empirical estimations of the IDP theory, quadratic form, qubic form and polynomial estimation models are used, but quadratic form is widely preferred. (Buckley and Castro, 1998) In addition, methodologically, earlier works show that time-series analysis does not provide significant relationship between investment and GDP per capita and cross-sectional analysis produces clustering of observations. (Bellak, 2000) Thus, in this paper a longitudinal data analysis is preferred for its explanatory power, but panel analysis needs a larger data set particularly in high-powered regression models. Thus, the quadratic form is chosen over the high-powered polynomial models to avoid the constraints of panels. In order to decide on the fixed or random effect, we run the

Hausman Test in which the null hypothesis is that the preferred model is random effects while the alternative is the fixed effects. Test results supports a fixed effect model for our quadratic form model. [4]

Finally, in order to see how the direction and speed of the factors of IDP might have been changed in overall data and in different staged countries, we tested the quadratic model in a longitudinal fixed data analysis for both pooled data and separately and we worked with 1-year-lag data for the regression analysis following the existing empirical literature.

The IDP Model with NIS factors:

$$Model: NOI_{t+1} = \beta_{0it} + \beta_{1it} PGDP + \beta_{2it} PGDP^2 + \beta_{3it} F1 + \beta_{4it} F2 + \beta_{5it} F3 + \beta_{6it} F4 + \varepsilon_t$$

in which;

- NOI: Net Outward Investment (Outward FDI Stock- Inward FDI Stock)
- NIS: National Innovation System
- PGDP: Gross Domestic Product (per capita)
- F1: Human and Production Capacity
- F2: Macro Institutional Capability
- F3: Innovation Capability
- F4: Liberal Structure

For all estimates, the quadratic equation model best explains the relationship between NOI and PGDP with high R-square results with significant t values for variables and errors at high confidence intervals.

[4] See Hausmann Test Results in Appendix

Empirical Results and Discussions

EFA Results

The results for the 1789 observations for the retained factors are given in the following table.

Table 4: Results for Factor Analysis

Variable	Human & Production Capacity (F1)	Macro Institutional Capability (F2)	Innovation Capability (F3)	Liberal Structure (F4)
Fixed and mobile phone subscriptions	**0.93**	-0.01	0.04	0.08
Internet users	**0.88**	0.14	0.23	-0.01
Gross Tertiary school enrollment	**0.60**	0.16	0.33	-0.24
ISO 9001 certifications	**0.63**	0.27	0.10	-0.18
USPTO Patents granted	0.26	0.19	**0.82**	-0.07
USPTO Patents applications	0.05	0.04	**0.73**	0.01
R&D expenditures	0.29	0.25	**0.76**	-0.28
Market capitalization of the listed companies	0.23	**0.37**	0.09	0.23
Property rights	0.03	**0.81**	0.30	-0.20
Freedom from Corruption	0.12	**0.73**	0.32	-0.19
Financial freedom	0.18	**0.70**	0.06	-0.09
Investment freedom	0.11	**0.63**	0.06	-0.21
Monetary freedom	0.23	**0.43**	0.25	0.11
Fiscal freedom	-0.18	0.12	-0.21	**0.68**
Government Spending	-0.30	-0.08	-0.18	**0.72**

As a result of EFA analysis, National Innovation system scores are obtained for the 4 factors. These factors explain 99% of the total variance in data.

The first factor loads highly on several variables related with social, technological and production capacity of the countries. Information and communication infrastructure, and education attainment as means of ability to access information have high loadings. In

addition, this factor also correlates highly with ISO 9001 certificates that is an important aspect to understand production capability of a country. Access to information and education in addition to the more diversified and high quality products are analyzed as part of the human development and production capacity of the country. Thus, we labeled the first factor as "human and production capacity"

F1: Human and Production Capacity: ICT infrastructure, education, ISO 9001 and product registration.

Second factor loads significantly high in institutional aspects. The rule of law within a society that is measured through property rights and corruption indicators load 0.81 and 0.73 respective in factor 2. A strong judicial system and lower uncertainty within a country positively correlates with the national innovation system. Similarly, regulatory efficiency of the market (financial freedom) and market capitalization in addition to the investment and monetary freedom scores are strongly and positively correlated in factor 2. Thus, we defined this second factor as macro institutional capability. The stronger the macro institutional capability, the countries would have more efficient national innovation systems.

F2: Macro Institutional Capability: Political freedom, fiscal freedom, property rights and market capitalization of the domestic firms

The third factor correlates highly with innovation indicators. Patent numbers load 0.82 and 0.76 and public R &D expenditures have loadings as 0.72. Thus, the factor is labeled as 'innovation capability' following the previous literature and our findings.

F3: Innovation Capability: Patents applications and grants, R&D expenditures.

The fourth factor loads highly on fiscal freedom and government spending indicators. These indicators measure if the taxes are burden for the market and how the government expenditures affect the efficiency of the market. Higher tax burden and high government spending have 0.72 and 0.68 factor loadings in this factor. We found these indicators to be related with the overall liberal structure of the government. Thus, fourth factor is labeled as 'liberal structure'

F4: Liberal Structure: Fiscal freedom and Government spending

Pool Data Results

Table 5 presents all countries regression results to test Hypothesis 1. It is found that human and production capacity, macro-institutional capability and liberal structure factors are strongly significant and supports the argument that they have stronger impact in the growth of inward FDI compared to OFDI, regardless of the development level of the countries. On the other hand, for innovation capability, the result is slightly insignificant that our proposition is not supported. We can infer that the impact of the innovation capacity is not clear when countries from different growth level are analyzed together.

This result might also be related to the fact that the factor heavily depended on patents as indicators. Patents by origins intensely concentrated on some industries and most of the innovative activities are not patentable. Patents strictly require global novelty

that limits the power of its statistics to be used as an indicator to understand for minor innovation and adaptation capability of the countries.

Similarly, the innovative capacity of the developing countries that remain below the technology frontier with limited patent applications and grants can not be understood by solely using a patent approach.

Table 5: Pool Data Results

VARIABLES	(1) All Countries
pgdp	-0.354**
	(0.164)
pgdp2	7.33e-06***
	(1.33e-06)
Human and Production Capacity	-4,256***
	(932.1)
Macro Institutional Capability	-8,454***
	(1,397)
Innovation Capability	-1,591
	(1,713)
Liberal Structure	-5,922***
	(1,619)
Constant	299.5
	(1,845)
Observations	1,715
Number of country	75
R-squared	0.073
Country FE	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Segmented data Results

Table 6 represents segmented-stage data regression results. Hypotheses 2, 3,4 and 5 can be tested through this table.

Table 6: Segmented Data Results

VARIABLES	(1) Stage 1	(2) Stage 2	(3) Stage 3	(4) Stage 4	(5) Stage 5
Pgdp	-0.444***	0.320**	0.0173	-13.86***	-0.736**
	(0.0685)	(0.135)	(0.147)	(4.683)	(0.293)
Pgdp^2	0.000274***	-7.92e-05***	-8.07e-06	0.000337***	8.73e-06***
	(5.21e-05)	(2.41e-05)	(8.57e-06)	(0.000123)	(2.12e-06)
Human & Production	-126.4***	-695.3***	-881.7***	-3,399	3,593**
	(26.45)	(96.37)	(143.4)	(2,873)	(1,550)
Macro Institutional	-51.12***	9.317	-514.5***	-199.3	3,429
	(18.00)	(107.7)	(190.5)	(4,828)	(3,200)
Innovation	-130.6***	-308.8	1,631***	6,941**	6,045*
	(49.23)	(222.4)	(392.5)	(3,599)	(3,460)
Liberal Structure	15.70	-265.5**	-798.4***	-609.1	-12,246***
	(16.15)	(106.3)	(276.6)	(4,282)	(3,858)
Constant	-134.3**	-1,109***	-1,194*	128,456***	3,237
	(54.16)	(248.7)	(611.3)	(43,141)	(8,820)
Observatios	246	397	363	328	381
R-squared	0.503	0.603	0.586	0.059	0.154
Number of country	16	40	49	40	27
Country FE	YES	YES	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Hypotheses 2a, 2b, 2c and 2e are strongly supported. There is strong evidence that Human and Production Capacity has strong and significant impact on NOI. As proposed in our hypotheses, we found significant negative results for the first 3 stages and significant positive results for the fifth stages. In other words, in stage 1, 2 and 3, human

and production capacity have higher impact to attract FDI compared to its influence on pushing FDI decisions of the local firms. At stage 5, however, we found positive affect of human and production capacity on NOI as proposed. These results show us that skilled labor, strong production capacity and ICT infrastructure in the developed countries are important to attract FDI into a country for developing countries, but for the developed ones strength in these features also encourages local firm's motivations to look for foreign locations in order to expand their operations.

H3a is strongly supported. The result proves that macro institutional capability is significantly has roles in shifting from stage 1 to stage 2 level of development. It is also very thought provoking to observe that in stage 3, macro institutional capability has significant and high impact on NOI. This result is another evidence that whenever there is a structural change macro institutional aspects becomes more important. Shifting from stage 1 to stage 2 and from stage 3 to stage 4 is very related with the factor. The latter shift for countries, by definition, a shift from developing country to developed ones. Similarly, for stage 1 countries, market structure and rule of law are distinguishing features.

The hypothesis H4 analyzes the role of innovation capability. H4a, H4c, H4d and H4e are all supported in our test results. That is, in stage 1 we found strong evidence that innovation capability significantly has higher impact on IFDI while in stage 3, 4 and 5 its impact on outward investment capacity of the domestic firms is higher. The results prove that starting from stage 3, the innovation capability has very strong effect on ownership

advantages of the local firms. On the other hand, the insignificant stage 2 results show that the direction and the effect of the factor in stage 2 is ambiguous, this might be as a result of the changing dynamics of firms specific advantages in stage 2, which is not yet strong enough to invest abroad but not so significant to have a role in attracting FDI.

Hypothesis H5 tests the role of limited government on NOI. Our hypotheses are strongly supported for stage 2 (H5b) , 3 (H5c) and 5 (H5e). This result provides evidence to see how locations with limited governments are popular for foreign direct investments decisions. Particularly for the fifth stage countries, limited government has become a distinguishing factor to attract FDI into the country from the other fourth and fifth stage developed countries. It is evident that the growth of OFDI is much higher in the more liberal structured economies.

The test results for all the hypotheses are summarized in the Table 7 below.

Table 7: Summary of Test Results

	Pool Data	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Human and Production Capacity	H1a: (-) Supported	H2a: (-) Supported	H2b: (-) Supported	H2c: (-) Supported	H2d: (-) Not Supported	H2e: (+) Supported
Macro Institutional Capability	H1b: (-) Supported	H3a: (-) Supported	H3b: (-) Not Supported	H3c: (-) Supported	H3d: (+) Not Supported	H3e: (+) Not Supported
Innovation Capability	H1c: (-) Not Supported	H4a: (-) Supported	H4b: (-) Not Supported	H4c: (+) Supported	H4d: (+) Supported	H4e: (+) Supported
Liberal Structure	H1d: (-) Supported	H5a: (-) Not Supported	H5b: (-) Supported	H5c: (-) Supported	H5d: (-) Not Supported	H5e: (-) Supported

Discussions and Implications

The recent internationalization of the markets also necessitates networking of actors and institutions for the development of national innovation. At this point, the roles taken by the governments shifted from being an active element of the innovation process to a catalyst's position for the institutional set of innovation. In this perspective, both the governments and the firms engaged to the innovation process are in interaction with the market structure and with other institutions.

Perhaps the most important insight from this study on innovation systems is a better understanding of complexity of national innovation systems. It is certain that there is much to learn about different features of innovation policies across countries. Nevertheless, our findings in this study sufficiently provide tools to comprehend the linkages between systems and processes. The comprehensive view of the national innovations systems also helps to understand factors influencing national innovation institutions and related capacity, capability and institutional structure in creation and diffusion of technologies. In this respect, governments should contribute to the instructional capability creation in order to absorb and promote innovation. This overall picture shows us the very integrated nature of the relations, but at the same time the necessity of bringing a new understanding for technology development.

Although there are real difficulties in measuring complexity and variety of the national systems and conceptualization of them, explanatory factor analysis applied in this part of the study identified four critical factors related with the national innovation systems. Using these factor scores, we explored how the NIS of a country interacts with

the O-L-I configuration of the countries in the model of IDP. The panel data application provided us an understanding for the dynamic interaction for the countries.

There are important findings from our estimation results. Firstly, we have strong evidence that all four factors of innovation system have significant roles on net outward investment positions of the countries. In all countries analysis, we found that macro institutional capability, liberal structure and human and production capacity all give strongly significant results and high impact on foreign investment, particularly for improvement of location advantages.

When we separate our data for different stage of development, very remarkable findings are obtained. For the first three stage countries, the effects of all four factors are strongly significant.[5] That's, for developing countries, we have strong evidence for the importance of the national innovation policies, particularly for the expansion of location advantages. Only innovation capability had stronger impact on OFDI at stage 3 countries that is remarkable parallelism with our arguments for ownership advantages of the local firms. In addition, high R-squared results also justify the predictive power of the model. These results are consistent with our broad definition of the national innovation system and support the relevance of our hypothesis.

For stage 4 and 5 countries, our findings prove that national innovation systems have strong and mostly positive impact on OFDI levels, that these impact are strikingly higher compared to the previous stages. Some insignificant results in fourth stage-developed countries also support the arguments that at these stages ownership advantages

[5] Only at stage 2, we have exceptions as discussed in previous section.

are more dependent to the firms-specific strategies. But still, our findings suggest that the impact of policy and institutions becomes increasingly important for NOI positions while IDP model argues that the role of growth on FDI is becoming relatively less important over time. (Dunning, 2002) Thus, our results underline the importance of policy and institutions when countries converge at their development levels.

CHAPTER 6: CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Conclusions

The theoretical chapters of this study have examined how changes in the global economy transformed the scholarly thinking about growth and FDI. The reflections of these changes are discussed in the context of the changing national innovation system appreciation.

Theoretical discussions of endogenous growth theory and the dynamic characteristic of the Eclectic Paradigm provided us a rich laboratory of indicators to be used empirically and more qualitatively for innovation research. When it comes to the evaluation of both technology and growth components within a national system, we benefited from the parallelism between these theories that we concluded that 'the change in understanding of technology in economic growth theory is consistent with the change in understanding of the role of government in national technology development.' In this regard, the most important differentiating feature of the methodology of this study lays in its measurement of the NIS that includes as many as variables from 75 countries for 30 years. Thus, the factor analysis provides invaluable understandings for the broad definition of national innovation.

As discussed throughout the study national innovation system of a country is a systematic network and key for enhancing economic performance. In the empirical sections of the study, we have analyzed the role of national innovation systems on a

country's net outward investment from where the country was initially a net receiver of FDI to a stage where it becomes a net investor abroad. Referencing methodologically to the IDP theory of Dunning (1981), we sought an extension for the dynamic OLI model through innovation capabilities.

Along with the advances in technology and transportation, and under the condition of the challenging global competitiveness, the transition from previous stages of the IDP curve to the more developed stages has widely seen. In this respect, innovative policies and strength of the countries, in its broader perspective is significant. The rapid transfer of the technological and organizational advances across nations and the emergence of global innovating economy have accelerated the process of industrialization of the countries. (Dunning, 2001) In addition, the challenges faced by the late-comers in the international business environment would be much intense to overcome that motivate those nation's transnational firms for asset exploration and exploitation in their earlier steps of development. Furthermore, with strategic innovation policies, the governments may play a catalytic role in promoting FDI would significantly influence the speed-up. (Otawa, 1996) Hence, although the evolution through five stages, the rate of change and points of inflection are unique to every country (Narula and Dunning, 2010), we found strong explanatory power in our four factors for explaining the role of national innovation policies to understand net outward investment positions and different stages of development. In doing so, fixed effect longitudinal data model is used in IDP regression model. There are several advantages of this approach to the conventional applications, namely the cross-section and time series model. We covered

countries from all the stages and significant findings are discussed for each stage of countries.

Limitations and Future Research

Although in recent study, remarkable contributions to the existing literature are presented in several ways, some limitations can be overcome in future research. First, IDP model has its own limitations. Following the model, this study categorized countries using their per capita income levels. However, a study on why and how a country moves from one stage to another needs to be investigated in a more flexible approach. In such an approach, NOI can be used to decide which stage a country in and later a separate analysis on outward and inward FDI can be applied to overcome the restraints of the NOI as an indicator. Incorporations from a linear model with separate IFDI and OFDI analysis may strengthen our hypothesis on innovation policy and institutions. Future scholarly work should also consider incorporating additional controls for country categorizations. Taking into account the resource-rich and resource-poor dimensions for the countries might change our findings and might provide interesting results.

In addition, it should be noted that the exact configuration of the OLI factors that an MNE would face depends not only country-specific factors but also industry and firm-specific factors. Even the country level analysis needs to consider home country specific factors affecting investing MNEs. However, this study is limited to explain one side of the country specific factors affecting FDI decisions both inward and outward. In doing so, entrepreneurial and business cultures peculiar to the countries are also beyond the scope of this study.

The industry-level analysis and controls for country concentrations in production are not included to the analysis. Likewise, firm level management and organizational strategies and firm's size and degree of internalization and firm-specific innovative capabilities affecting OLI of a country are not distinguishably analyzed. For future research, national innovation factors can be tested for their effects on firm and industry level data.

Similarly, a comparative analysis for specific different stage countries, and detailed comparison of their policies has strong potentials to contribute national innovation system studies, but at this point left to the future studies.

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APPENDIX

Indicators and Sources

- All the variables used in analysis are constant numbers and controlled for population.
- USPTO Patents are the number of utility patents for invention applied and granted by the U.S. Patent and Trademark Office. First named inventors residency is used as the origin of the country.
- ISO 9001 Certifications are quality management by the International Standard Organization.
- Heritage Foundation Indexes are scaled from 0-100 and freedom means higher score.

Variable	Variable name	Scale	Source
Gross Secondary school enrollment	ip2_data49	per capita	WDI, Global Education Digest 2015
Gross Tertiary school enrollment	ip2_data50	per capita	WDI, Global Education Digest 2015
Internet users	ip2_data57_2	per 100 people	World Telecommunication Indicators, 2015
Market capitalization of the listed companies	ip2_data61	% of GDP	World Development Indicators, 2015
Fixed and mobile phone subscriptions	data70_	per 100 people	World Telecommunication Indicators, 2015
USPTO Patents applications (residents)	ip_data79	per capita	USPTO, 2015
R&D expenditures	ip2_data95	% of GDP	World Development Indicators, 2015
Property rights	ip_property	Index 0-100	Heritage Foundation, 2015
Financial freedom	ip_freedom	Index 0-100	Heritage Foundation, 2015
Fiscal freedom	ip_fiscal	Index 0-100	Heritage Foundation, 2015
Freedom from Corruption	ip_corrupt	Index 0-100	Heritage Foundation, 2015
Government Spendings	ip_govern	Index 0-100	Heritage Foundation, 2015
Freedom of Trade	ip_trade	Index 0-100	Heritage Foundation, 2015
Investment freedom	ip_invest	Index 0-100	Heritage Foundation, 2015
Monetary freedom	ip_monetary	Index 0-100	Heritage Foundation, 2015
USPTO Patents granted (residents)	patent2_	per capita	USPTO,2015
ISO 9001 certifications	ip_iso	per capita	ISO 9001 Surveys
Population			World Development Indicators, 2015
Gross Domestic Product	Pgdp	percapita, constant, 2005	World Development Indicators, 2015
Net Outward Investment	Noi	stocks, real numbers	UNCTAD, 2015

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ip2_data13	2,279	63.29722	47.40512	1.125519	311.9845
ip2_data49	2,186	83.40135	25.75647	9.13528	163.101
ip2_data50	2,206	34.47359	23.24475	.75	110.2631
ip2_data57_2	2,400	2035.438	2718.79	0	9631
ip2_data61	2,144	55.80742	84.45532	.055394	1254.465
data70_	2,359	4328.637	5090.162	1	23736.19
ip_data79	2,289	14.98102	37.41231	1	326.387
ip2_data95	2,146	.9408409	.9041124	.00544	4.47954
ip_property	2,300	61.21087	23.06807	10	95
ip_financial	2,299	58.19052	17.30271	10	90
ip_fiscal	2,299	68.08053	15.95149	29.8	99.9
ip_corrupt	2,299	52.04554	25.38728	7	100
ip_govern	2,299	57.47314	26.77809	0	99.3
ip_trade	2,299	70.22658	15.01796	0	95
ip_invest	2,299	60.90474	17.61902	0	95
ip_monetary	2,299	72.13693	18.58508	0	95.4
patent2_	2,392	3.72342	5.894167	1	46.33574
ip_iso	2,363	19.43976	32.08453	1	278.9444

Model Specification: Hausmann Test Results

	---- Coefficients ----			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
pgdp	-.4524296	-.2459452	-.2064844	.0931046
pgdp2	7.53e-06	6.00e-06	1.53e-06	6.26e-07
f1	-4391.146	-2644.375	-1746.771	539.5402
f2	-7352.039	-2487.809	-4864.23	1053.069
f3	-2844.811	2210.526	-5055.337	1355.245
f4	-9976.453	-1042.692	-8933.76	1492.611

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 42.54
Prob>chi2 = 0.0000

Factor Analysis/ Correlations

Factor analysis/correlation — Number of obs = 1,789
Method: principal factors — Retained factors = 4
Rotation: orthogonal varimax (Kaiser off) — Number of params = 54

Factor	Variance	Difference	Proportion	Cumulative
Factor1	2.81717	0.09833	0.3094	0.3094
Factor2	2.71884	0.34495	0.2986	0.6080
Factor3	2.37389	0.92687	0.2607	0.8687
Factor4	1.44702	.	0.1589	1.0277

LR test: independent vs. saturated: chi2(105) = 1.8e+04 Prob>chi2 = 0.0000