Global Outward Foreign Direct Investment And Economic Development: Panel Regression Approach

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Abstract

Outward Foreign Direct Investment (OFDI) is in the nature of international relocation of production. OFDI acts as a complementary input in the host country and hence aims at rational allocation of global resources. The pattern of economic development on a multilateral scale would, thus, determine the pattern of OFDI. We consider the effect of economic development on OFDI originated from developing countries, with the help of a set of socio-economic variables.

With the help of Principal Component Analysis we construct a set of six composite indices, namely, human resource, infrastructure, labour, market, trade openness and resource, as determinants of OFDI. We use a panel regression approach both in terms of OFDI stock and flow. The period of study is 1990-2009.

Empirical results indicate that developing countries outflow has not been growing significantly. The annual growth rate of global FDI outflows is 3.2 percent. FDI outflow is mainly from developed countries. Resource is most important determinant because it has elasticity greater than one. Resource and market variables indicate that in long run FDI focused on resource-seeking and market-seeking.

Keywords: Outward Foreign Direct Investment, Globalization, Economic Development, Panel Regression Analysis

Introduction

Globalization can be summarized as opening-up of markets, leading to transfer of capital, technology and people. However, another important dimension of globalization is multilateralism. It would be obvious that the former cannot be effective without later. One of the major objectives of international economic reforms was to encourage multilateralism. The economic basis of multilateralism lies in allocative efficiency. This implies that economies are able to import from most efficient sources and are able to export to the best destinations. In an analogous manner, it can be said about Outward Foreign Direct Investment (OFDI) that multilateralism implies importing capital from a variety of sources as may be most efficient rather than restricting to a bilateral basis. Similarly, the obverse of this phenomenon would be to export capital where it can be most efficiently utilized, by combining capital with other resources optimally. Second, these capital transfers should have work as two way relationship. Foreign Direct Investment (FDI) could promote economic development and economic development could promote FDI. Third, there have been inward capital movements and outward capital movements.

In this paper we concentrate on outward capital flows and study the effect of economic development (socio-economic variables) on outward FDI. Most of the extant literature is focusing on the impact of FDI on the level of economic growth.

Plan of the Study

The plan of study follows the hierarchy: Rationale, Literature Review and Methodology in consecutive sub sections. The following section contains the results and analysis. The last section is about conclusions and final analysis.

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Rationale

With globalization, development has become an international issue. Expectation out of globalization is that it will promote international investment flows, so that there is global development, universally.

The problem caused by FDI theory is about explaining international capital flows in a generalized framework. It ought to be generalized in two senses:

1. It should be inclusive (developed and developing economies); and
2. It should be based on countries rather than firms.

Thus the rationale for studying international FDI patterns arises from two stand points:

1. With globalization (WTO) and liberalization international long-term capital flows in the form of FDI are promoted. Capital is the complementary input to labour, natural resources, infrastructure etc. This leads to international relocation of production. If such flows follow rational allocation, it will lead to global optimum allocation of resources and global economic welfare.
2. If the above happens there must be a visible relationship between socio-economic variables (economic development) such as labour, human resource, infrastructure, openness, market, resources etc; and the patterns of FDI flows internationally.

Within the background of the rationale, we are considering a set of hypotheses that could validate the relationship between outward FDI and economic development.

I. Primary Hypotheses

1. Determinants of OFDI do not differ across developed and developing countries.
2. Determinants of OFDI do not differ across top ten and rest of the countries amongst developing and developed countries grouping respectively.

II. Secondary Hypotheses

1. Human resources do not affect OFDI.
2. Infrastructure does not affect OFDI.
3. Labor does not affect OFDI.
4. Market does not affect OFDI.
5. Trade openness does not affect OFDI.
6. Resources do not affect OFDI.

These hypotheses are tested with the help of an elaborate methodology laid out in section 4.

Literature Review

In the following section we shall examine the extant literature related to relationship between FDI and economic growth/development. Most of the literature is focused on impact of FDI on economic growth/development. This paper has been mainly devoted to studies related to impact of growth/developmental variables on international FDI pattern.

Al-sadig (2013) provides new empirical evidence of the effects of outward FDI on the domestic investment rate in developing countries. The empirical results show a robust negative relationship between outward FDI and the rate of domestic investment. A one percentage point increase in outward FDI leads to a reduction of about 29 percent in domestic investment. . These results may be driven by the presence of distortions and domestic bottlenecks in the local economies, such as scarcity of capital and imperfect financial markets. The types of policy prescription needed to address these distortions could help to mitigate the negative impact of outward FDI, and, in some cases, to boost domestic saving and investment.

Das (2012) examines various home country determinants of outward FDI from a large sample of developing economies, which has received limited attention in empirical studies. The analysis is carried out using panel data econometrics, and covers the most recent period, 1996-2010. The results indicate that source country's level of economic development, globalization, political risk, and science and technology investments contribute significantly to outward FDI from developing countries. The analysis has pertinent policy implications as well. Although outward FDI might be unavoidable in the course of economic development and globalization, developing countries need to emphasize on improving political governance in order to prevent capital outflow arising out of higher domestic political risk. On the flip side, science and technology investments could contribute to higher level of outward FDI thereby yielding complementary benefits of internationalization in the long run.

Banga (2009) identifies the drivers of outward FDI from 13 developing economies of East, South and South-East Asia in the period 1980-2002. An empirical analysis is undertaken using panel data techniques. An attempt is made to conceptualize the process of outward FDI from developing economies using three sets of drivers: trade-related drivers; capability related drivers; and domestic drivers. The results show that the phenomenon of outward FDI from developing economies has greatly facilitated by international trade.

Poelhekke and Ploeg (2008) examines the determinants of outward FDI from the USA. The paper has tried to shed some light on this topical question by investigating the empirical evidence for the effects of urbanization, city formation and primacy on FDI and growth performance. This paper concludes that cities are important for FDI and growth: more medium-sized cities stimulate growth but congestion; pollution and over-crowding associated with mega-cities seem to depress economic performance. Although there may be potential benefits of regional integration for FDI and growth performance as good institutions and high road density in neighboring countries attract FDI, countries also attract more FDI if their neighbors restrict international trade are less urbanized and low market potential.

Gammeltoft (2008) following a brief discussion of FDI and emerging economies in general it is suggested that the current increase in outward investment from emerging and developing economies may constitute a third 'wave', distinct from the two previous waves depicted in the literature. The contours of such a wave is outlined, followed by an empirical analysis of outward investment from the BRICS countries.

The most of the existing literature either focused on outward FDI from specific country or specific group of countries such as USA, BRICS etc. or included individual socio-economic variables such as political risk, urbanization, science and technology, trade etc. Comprehensive study of the impact of level of economic development on OFDI across countries is missing, which motivate us for this paper. Our study has developed six unique socio-economic variables and each variable consists of number of related variables so as to get overall impact of these variables on global outward FDI.

Our study is a cross county study which includes developed and developing countries, which is missing in the existing literature. None of the studies has considered OFDI in term of stock. This paper has taken into consideration both OFDI flows and stock.

Research Methodology

I. Data Sources

Data has been taken online mainly from UNCTAD and World Bank website. The period of study is 1990-2009. The continuous data of FDI is available for 53 countries in terms of FDI inflows and inward stock. However, the continuous data on development variables (socio-economic variables) have been available only for 36 countries. Therefore, the study has taken data set of 36 countries which include 20 developed countries and 16 developing countries. The paper has used UNCTAD classification of developed countries and developing countries. Developed countries include Australia, Austria, Belgium-Luxembourg, Canada, Czech Republic, Denmark, France, Germany, Hungary, Ireland, Japan, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States. Developing countries include Argentina, Brazil, Chile, China, Egypt, India, Malaysia, Mexico, Morocco, Philippines, South Africa, South Korea, Sri Lanka, Tunisia, Turkey and Venezuela. The paper has used the dummy variables for studying the impact of financial turbulence across the country such as Asian financial crisis etc.

The paper has used principal component analysis (PCA) and panel regression model (fixed effect).

II. Method of Principal Component Analysis

When we consider developmental variables like population, GDP, and so on, there is bound to be a high degree of correlation amongst independent variables. There could be three strategies that can be used for dealing with such an econometric problem:

1. If we drop all correlated variables there is a great loss of information.
2. We could use Principal Component Analysis (PCA) to determine the "principal variables."
3. We could use PCA for formation of a composite index.

The method of Principal Component Analysis (PCA) has two purposes. Firstly, we use PCA for data reduction, especially where the variables are interrelated. Secondly, we use PCA for compilation of a composite index. For estimating the determinants of international FDI patterns we have used a two step procedure. Firstly, components of FDI patterns are many and are correlated. Variables like GDP, human resources, trade openness, and so on which may be correlated. Under such circumstance it is not possible to use the variables directly in a regression framework on account of multi-collinearity. Secondly, when there are a large number of variables we need to collapse them into a single independent variable with the help of PCA. The variable should be such that it captures all the information contained in all the individual variables. In view of these weaknesses of an ordinary regression framework, we opt for an alternative method - Principal Component Analysis (PCA). PCA is based on a linear transformation of the regressors so that they are orthogonal to each other by design. Hence, no information contained in the points in the event space is lost. Second, the normality assumption is not essential in PCA. Third, with such a dispersed set of outcomes, PCA is ideally suited because it maximizes the variance rather than minimizing the least square distance.

One aim of our empirical work is to evolve a set of composite indices so as to include them as the causal variables consisting of developmental variables such as human resource, infrastructure, labour, market, openness and resources. Hence, we need to choose the essential variables by a data reduction procedure and arrive at relative weights for the purpose of consolidating these variables into a single index. We chose Principal Components Analysis (PCA), which is popular in the literature since it has a number of desirable properties. It retains the maximum information, allows the composite variables to remain uncorrelated amongst each other. The data reduction procedure involves selection of the most relevant variables that capture the maximum information and diverse information. Both the un-rotated and rotated solutions explain exactly the same amount of variation in the variables. The choice between them hinges upon the interpretative power of each solution. The component scores (both rotated and un-rotated), with respect to the first component are calculated. The most popular orthogonal rotation procedure is Kaiser's Varimax rotation. We therefore retain this procedure.

The following consideration should be kept in mind while applying PCA:

1. For determining the retained component we need a criterion.
2. The PCA methodology tells us the total variance explained by each retained principal component as well as the cumulative percentage of the explained variation. This is a measure of the explanatory power of the component for the information content of the procedure.
3. There were various methods of rotation but the most popular method is the Varimax with the Kaiser normalization. The purpose of the rotation is to make the interpretation of the PCA more meaningful. Method of rotation however retains the same information and explanatory power.

After doing these procedures there was a choice between retained principal components in a regression framework or selecting the principal variables that are associated with each of those components. This involves the Jolliffe (2002) procedure. In the first case regression is known as principal component regression and in the second case it is known as principal variable regression. We have chosen the latter because it is difficult to interpret the principal component regression. We have chosen to retain three components so that we finally land up with three principal variables. The reason is that using the Kaiser criterion of Eigen value less than one leaves only two components while retaining all seven variables leads to multi-collinearity.

On the other hand eliminating some variables through PCA does not affect the explanatory power of the equation because the retained variables contain the information of those which are eliminated. We have used the Joliffe's procedure for selecting principal variables. We take up each rotated component and select the variable that has the highest component score. Then we move to the next component and so on. This way we get the three principal variables which represent the maximum information and eliminate the variables that are correlated to them and hence create multi-collinearity.

III. Method for Construction of the Index

The method for construction of a composite index is given by Jha and Murthy (2006). Once the number of retained

Table 1: Developmental Variable Selected through Principal Component Analysis

Variable	*Variables Included (in PCA)*	*Principal Variables Selected (by PCA)*	*Composite Index*
Human Resource (HR)	EDUX, EDU_P, POPT	EDUX, EDU_P, POPT	IHR
Infrastructure (INFRA)	ENP, ELP, ATS, ATP, ROAD, TEL, TEL_P	ROAD, TEL, TEL_P	IINFRA
Labour (LAB)	EMPTEEN, EMP, GDPPC, LRATE, LFT, POPWA	LRATE, LFT, POPWA	ILAB
Market (MKT)	MKTCAP, COS, POPDEN, POPL, MFWA, INVA, SVA	MKTCAP, POPDEN, POPL	IMKT
Openness (OPN)	TRES, TOPEN, EXCG	TRES, TOPEN, EXCG	IOPN
Resource (RES)	GFCF, GDP, GDPPC, GDS, TNRES	GFCF, GDPPC, TNRES	IRES

principal components is determined and the rotated component scores obtained, we have the choice of using the principal components as such or selecting certain subset of variables from the larger set of variables. Jolliffe proposes selecting one variable to represent each of the retained principal components. The variable that has the highest loading on a component is chosen to represent that component, provided that it has not already been chosen. If it has been chosen, the variable with the next largest loading is selected. The procedure starts with the largest principal component and proceeds to the smallest retained component[1].

$$Index = \sum_{j}^{3} wjxj$$

Where:

Xj = retained variables

Wj = component scores (weights).

This procedure has been used for creating the following indices:

1. Index of Human Resources;
2. Index of Infrastructure
3. Index of Labour
4. Index of Market
5. Index of Trade Openness
6. Index of Resources

IV. Panel Regression Models

A common panel data regression model looks like:

$$y_{it} = a + bx_{it} + \epsilon_{it},$$

Where *y* is the dependent variable, *x* is the independent variable, *a* and *b* are coefficients, *i* and *t* are indices for individuals and time. The error ϵ_{it} is very important in this analysis. Assumptions about the error term determine whether we speak of fixed effects or random effects. In a fixed effects model, ϵ_{it} is assumed to vary non-stochastically over *i* or *t* making the fixed effects model analogous to a dummy variable model in one dimension. In a random effects model, ϵ_{it} is assumed to vary stochastically over *i* or *t* requiring special treatment of the error variance matrix.

The Fixed Effects Model (Least Squares Dummy Variable Model)

The models which capture the individual effects are called fixed effects models. Random effects models, on the other hand capture the generalized effects. One kind of the fixed effects panel model would have constant slopes of the independent variables but intercepts would differ according to the cross-sectional (group) unit— in our case, the country. In such cases although there are no significant temporal effects, there are significant differences among countries in this type of model, which is what we would

1 An alternative approach is to delete variables by using the discarded principal components. Starting with the smallest discarded component, the variable with the largest weight on that component is deleted. Then the variable with the largest loading on the second smallest component would be discarded. If the variable has previously been discarded, then the variable with the next highest loading would also be discarded. This procedure continues up to the largest such discarded component.

normally expect if we were to analyze FDI flows in general. While the intercept is cross-section (group) specific and in this case differs from country to country, it may or may not differ over time. This is because the main independent variables all refer to the determinants of FDI patterns. As our interest is in capturing the elasticities of developmental variables in the form of dynamic effects such a model will not suffice. Another type of fixed effects model has differential intercepts and slopes. This kind of model has intercepts and slopes that both vary according to the country grouping. To formulate this model, we would include not only country dummies, but also their interactions with the time-varying covariates. The one big advantage of the fixed effects model is that the error terms may be correlated with the individual effects. Therefore, the individual effects can be captured.

In our case we are interested in knowing the 'individual effects' is two ways. Firstly, we wish to know the effect of the presence of a difference in respect of developing countries vis-à-vis developed countries, in terms of the intercept. Secondly, we wish to know the effect of the difference amongst elasticities of the determinants with respect to developed countries. Therefore, we need to design the panel model so as to capture two effects. The first effect is due to scalar effect. The second effect is due the dynamic changes in the determinants (developmental variables). In the first case the difference dummy with respect to the base country grouping would be significant if the initial level of FDI in the developed countries is higher (or lower) than the general trend. In the second case it would show whether the determinants differ between all countries in general and the developed country grouping. Similarly, over a period of time the effect would be captured by the interactive dummy which is a product of the time variable and the country grouping dummy that is in difference form.

FDI Outflows

The general form of the fixed effects model is:

$$(FDI_{OF})_{it} = e^{\{[\alpha_0]+[\beta_1]*(t)+D_2+[\beta_2]*D2(t)\}}.(IHR)_{it}^{\beta 3}.(IINFRA)_{it}^{\beta 4}.(ILAB)_{it}^{\beta 5}.(IMKT)_{it}^{\beta 6}.(ITOPN)_{it}^{\beta 7}.(IRES)_{it}^{\beta 8} \quad (3)$$

Taking log on both the side and add error term

$$L(FDI_{OF})_{it} = \alpha_0 + \beta_1*(t) + D_2 + [\beta_2]*D_2(t) + \beta_3 L(IHR)_{it} + \beta_4 L(IINFRA)_{it} + \beta_5 L(ILAB)_{it} + \beta_6 L(IMKT)_{it} + \beta_7 L(ITOPN)_{it} + \beta_8 L(IRES)_{it} + U_{it} \quad (3a)$$

Where, FDI_{OF} = Foreign Direct Investment Outflows

α_0 = Intercept

t = 1990, 1991, 2009

β_1 = Growth Rate of World FDI

D_2 = Difference Dummy for Developed Countries

β_2 = Difference in Growth Rate of Developed Countries' FDI

β_3, β_4, β_5, β_6, β_7, and β_8 = Elasticities of Developmental Variables

IHR = Composite Index of Human Resource

IINFRA = Composite Index of Infrastructure

ILAB = Composite Index of Labour

IMKT = Composite Index of Market

IOPN = Composite Index of Trade Openness

IRES = Composite Index of Resources

FDI Outward Stock:

The general form of the fixed effects model is:

$$(FDI_{OS})_{It} = e^{\{[\alpha_0]+[\beta_1]*(t)+D_2+[\beta_2]*D2(t)\}}.(IHR)_{it}^{\beta 3}.(IINFRA)_{it}^{\beta 4}.(ILAB)_{it}^{\beta 5}.(IMKT)_{it}^{\beta 6}.(ITOPN)_{it}^{\beta 7}.(IRES)_{it}^{\beta 8} \quad (4)$$

Taking log on both the side and add error term

$$L(FDI_{OS})_{it} = \alpha_0 + \beta_1*(t) + D_2 + [\beta_2]*D_2(t) + \beta_3 L(IHR)_{it} + \beta_4 L(IINFRA)_{it} + \beta_5 L(ILAB)_{it} + \beta_6 L(IMKT)_{it} + \beta_7 L(ITOPN)_{it} + \beta_8 L(IRES)_{it} + U_{it} \quad (4a)$$

Where, FDI_{OS} = Foreign Direct Investment Outward Stock

α_0 = Intercept

t = 1990, 1991, 2009

β_1 = Growth Rate of World FDI

D_2 = Difference Dummy for Developed Countries

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IMKT = Composite Index of Market

IOPN = Composite Index of Trade Openness

IRES = Composite Index of Resources

Empirical Results and Analysis:

I. Principal Component Analysis of World Developmental Variables:

Human Resource

Human resource represents skilled manpower, which would have an impact on the FDI patterns. For measuring the variable we have identified variables- Expenditure on Education (EDUX), Primary Education, Pupils (EDU_P) and Total Population (POPT) and it has been explained about how we shall be developing a composite index, that summaries the information contained in all these variables. It involves three steps:

Table 2(a): KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		*.452*
Bartlett's Test of Sphericity	Approx. Chi-Square	2732.534
	Df	3
	Sig.	.000

First step involves the Kaiser-Meyer-Olkin (KMO) test which tells us about the adequacy of sample and appropriateness of PCA as a methodology. In general, value of KMO test should be on higher side. In case of human resource, value is 0.45, which is just reasonable. Bartlett test measures sphericity which states about suitability of using of PCA. If it is statistically significant then it tells about suitability of using principal component analysis. KMO test is highly statistically significant in case of human resource, which refers suitability of PCA. (***Table 2(a)***).

Results of Principal Component Analysis of Human Resource:

Next step is to find out number of principal components which are being retained. In this case, we got three variables and we have imposed the condition that all three variables have to be retained. Therefore total variance explained by these three variables is 100 percent. ***Table 2(b)*** gives the total explained variation captured by three retained components.

In the next step, we used Varimax rotation method, to arrive at rotated component score. This would enable us to have a better interpretation of components. Moreover it helps us in generating the value weights obtained from the factor loading for constructing the composite index.

Table 2(c): Rotated Component Matrix

Variable	*Component*		
	1	*2*	*3*
EDU_P	.997	.030	-.074
POPT	.993	.085	.076
EDUX	.057	.998	.002

Rotated component scores of EDU_P, EDUX and POPT are 0.997, 0.998 and 0.076 respectively (***Table 2(c)***). These scores are used for construction of composite index of human resource.

Composite Index of Human Resources:

I_{HR} = 0.997EDU_P + 0.998EDUX + 0.076POPT

Infrastructure:

Table 2(b): Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	2.013	67.094	67.094	2.013	67.094	67.094
2	.976	32.531	99.624	.976	32.531	99.624
3	.011	.376	100.000	.011	.376	100.000

Infrastructure refers to the facilities through which others resources can be efficiently and optimally used. For measuring this variable we have identified following variables- Energy Production (ENP), Electricity Production (ELP), Air Transport (ATS), Air Transport-Passengers (ATP), Road Sector Energy Consumption (ROAD), Telephone Lines (TEL) and Telephone Lines (per 100 People) (TEL_P). It shall be used to develop composite index that summaries the information contained in all these variables. In general, value of KMO test should be on higher side which represents good. The value of KMO test is 0.815, which is high and good. Bartlett test suggests infrastructure variable is highly statistically significant (***Table 3(a)***).

Results of Principal Component Analysis of Infrastructure:

Table 3(a): KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		*.815*
Bartlett's Test of Sphericity	Approx. Chi-Square	9192.486
	Df	21
	Sig.	.000

In this case, we have seven variables and we have imposed the condition that three variables have to be selected. The retained variables are ROAD, TEL, and TEL_P. Total variance explained by these three variables is 96.56 percent. Table 3b gives the total explained variation captured by three retained components.

Now, we used Varimax rotation method, to arrive at rotated component score. This would enable us to have a better interpretation of components. Moreover it helps us in generating the value weights obtained from the factor loading for constructing the composite index.

Table 3(c): Rotated Component Matrix

Variable	*Component*		
	1	*2*	*3*
ROAD	.896	.407	.096
ATP	.885	.428	.133
ATS	.869	.348	.216
ELP	.716	.683	.094
TEL	.350	.910	.090
ENP	.532	.805	-.030
TEL_P	.148	.039	.987

Rotated component scores of ROAD, TEL and TEL_P are 0.896, 0.910 and 0.987 respectively (***Table 3(c)***). These scores are used for construction of composite index of Infrastructure.

Composite Index of Infrastructure:

$$I_{INFRA} = 0.896ROAD + 0.910TEL + 0.987TEL\_P$$

Labour

Labour represents raw human work force. Cheap raw labour may influence cost side. For measuring this variable we have identified following variables- Employment, 15-24 age (EMPTEEN), Employment (EMP), GDP Per Person (GDPPC), Labour Participation Rate (LRATE), Labour Force, Total (LFT) and Population Working Ages (POPWA). It shall be used to develop composite index that provides the information contained in all these variables.

KMO test tells us about the adequacy of sample and appropriateness of PCA as a methodology. In general,

Table 3(b): Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	5.290	75.572	75.572	5.290	75.572	75.572
2	.993	14.187	89.759	.993	14.187	89.759
3	.479	6.840	96.599	.479	6.840	96.599
4	.151	2.164	98.763			
5	.065	.929	99.691			
6	.014	.199	99.891			
7	.008	.109	100.000			

value of KMO test should be on higher side which represents good. The value of KMO test is 0.666, which is good. Bartlett test suggests labour variable is highly statistically significant (***Table 4(a)***).

Results of Principal Component Analysis of Labour

Table 4(a): KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.666
Bartlett's Test of Sphericity	Approx. Chi-Square	2909.533
	Df	15
	Sig.	.000

Next step is to be found out number of principal components which are being retained. In this case, we have six variables and we have imposed the condition that three variables have to be selected. The retained variables are LRATE, LFT and POPWA. Total variance explained by these three variables is 89.01 percent (Table 4b).

Table 4(c): Rotated Component Matrix

Variable	*Component*		
	1	*2*	*3*
LRATE	.932	.183	.102
EMP	.929	.243	.104
EMPTEEN	.908	-.113	.097
LFT	.345	.860	.080
GDPPC	.268	-.673	.562
POPWA	.076	.002	.969

Next, we used Varimax rotation method, to arrive at rotated component score. This would enable us to have a better interpretation of components. Moreover it helps us in generating the value weights obtained from the factor loading for constructing the composite index.

Rotated component scores of LRATE, LFT and POPWA are 0.932, 0.860 and 0.969 respectively. These scores are used for construction of composite index of labour.

Composites Index of Labour

I_{LAB} = 0.932LRATE + 0.860LFT + 0.969POPWA

Market

Market is a place where production is used for consumption. For measuring this variable we have identified following variables- Market Capitalization of Listed Companies (MKTCAP), Listed Domestic Companies (COS), Population Density (POPDEN), Population in Largest City (POPL), Manufacturing-Value Added (MFWA), Industry-Value Added (INVA) and Services-Value Added (SVA). It shall be used to develop composite index that summaries the information contained in all these variables.

KMO test tells us about the adequacy of sample and appropriateness of PCA as a methodology. In general, value of KMO test should be on higher side which represents good. The value of KMO test is 0.824, which is high and good. Bartlett test suggests market variable is highly statistically significant (***Table 5(a)***).

Results of Principal Component Analysis of Market

Next step is to be found out number of principal components which are being retained. In this case, we have seven

Table 4(b): Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	2.983	49.715	49.715	2.983	49.715	49.715
2	1.566	26.093	75.808	1.566	26.093	75.808
3	.793	13.211	89.018	.793	13.211	89.018
4	.363	6.051	95.069			
5	.243	4.054	99.123			
6	.053	.877	100.000			

variables and we have imposed the condition that three variables have to be selected. The retained variables are MKTCAP, POPL and POPDEN. Total variance explained by these variables is 91.37 percent (***Table 5(b)***).

Table 5(a): KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		*.824*
Bartlett's Test of Sphericity	Approx. Chi-Square	7823.383
	Df	21
	Sig.	.000

We applied Varimax rotation method, to arrive at rotated component score. This would enable us to have a better interpretation of components. Moreover it helps us in generating the value weights obtained from the factor loading for constructing the composite index.

Table 5(c): Rotated Component Matrix

Variable	*Component*		
	1	*2*	*3*
MKTCAP	.962	.093	-.043
SVA	.961	.200	-.012
INVA	.907	.354	.052
MFVA	.897	.355	.067
COS	.695	.363	.141
POPL	.328	.929	.106
POPDEN	.023	.092	.993

Rotated component scores of MKTCAP, POPL and POPDEN are 0.962, 0.929 and 0.993 respectively. These scores are used for construction of composite index of Market (Table 5c).

Composite Index of Market:

I_{MKT} = 0.962MKTCAP + 0.929POPL + 0.993POPDEN

Trade Openness

Trade openness refers to openness of domestic country for international trade activities. It facilitates free movement of goods and services amongst countries. For measuring the variable we have identified variables- Total reserves (TRES), Trade Openness (TOPEN) and Official exchange rate (EXCG) and it has been explained about how we shall be developing a composite index, that summaries the information contained in all these variables.

KMO test which tells us about the adequacy of sample and appropriateness of PCA as a methodology. In general, value of KMO test should be on higher side which represents good. The value of KMO test is 0.485, which is reasonable. Bartlett test suggests trade openness variable is significant at 10 percent level of significance (***Table 6(a)***).

Results of Principal Component Analysis of Trade Openness

Table 6(a): KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		*.485*
Bartlett's Test of Sphericity	Approx. Chi-Square	6.958
	Df	3
	Sig.	.073

Next step is to be found out number of principal components which are being retained. In this case, we got three variables and we have imposed the condition that all three variables have to be retained. Therefore total variance explained by these three variables is 100 percent. Table 6b gives the total explained variation captured by three retained components.

Table 5(b): Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	4.734	67.628	67.628	4.734	67.628	67.628
2	1.072	15.318	82.947	1.072	15.318	82.947
3	.590	8.424	91.371	.590	8.424	91.371
4	.432	6.171	97.542			
5	.135	1.928	99.470			
6	.034	.487	99.957			
7	.003	.043	100.000			

In the next step, we used Varimax rotation method, to arrive at rotated component score. This would enable us to have a better interpretation of components. Moreover it helps us in generating the value weights obtained from the factor loading for constructing the composite index.

Table 6(c): Rotated Component Matrix

Variable	*Component*		
	1	*2*	*3*
EXCG	1.000	-.014	-.020
TRES	-.014	.999	-.042
TOPEN	-.020	-.043	.999

Rotated component scores of EXCG, TRES and TRADE are 1.00, 0.999 and 0.999 respectively (Table 6c). These scores are used for construction of composite index of trade openness.

Composite Index of Trade Openness

I_{TOPN} = 1.00EXCG + 0.999TRES + 0.999TOPEN

Resource

Resource includes Gross Fixed Capital Formation (GFCF), Gross Domestic Products (GDP), GDP Per Capita (GDPPC), Gross Domestic Savings (GDS) and Total Natural Resources (TNRES). These resources are used to developed composite index, which gives information contained in these variables.

KMO test which tells us about the adequacy of sample and appropriateness of PCA as a methodology. In general, value of KMO test should be on higher side which represents good. The value of KMO test is 0.560, which is good. Bartlett test suggests resource variable is highly significant.

Results of Principal Component Analysis of Resource

Table 7(a): KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.560
Bartlett's Test of Sphericity	Approx. Chi-Square	4820.623
	Df	10
	Sig.	.000

Next step is to be found out number of principal components which are being retained. In this case, we have five variables and we have imposed the condition that three variables have to be selected. The retained variables are GFCF, GDPPC and TNRES. Total variance explained by these variables is 98.02 percent (Table 7b).

In the next step, we used Varimax rotation method, to arrive at rotated component score. This would enable us to have a better interpretation of components. Moreover it helps us in generating the value weights obtained from the factor loading for constructing the composite index.

Table 7(c): Rotated Component Matrix

Variable	*Component*		
	1	*2*	*3*
GFCF	.989	.118	-.068
GDS	.968	.125	-.066
GDP	.960	.152	-.062
GDPPC	.172	.982	-.079
TNRES	-.080	-.076	.994

Rotated component scores of GFCF, GDPPC and TNRES are 0.989, 0.982 and 0.994 respectively (Table 7c). These scores loading are used for construction of composite index of resource.

Table 6(b): Total Variance Explained

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	1.086	36.191	36.191	1.086	36.191	36.191
2	1.020	34.002	70.193	1.020	34.002	70.193
3	.894	29.807	100.000	.894	29.807	100.000

Table 7(b): Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.078	61.552	61.552	3.078	61.552	61.552
2	1.016	20.328	81.879	1.016	20.328	81.879
3	.807	16.143	98.022	.807	16.143	98.022
4	.094	1.877	99.899			
5	.005	.101	100.000			

Composite Index of Resources

I_{RES} = 0.989GFCF + 0.982GDPPC + 0.994TNRES

II. World Outward FDI and Economic Development:

FDI Outflows: The growth rate of FDI outflows is 3.2 percent per annum. That of developed countries is not significantly different to the global pattern. FDI outflow is primarily from developed countries and hence human resource is negative and inelastic but significant. It shows that developed countries are not having any advantage in terms of human resources. The pattern of human resource variable is reflected in case of labour variable, only it is much larger in terms of magnitude. It is also more significant. Thirdly openness is greater in case of developed countries and FDI outflows are also growing. Therefore, the sign is positive and it is significant. However, the magnitude is not very large (Table 8).

In terms of market, the magnitude is large and the coefficient is also very significant. Most of the outflows are from developed markets. Developed markets are large. They have a large industrial base. Therefore, there would be large backward or forward linkages which lead to FDI outflow. However, infrastructure bears a negative sign although it is not statistically significant. Infrastructure may be related to the domestic economy of the countries and not to OFDI.

Table 8: Regression Statistics of World FDI Outflows and Developmental Variables

Multiple R	0.88
R Square	0.78
Adjusted R Square	0.78
Standard Error	1.41
Observations	720

Resource is the most important determinant because its magnitude is largest and unlike other coefficients, it has elasticity greater than one. This implies that one percent increase in resources would lead to 1.37 percent increase in FDI outflow (***Table 8***). This is highly significant. Most of the developed countries like USA, Australia, Canada, and Germany have ample resources. Therefore, it is obvious that they are in a position to process these resources because of technology and managerial skills. They have

ANOVA

	Df	SS	MS	F	Significance F
Regression	9	5074.50	563.83	283.67	0.00
Residual	710	1411.22	1.99		
Total	719	6485.72			

	Coefficients	Standard Error	t Stat	P-value
Intercept	-77.065	32.052	-2.404	0.016
DUMMY (D)	18.913	42.077	0.449	0.653
TIME	0.032	0.016	2.000	0.046
TIME*D	-0.009	0.021	-0.441	0.659
IHR	-0.234	0.086	-2.713	0.007
IINFRA	-0.136	0.137	-0.990	0.322
ILAB	-0.790	0.093	-8.524	0.000
IMKT	0.639	0.057	11.119	0.000
ITOPN	0.171	0.085	2.010	0.045
IRES	1.370	0.155	8.855	0.000

capability of large scale production on an industrial scale. Therefore, FDI outflow gives them the opportunity to invest in facilities abroad, which operate on backward linkage. This points out towards the organizational and integration aspect of OLI theory.

FDI Outward Stock:

Table 9: Regression Statistics of World FDI Outward Stock and Developmental Variables

Multiple R	*0.934*
R Square	0.873
Adjusted R Square	0.871
Standard Error	0.979
Observations	720

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	9	4678.86	519.87	542.24	0.00
Residual	710	680.72	0.96		
Total	719	5359.58			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-46.169	22.261	-2.074	0.038
DUMMY (D)	-34.448	29.223	-1.179	0.239
TIME	0.020	0.011	1.791	0.074
TIME*D	0.017	0.015	1.192	0.234
IHR	0.073	0.060	1.216	0.224
IINFRA	0.096	0.095	1.010	0.313
ILAB	-0.723	0.064	-11.234	0.000
IMKT	0.630	0.040	15.773	0.000
ITOPN	-0.047	0.059	-0.795	0.427
IRES	0.940	0.107	8.748	0.000

In terms of outward stock, the intercept of developed countries is lower but it is not statistically significant. This result is not very reliable because standard error is very high (table 9). In terms of growth rate, it is somewhat significant but stand at only 2 percent. However, developed countries have marginal advantage, although it is not statistically significant. Human resource as a variable shows a change in sign. However it is not statistically significant. The earlier interpretation would stand. In case of infrastructure also a similar trend is visible where the sign changes but it is not statistically significant. The labour variable behaves exactly in the same manner as in case of outflow. Even in a case of market the variable behaves in an identical manner. Openness again shows a change of sign but it is not statistically significant, perhaps annual changes in policy do not affect the long term trend, stock represents long term behavior pattern of OFDI. The elasticity of resource behaves in a similar manner only the value is slightly below unity. Possibly this shows that long run average change is lower than the annual marginal effect (***Table 9***).

Concluding Remarks

FDI Outflows: The annual growth rate is 3.2 percent. FDI outflow is mainly from developed countries. Since human resource is negative and inelastic but significant. It indicates that developed countries are not having any advantage in terms of human resources. The pattern of human resource is reflected in labour variable. Infrastructure is not significant. Market, openness and resource are positive and significant. Resource is the most important determinant because it has elasticity greater than one.

FDI Outward Stock: The annual growth rate is 2 percent. Human resource, infrastructure and openness are not significant. Labour is significant but with a negative coefficient. Resource and market variables indicate that OFDI has been focusing on resource-seeking purpose and market-seeking purpose.

The most of OFDI is directed towards market-seeking purpose and resource-seeking purpose. However, trade

openness is negative and not significant in case of stock. TRIMs which are trade related investment measures are not going to be very meaningful. Trade openness is a short-term measure for promoting trade but not investment. There is a need for having long-term policies which strengthen the trend towards long-term development of FDI. This is indicating for developing global FDI policy on the basis of multilateralism rather than bilateralism.

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Appendix

I. Developmental Variables:

Human Resources

EDUX : Adjusted savings: education expenditure (current US$)

EDU_P : Primary education, pupils

POPT : Population, total

Infrastructure

ENP : Energy production (kt of oil equivalent)

ELP : Electricity production (kWh)

ATS : Air transport, freight (million ton-km)

ATP : Air transport, passengers carried

ROAD : Road sector energy consumption (kt of oil equivalent)

TEL : Telephone lines

TEL_P : Telephone lines (per 100 people)

Labour

EMPTEEN : Employment to population ratio, ages 15-24, total (%)

EMP : Employment to population ratio, 15+, total (%)

GDPPC : GDP per person employed (constant 1990 PPP $)

LRATE : Labour participation rate, total (% of total population ages 15+)

LFT : Labour force, total

POPWA : Population in age 15-64 (% of total)

Market

MKTCAP : Market capitalization of listed companies (current US$)

COS : Listed domestic companies, total

POPDEN: Population density (people per sq. km of land area)

POPL : Population in largest city

MFWA : Manufacturing, value added (current US$)

INVA : Industry, value added (current US$)

SVA : Services, etc., value added (current US$)

Openness

TRES : Total reserves (includes gold, current US$)

TOPEN : Trade Openness

EXCG : Official exchange rate (US$ per LCU, period average)

Resources

GFCF : Gross fixed capital formation (current US$)

GDP : Gross Domestic Products (current US$)

GDPPC : GDP per capita (current US$)

GDS : Gross domestic savings (current US$)

TNRES : Total natural resources rents (% of GDP)