# Foreign Direct Investment, Growth and Convergence Hypothesis: A Cross Country Analysis

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## Abstract

This study investigates the relationship between foreign direct investment and economic growth by using seven years average annual data of 129 countries from the period of 2003 to 2009. Results indicate the significant positive relationships between foreign direct investment and economic growth in all countries, as well as in high, middle and low income countries. The foreign direct investment is contributing more in low income countries as compare to middle and high income countries. Results of unconditional convergence indicate that convergence exist in all, low, middle and high income countries. Results confirm that countries are coming together with respect to per capita income. Results of conditional convergence based on foreign direct investment suggest that the low and middle income countries are converging each other more rapidly. In high income countries the initial per capita income is remains negative and significant but the coefficient is almost similar in both conditional and unconditional models. This shows that chances of convergence in high income countries remain steady in the presence of foreign direct investment. On the other hand, in all countries model, coefficient is almost 60 percent higher in conditional model as compare to unconditional model. This indicates that with the existence of foreign direct investment, the overall countries are converging with the higher rate. In the light of above argument we can suggest to host country's to make unproblematic policies to attract foreign direct investment to make efficient utilization of resources and, reduce output gap in the country.



**Key words:** Foreign Direct Investment, Economic Growth, Cross Country Analysis

**JEL Classification:** F21, F43, O47

## 1. Introduction

Foreign direct investment (FDI) is found to be an important source of economic development in many developing countries. FDI reduce the unemployment in developing countries by providing more opportunity for jobs. Foreign direct investment facilitates the developing countries by transferring technologies from developed countries. FDI also stimulates domestic investment and facilitates improvement in human capital and institutions in the host countries. There are two main theories based on exogenous and endogenous growth theories have been used in past studies to explain the relationship between foreign direct investment and economic growth.

Exogenous growth theory (Neoclassical model) argue that economic development require high capital investment. The long run growth can only arise because of technological development, capital accumulation and growth in population. Foreign direct investment can only promote long run economic growth if it affects the technological development positively, consistently and permanently. Endogenous growth theory argues that economic development is mainly arising by internal factors. The long run growth can only achieved by investment in human capital, knowledge, domestic production and innovation. Foreign direct investment can affect economic development endogenously by increasing in domestic production and spillover effect.

FDI is a main source of transferring technologies in developing countries. New technology provide efficient production methods which leads to increase in domestic production. New technologies require training of employees, so technology transfer contributes to human capital formation through training and knowledge sharing. The past researchers pay special attention to the spillover effect. FDI provide technological boost in the industry which leads to

economic growth. This knowledge diffusion or efficiency spillover can lead to improvement in domestic production in several manners. A spillover can occur by adopting the technologies used by multinational corporations (MNCs) to improve domestic production. A spillover can also occur when domestic firms used same technology and resources more efficiently and effectively by the pressure of foreign competition.

FDI also provide significant increase in tax revenue of host country because of presence of foreign firms.[1] FDI not only provide the increase in capital investment but also provide growth in export and also in private sector which leads to economic growth. In developing countries foreign direct investment play an important role to financing the current account deficit as a source of capital inflows. FDI brings additional competition in domestic market. Domestic producers require to engage in market game more actively, through improvement in quality, reducing cost and innovation in products. Consumers may also beneficial because more varieties and quality products are available in the market.

Few previous studies also found some negative impact of foreign direct investment on economic growth. Introduction of new technologies assume or requires the existence of skilled labor in the host country, which are capable and trained of using those technologies. If the supply of labor is short in host country than it leads to negative impact on production and economic growth. Another possible reason of negative impact may include the imperfect competitive market. Entrance of foreign companies in the imperfect competitive markets may leads to reduce market share of domestic producers. Capabilities of scale economies also suffer in domestic producers because of lost of market share, which has a negative impact on productivity.

(Adams 2009), argues that more focus and dependence on foreign investment may discourage the domestic industry. (Singer 1950), and (Prebisch 1968), also argue that the host

[1] See, (Freeman 2002).

countries of FDI receive very few benefits, because most benefits are transferred to the multinational company's country.

The reviews of previous studies shows that the most of the empirical studies use the cross country data[2] but some time series[3] studies have been also conducted to analyze the relationship between foreign direct investment and economic growth. From above discussion no clear relationship has been found between foreign direct investment and economic growth. The question is, does foreign direct investment plays important role to enhance economic growth and reduce the gap between high middle and low income countries with respect to per capita income. In this study, we reexamine the relationship between foreign direct investment and economic growth by using a large sample of 129 countries. Additionally, convergence hypothesis has also been tested based on workers' remittances.

The rest of the paper is organized as follow: following introduction section 2 review some selected studies, section 3 discuss empirical strategy, section 4 shows estimations and results, section 5 performs sensitivity analysis, section 6 discuss the results of convergence and the final section conclude the study and provide some policy implications.

## 2. Literature Review

(Borensztein 1998), empirically identify the impact of foreign direct investment on economic growth on a sample size of 69 countries by using the data from the period of 1970 to 1989. Results indicate the positive relationship between foreign direct investment and economic growth. It is concluded that foreign direct investment contributes to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy.

[2] (Borensztein *et al.* 1998), (Katerina *et al.* 2004), and (Rachdi, Saidi 2011).
[3](Pradhan 2010), (Ghazali 2010)and (Egbo *et al.* 2011).

(Katerina *et al.* 2004), empirically investigate the relationship between foreign direct investment and economic growth in 17 transition economies by using the data from the period 1995 to 1998. Results suggest that foreign direct investment have positive but insignificant impact on economic growth in transition economies. (Bhandari et al. 2007), empirically examine the relationship of foreign aid and foreign direct investment with economic growth in 6 East European countries by using the pooled time series data from the period of 1993 to 2002.[4] Results indicate that inward foreign direct investment have significant positive impact on economic growth while, foreign aid have an insignificant effect on economic growth.

(Stanisic 2008), empirically investigate the correlation between foreign direct investment and economic growth in 7 Southeastern European transition economies by using annual data from the period 1997 to 2006. Results suggest that there is lack of correlation between foreign direct investment and economic growth. (Ndambendia, Njoupouognigni 2010), empirically examine the relationship of foreign aid and foreign direct investment with economic growth in 36 Sub Saharan African countries by using the data from the period 1980 to 2007. Pooled mean group (PMG) estimator and dynamic fixed effect (DFE) model have been used. Results suggest the positive relationship of both foreign aid and foreign direct investment with economic growth in Sub Saharan African countries. However, the foreign direct investment is contributing more in economic growth as compare to foreign aid.

(Tiwari, Mutascu 2011), empirically examine the relationship between foreign direct investment and economic growth in 23 Asian countries by using panel data from the period of 1986 to 2008. Results indicate the positive and significant relationship between foreign direct investment and economic growth. They suggest that policy makers should focus on enhancement of foreign direct investment for rapid growth in Asian developing countries. (Rachdi, Saidi

[4] These countries were Poland, Estonia, Hungary, Latvia, Lithuania and Czech Republic.

2011), empirically identify the impact of foreign direct investment on economic growth on a sample size of 100 countries by using the panel data from the period of 1990 to 2009. Countries are divided in three groups namely; full sample, developed countries and developing countries. Generalized methods of moments, fixed effect and random effect techniques have been used. Results indicate the significant positive relationship between foreign direct investment and economic growth in all 3 groups.

(Bilel, Mouldi 2011), investigate the impact of financial liberalization and foreign direct investment on economic growth in six MENA countries by using the data from the period 1986 to 2010. Results suggest the positive relationship between foreign direct investment and economic growth. On the other hand negative relationship is found between financial liberalization and economic growth. (Rabiei, Masoudi 2012), investigate the relationship between foreign direct investment and economic growth in eight Islamic countries by using pooled time series data from the period of 1980 to 2009. Regression results suggest the positive and significant impact of foreign direct investment on economic growth.

(Javed et al. 2012), investigate the impact of foreign direct investment and trade on economic growth in South Asian countries by using the data from the period of 1973 to 2010. Generalized methods of movements has been used. Results indicate the positive and significant impact of foreign direct investment on economic in Pakistan, Bangladesh and India while, significant negative relationship is found in Sri Lanka between foreign direct investment and economic growth.

**3. Empirical Framework**

The model to investigate the relationship between foreign direct investment and economic growth is estimated by using the production function framework.

$$Y = f(A, L, K) \quad (3.1)$$

Where $Y$ is the annual growth rate of per capita income, $L$ is the labor force, $K$ is the capital stock and $A$ is the total factor productivity. It is assumed that impact of foreign direct investment on economic growth operates through $A$.[5] The model for empirical estimation is developed as follow:

$$Y_t = \beta_0 + \beta_1 L_t + \beta_2 K_t + \beta_3 F_t + \varepsilon_t \quad (3.2)$$

Whereas $\varepsilon_t$ is the error term. $L$ is the total labor force and $F$ represents the foreign direct investment. Data of capital stock is not available so real gross fixed capital formation as percentage of *GDP* is used as a proxy of capital stock.[6] The positive sign is expected for $L$ and $K$ while, the sign of $F$ is to be determined.

Seven years average annual data of 129 countries from the period of 2003 to 2009 have been used. All the data are collected from the official database of World Bank. Countries are further divided into three groups; low income, middle income, high income countries. Furthermore, 57 countries are classified in low income, 33 countries are classified in middle income and 39 countries are classified in high income countries.[7] Selection of countries is based on availability of data. The list of all countries is provided in table 3.1.

***Insert table 3.1 here***

## 4. Estimations and Results

The relationship between foreign direct investment and economic growth has been examined by applying ordinary least square estimation procedure. Table 4.1 represents the results of OLS estimations.

***Insert table 4.1 here***

[5] See, (Kohpaiboon 2003).
[6] See (Jawaid, Waheed 2011).
[7] World Bank has divided the countries in 4 groups namely high, upper middle, lower middle and low income countries. In this study lower middle and low income countries are considered as a low income countries.

Results indicate the significant positive impact of foreign direct investment on economic growth in all as well as high, middle and low income countries. The findings are consistent with (Borensztein 1998), (Balamurali, Bogahawatte 2004), (Bhandari et al. 2007), (Ndambendia, Njoupouognigni 2010) and (Rachdi, Saidi 2011). The coefficient of foreign direct investment of low income countries is greater than middle income and high income countries. It confirms that foreign direct investment is contributing more in low income countries as compare to middle and high income countries.

**5. Sensitivity Analysis**

The contribution of foreign direct investment in the economic growth is confirmed through the results of ordinary least square method, however, the presence of larger variation in the data because of large sample size of 129 countries demanding to check the robustness of initial results. Sensitivity analysis is used to test the consistency in the results of focus variable. If the focus variable provide same significance and coefficient sign after putting additional variables in basic model than results are said to be robust otherwise results are fragile (Leven, Renelt 1992). Following model is developed to perform sensitivity analysis.

$$Y_t = \beta_0 + \beta_1 L_t + \beta_2 K_t + \beta_3 F_t + \beta_3 Z_t + \notin_t \quad (5.1)$$

Where Y represents the average growth rate of per capita income, L represents the total labor force, K represents the gross fixed capital formation as percentage of GDP, F represents the foreign direct investment as percentage of GDP, and Z represents a subset of additional variables that are theoretically and empirically related with the economic growth. (Adeniyo, Abiodun 2011), consider health expenditure; (Barro 1996), consider life expectancy, inflation, primary school enrollment and fertility rate and (Yanikkaya 2003), consider export as percentage of GDP as other major determinates of economic growth. In this study primary school enrollment (PSE),

inflation (INF), export as percentage of GDP (EXP), fertility rate (FER), health expenditure (HEX) and life expectancy (LEX) have been used as additional determinants of economic growth. Results of sensitivity analysis are presented in table 5.1.

***Insert table 5.1 here***

Table 5.1 shows the results of sensitivity analysis comprises of 15 models. Results indicate that focus variable foreign direct investment provides consistent coefficient sign and significance in all 15 models which confirms the robustness of results.

## 6. Convergence

In this section two different test of convergence have been performed namely unconditional convergence and conditional convergence. Convergence hypothesis argues that the per capita income of poorer economies is tend to grow faster than richer economies. Consequently, all economies should ultimately converge in terms of per capita income. [8]

### 6.1 Unconditional Convergence

The results of unconditional convergence in all countries, as well as in low, middle and high income countries are reported in table 6.1.

***Insert table 6.1 here***

Results indicate that the role of initial per capita income is significantly negative in all countries, as well as in low, middle and high income countries. The negative coefficients of initial per capita income indicate convergence in all four groups. Results confirm that countries are significantly coming together with respect to per capita income.

[8] To test convergence hypothesis we used data of 95 countries than 129. It depends upon availability of initial per capita income for the year of 1980. Furthermore in convergence hypothesis, 31 countries are classified in high income, 25 countries are classified in middle income and 39 countries are classified in low income countries.

### 6.2 Conditional Convergence based on Foreign Direct Investment

This section represents the results of effects of initial per capita income of a country on growth of per capita income, when foreign direct investment is also taken into account.

***Insert table 6.2 here***

Results of table 6.2 indicate that the initial per capita income is negative and significant in model of all countries as well as in low, middle and high income countries in the presence of foreign direct investment in the model. The coefficients of initial per capita income are increasing in low and middle income countries model in the presence of foreign direct investment. This shows that low and middle income countries are converging each other more rapidly because of foreign direct investment. In high income countries the initial per capita income is remains negative and significant but the coefficient is almost similar in both conditional and unconditional models. This shows that chances of convergence in high income countries remain steady in the presence of foreign direct investment. On the other hand, in all countries model the coefficient is almost 60 percent higher in conditional model as compare to unconditional model. This indicates that with the existence of foreign direct investment, the overall countries are converging with the higher rate.

However, low (middle and low) income countries get more benefit from foreign direct investment than high income countries because the gap between actual and potential output is greater in low and middle income than higher income countries. FDI helps these countries to utilize their resources effectively and reduce output gap in the country.

## 7. Conclusion and Recommendations

This study investigates the relationship between foreign direct investment and economic growth by using seven years average annual data of 129 countries from the period of 2003 to

2009. Results indicate the significant positive relationship between foreign direct investment and economic growth in all countries, as well as in high, middle and low income countries. The foreign direct investment is contributing more in low income countries as compare to middle and high income countries. Results of unconditional convergence indicate that convergence exist in all countries as well as in high, middle and low income countries.

Results confirm that countries are coming together with respect to per capita income. Results of conditional convergence based on foreign direct investment suggest that the low and middle income countries are converging each other more rapidly. In high income countries the initial per capita income is remains negative and significant but the coefficient is almost similar in both conditional and unconditional models. This shows that chances of convergence in high income countries remain steady in the presence of foreign direct investment. On the other hand, in all countries model the coefficient is almost 60 percent higher in conditional model as compare to unconditional model. This indicates that with the existence of foreign direct investment, the overall countries are converging with the higher rate. In the light of above argument we can suggest to host country's to make unproblematic policies to attract foreign direct investment to make efficient utilization of resources and reduce output gap in the country.

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**Table 3.1: Sample of 129 high, middle and low income countries**

| | High Income | 43 | Azerbaijan | 86 | El Salvador |
|---|---|---|---|---|---|
| 1 | Austria | 44 | Belarus | 87 | Ethiopia |
| 2 | Bahamas, The | 45 | Bosnia and Herzegovina | 88 | Georgia |
| 3 | Barbados | 46 | Botswana | 89 | Ghana |
| 4 | Belgium | 47 | Brazil | 90 | Guatemala |
| 5 | Canada | 48 | Bulgaria | 91 | Guinea |
| 6 | Croatia | 49 | Chile | 92 | Guyana |
| 7 | Cyprus | 50 | China | 93 | Honduras |
| 8 | Czech Republic | 51 | Colombia | 94 | India |
| 9 | Equatorial Guinea | 52 | Costa Rica | 95 | Indonesia |
| 10 | Estonia | 53 | Dominican Republic | 96 | Kenya |
| 11 | Finland | 54 | Ecuador | 97 | Kyrgyz Republic |
| 12 | France | 55 | Gabon | 98 | Lao PDR |
| 13 | Germany | 56 | Jordan | 99 | Madagascar |
| 14 | Greece | 57 | Kazakhstan | 100 | Malawi |
| 15 | Hong Kong SAR, China | 58 | Latvia | 101 | Malta |
| 16 | Hungary | 59 | Lebanon | 102 | Mauritania |
| 17 | Iceland | 60 | Lithuania | 103 | Moldova |
| 18 | Ireland | 61 | Macedonia, FYR | 104 | Mongolia |
| 19 | Israel | 62 | Malaysia | 105 | Morocco |
| 20 | Italy | 63 | Mauritius | 106 | Mozambique |
| 21 | Japan | 64 | Mexico | 107 | Nepal |
| 22 | Korea, Rep. | 65 | Namibia | 108 | Nicaragua |
| 23 | Macao SAR, China | 66 | Panama | 109 | North America |
| 24 | Netherlands | 67 | Peru | 110 | Pakistan |
| 25 | New Zealand | 68 | Romania | 111 | Papua New Guinea |
| 26 | Norway | 69 | Russian Federation | 112 | Paraguay |
| 27 | Poland | 70 | Turkey | 113 | Philippines |
| 28 | Portugal | 71 | Uruguay | 114 | Rwanda |
| 29 | Qatar | 72 | Venezuela, RB | 115 | Senegal |
| 30 | Saudi Arabia | | **Low income** | 116 | Sierra Leone |
| 31 | Singapore | 73 | Angola | 117 | Sri Lanka |
| 32 | Slovak Republic | 74 | Armenia | 118 | Sudan |
| 33 | Slovenia | 75 | Bangladesh | 119 | Swaziland |
| 34 | Spain | 76 | Benin | 120 | Syrian Arab Republic |
| 35 | Sweden | 77 | Bhutan | 121 | Tajikistan |
| 36 | Switzerland | 78 | Bolivia | 122 | Tanzania |
| 37 | United Arab Emirates | 79 | Cambodia | 123 | Tonga |
| 38 | United Kingdom | 80 | Cape Verde | 124 | Turkmenistan |
| 39 | United States | 81 | Chad | 125 | Uganda |
| | **Middle Income** | 82 | Comoros | 126 | Ukraine |
| 40 | Albania | 83 | Congo, Rep. | 127 | Uzbekistan |
| 41 | Algeria | 84 | Cote d'Ivoire | 128 | Vietnam |
| 42 | Argentina | 85 | Egypt, Arab Rep. | 129 | Zambia |

**Table 4.1: Determinants of Economic Growth**

| Variables | All Countries | | | High Income | | | Middle Income | | | Low Income | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** |
| **C** | -1.090 | -1.120 | 0.265 | -4.196 | -4.522 | 0.000 | -8.842 | -2.740 | 0.010 | -3.466 | -1.364 | 0.178 |
| **L** | 0.005 | 1.717 | 0.088 | 0.053 | 2.872 | 0.007 | 0.128 | 1.719 | 0.096 | 0.098 | 1.737 | 0.088 |
| **K** | 0.164 | 3.778 | 0.000 | 0.065 | 2.599 | 0.014 | 0.283 | 3.116 | 0.004 | 0.100 | 2.059 | 0.044 |
| **F** | 0.106 | 1.806 | 0.073 | 0.243 | 2.089 | 0.045 | 0.201 | 1.765 | 0.088 | 0.611 | 1.771 | 0.082 |
| **Adj. $R^2$** | 0.238 | | | 0.517 | | | 0.499 | | | 0.221 | | |
| **F-stats (prob.)** | 9.801(0.000) | | | 11.093(0.000) | | | 9.236(0.000) | | | 4.988(0.004) | | |

**Table 5.1: Results of Sensitivity Analysis**

| Models | All Countries | | | | High Income | | | | Middle Income | | | | Low Income | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff. of F | t-stats. (prob.) | $R^2$ | F-stats. (prob.) | Coeff. of F | t-stats. (prob.) | $R^2$ | F-stats. (prob.) | Coeff. of F | t-stats. (prob.) | $R^2$ | F-stats. (prob.) | Coeff. of F | t-stats. (prob.) | $R^2$ | F-stats. (prob.) |
| **Basic Model** | 0.106 | 1.806 (0.073) | 0.238 | 9.801 (0.000) | 0.243 | 2.089 (0.014) | 0.518 | 11.093 (0.000) | 0.201 | 1.765 (0.089) | 0.488 | 9.227 (0.000) | 0.611 | 1.771 (0.082) | 0.220 | 4.989 (0.004) |
| **EXP** | 0.101 | 1.678 (0.096) | 0.191 | 7.334 (0.000) | 0.244 | 1.944 (0.028) | 0.517 | 7.499 (0.000) | 0.202 | 1.738 (0.093) | 0.489 | 6.89 (0.000) | 0.659 | 1.685 (0.098) | 0.216 | 3.374 (0.016) |
| **FER** | 0.106 | 1.798 (0.074) | 0.221 | 7.293 (0.000) | 0.252 | 2.126 (0.042) | 0.524 | 8.268 (0.000) | 0.214 | 1.794 (0.084) | 0.495 | 6.607 (0.000) | 0.623 | 1.795 (0.078) | 0.223 | 3.838 (0.008) |
| **HEX** | 0.106 | 1.798 (0.075) | 0.221 | 7.292 (0.000) | 0.380 | 2.359 (0.028) | 0.565 | 7.152 (0.000) | 0.194 | 1.722 (0.096) | 0.493 | 7.051 (0.000) | 0.609 | 1.783 (0.082) | 0.278 | 4.793 (0.002) |
| **INF** | 0.101 | 1.772 (0.079) | 0.251 | 10.327 (0.000) | 0.251 | 2.118 (0.043) | 0.524 | 8.240 (0.000) | 0.228 | 1.790 (0.086) | 0.529 | 7.038 (0.000) | 0.629 | 1.753 (0.086) | 0.284 | 3.831 (0.008) |
| **LEX** | 0.106 | 1.798 (0.075) | 0.221 | 7.293 (0.000) | 0.241 | 1.939 (0.063) | 0.518 | 7.537 (0.000) | 0.198 | 1.713 (0.098) | 0.525 | 9.473 (0.000) | 0.589 | 1.695 (0.096) | 0.228 | 3.831 (0.008) |
| **PSE** | 0.106 | 1.806 (0.073) | 0.198 | 7.029 (0.000) | 0.198 | 1.754 (0.090) | 0.595 | 10.666 (0.000) | 0.200 | 1.705 (0.092) | 0.494 | 6.590 (0.000) | 0.651 | 1.87 (0.067) | 0.325 | 4.820 (0.001) |
| **EXP, FER** | 0.100 | 1.660 (0.099) | 0.191 | 5.825 (0.000) | 0.379 | 2.141 (0.045) | 0.567 | 4.966 (0.004) | 0.219 | 2.024 (0.058) | 0.463 | 4.631 (0.007) | 0.649 | 1.679 (0.093) | 0.255 | 3.019 (0.018) |
| **INF, HEX** | 0.106 | 1.764 (0.080) | 0.252 | 8.196 (0.000) | 0.392 | 2.394 (0.026) | 0.576 | 5.700 (0.002) | 0.236 | 2.151 (0.046) | 0.578 | 4.663 (0.007) | 0.692 | 1.721 (0.092) | 0.263 | 2.648 (0.034) |
| **INF, PSE** | 0.099 | 1.701 (0.091) | 0.252 | 7.936 (0.000) | 0.204 | 1.772 (0.087) | 0.598 | 8.342 (0.000) | 0.259 | 2.278 (0.036) | 0.578 | 4.675 (0.007) | 0.686 | 1.727 (0.090) | 0.221 | 2.722 (0.030) |
| **PSE, LEX** | 0.106 | 1.760 (0.080) | 0.202 | 5.578 (0.000) | 0.299 | 1.969 (0.065) | 0.707 | 8.685 (0.000) | 0.244 | 2.187 (0.042) | 0.568 | 4.729 (0.006) | 0.627 | 1.741 (0.088) | 0.277 | 3.598 (0.007) |
| **PSE, HEX** | 0.106 | 1.759 (0.081) | 0.213 | 5.578 (0.000) | 0.317 | 2.245 (0.036) | 0.706 | 9.618 (0.000) | 0.164 | 1.875 (0.075) | 0.532 | 4.554 (0.006) | 0.615 | 1.742 (0.088) | 0.286 | 3.918 (0.004) |
| **EXP, FER, HEX** | 0.096 | 1.676 (0.096) | 0.296 | 8.143 (0.000) | 0.344 | 1.825 (0.083) | 0.586 | 4.723 (0.004) | 0.232 | 1.954 (0.067) | 0.571 | 3.779 (0.014) | 0.689 | 1.740 (0.089) | 0.291 | 3.079 (0.013) |
| **PSE, INF, HEX** | 0.099 | 1.699 (0.092) | 0.252 | 6.557 (0.000) | 0.326 | 2.251 (0.036) | 0.710 | 7.768 (0.000) | 0.225 | 2.063 (0.056) | 0.647 | 4.877 (0.005) | 0.661 | 1.681 (0.099) | 0.296 | 3.147 (0.012) |
| **PSE, LEX, HEX** | 0.103 | 1.830 (0.069) | 0.293 | 8.157 (0.000) | 0.313 | 2.183 (0.042) | 0.712 | 7.826 (0.000) | 0.288 | 3.297 (0.005) | 0.614 | 4.643 (0.006) | 0.677 | 1.662 (0.093) | 0.307 | 3.238 (0.019) |
| **EXP, LEX, HEX** | 0.096 | 1.676 (0.096) | 0.286 | 8.143 (0.000) | 0.359 | 1.852 (0.079) | 0.591 | 4.582 (0.004) | 0.206 | 1.949 (0.069) | 0.646 | 4.867 (0.005) | 0.656 | 1.806 (0.078) | 0.305 | 3.011 (0.015) |

Source: Authors' estimation.

**Table 6.1: Results of Unconditional Convergence**

| Variables | All Countries | | | High Income | | | Middle Income | | | Low Income | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** |
| **C** | 4.408 | 2.478 | 0.019 | 5.843 | 2.844 | 0.009 | 4.583 | 2.564 | 0.017 | 3.043 | 5.460 | 0.000 |
| **G80** | -0.631 | -2.324 | 0.027 | -0.618 | -2.840 | 0.009 | -0.449 | -1.947 | 0.064 | -0.332 | -3.872 | 0.001 |
| **Adj. $R^2$** | 0.153 | | | 0.244 | | | 0.141 | | | 0.301 | | |
| **F-stats (prob.)** | 5.399(0.027) | | | 8.067(0.008) | | | 3.791(0.064) | | | 14.989(0.000) | | |

Source: Authors' estimation.

**Table 6.2: Results of Conditional Convergence**

| Variables | All Countries | | | High Income | | | Middle Income | | | Low Income | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** | **Coeff.** | **t-stats** | **Prob.** |
| **C** | 6.326 | 3.221 | 0.004 | 5.574 | 2.318 | 0.033 | 6.804 | 3.375 | 0.004 | 3.058 | 5.538 | 0.000 |
| **F** | 0.488 | 1.732 | 0.096 | 0.241 | 2.061 | 0.055 | 0.540 | 1.938 | 0.072 | 0.108 | 1.288 | 0.207 |
| **G80** | -1.012 | -3.239 | 0.003 | -0.618 | -2.441 | 0.026 | -0.854 | -3.345 | 0.004 | -0.351 | -4.072 | 0.000 |
| **Adj. $R^2$** | 0.306 | | | 0.428 | | | 0.513 | | | 0.332 | | |
| **F-stats (prob.)** | 5.516(0.010) | | | 6.358(0.009) | | | 7.916(0.005) | | | 8.465(0.001) | | |

Source: Authors' estimation.