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# **Aggregate and Disaggregate Natural Resources Agglomeration and Foreign Direct Investment in France**

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## **Abstract**

The inflow of foreign direct investment shows the economic and political strength of a country (Bevan & Estrin, 2004). Resources agglomeration and foreign direct investment have a theoretical and empirical relationship (Carlton, 1983; Hansen, 1987; Krugman, 1991; Wheeler and Mody, 1992; Friedman et al., 1992; Head et al., 1995; Henderson and Kuncoro, 1996; Head and Ries, 1996; Devereux and Griffith, 1998; Head et al., 1999; Guimaraes et al., 2000). This paper has examined the impact of aggregate and disaggregate natural resources agglomeration on foreign direct investment in the case of France from 1989 to 2012. Seven different model specifications are used for empirical analysis. The inflow of foreign direct investment from Greece, Australia, Austria, Germany, Canada, Finland, Ireland, Hungary, Israel, Japan, Italy, Republic of South Korea, Switzerland, Norway, Netherlands, Poland, Spain, Portugal, Sweden, Turkey, United States, Mexico, Korea and United Kingdom in France is taken as the dependent variable. Total natural resources agglomeration, population density, trade openness, secondary education, taxes, inflation rate, primary education, agriculture land agglomeration, forest agglomeration, oil production agglomeration, mineral production agglomeration and natural gas production agglomeration are selected as explanatory variables. The results show that aggregate and disaggregate natural resources agglomeration are important indicators of foreign direct investment. The results show that the population density is a key indicator of foreign direct investment, the current population growth of France and many developed countries is below the replacement rate. Agriculture land agglomeration, oil production agglomeration and mineral production agglomeration are the inputs of many economic activities. This shows that for higher amount of foreign direct investment, natural resources agglomeration must be encouraged.

**Keywords:** natural resources agglomeration, foreign direct investment

**JEL Codes:** N5, F21

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## **Introduction**

Foreign direct investment is equally important for developing and developed countries (Schneider & Frey 1985). Simply, when a country or firm directly invests to another country, it is known as foreign direct investment. Numerous theories have tried to explain the different determinants of foreign direct investment. These theories have developed different systematic framework for the emergence of foreign direct investment, every theory has its own advantages and disadvantages (Itaki, 1991; Parry, 1985; Agarwal, 1980). There are three main kinds of foreign direct investment (Dunning, 1993; UNCTAD, 1998). The first kind of foreign direct investment is called market seeking, the main aim of this type of foreign direct investment is capture regional and local market. This kind of investment is also known as horizontal foreign direct investment, because it encourages production replication process in the host country (Dunning, 1993; UNCTAD, 1998). Higher tariff and trade barriers are very useful for this type of foreign investment, because horizontal foreign direct investment favors local production in the local market. As a result, the products market grows in the host country, but higher trade barriers will increase transport costs and new machinery cost in the foreign investment receiving country. The second kind of foreign direct investment known as efficiency seeking (Dunning, 1993). This investment takes place when a foreign firm invests in a country due to its better geographic, governances, large economies of scales and efficient labor (UNCTAD, 1998). The third kind of foreign direct investment is known as resources seeking. If a firm invests in another country due to lack of specific resource in its home country, i.e. low labor costs, raw material or natural resources (UNCTAD, 1998). Resources seeking foreign investment is occurring when multinational firms indulge themselves into an export promotion process of the host country, this is also known as export oriented or vertical foreign direct investment (Dunning, 1993). Unlike the horizontal foreign investment, vertical foreign investment encourages production process in the host country. The low cost of labor is the prime part of vertical foreign direct investment, plentiful natural resources endowments (natural gas and oil etc.) also attract multinational firms' investment.

For over 100 years, natural resources agglomeration became a topic of discussion among the developed and developing countries. It is the resources agglomeration that decides the productivity of a nation (Marshall, 1890). Natural resources agglomeration enhances the importance of particular places for individuals and firms. In the beginning, natural resources urge domestic firms,

and then foreign firms would rise the overall concentration as well. This further increases the size of the place; cost of production will decrease and the overall potential of the place will increase for the households and businesses. The process of agglomeration will the congestion of the people. Krugman (1991) points out that economics of agglomeration has become the main part of the geographical economics. Therefore, economics of agglomeration generates huge number of economic activities for national as well as international businesses. Moreover, the rising agglomeration creates localization among economies. Foreign direct investment is playing a vital role in the procedure of economic integration among the nations (OECD, 2007; Baldwin and Martin, 1999). The process of liberalization provides root to the development of new markets, the emergence of services sector and constraints of capital movement are diminished. These trends create friendly conditions for higher foreign direct investment. France is one of the big developed countries which has a huge amount of inflow and outflow of foreign direct investment. This type of study is hardly available in the case of France. This is why the study will be a healthy contribution towards respective literature.

### **Literature Review**

Following a large number theoretical and empirical studies, here we have selected most relevant and recent for literature review. The importance of foreign direct investment is a topic of controversy. Schneider and Frey (1985), Culem (1988) and Lunn (1980) conclude that there is positive and significant relationship between growth and FDI. Whereas Tsai (1994) finds insignificant relationship between growth and FDI in the case of developing countries. Nigh (1985) mentions that there is positive but weak correlation between determinants of FDI in developing correlation whereas there is negative but weak correlation in developed countries. Ancharaz (2003) examines the determinants of FDI in African countries, the study finds insignificant effects of determinants on FDI in African countries. Schneider and Frey (1985) and Gastanaga et al. (1998) find significant and positive relationship between growth and FDI. Charkrabarti (2001) mentions that hypothesis developed by Lim (1983) highlights that newly developed economies have much opportunities for foreign firms to earn profit. So, huge amount of FDI were seen in developing countries like China and India during 1990's.

There are number studies which link foreign direct investment to fiscal benefits of the host country i.e. tax evasion. Swenson (1994) finds positive and significant relation between fiscal policy and

foreign direct investment. Some studies mention that host country corporate tax policy has negative and significant impact on foreign direct investment (Kemsley, 1998; Cassou, 1997; Loree and Guisinger, 1995; Hartman, 1994; Hines and Rice, 1994; Grubert and Mutti, 1991). But there are number of studies which conclude that fiscal policy has insignificant impact on inflow of foreign direct investment (Porcano and Price, 1996; Ning and Reed, 1995; Jackson and Markowski, 1995; Wheeler and Mody, 1992; Lim, 1983; Root and Ahmed, 1979). Artige and Nicolini (2005) find market size play a significant role in deciding the inflow of foreign direct investment. Marr (1997) examines the relationship between market size and foreign direct investment in cross sectional analysis. The results of the study show that market size is not much influential indicator to attract foreign direct investment. Charkrabarti (2001) also highlights that trade openness has enhanced the inflow for foreign direct investment whereas market size does not contribute much in this regard.

Jordaan (2004) points out that trade openness has different impacts for different types of foreign direct investment. The study mentions that market seeking foreign direct investment has positive relation with trade restrictions whereas export seeking foreign direct investment encourages more trade openness. Wheeler and Mody (1992) finds positive relationship between manufacture sector growth and foreign direct investment. Pärletun (2008), Edwards (1990), Culem (1988) and Kravis and Lipsey (1982) conclude that trade openness encourages the inflow of foreign direct investment irrespective of country size. Schmitz and Bieri (1972) find a weak relationship between trade openness and inflow of foreign direct investment. Demirhan and Masca (2008) examine the determinants of foreign direct investment with the help of cross-sectional data from 2000 to 2004. This study uses 38 developing countries for empirical analysis. This study uses corporate tax, risk factors, degree of openness, manufacturing industry index, labor costs, availability of telephone per 1000 population, inflation rate and GDP per capita as independent variables, inflow of foreign direct investment is taken as dependent variable. The results of the study explain that degree of openness, availability of telephone and income per capita has significant impact on inflow of foreign direct investment in developing countries. Tax rate and inflation rate have significant and negative impact on inflow of foreign direct investment, whereas risk factors and labor costs have insignificant impact on inflow of foreign direct investment in developing countries.

Schlager and Ostrom (1992) mention that natural resources and property rights motivate investors to make investment. Zambrano (2015) examine the impact of natural resources on economic growth. The study finds positive and significant relationship between natural resources and economic growth. Betz et al. (2015) mention that resources agglomeration plays significant role in deciding the amount of national and international investment. Farhadiet al. (2015) point that resources and property right with freedom decide the pattern of investment. Jovic et al. (2016) conclude that natural resources are very important indicators for economic development. Ebeke and Etoundi (2017) conclude that natural resources set the pattern of urbanization and other facilities in an economy. Ullahet al. (2017) and Sikor et al. (2017) mention that natural resources are very important for investment decision. Ali and Zulfiqar (2018) conclude that natural resources agglomeration reduces unemployment and enhance investment opportunities in an economy.

### **The model**

The fundamental objective of economics is to provide understanding about the human choice. Hypotheses or models are framed in such a way that the real presentation of human choice can be achieved. Likewise, when a foreign investor wants to invest in a foreign country, he/she must face a number of internal and external factors. This is very complicated task; an individual investor cannot observe or examine all influencing factors related to an investment. This is why econometricians suggest a sampling process for valid empirical analysis (McFadden, 1974). Numerous theories present a systemic framework for the emergence of FDI. Each theory has its own self-contained generalization for explaining the process and kinds of FDI i.e. inward and outward FDI, country level, industry level and firm level FDI (McFadden, 1974; Agarwal, 1980; Parry, 1985; Itaki, 1991). This study follows the methodologies of (Marshall, 1920; Bandera and White, 1968; Schmitz and Bieri, 1972; McFadden, 1974; Shaw and Teye, 1978; Lunn, 1980; Arthur, 1990; David and Rosenbloom, 1990; Krugman, 1991; Rolfe and White, 1992; Arthur, 1994; Devereux and Griffith, 1998; Head et al., 1999; Guimaraes et al., 2000 and Ali and Zulfiqar, 2018). Suppose an individual country,  $i$  when to invest in France  $F$  and earn profit of  $\pi_{iF}$ . This can be written in an econometric form.

$$\pi_{iF} = X_{iF} + \mu_{iF} \quad (1)$$

Here  $X_{iF}$  is a linear combination of explanatory variables,  $\mu_{iF}$  presents a white noise error term,  $i$  is the investing country in France. The investing country preferred investment in France if

$$\pi_{iF} > \pi_{iD}, \quad D \neq F \quad (2)$$

This shows that the investing country will have greater expected profits in France in comparison to its national territories.

The natural behavior of the investing country for profit earning implies that the foreign investment by a country is

$$FDI_i = \text{Prob}(\pi_{iF} > \pi_{iD}), \quad D \neq F \quad (3)$$

Therefore, the linear functional form of the model becomes as

$$FDI_i = f(X_i) \quad (4)$$

Here, FDI= inflow foreign direct investment in France

i= selected countries (Greece, Australia, Austria, Germany, Canada, Finland, Ireland, Hungary, Israel, Japan, Italy, Republic of South Korea, Switzerland, Norway, Netherlands, Poland, Spain, Portugal, Sweden, Turkey, United States, Mexico, Korea and United Kingdom).

The econometric function becomes as:

$$FDI_i = \alpha + \beta X_{iF} + \mu_i \quad (5)$$

Total natural resources index, population density, trade openness, secondary enrollment, taxes, inflation rate, agriculture land as a percentage of total land, forest as a percentage of total land, mineral production, natural gas production and oil production are selected as independent variables. The data of selected variable is taken from the official website of OECD and World Bank.

### **Econometric Methodology**

Application of econometric methods on macro-economic variables is an imperative feature within numerical economic inquiry. For baseline estimation, ordinary least squares (OLS) method has not been applied. A constraint of this method is that it applies to linear time series data if data is non-linear OLS provides unreliable estimates of the parameters. It means that, the measurements for consideration will not essentially reach near the accurate population parameters on the basis of sample data. Moreover, time series data have the non-stationarity or unit root problem. Nelson and Plosser (1982) discuss that frequency time-series data of macro-economic variables have unit-root

issue. Nemours unit root tests are available in applied econometric literature. Hadri (2000) introduces a panel unit root test based on Kwiatkowski-Phillips-Schmidt- Shin test (KPSS). Hadri (2000) uses null hypothesis based on KPSS tests, which decides the series is stationary in the presence of time trend. Theoretically Hadri (2000) unit root test estimates the error with the help of OLS from  $Y_{it}$ . It may have constant only, time trend only or including all at the same time. There is no unit root issue, it is the standard null hypothesis of the test and alternative is vice-versa.

$$Y_{it} = r_{it} + e_{it} \quad (6)$$

$$r_{it} = r_{i,t-1} + u_{it} \quad (7)$$

$$H_0: \sigma^2_u=0 \quad (8)$$

In any case, the variance error term is zero, in such situation the  $r_{it}$  is considered as constant term and the series is stationary. Heteroskedasticity can also be adjusted with the help of Hardi (2000) unit root test.

As the issue of the unit is resolved, the long and short coefficient of the model can be examined. Pesaran et al., (1999) introduced PMG (Pooled Mean Group) test to examine non-stationary dynamic panels. The solution of the non - stationarity issue is very necessary in case of dynamic panel's analysis. PMG test uses amalgamating and averaging process for measuring the parameters (Peraran et al., 1999). Following the proposed assumptions of PMG, the short run coefficient of the model can be estimated for the group. PMG eq. becomes as:

$$y_{it} = \sum_{j=1}^p \lambda_{ij} y_{i,t-j} + \sum_{j=0}^q \delta_{ij} X_{i,t-j} + u_t + \varepsilon_{it} \quad (9)$$

Here cross section  $i=($ Greece, Australia, Austria, Germany, Canada, Finland, Ireland, Hungary, Israel, Japan, Italy, Republic of South Korea, Switzerland, Norway, Netherlands, Poland, Spain, Portugal, Sweden, Turkey, United States, Mexico, Korea and United Kingdom) and time period  $t=1989$  to  $2012$ .  $X_{it}$  comprise of  $K \times 1$  regressors,  $\lambda_{ij}$  is a scalar,  $u_i$  presents effects of specific group. In any case if variables have  $I(1)$  order of integration the residual is integrated at  $I(0)$  order. This represents that integrated variables are rejoin the long run equilibrium, if in case of short some deviation. This is known as error correction dynamics. The panel error correction term is as:



$$y_{it} = \phi_i y_{i,t-j} - \theta_i X_{i,t-j} \sum_{j=1}^{p-1} \lambda_{ii} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta X_{i,t-j} + u_i + \varepsilon_{it} \quad (10)$$

Here  $\phi_i$  represents the error correction parameter, this explains the adjustment speed from short run to long run. If  $\phi_i = 0$ , this explains that presence of long run relationship among variables. It is a necessary and sufficient condition for convergence, the value do  $\phi_i$  must be significant and negative.

## Results and Discussion

This article is going to examine the impact of aggregate and disaggregate natural resources on foreign direct investment in France over the period of 1989 to 2012. Foreign direct investment from Greece, Australia, Austria, Germany, Canada, Finland, Ireland, Hungary, Israel, Japan, Italy, Republic of South Korea, Switzerland, Norway, Netherlands, Poland, Spain, Portugal, Sweden, Turkey, United States, Mexico, Korea and United Kingdom is selected as a dependent variable whereas total natural resources, population density, trade openness, secondary enrollment, taxes, inflation rate are selected as explanatory variables. This study also uses natural resources such as agriculture land as a percentage of total land, forest as a percentage of total land, mineral production, natural gas production and oil production as explanatory variables for disaggregated natural resources impacts of foreign direct investment in the case of France. This study uses Hadri Z-stat and Heteroscedastic Consistent Z-stat for unit root analysis. The estimated results of the study reveal that all the selected variables are stationary at I(0). This article has used panel ARDL for long run and short run empirical analysis.

**Table-1**

Variables	Test	Statistic	Prob**	Obs
FDI_PERCENT (0)	Hadri Z-stat	15.8207	0.0000	552
	Heteroscedastic Consistent Z-stat	13.5853	0.0000	552
TOTAL_NATURAL	Hadri Z-stat	11.6371	0.0000	552
	Heteroscedastic Consistent Z-stat	11.6371	0.0000	552
POP_DENSITY	Hadri Z-stat	17.1369	0.0000	552
	Heteroscedastic Consistent Z-stat	17.1369	0.0000	552
OPEN	Hadri Z-stat	17.0530	0.0000	552
	Heteroscedastic Consistent Z-stat	17.0530	0.0000	552
SECONDARY_EN	Hadri Z-stat	8.50082	0.0000	552
	Heteroscedastic Consistent Z-stat	8.50082	0.0000	552
TAX	Hadri Z-stat	12.4977	0.0000	552

	Heteroscedastic Consistent Z-stat	12.4977	0.0000	552
INF	Hadri Z-stat	4.60785	0.0000	552
	Heteroscedastic Consistent Z-stat	4.60785	0.0000	552
AGRI_LAND	Hadri Z-stat	17.5605	0.0000	552
	Heteroscedastic Consistent Z-stat	17.5605	0.0000	552
FOREST	Hadri Z-stat	14.4219	0.0000	552
	Heteroscedastic Consistent Z-stat	14.4219	0.0000	552
MINERAL	Hadri Z-stat	2.19331	0.0141	552
	Heteroscedastic Consistent Z-stat	2.19331	0.0141	552
NATURAL_G	Hadri Z-stat	11.4501	0.0000	552
	Heteroscedastic Consistent Z-stat	11.4501	0.0000	552
OIL	Hadri Z-stat	1.44176	0.0747	552
	Heteroscedastic Consistent Z-stat	1.44176	0.0747	552

The long run results of the study are presented in the table-2. For aggregate and disaggregate analysis, this study uses 7 different specifications for empirical analysis. Aggregate natural resource agglomeration specifications are presented in model 1 and model 2. The disaggregate natural resource agglomeration specifications are presented in model-3 to model-7.

**Model-1:** The model-1 specification uses foreign direct investment as a dependent variable, whereas total natural resources agglomeration, population density, trade openness, taxes, inflation and secondary education are used as explanatory variables. The long run outcomes of the model-1 explains that natural resources agglomeration has a significant impact on foreign direct investment. The results reveal that a 1 percent rise in natural resources agglomeration brings (0.000446) percent increase in foreign direct investment in France. Guimaraes et al., (2000) points out that natural resource agglomeration decides the location of national and international firms for investment. The findings of this study are in-line with the findings of Guimaraes et al., (2000), De Gregori, (2005) and Asiedu, (2006). Population density has a positive and significant impact on foreign direct investment. Rising population demands more employment opportunities and if the domestic investment is insufficient then the economies encourage foreign direct investment. The estimated outcomes reveal that a 1 percent increase in population density increases foreign direct investment by (2.75E-05) percent in the case of France. These findings are consistent with the findings of Guimaraes et al., (2000). The results show that trade openness has a negative and significant relationship with foreign direct investment. The estimates show that a 1 percent increase in trade openness brings (-0.00089) percent decrease in foreign direct investment in France. Secondary school education impacts positively and significantly foreign direct investment. Higher education and technical education enhance human capital and demand more employment opportunities. The results reveal that a 1 percent rise in secondary school education brings (2.34E-

06) percent rise in foreign direct investment in the case of France. Leite and Weidmann (1999), Billington (1999) and Guimaraes et al., (2000) mention that higher education encourages foreign investors. The estimated outcomes show that tax structure has a positive and significant impact on foreign direct investment in France. Public policy is one of the main determinants of foreign direct investment. It is the government that provides a stable political and economic environment for foreign investors. The results reveal that a 1 percent increase in taxes bring a (1.05E-05) percent increase in foreign direct investment. The findings of this study are consistent with the findings of Acs and Szerb (2007). Inflation puts a positive and significant impact on foreign direct investment. Macroeconomic stability plays an important role in determining the inflow of foreign direct investment. The estimated results show that a 1 percent increase in inflation brings a (2.04E-05) percent increase in foreign direct investment in the case of France. Bellak and Leibrecht (2009) and Azam (2010) mention that rising macroeconomic instability discourages foreign direct investment. The overall results of the selected specification in model-1 show that the total natural resources agglomeration, population density, secondary education, inflation rate and tax structure are enhancing foreign direct investment in the case of France, whereas trade openness is depressing foreign direct investment in France.

**Model-2:** In model-2 specification, total natural resources agglomeration, population density, trade openness, taxes, inflation and primary education are selected as independent variables whereas foreign direct investment is a dependent variable. The long run results of model-2 show that total natural resources agglomeration has a negative, but insignificant impact on foreign direct investment in the case of France. The estimated results reveal that population density has a positive and significant relationship with foreign direct investment in France. Rising population demands more employment opportunities and if the domestic investment is insufficient then the economies encourage foreign direct investment. The results show that a 1 percent rise in population density brings a (2.75E-05) percent increase in foreign direct investment. Guimaraes et al., (2000) find the same findings in the case of Portugal. The results reveal that trade openness has a negative and significant relationship with trade openness. Trade openness enhances foreign direct investment in developing countries whereas trade openness and foreign direct investment has an inverse relationship (Liargovas & Skandalis 2012). The results reveal that a 1 percent increase in trade openness brings a (-0.002743) percent decrease in foreign direct investment in France. The estimated outcomes reveal that taxes and inflation have a positive and significant relationship with

foreign direct investment in the case of France. The public policies are modelled in a way that more foreign direct investment can be encouraged. The outcomes show that a 1 percent increase in taxes and inflation brings a (2.46E-05) percent and a (7.45E-05) percent respective increase in foreign direct investment. These findings are consistent with the findings of (Darley 2012). The results show that primary education has a negative and significant relationship with foreign direct investment in France. Higher education is attached with higher human capital (Barro, 1990) and higher human capital encourages domestic and foreign direct investment activities. Therefore, primary education has a negative relationship with foreign direct investment. The results reveal that a 1 percent increase in primary education brings a (-2.33E-05) percent decrease in foreign direct investment in France. The overall results show that the total natural resources agglomeration, trade openness and primary education has a negative and significant relationship with foreign direct investment in France, whereas population density, taxes and inflation have a positive impact on foreign direct investment in the case of France. The results show that following the specification of model-2, primary education and total natural resources agglomeration have a negative impact on foreign direct investment in the case of France. This highlights that higher and technical education, public policy with total natural resources agglomeration encourage foreign direct investment. Therefore, the French government sets rates for higher foreign direct investment.

**Model-3:** The model-3 is based on a third specification where disaggregated natural resources agglomeration is used. Agriculture land agglomeration, forest agglomeration and oil production agglomeration are selected as indicators of natural resources agglomeration. The results explain that population density and secondary education have a positive and significant relationship with foreign direct investment in the case of France. The results reveal that respectively a (0.000369) percent and a (3.03E-05) percent increase in foreign direct investment are occurring through population density and secondary education. These findings are consistent with the findings of (Guimaraes et al., 2000). The results reveal that agriculture land agglomeration has a positive and significant relationship with foreign direct investment. The results reveal that a 1 percent increase in agricultural land agglomeration brings a (0.001424) percent rise in foreign direct investment in France. There is a number of multinational firms that like to invest in primary goods and services. The fact that these countries have larger agriculture land is the main focus of foreign direct investment even in this technological advanced age. The estimated results show that forest agglomeration has a negative, but insignificant impact on foreign direct investment in France. The

outcomes show that oil production agglomeration has a negative and significant relationship with foreign direct investment. The results show that a 1 percent increase in oil production agglomeration decreases (-0.017773) percent the foreign direct investment in France. The overall long run result of model-3 shows that among natural resources agglomeration, agriculture land agglomeration has a positive impact on foreign direct investment along with population density and secondary education.

**Model-4:** The model-4 presents the fourth specification; population density, secondary education and taxes are explanatory variables with a disaggregated natural resources agglomeration of agriculture land agglomeration, forest agglomeration and oil production agglomeration. The results show that population density and secondary education have a positive and significant impact on foreign direct investment in France. The estimated results that that a 1 percent increase in population density and secondary education bring a (0.000365) percent and a (2.81E-05) percent respective increase in foreign direct investment. The results show that taxes have a negative and insignificant impact on foreign direct investment in France. Agriculture land agglomeration has a positive and significant relationship with foreign direct investment. The estimates show that a 1 percent increase in agricultural land agglomeration brings a (0.001389) percent increase in foreign direct investment in the case of France. The estimated outcomes reveal that forest agglomeration has a negative but insignificant impact on foreign direct investment in France. The results reveal that oil production agglomeration has a negative and significant impact on foreign direct investment in France. The overall results of the model-4 explain that population density, secondary education and agriculture land agglomeration are enhancing foreign direct investment in France. Public policy and forest agglomeration have a negative and insignificant impact on foreign direct investment.

**Model-5:** The model-5 presents the fifth specification; population density, secondary education, trade openness and taxes are explanatory variables with a disaggregated natural resources agglomeration of agriculture land agglomeration, forest agglomeration and oil production agglomeration. The results show that population density, secondary education and taxes have a positive and significant impact on foreign direct investment in the case of France. The estimated results reveal that a 1 percent increase in population density and secondary education and taxes bring a (0.000391) percent, a (3.16E-05) percent and a (1.57E-05) percent increase in foreign direct investment in the case of France, respectively. Trade openness, oil production agglomeration and

forest agglomeration have a negative and insignificant impact on foreign direct investment in France. Agriculture land agglomeration has a positive and significant impact on foreign direct investment. The outcomes show that a 1 percent increase in agricultural land agglomeration brings a (0.001368) percent rise in foreign direct investment in the case of France after the selected time period. The overall results of the model-5 explain that population density, secondary education, public policy and agriculture land agglomeration are enhancing foreign direct investment in France, whereas trade openness, forest agglomeration and oil production have an insignificant impact on foreign direct investment in France.

**Model-6:** The model-6 presents the sixth specification; population density, trade openness, taxes and primary education are explanatory variables with a disaggregated natural resources agglomeration of agriculture land agglomeration, forest agglomeration and oil production agglomeration. Population density and tax structure have a positive and significant impact on foreign direct investment in the case of France. The estimated outcomes reveal that a 1 percent increase in population density and taxes brings a (0.001508) percent and a (0.000174) percent respective rise in foreign direct investment. Trade openness is negatively and significantly impacting foreign direct investment in France. A 1 percent rise in trade openness reduces of (-0.026154) percent foreign direct investment. Primary education has a negative, but insignificant impact on foreign direct investment in France. The results reveal that agriculture land agglomeration and forest agglomeration have a positive and significant impact on foreign direct investment in France. The coefficients show that a 1 percent increase in agricultural land agglomeration and forest agglomeration brings a (0.004578) percent and a (0.074912) percent rise in foreign direct investment, respectively. Oil production agglomeration has a negative and significant impact on foreign direct investment. The outcomes show that a 1 percent increase in oil production brings a (-0.075792) percent decrease in foreign direct investment in France. The overall results of this specification reveal that population density, public policy, agriculture land agglomeration and forest agglomeration are enhancing foreign direct investment in the case of France. Trade openness and oil production agglomeration are depressing foreign direct investment in France. The results show that the presence of insignificant primary education that disaggregated natural resources is significantly contributing to foreign direct investment.

**Model-7:** The model-7 presents the seventh specification; this specification is completely based on disaggregated natural resources agglomeration such as agricultural land agglomeration, forest

agglomeration, oil production agglomeration, mineral production agglomeration and natural gas production agglomeration. Agriculture land agglomeration has a positive, but insignificant impact on foreign direct investment in France. The estimated results reveal that oil production agglomeration, mineral production agglomeration and natural gas production agglomeration have a positive and significant impact of foreign direct investment. The outcomes show that a 1 percent increase in oil production agglomeration, mineral production agglomeration and natural gas production agglomeration brings a respective (0.012597) percent, (0.247562) percent and (0.046190) percent increase in foreign direct investment in the case of France. The forest agglomeration has a negative and significant impact on foreign direct investment. The results reveal that a 1 percent increase in forest agglomeration brings a (-0.042956) percent decrease in foreign direct investment in France. The results of model-7 reveal that disaggregate natural resources agglomeration are very important factors of foreign direct investment in France. The overall long run results of all specifications show that natural resources agglomeration, population density and public policy are important indicators for deciding the amount of foreign direct investment in the case of France.

**Table-2 Long Run Results**

Dependent Variable FDI							
Variables (1,1,1,1, 1,1,1)	Model-1	Model-2	Model-3	Model-4	Model-5	Model-6	Model-7
TOTAL_NATURAL	0.000446***	-0.002411	-	-	-	-	-
POP_DENSITY	2.75E-05***	6.11E-05***	0.000369***	0.000365***	0.000391***	0.001508**	-
OPEN	-0.00089***	-0.002743**	-	-	-0.002456	-0.026154***	-
SECONDARY	2.34E-06***	-	3.03E-05***	2.81E-05***	3.16E-05***	-	-
TAX	1.05E-05***	2.46E-05*	-	-7.70E-06	1.57E-05	0.000174**	-
INF	2.04E-05***	7.45E-05***	-	-	-	-	-
PRIMARY_EN	-	-2.33E-05***	-	-	-	-0.000116	-
AGRI_LAND	-	-	0.001424***	0.001389***	0.001368**	0.004578*	3.69E-05
FOREST	-	-	-0.004705	-0.004950	-0.004707	0.074912***	-0.042956***
OIL	-	-	-0.017773**	-0.017713**	-0.014954	-0.075792*	0.012597***
MINERAL	-	-	-	-	-	-	0.247562***
NATURAL_G	-	-	-	-	-	-	0.046190

\*\*\*1 percent significant level \*\*5 percent significant level \*10 percent significant level

This study is going to examine the impact of aggregate and disaggregate natural resources agglomeration on foreign direct investment from Greece, Australia, Austria, Germany, Canada, Finland, Ireland, Hungary, Israel, Japan, Italy, Republic of South Korea, Switzerland, Norway, Netherlands, Poland, Spain, Portugal, Sweden, Turkey, United States, Mexico, Korea and United Kingdom in the case of France. The short run results of selected specifications are presented in the table-3.

**Model-1:** The short run results of the model-1 show that total natural resources agglomeration, taxes and trade openness have an insignificant impact on foreign direct investment. Population density has a positive and significant effect on foreign direct investment in France. The results reveal that inflation has a negative and significant relationship with foreign direct investment in the case France. ECM explains the speed of adjustment from short run to long run. The value of ECM must be negative and significant for convergence. The ECM results of a first specification reveal that short runs converge in the long run. The coefficient of ECM shows that short run needs around 5 years and 9 months to converge in the long run.

**Model-2:** The short run results show that the total natural resources agglomeration, trade openness and taxes have an insignificant relationship with foreign direct investment. The estimated results show that population density has a positive and significant impact on foreign direct investment in France. The short run outcomes reveal that inflation and primary education have a negative and significant impact on foreign direct investment in the case of France. The values of ECM reveal that short run needs around 7 years and 7 months to converge in the long run.

**Model-3:** The results of the third specification show that population density and forest agglomeration have a positive and significant short run impact on foreign direct investment in France. Secondary education and oil production agglomeration have a negative and significant short run relationship with foreign direct investment in France. The outcomes show that agriculture land agglomeration has an insignificant short run impact on foreign direct investment in France. The estimated outcomes of ECM reveal that short run needs 7 years and 9 months to converge in the long run.

**Model-4:** The short run results of the fourth specification reveal that population density and forest agglomeration have a positive and significant relationship with foreign direct investment. Agriculture land agglomeration and taxes have an insignificant impact on foreign direct investment in the case of France. Secondary education and oil production agglomeration are depressing foreign direct investment in the short run. The estimated ECM shows that short run needs around 7 years and 9 months to converge in the long run.

**Model-5:** The results of the fifth specification show that population density has a positive and significant short run impact on foreign direct investment in the case of France. Taxes, trade openness and forest agglomeration have an insignificant short run relationship with foreign direct investment. The estimated short run results show that secondary education and oil production



agglomeration have a negative and significant impact on foreign direct investment in the case of France. The calculated coefficient of ECM reveals that short run needs 7 years and 6 months to converge in the long run.

**Model-6:** The short run results of the sixth specification reveal that population density, trade openness, agriculture land agglomeration and forest agglomeration have a positive and significant impact on foreign direct investment in France. Taxes have an insignificant relationship with foreign direct investment. Secondary education and oil production agglomeration have a negative and significant impact on foreign direct investment in the case of France. The results of ECM reveal that short run needs around 16 years and 7 months to converge in the long run.

**Model-7:** The results of the seventh specification show that forest agglomeration and mineral agglomeration have a positive and significant impact on foreign direct investment in France. Agriculture land agglomeration and natural gas production agglomeration have an insignificant influence on foreign direct investment in the case of France. Oil production agglomeration has a negative and significant relationship with foreign direct investment. The outcomes of ECM show that short run needs around 14 years and 4 months to converge in the long run.

The overall short run results show that all the selected specifications are theoretically correct and converge in the long run. The estimated results show that oil production agglomeration is negatively impacting foreign direct investment. In short run agriculture land agglomeration has an insignificant role in deciding foreign direct investment in France. Population density is a more effective factor for enhancing foreign direct investment.

**Table-3 Short Run Results**

Variables (1,1,1,1, 1,1,1)	Model-1	Model-2	Model-3	Model-4	Model-5	Model-6	Model-7
TOTAL_NATURAL	-0.000564	0.000875	-	-	-	-	-
POP_DENSITY	0.000204**	0.000227***	0.000342**	0.000356**	0.000359**	0.000561***	-
OPEN	0.000516	0.000607	-	-	7.52E-05	0.000566**	-
SECONDARY_EN	-6.72E-06**	-	-8.18E-06**	-7.94E-06**	-8.51E-06**	-1.68E-05*	-
TAX	5.87E-08	5.78E-06	-	3.32E-06	3.14E-06	1.18E-05	-
INF	-5.21E-05***	-6.29E-05**	-	-	-	-	-
PRIMARY_EN	-	-1.69E-05***	-	-	-	-	-
AGRI_LAND	-	-	-5.27E-05	-6.67E-05	-4.55E-05	0.000669***	-9.66E-05
FOREST	-	-	0.003445**	0.003684**	0.003716	0.006482***	0.002984**
OIL	-	-	-0.013639***	-0.013983***	-0.014172***	-0.017103***	-0.007343***
MINERAL	-	-	-	-	-	-	0.019103**
NATURAL_G	-	-	-	-	-	-	0.002043
ECM	-0.173701***	-0.136411***	-0.135799***	-0.133833***	-0.130537***	-0.059787***	-0.069857***
***1 percent significant level **5 percent significant level *10 percent significant level							

## **Conclusions**

This study is examining the impact of aggregate and disaggregate natural resources agglomeration on foreign direct investment from Greece, Australia, Austria, Germany, Canada, Finland, Ireland, Hungary, Israel, Japan, Italy, Republic of South Korea, Switzerland, Norway, Netherlands, Poland, Spain, Portugal, Sweden, Turkey, United States, Mexico, Korea and United Kingdom in the case of France over the period of 1989 to 2012. This study uses seven different model specifications for empirical analysis. This study uses foreign direct investment as the dependent variable. The total natural resource agglomeration is measured with the help of an index of total natural resources as independent variables. Population density, trade openness, secondary education, taxes, inflation rate, primary education, agriculture land agglomeration, forest agglomeration, oil production agglomeration, mineral production agglomeration and natural gas production agglomeration are selected as explanatory variables for seven specifications. This study has used Hadri Z-stat and Heteroscedastic Consistent Z-stat for unit root analysis. Panel ARDL is used for examining the long run and short run relationship among the selected specifications. The results of a first specification reveal that total natural resources agglomeration population density, secondary education, inflation rate and public policy are enhancing foreign direct investment whereas trade openness is depressing foreign direct investment in France. The results of the second specification reveal that in the presence of the primary education, total natural resources agglomeration is playing an insignificant role in deciding foreign direct investment in France. Trade openness and primary education have a negative and significant impact on foreign direct investment. Population density, public policy and inflation are enhancing foreign direct investment following the second specification. Third, fourth, fifth, sixth and seventh specifications are used for disaggregated natural resource agglomeration analysis. The results of third specification reveal that population density, secondary education and agriculture land agglomeration are enhancing foreign direct investment in France. Forest agglomeration and oil production agglomeration are discouraging foreign direct investment in the case of France. The results of fourth specification show that population density, secondary education and agriculture land agglomeration are increasing foreign direct investment. Public policy has an insignificant impact on foreign direct investment. Oil production agglomeration and forest agglomeration are depressing foreign direct investment in France. The fifth specification shows that population density, secondary education and agriculture land agglomeration have a positive and significant impact on foreign direct investment in the case

of France. The estimates show that trade openness, public policy, primary education, forest agglomeration and oil production agglomeration have an insignificant impact on foreign direct investment. The sixth specification reveals that population density, public policy, agriculture land agglomeration and forest agglomeration are enhancing foreign direct investment, whereas trade openness and oil production agglomeration are discouraging foreign direct investment in France. The seventh specification shows that oil production agglomeration and mineral production agglomeration have a positive and significant impact on foreign direct investment. Oil production has a negative and significant impact on foreign direct investment.

The results show that population density is a key indicator of foreign direct investment, so the French government should encourage population growth. As the current population growth of France and many developed countries is below the replacement rate. Total natural resources agglomeration is encouraging foreign direct investment. Therefore, developed countries like France encourage the improvement of natural resources. Agriculture land agglomeration, oil production agglomeration and mineral production agglomeration are the inputs of many economic activities. This shows that, for higher amount of foreign direct investment, natural resources agglomeration must be encouraged.

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