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Determining the Effects of Factors on FDI in Global Crisis Period

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ABSTRACT: The purpose of this study is to analyze factors affecting Foreign Direct Investment (FDI) in countries with a high rate of FDI from 2005 to 2011, by examining the effects of the 2008 crisis. A Panel Tobit model is estimated in order to see the effects on the whole period, and classical Tobit models for each year are estimated separately for the purpose of examining the effects prior to, after and during the crisis, in detail. In the Tobit models, estimated separately for each year, the labor rate and inflation rate variables that are significant in panel Tobit models are not found significant for any of the examined years. As the balance of current accounts is found to be significant both prior to and after the crisis, it can be said that the effect of this variable on FDI is not affected by the crisis. Although there are studies examining factors affecting the FDI in the crisis period, to the best of our knowledge this is the only study using panel Tobit and classical Tobit models to that end.

Keywords: Cross sectional models; panel Tobit model; foreign direct investment
JEL Classifications: C21; C23; C24; F21

1. Introduction

The globalization of capital and especially the globalization of foreign direct investment have significantly increased in the past 20 years. In the developing world, foreign direct investment is the most consistent and largest component of capital flows (Adams, 2009). Capital flow realizes in various ways between countries. Foreign Direct Investment (FDI), foreign portfolio investment and liabilities, are the primary ones. Among these, FDI plays a significant role in world capital sharing between countries by creating business opportunities, enabling technological skills and improving competition. As international flows enable capital diversity, they decrease the risks encountered by capital owners. Global integration of capital markets may contribute to the propagation of the best practices of corporate management, accounting standards and legal customs. Global movement of capital limits governments from following negative policies (Razin and Sadka, 2007).

For multinational enterprises, opening directly to a foreign country is less costly than opening abroad through trade. This form of FDI is the "horizontal FDI" which replaces export and the FDI made through trade is called "vertical FDI". According to the neoclassical approach, FDI closes the distance between capital and return through the transfer of capital from the economies where it is plentiful to economies where it is scarce by enabling the moving of capital from rich to poor, and increases the worldwide effectiveness of capital stock (Razin and Sadka, 2006).

In macroeconomic finance literature, it is maintained that FDI is not very sensitive to financial crises. FDI has not been sensitive to the Latin American crisis in the 1980s, to the Mexican crisis in 1994-1995, or to the East Asia crisis in 1997-1998 (Razin and Sadka, 2007). In the recession period which was started in United States by the high interest mortgage crisis in 2006-2007, it was not believed that the interest market would have a significant effect on the economy of the United States. The financial institutions of Asia were not directly exposed to the effect of America's high interest market and the Asian corporate sector was very robust (IMF, 2009). Global FDI flow volume achieved an historical peak in 2007. It started to decrease following the worldwide downfall in real estate values, share markets, consumer confidence, production, loan aquisition and world trade. Regional share prices were also steady until 2008. When a slowdown was observed in 2008, it was expected that the developments would be relatively manageable in the whole region but, with the sudden downfall of global loan markets due to the bankruptcy of Lehman Brothers, severe capital withdrawal and the loan crisis following in the summer of 2008, Asia again encountered the boom and bust caused by the foreign capital inflows and outflows (Rajan, 2009). The financial and economic crisis which started in the West in 2008, was not only the worst crisis in the last 70 years, it was much more severe than the financial crisis of Asia which occurred in the 1990s and the crisis of 2001 which followed September 11. Given that economic growth is the most important factor determining FDI, the economic recession suppressed FDI flow. The overseas investment constraints of companies further increased this economic pressure (Onwuamaegbu and Sauvant, 2011). FDI continued to decrease in 2009, and became stagnant in 2010. The recession had powerful effects on banks and financial institutions in the West, and consequently they were forced to cancel, postpone or decrease overseas mergers and acquisitions. FDI started to increase again in 2010 and exhibited a powerful performance in many Latin American and Asian countries (Poulsen and Hufbauer, 2011).

The purpose of this study is to analyze factors affecting FDI in countries with a high rate of FDI from 2005-2011 by examining the effect of the 2008 crisis. If FDI can be observed over a specific interval, then a Tobit model, which is also known as a censored normal regression model, can be used. A Panel Tobit model is estimated in order to see the effect on the whole period, and Tobit models for each year are estimated separately for the purpose of examining the effects prior to, after and during the crisis, in detail. Most empirical studies on international capital flows during financial crisis periods tend to focus on portfolio investments. When considered from this point of view investigation of the relation between FDI and the financial crisis with Tobit models is the contribution of this study to the literature as being relatively new. A censoring point is determined by calculating the arithmetic mean of the ratio of FDI to national income for countries in the study, with the intent of obtaining results for countries receiving a high rate of FDI.

2. Literature Review

Due to increase of FDI globalization in recent years, it is one of the conspicuous titles termly. In literature there are many studies examining the factors affecting FDI by using Tobit models. Lemi and Asefa (2003), examine the effect of economic and political uncertainty on FDI to African economies by using the generalized autoregressive conditional heteroscedasticity (GARCH) model. The indicators specifying uncertainty in inflation rates and real exchange rates are derived from the GARCH model and are used in the FDI model as indicators of political instability. As censored values are found in U.S. FDI data, panel Tobit models -in which four distinct FDI variables are dependent variables- are estimated and compared with the standard random effects model. The results of the study, in which the annual data from the years 1989-1998 were used, indicate that the effect of uncertainty on the FDI flow is insignificant for all the source countries. Economic and political uncertainty is not a matter of concern for the combined U.S. FDI variable, only political instability and government policy decisions for the U.S. manufacturing FDI are significant factors. For the U.S. non-manufacturing FDI variable, only political instability and economic uncertainties along with liability load are primary obstructions. Other economic factors such as manpower, commercial connections, size of the export sector, amount of foreign debt and market size, significantly affect FDI to African countries. The results of the study indicate that uncertainty does not have a significant effect on FDI for all source countries.

Schiavo (2007) examines the effect of the European Monetary Union on FDI. He finds that the Monetary Union had a positive effect on FDI by estimating the gravity model by the Least Squares

(LS) and the panel Tobit model with the data of 25 OECD countries in the years 1980-2001. Acaravci and Ozturk (2012) investigate the causal relationship between economic growth, export and FDI for the ten transition European countries. Results reveal that there is causal relationship between FDI, export and economic growth in four out of ten countries considered. Dinga and Dingova (2011) use the LS and the Tobit estimation methods in order to examine the effect of the transition to the Euro on international FDI flows with the panel data of 35 OECD countries in the years 1997-2008. Generally, the Euro does not have a significant effect on FDI, but it is observed that FDI increases in some of the member states of the EU. Membership in the European Union increases the FDI flows more than the Euro itself does. While high gross domestic product (GDP), less distance in between the countries, and low levels of unit cost of labor in the target country, positively affect FDI, long term exchange rate volatility hinders FDI flows.

Anwar et al. (2008) examine the location determinants of FDI with respect to Indian Multinational Enterprises in the years 1970-1990. The estimation results of the LS regression model and the censored Tobit model show that real GDP, real GDP per capita income, geographic distance and the real GDP deflator of the host country are significant determinants of FDI. The results of the Tobit model indicate that FDI is positively affected by the real GDP of the host country. The relationship between real GDP per capita and FDI is significant, but negative. This result shows inconsistency with the theory. Aguiar et al. (2012) investigates the factors affecting Brazilian FDI according to the country source. Tobit, Heckit and Probit models are estimated with the 2005 data of 180 countries making and not making investments in Brazil. The result of analysis indicates that countries with low political risk undertake more FDI in Brazil.

Razin and Sadka (2007) estimate Heckman, Tobit and LS models with the panel data of 24 OECD countries in the period of 1981-1998 in order to examine the determinants of FDI and obtain findings regarding fixed setup costs. They also estimate the model with the data of 62 OECD and non-OECD countries in the years 1987-2000 to investigate the effects of productivity shocks on FDI. Positive productivity shock in the host country increases the FDI flow volume to be directed to this country. As the result of Tobit model, it is concluded that the educational gaps between countries have a significant effect on the FDI flows.

As loan restrictions affect the intensity and scope of inward FDI, Kandilov et al. (2013) examine the effect of two banking deregulations in the U.S. manufacturing sector on the FDI operations. The panel data of U.S. states from 1977-1994 is used for estimating LS regression, negative binomial and Tobit models. It is found that banking deregulations have an increasing effect on FDI operations. Singer (2013) estimates the expanded model in which the immigrant variable is included following the classical gravity model, in order to examine the effect of immigrants on the outward FDI. The model in which the logarithmic FDI outward to 180 countries from the Netherlands from 1997-2006 is the dependent variable, is estimated with the panel Tobit model. As the variability of the sample arises from cross sections, the cross sectional model is also estimated by averages from the 2002-2006 period. When the panel model and cross sectional model are compared, the results are nearly the same except small differences in the estimated values of coefficients. The results of the estimation indicate that FDI is positively related to GDP, management, immigrant network and colony variables.

As it is mentioned in the introduction section, investigating the relation between FDI and the financial crisis by using Tobit models is relatively new. Dornean et al. (2012) also want to examine the financial crisis effect on FDI, for this aim they estimate the panel regression model for Central and Eastern European countries and find that the sign of the dummy variable expressing crisis has significant negative effect on FDI. Although there are some other studies investigating the crisis effects on FDI (Ucal et al., 2010; Poulsen and Hufbauer, 2011) to the best of our knowledge this is the only study using panel Tobit model for that purpose.

3. Methodology

When the dependent variable of the linear regression is censored so that it can only be observed at a specific range, the Tobit model can be used. As the censored dependent variable does not represent the population well, in the case of the censored dependent variable, consistent parameter estimators cannot be obtained by the estimation of the LS regression. During the usage of the LS method, the observations where $y_i^* \leq 0$ are ignored, so the average of u_i error terms is not zero, thus the distribution of error terms becomes a truncated normal distribution and its average is not zero

(Maddala, 1983). For the estimation of the Tobit model, Maximum Likelihood Method (MLM) is suggested. Heckman (1976) asserted the two phase estimation method as an alternative to MLM in the estimation of the Tobit model. Consistent estimators of the parameters can be obtained by this method, but the estimators are not as efficient as the estimator that is obtained by MLM (Gujarati, 2003). In this study models are estimated by MLM.

The latent y_i^* variable in the Tobit model, which is also known as censored normal regression model asserted by Tobin (1958), is specified as in equation (1).

$$y_i^* = x_i'\beta + u_i, \quad (1)$$

where β is the vector of unknown parameter. If $y_i^* > 0$ then y_i^* can be observed, and if $y_i^* \leq 0$ then it can not be observed. The observed y_i is specified as in equation (2).

$$y_i = \begin{cases} y_i^* > 0 \; if \;\; y_i^* = x_i'\beta + u_i \\ y_i^* \leq 0 \; if \;\;\;\;\;\; 0 \end{cases}, \quad (2)$$

where $u_i \sim N(0, \sigma^2)$ and $y_i^* \sim N(x_i'\beta, \sigma^2)$. In equation (3), The logarithmic likelihood function for censored regression model is specified.

$$lnL(\beta, \sigma^2) = \sum_{y_i>0} -\frac{1}{2}\left[\log(2\pi) + ln\sigma^2 + \frac{(y_i - x_i'\beta)^2}{\sigma^2}\right] + \sum_{y_i=0} ln\left[1 - \Phi\left(\frac{x_i'\beta}{\sigma}\right)\right], \quad (3)$$

where Φ(.) indicates the standard normal cumulative distribution function. Parameters are estimated by the maximization of this function (Gourieroux, 2000).

The Tobit model may also be estimated for panel data. The panel Tobit model is one of the estimation methods of non-linear panel data models. In the panel Tobit model, the y_{it}^* latent variable is specified as in equation (4).

$$y_{it}^* = \alpha_i + x_{it}'\beta + u_{it}, \quad i = 1,2,\dots,N, \; t = 1,2,\dots,T, \quad (4)$$
$$u_{it} = v_i + \epsilon_{it}, \quad (v_i \sim N(0, \sigma_v^2)), \; (\epsilon_{it} \sim N(0, \sigma_\epsilon^2)).$$

The variables observed in equation (4) are determined as in equation (5).

$$y_{it} = \begin{cases} y_{it}^* = \beta x_{it} + u_{it} & if \; y_{it}^* > 0 \\ 0 & if \; y_{it}^* \leq 0 \end{cases}, \quad (5)$$

The error term u_{it} must be independent from time. In this study, the condition in which the error term components model is separated into two parts will be addressed and individual random effect v_i fixed as per time and random error ϵ_{it} varying as per time.

As the fixed effect estimator is inconsistent, generally the random effect estimator is used. On the assumption that $\alpha_i \sim N(0, \sigma_\alpha^2)$ the random effect logarithmic likelihood function of $\beta, \sigma_u^2, \sigma_\alpha^2$ is specified as (Cameron and Trivedi, 2005):

$$f(y_i|X_i, \beta, \sigma_u^2, \sigma_\alpha^2) = \int f(y_i|X_i, \alpha_i, \beta, \sigma_u^2) \frac{1}{\sqrt{2\pi\sigma_\alpha^2}} antilog\left(\frac{-\alpha_i}{2\sigma_\alpha^2}\right)^2 d\alpha_i \quad (6)$$

4. Empirical Results

In this study, the panel Tobit model is estimated for 117 countries whose data for years 2005-2011 are completely available from the World Bank Online Source Site for the determination of macroeconomic time series that affect FDI. The countries used in the analysis are included in the Appendix. While the logarithmic value of FDI is used as the dependent variable, balance of current accounts, growth rate, reserves, labor rate, inflation rate and dummy variables specifying the countries receiving loans from the IMF and representing the effect of crisis are used as independent variables.

As the world's countries are different with respect to factors such as population, surface area, and size of economy, the inflowing FDI amount to such countries will also be different. Thus, as it will be deceptive to express FDI as an amount, expressing it as proportional to either per person or national income prevents the exclusion of some information. Variables, except the growth rate, labor increase rate and inflation rate, which are displayed as rates in the analysis, are expressed as proportions of the GDP values of the countries. When the descriptive statistics of the variables is considered in Table 1, it is observed that the highest average is at the inflation and the lowest average is negative at the balance of current accounts.

FDI is the type of investment realized by the investor in the form of free field and grey field investments and purchasing of immovables in a country other than his own. One of the indicators of the economic size of a country is the GDP, which is the value in currency of the element remaining

after the deduction of intermediate goods used for production from the total goods and services produced in a specific time period within the borders of a country. Higher GDP indicates higher total income, and thus the tendency for overseas investment increases. Lower real GDP specifies limited market size, and the companies require such areas in order to obtain market share and expand beyond the borders (Rajan, 2009). Growth of GDP is an indicator of increasing investment opportunities and that investment will be drawn to the country (Anwar et al., 2008). In order to include the observations in the analysis in which the rate of FDI to GDP is negative, data conversion will be performed. With this purpose, $lnFDI_i \equiv ln(x+FDI_i)$ conversion may be performed, where x is a positive scaler magnitude. As it is hard to interpret the parameter estimations in the case of performance of this conversion, the dependent variable is defined as $lnFDI_i \equiv ln(1+FDI_i)$ for the implementation of the Tobit model (Dinga, 2011). After making conversion for 117 countries in the years 2005-2011, the average values are calculated one by one, and censoring is applied by assigning 0 to FDI remaining under average. Huber/White Robust covariances are used in the estimated models.

Table 1. Descriptive statistics

Variable	Mean	Std.Dev.	Minimum	Maximum
FDI	0.053	0.064	-0.161	0.538
BCA	-0.024	0.106	-0.331	0.446
GR	4.306	4.539	-17.954	34.5
RES	0.203	0.185	0.003	1.195
LF	0.019	0.018	-0.071	0.134
INF	5.752	4.834	-3.653	53.228

Note:FDI, foreign direct investment; BCA, balance of current accounts; GR, growth rate; RES, reserves; LF, labor rate; INF, inflation rate.

The most important account item of the payments balance is the balance of current accounts where a significant part of the economic operations of a country is recorded. Balance of current accounts is one of the most important factors affecting the sustainability of national economies. It consists of the sum of the balances of services (service procurements-sales), foreign trade (balance of export-import), investment revenues (foreign investment incomes-expenses) and current transfers (extraneous incomes obtained without provision-extraneous expenses made without provision). If the income obtained by the countries from current accounts is more than the expenses, current account surplus, otherwise current account deficit is occur. Total reserves consist of currency, monetary gold and foreign exchange assets that are under the supervision of monetary authorities. As the reserve level indicates the power of countries to resist crises, it is an effective significant variable for institutions and countries making investments in these countries and providing loans to these countries (Yaman, 2003). Inflation reflects the annual percentage change of the average cost of goods and services for consumers. All individuals over the age of 15 contributing to production of goods and services in a specific period in a country, compose the labor. The IMF loan usage of the countries is a monetary indicator covering fund loans as well as regulations of expanded structural conformity, improved structural conformity and institution of systematic transformation realized under Stand-By. For the years 2005-2011, it is determined that there are countries which had used and countries which had not used loans from the IMF. When the value of IMF loans to countries using those loans is examined as a proportion of the GDP values of those countries, it is observed that they are not significant. Due to these two reasons IMF loan usage is included as dummy variable in the analysis. In addition, the effect of the 2008 crisis, which started in U.S. mortgage housing market, affected the whole financial sector through derivatives, and affected many countries negatively by spreading to the whole world in a short while, is examined. In order to determine the starting year of the effect of the crisis, dummy variables are defined for 2008 and 2009 and separate models are estimated. Among the estimated models the models with dummy variables defined for 2008 provided better results so these models are the ones included in this study. Variables that states the past values of FDI inflows were also included in some models in order to capture the persistence of the dependent variable but those models are not included in the estimation results as those variables do not have significant effects on FDI.

In Table 2, the estimation results of two distinct panel Tobit models, Model 1 and Model 2, with the data of 117 countries for the period of 2005-2011 are shown. The factor that differentiates the two models is the dummy variable specifying the 2008 crisis. Model 2 is estimated with dummy variables composed for different breaking years. The model providing the best results among these models is included. There are observations with negative notations in other variables excluding reserves. Thus, when interpreting the coefficients, the differences of the notations will be considered. When the marginal effects are considered, it is observed that the growth rate in Model 1 –being the primary variable affecting social welfare- is the most significant variable affecting the FDI. While the reserve and labor rates are causing a significant effect, the inflation rate is exhibiting an insignificant effect. Moreover, it is observed that the balance of current accounts has a negative effect and a powerful significance. While the growth rate in Model 2 has a large effect just as in Model 1, the inflation rate in Model 2 is the variable that positively affects the FDI the most, differently from Model 1. Also, while the coefficients of variables representing reserves, the effect of 2008 crisis and countries using loans from the IMF are positive and significant, labor rate is insignificant. When the two models in which the effect of the crisis is included in one but not the other are examined, it is observed that the balance of current accounts, the growth rate, the reserves of countries and the countries using loans from the IMF, all affect FDI.

Table 2. Panel Tobit model of 117 countries for the years 2005-2011

	Model 1		Model 2	
ln(FDI)	Coefficients	Marginal effects	Coefficients	Marginal effects
Constant	-0.0592***		-0.0450**	
	(0.0212)		(0.0211)	
BCA	-0.4891***	-0.0242	-0.4968***	-0.0242
	(0.0636)		(0.0635)	
GR	0.0039***	4.3067	0.0030***	4.3067
	(0.0008)		(0.0009)	
RES	0.1170***	0.2037	0.1364***	0.2037
	(0.0408)		(0.0412)	
LF	0.5914*	0.0193		
	(0.3066)			
INF			0.0018*	5.7522
			(0.0009)	
D8			-0.0200**	0.5714
			(0.0079)	
IMF	-0.0732***	0.6923	-0.0762***	0.6923
	(0.0225)		(0.0229)	
Wald Statistics	88.09		93.62	
Log likelihood	78.32		80.75	

Notes: BCA, balance of current accounts; GR, growth rate; RES, reserves; LF, labor rate; INF, inflation rate; D8, dummy variable reflecting the effect of 2008 crisis; IMF, dummy variable reflecting the countries using loan from IMF. Figures in parenthesis are standard errors. ***,** and * indicates significance at 1 %, 5 % and 10 % statistical levels respectively.

Tobit model results, estimated separately for each year, are shown in Table 3. It is seen that the balance of current accounts, the reserves, the growth rate, and the dummy variable representing countries using loans from the IMF affect FDI significantly until the international crisis of 2008, and among these variables it is observed that the variable with the highest marginal effect is growth rate.

The growth rate and the dummy variable representing the countries using loans from the IMF, although they are initially affecting FDI significantly with high effects, become statistically

insignificant from 2008 on. This condition continues until 2011, and by 2011 only the growth rate becomes statistically significant again, but its marginal effect is decreased compared to the period prior to the crisis. Considering the results, it is observed that the balance of current accounts has significant impact on FDI each period and that the marginal effect of this variable is negative. As balance of current accounts is seen as deficit in some countries and as current accounts surplus in other countries, it is observed that the effect of the balance of current accounts will vary accordingly. It is also observed that the reserves have a significant and powerful effect on FDI prior to and during crisis, but that this effect disappears by 2011.

When the panel Tobit and Tobit models estimated separately for each year are compared, the labor rate and inflation rate variables that are statistically significant in panel Tobit models and the dummy variable representing the crisis of 2008 are not found statistically significant in any of the Tobit models which are examined in detail. In the Tobit models which are estimated separately for each year, while it can be observed that the dummy variable representing the countries using loans from the IMF and growth rate variables do not have significant effects on FDI as from 2008, these detailed effects cannot be observed in the estimated panel Tobit models.

Table 3. Tobit model of 117 countries for the years 2005-2011

ln(FDI)	2005	2006	2007	2008	2009	2010	2011
Constant	-0.0677**	-0.1260***	-0.0832*	-0.1159***	-0.0755***	-0.0993***	-0.0908***
	(0.0299)	(0.0335)	(0.0433)	(0.0379)	(0.0238)	(0.0269)	(0.0291)
BCA	-0.5416***	-0.7735***	-0.7226***	-0.3609**	-0.4552***	-0.3081**	-0.3763**
	(0.1120)	(0.1200)	(0.1625)	(0.1768)	(0.1518)	(0.1478)	(0.1641)
	(-0.0130)	(-0.0138)	(-0.024)	(-0.0438)	(-0.0231)	(-0.0239)	(-0.0260)
GR	-0.0113***	0.0144***	0.0141***				0.0094**
	(0.0034)	(0.0010)	(0.0048)				(0.0036)
	(5.3730)	(6.2900)	(6.1540)				(4.3460)
RES	0.2354***	0.39164***	0.2676***	0.2608***	0.1491**	0.2413***	
	(0.0604)	(0.0610)	(0.0920)	(0.0991)	(0.0674)	(0.0740)	
	(0.1690)	(0.1900)	(0.2060)	(0.1840)	(0.2300)	(0.2290)	
IMF	-0.0979***	-0.1126***	-0.1756***				
	(0.0249)	(0.0250)	(0.0400)				
	(0.6920)	(0.6920)	(0.6920)				
Left CO	73	74	74	77	76	76	76
Non-CO	44	43	43	40	41	41	41
Log likelihood	4.56	7.40	-12.98	-16.09	-0.68	-5.06	-2.67
Dhyrme's R^2	63.14%	61.83%	54.85%	33.26%	47.21%	54.02%	63.70%

Notes: BCA, balance of current accounts; GR, growth rate; RES, reserves; IMF, dummy variable reflecting the countries using loan from IMF; Left CO, left centered observations; Non-CO, non-centered observations. Figures under estimated coefficients in parenthesis are standard errors; under standard errors in parenthesis are marginal effects. ***,** and * indicates significance at 1 %, 5 % and 10 % statistical levels respectively. Dhyrme's R2 is used as specification coefficient in Tobit models.

5. Conclusion

The financial crisis which started in the West in 2008 caused significant decrease in foreign direct investment which plays a significant role in world capital sharing. In this study, the effect of 2008's crisis on the world's foreign direct investment for the period of 2005-2011 is examined and the factors effecting the foreign direct investment are analyzed. In the study, censoring is made and the countries receiving a high rate of foreign direct investment compared to national income are examined. A panel Tobit model is estimated in order to see the effect in the whole period, and Tobit models for each year are estimated in order to examine in detail the effects prior to, after and during the crisis.

After calculating the average values one by one for 117 countries in between years 2005-2011, a censor is applied by assigning 0 to foreign direct investment remaining under average. Thus exclusion of countries remaining below the average is prevented and they are subjected to analysis. It is intended to observe the positive and negative effects of the inflow of foreign direct investment to countries prior to and after 2008 crisis on the macroeconomic variables. Although there are studies examining factors affecting the foreign direct investment in the crisis period, the contribution of our study to literature is preventing the exclusion of countries remaining under average and including in analysis while censoring and also revealing the factors affecting FDI in detail by estimating both panel Tobit and classical Tobit models.

In the panel Tobit model, in which the effect of crisis is not included, while the growth rate, reserve, labor rates and the dummy variable representing the countries using loans from the IMF are positively affecting the foreign direct investment, balance of current accounts is negatively affecting. And in the panel Tobit model, in which the effect of crisis is included, while the labor rate has no significant effect on the foreign direct investment as different from the first model, the inflation rate effects the foreign direct investment more positively than the growth rate.

In the Tobit models, estimated separately for each year, the labor rate and inflation rate variables that are statistically significant in panel Tobit models are not found significant for any of the examined years. As the balance of current accounts is found to be statistically significant both prior to and after the crisis, it can be said that the effect of this variable on foreign direct investment is not affected by the crisis. While the marginal effect of the growth rate on foreign direct investment is much more than other significant variables' in all the periods before 2008, the growth rate has no significant effect on foreign direct investment during and after the 2008 crisis due to the crisis and this condition continues until 2011 when the effect of crisis started to recover. As decreasing GDP indicates less total income and a decrease in the tendency to invest overseas, this condition explains why the growth rate does not have a significant effect on foreign direct investment along with the crisis. The dummy variable representing the countries using loans from the IMF does not affect the foreign direct investment during and after the crisis. While reserves significantly affect foreign direct investment in all other years, the reserves have no significant effect in 2011.

If we consider the results with respect to the effect of the crisis on foreign direct investment, while the effect of variables is examined as a whole in panel Tobit models, the effect of variables on foreign direct investment prior to and after the crisis is observed in detail in Tobit models estimated separately for each year. Thus, the effect of the crisis is observed more clearly. As the result of the comparison of estimated models, it is revealed that the factors affecting foreign direct investment are changed by the effect of the crisis, that the effects of variables within the panel Tobit models on the foreign direct investment disappeared after the crisis so these variables must not be included in the model, and that the panel data model may provide different results in the case of estimation as two separate models instead of using a dummy variable. As the amount of data used in the study does not allow the estimation of the panel Tobit model as two separate models as prior to and after crisis, this implementation could not be performed.

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Appendix
Countries included in the analysis

Albenia	Burundi	Ermenia	Italy	Moldova	Raunda	Togo
Algeria	Cameron	Esthonia	Japan	Mongolia	Romania	Tunus
Angola	Canada	Fiji	Jordan	Morocco	Russia	Turkey
Arabia	Canbodia	Finland	Kazakhstan	Mozambique	Samoa	Uganda
Australia	Cape Verde	France	Kenya	Nepal	Santa Lucia	Ukraine
Austria	China	Gana	Kuwait	Netherland	Senegal	USA
Azerbaijan	Colombia	Germany	Kyrgyzstan	New Zealand	Singapore	Vanuatu
Bahamas	Corea	Georgia	Lao	Nicaragua	Slovenia	Vietnam
Bahrain	Costa Rico	Grenada Isl.	Latvia	Niger	Solomon Isl.	Zambia
Bangadesh	Croatia	Guatemala	Lithuania	Nigeria	South Africa	
Belarus	Cyprus	Haiti	Macao, China	Norway	Spain	
Belize	Czech Rep.	Honduras	Macedonia	Pakistan	Sri Lanka	
Benin	Denmark	Hong Kong	Malavi	Panama	Sudan	
Bolivia	Dominic Rep.	Hungary	Malesia	Paraguay	Swaziland	
Botswana	Egypt	Iceland	Mali	Peru	Sweden	
Brazil	El Salvador	India	Malta	Philippines	Switzerland	
Bulgaria	England	Indonasia	Mauritius	Poland	Tanzania	
Burkina Faso	Equator	Israel	Mexico	Portugal	Thailand	