

# **Foreign Direct Investment in the US: Externalities between the Two-Sector of the Economy**

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## **Abstract**

This paper empirically unfastens the spillover effects between the domestic-funded sector and the foreign-funded sector in the United States using inter-sectorial externalities. The study analyzes the spillover effect from domestic firms to foreign firms of the United States economy. Based on the two-sector analysis, the hypothesis that the domestic-funded sector plays a significant role in promoting the foreign-funded sector was tested in order to derive the externalities between the two sectors of the economy. The research provides support that a mean to supplement foreign investment for achieving a higher level of economic growth is possible through capital structure, transfer of technology, and managerial skills. Empirical evidence provided considerable support that the domestic-funded sector plays a significant role in promoting the foreign-funded sector in the United States. Indeed, the contribution of foreign direct investment is minimal. The empirical results also strengthen the view that multinationals concentrate their more capital-intensive or skill-intensive operations in the United States and allocate their more labor-intensive production to their affiliates in poor countries.

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**Keywords:** adaptive expectation, domestic-funded sector, externalities, foreign direct investment, foreign-funded sectors, investment demand, investment supply, moving averages, production function, spillover effect.

## **1 Introduction**

Studies on the spillovers of foreign technologies and skills, an issue of interest among researchers, have attempted to analyze the extent to which capital flow into the emerging economies has contributed to economic growth. Even though the perception seems to differ on ground of hypotheses, all the theories lead to the determination of the role of foreign direct investment in economic growth. In the United States, studies on foreign

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direct investment have focused on examining the home-country consequence of the foreign direct investment. By doing this, researchers failed to examine inward direct investment into the United States. Supposedly, the neglect of these issues is due to the role of the United States as dominant outward investor.

## 2 Methodological Analysis

In this study, the use of investment incentives focuses on domestic supply and foreign demand in order to determine the externalities between the two sectors of the economy. On the expectation that some of the knowledge brought by the United States multinational corporations may spill over to foreign multinational corporations, the economy is dichotomized into the domestic-funded sector and the foreign-funded sector. The following analytical framework is developed as a way to use empirical analysis to investigate the theoretical motives for financial subsidies to foreign investments, and therefore examine the link between domestic and foreign investments. The study utilizes foreign investment supply and domestic investment demand for a quantitative assessment of the association between the foreign-funded sector and the domestic-funded sector in the United States. In the footsteps of Esq, and al. (2010), this research deeply looks into domestic investment supply and foreign investment demand on the basis that the factor productivity in the foreign sector is less than that in the domestic sector in industrialized countries open economies.

### 2.1 Domestic Investment Supply

The spillover effect from the domestic-funded sector to the foreign-funded sector of the economy is derived from the supply guided model. Attention is paid to the neo-classical production function that ties economic growth to the factors of production. The production function of the domestic-funded sector is posited in the form:

$$D_t = f(L_t^d, K_t^d) \quad (1)$$

D is the output of the domestic-funded sector; L represents the labor forces; K denotes the capital stocks; and the subscripts d and t stand for domestic sector and time indexes respectively. The output of the foreign-funded sector is a function of capital, labor, and the expected output of the domestic-funded sector due to the presence of spillover effect. In this respect, an equation of the foreign-funded sector that accounts for the spillover effect is reformulated as follow:

$$F_t = g(L_t^f, K_t^f; D_t^*) \quad (2)$$

F is the output of the foreign-funded sector;  $D_t^*$  represents the expected output of the domestic-funded sector; and the subscript f denotes the foreign sector. Based on the adaptive expectations model in which expectations are revised in proportion to the error of the previous level of expectation (Koyck Geometric Lag Model), it is assumed that the production of the domestic-funded sector is expected; therefore,

$$D_t^* - D_{t-1}^* = \theta (D_{t-1} - D_{t-1}^*) \text{ with } 0 < \theta < 1 \quad (3)$$

The economy is composed of the foreign-funded sector and the domestic-funded sector because both sectors absorb the total capital stocks and labor forces. The output of the domestic-funded sector is the difference between the total output of the economy and the output of the foreign-funded sector. Output, capital, and labor of the domestic-funded sector are thus derived from the total output, labor employment, and the aggregate capital investment via the following functions:

$$Y_t = L_t + D_t \quad (4)$$

$$L_t = L_t^f + L_t^d \quad (5)$$

$$K_t = K_t^f + K_t^d \quad (6)$$

$Y$  is the total production of the economy. The marginal factor productivities are not equal in the domestic-funded sector and the foreign-funded sector of the economy; the difference resulting from inter-sectorial beneficial externalities (Feder, 1983). In this respect, the model assumes that the marginal factor productivity in the domestic funded sector is higher than that in the foreign sector in industrialized countries. Based on this view, the model assumes that the ratio of the marginal factor productivity of the foreign labor to the domestic labor deviates from unity by a factor of  $\delta$  which lead to express the partial derivatives of labor and capital as follows:

$$D_t / F_t = D_k / F_k = 1 + \delta \text{ with } \delta > 0 \quad (7)$$

Assuming that the two production functions (capital and labor) are homogeneous of degree one, differentiation of the production function of the domestic-funded sector (1) and the production function of the foreign-funded sector (2) with respect to time gives the following results respectively:

$$dK_t / Y_t \quad (8)$$

$$dL_t / dL_t^f + \delta / (1 + \delta) + D_t^{d*} \quad (9)$$

Under the assumption that a linear relationship exists between the marginal productivity in a given sector and the average output per labor in the economy (Bruno, 1968), the derivation of the above relationship in the foreign-funded sector gives the following result:

$$F_t = \alpha (Y/L) \quad (10)$$

The above result is then used to generate the growth equation as follows:

$$dY_t / Y_t = \alpha (dK_t / Y_t) + \beta (dL_t / dL_t^f) + \left[ \delta / (1 + \delta) + D_t^{D*} \right] (dD_t / D_t) (D_t / Y_t) \quad (11)$$

In this equation,  $dY_t/Y_t$  is the economic growth rate,  $dK_t/Y_t$  represents the investment-output ratio,  $dL_t/dL_t^f$  stands for the ratio of labor employment to labor forces employed in the foreign-funded sector,  $\delta/(1+\delta)+D_t^{D*}$  measures the amount by which the total marginal productivity in the domestic-funded sector exceeds that in the whole economy,  $(dF_t/F_t)(F_t/Y_t)$  denotes the foreign-funded sector weighted output growth rate, and  $D_t^{D*}$  is the spillover effect of the domestic-funded sector to the foreign-funded sector, which is measured as  $dF_t/dD_t^*$ . The coefficients  $\alpha$  and  $\beta$  are the marginal productivity of capital in the domestic-funded sector, and a proportionality factor linking the marginal productivity of labor in the domestic-funded sector to the average labor output respectively. Estimation of the productivity differential reflects the difference in the factor productivities in both the foreign- and domestic-funded sectors. Under the assumption that the output of the domestic-funded sector affects the output of the foreign-funded sector at a constant exponential rate equation (2) is modified and the output of the foreign-funded sector is redefined as follow:

$$F_t=(D_t^*)^\chi \varphi(L_t^f, K_t^f) \quad (12)$$

Where  $\varphi$  is the rate, at which the domestic-funded sector influences the foreign-funded sector. The elasticity coefficient  $\chi$  is considered as an indicator that evaluates the level of spillover effect, it follows that

$$dF_t/dD_t^* = \chi (F_t/D_t^*) \quad (13)$$

The principle of adaptive expectation helps determine the production differential of equation 12 with respect to time. Substitution into the conventional growth of equation 11 results in the growth rate below:

$$dY_t/Y_t = \alpha (dK_t/Y_t) + \beta (dL_t/dL_t^d) + [(\delta/(1+\delta)) - \chi](dD_t/D_t)(F_t/Y_t) + \chi dD_t^*/D_t^* \quad (14)$$

The output of the domestic-funded sector is expected, and therefore can be expressed as the weighted average of current and past values of the production of the domestic-funded sector. Therefore, the expected output of the domestic-funded sector (3) is re-arranged as follows:

$$D_t^* = \theta D_{t-1} + (1-\theta)(D_{t-1}^*) = \sum_0^\infty (1-\theta)^u D_{t-u} \text{ where } \sum_0^\infty (1-\theta)^u = 1 \quad (15)$$

Transformation into a dynamic function of economic growth is accomplished using a combination of equations (12), (14) and (15) as follows:

$$dY_t/Y_t = \alpha \theta (dK_t/Y_t) + \beta \theta (dL_t/dL_t^f) + [(\delta/(1+\delta)) - \chi] \theta (dD_t/D_t)(F_t/Y_t) + \chi \theta dD_t^*/D_t^* + (1-\theta)(dY_{t-1}/Y_{t-1}) \quad (16)$$

The above equation associates economic growth with the growth of capital for each additional unit of output, the ratio of labor force for each additional worker in the foreign-funded sector, the weighted output growth rate of the domestic-funded sector, the ratio of the output of the domestic-funded sector to the aggregate output, and the economic growth of the previous period. The domestic investment supply guided model is determined using an empirical analysis that is accomplished through the transformation of equation 16 into a testable equation of the following form.

$$dY_t/Y_t = \alpha_0 + \alpha_1 (dK/Y)_t + \alpha_2 (dL/dL^f)_t + \alpha_3 (dD/D)_t (F/Y)_t + \alpha_4 (dD/D)_t + \alpha_5 (dY/Y)_{t-1} + u_t \quad (17)$$

where  $u_t$  is a random error term.

## 2.2 Foreign Investment Demand

A derivation of the foreign investment demand driven model linking the spillover effect from the foreign-funded sector to the domestic-funded sector in the United States economy is derived from the demand guided model using the two sectors of the economy as follows.

$$F_t = g(L_t^f, K_t^f) \quad (18)$$

As previously mentioned the output of the domestic-funded sector is a function of capital, labor, and the expected output of the foreign-funded sector due to the presence of spillover effect. In this respect, an equation of the foreign-funded sector that accounts for the spillover effect is reformulated as follow:

$$D_t = f(L_t^d, K_t^d; F_t^*) \quad (19)$$

As in the supply guided model, the theory assumes that the production of the foreign-funded sector is expected; therefore

$$F_t^* - F_{t-1}^* = \kappa (F_{t-1} - F_{t-1}^*) \text{ with } 0 < \kappa < 1 \quad (20)$$

$F_t^*$  is the expected output of the foreign-funded sector. Under the assumption that the difference of the marginal factor productivity of the domestic labor to the foreign labor deviates from unity by a factor of  $\Pi$ , couple with the logic that the marginal factor productivity in the foreign funded sector is less than that in the domestic sector in industrialized countries open economies, the partial derivatives of labor and capital are expressed as follow:

$$D_l/F_l = D_k/F_k = 1 + \Pi \text{ with } \Pi > 0 \quad (21)$$

Estimation of the productivity differential reflects the difference in the factor productivities in both the domestic- and foreign-funded sectors. Under the assumption that the output of the foreign-funded sector affects the output of the domestic-funded sector at a constant exponential rate, equation 19 is reformulated and the output of the foreign-funded sector is as follow:

$$D_t = (F_t^*)^\psi \tau(L_t^d, K_t^d) \quad (22)$$

The level of spillover effect is evaluated using the elasticity coefficient. It follows that

$$dD_t/dF_t^* = \psi (D_t/F_t^*) \quad (23)$$

The economic growth rate is derived in the same way as in equation 14

$$dY_t/Y_t = \mathcal{G}(dK_t/Y_t) + \iota(dL_t/dL_t^f) + \left[ \left( \frac{\Pi}{1+\Pi} \right) - \psi \right] (dF_t/F_t)(F_t/Y_t) + \psi dF_t^*/F_t^* \quad (24)$$

Using the principle of adaptive expectations, a dynamic function is derived from the above equation as follows:

$$dY_t/Y_t = \mathcal{G} \kappa (dK_t/Y_t) + \iota \kappa (dL_t/dL_t^d) + \left[ \left( \frac{\Pi}{1+\Pi} \right) - \psi \right] \kappa (dF_t/F_t)(F_t/Y_t) + \psi \kappa dF_t^*/F_t^* + (1-\kappa)(dY_{t-1}/Y_{t-1}) \quad (25)$$

The above equation is the foreign investment demand-driven model that associates economic growth with the growth of capital for each additional unit of output, the ratio of labor force for each additional worker in the foreign-funded sector, the weighted output growth rate of the domestic-funded sector, the ratio of the output of the domestic-funded sector to the aggregate output, and the economic growth of the previous period. The domestic investment supply guided model is determined using an empirical analysis that is accomplished through the transformation of (25) into a testable equation of the following form.

$$dY_t/Y_t = \beta_0 + \beta_1 (dK/Y)_t + \beta_2 (dL/dL^d)_t + \beta_3 (dF/F)_t (D/Y)_t + \beta_4 (dF/F)_t + \beta_5 (dY/Y)_{t-1} + v_t \quad (26)$$

where  $v_t$  is a random error term

### 3 Previous Literature and Data Considerations

Despite the significance of studies on outward foreign direct investment from the United States, there are questions that can be asked; one is about the spillover effects from the domestic-funded sector to the foreign-funded sector. Previous studies fail to examine inward direct investment in the United States. Shahmoradi and Najibzadehr (2010) analyze the relationship between the flow of foreign direct investment and economic growth in India. Using the gross domestic product as the measure of economic growth, the authors find a strong correlation, coupled with a unidirectional causality between foreign direct investment inflows and economic development. Using a two-steps

procedure, Esq and al. (2010) also analyzed the interrelation between foreign direct investment and economic growth in China in terms of inter-sectorial externalities. The study employed the domestic-funded sector and the foreign-funded sector to analyze the externalities between the two sectors of the economy. The authors found that foreign capital contributed positively to China's economic growth with a weakening spillover effect over time.

Secondary data of the World Bank (World Development Indicators), ProQuest statistical datasets, and the United States Department of Commerce (Bureau of Economic Analysis) are essential components of the groundwork for the empirical testing of the theoretical analysis. All data are from 1970 to 2010. The foreign output, the total output, and the capital stocks variables are expressed in billions of dollars. The foreign and domestic labor employment is expressed in thousands of dollars. The output of the foreign-funded sector is the difference between the total output of the economy, expressed as the gross domestic product, and the output of the domestic sector; idem for labor. The unavailability of an index of foreign labor in the United States for the years 1970 to 1986 leads to update the missing foreign labor years using an index conversion procedure that consists of moving averages.

#### **4 Empirical Development**

The basic problem with studies of externalities between the two sectors of the economy consists of examining the interaction between the domestic-funded sector and the foreign-funded sector. This research looks at the way to introduce and posit the domestic investment supply and the foreign investment demand in order to analyze the spillover effects from the domestic sector to the foreign sector or vice versa. The empirical investigation of the theoretical analysis is aimed at computing the contribution of one sector to another sector as a way to determine and analyze the flow direction in the economy.

Table 1: Regression results: Values in parentheses are the t-statistics and values in brackets are probabilities

Domestic Supply-Guided Model		Foreign Demand-Driven Model	
<b>Economic Growth of the previous period</b>	0.01 (0.01) [0.99]	<b>Economic Growth of the previous period</b>	0.27 (3.13) [0.01]
Capital Stocks Growth Rate	0.09 (3.16) [0.01]	Capital Stocks Growth Rate	0.32 (6.62) [0.01]
Labor Growth Rate in the Domestic Sector	-0.09 (-0.88) [0.38]	Labor Growth Rate in the Foreign Sector	-0.04 (-0.83) [0.41]
Domestic Funded Sector Weighted Output Growth Rate	-2.14 (-1.16) [0.25]	Foreign Funded Sector Weighted Output Growth Rate	-0.84 (-1.12) [0.27]
Domestic Output Growth Rate	3.02 (1.65) [0.10]	Foreign Output Growth Rate	0.01 (1.21) [0.23]
R <sup>2</sup>	0.83	R <sup>2</sup>	0.98

Based on the empirical results, it is evident that a mean to supplement foreign investment for achieving a higher level of economic growth can be done through capital structure, transfer of technology, and managerial skills. The above table infers that the economic output is particularly sensitive to the growth rate of the capital stocks. The coefficients of the capital stock are positive and statistically significant in both the domestic and foreign sectors of the economy. This result strengthens the view that multinationals concentrate their more capital-intensive or skill-intensive operations in the United States. The model refutes the theoretical argument that the labor force employed by both domestic- and foreign-capital enterprises contributes to economic growth, as the coefficients of the labor growth rate appear to be statistically insignificant in the two sectors of the economy. The result is consistent with the view that multinationals allocate their more labor-intensive production to their affiliates in poor countries. An important aspect of the economic growth resides in the statistically significant positive coefficient of the domestic output growth rate. This indicates a significant trend rate of growth and the estimated value traces out a pattern of three percent a year. Inconsistent with the financial logic is the lack of support of the apparent reality of domestic output determination in the United States. Economic evidence that past realizations of growth tend to have a positive effect in the short run does not find support in the domestic sector of the economy as the magnitude of the output coefficient is statistically insignificant. In the foreign sector however, the model supports the impact of the output observed in the previous period in affecting the current output. The silent nature of the weighted output growth rate in both the domestic- and the foreign-funded sectors is disappointing, as the empirical results minimize the influence of both the domestic- and foreign-funded sector on the total output of the economy.

The hypothesis that there are externalities between the two sectors of the United States economy implies the determination of the constant exponential rates from the domestic to

the foreign sector  $\chi$  and from the foreign to the domestic sector  $\psi$  in order to determine the magnitude of the spillover effect. Based on the insights of Esq, and al. (2010), the coefficients of the domestic- and foreign-output growth rates of the table above, in conjunction with equations (14) and (24) pertain to the determination of the estimated values of  $\chi$  and  $\psi$  respectively:

$$\chi = \frac{\hat{\chi}\theta}{\hat{\chi}} = \frac{3.02}{1-0.01} = 3.05$$

$$\psi = \frac{\hat{\psi}\kappa}{\hat{\psi}} = \frac{0.01}{1-0.27} = 0.01$$

The purpose of this research is to evaluate the magnitude of the spillover effect from one sector of the economy to the other sector. The estimated values of the elastic coefficients  $\chi$  and  $\psi$  are thus employed to evaluate the spillover effect using the formula below:

$$\delta D_t / \delta D_t^* = \chi (D_t / F_t^*)$$

$$\delta F_t / \delta F_t^* = \psi (F_t / D_t^*)$$

The table below shows the summary of the results reported in appendix, which represent of the spillover for each year.

Table 2: Summary of the estimated spillover effect

	From the Domestic to the Foreign Sector	From the Foreign to the Domestic Sector
Lowest Value	91.42529	0.00000773
Highest value	3947.226	0.000334
Range	3855.8008	0.00032627
First Quartile	242.9774	0.0000305
Median	388.2101	0.0000786
Third Quartile	1000.0181	0.0001255
Interquartile Range	757.0407	0.000095

The above table supports the economic evidence that the factor productivity in the domestic-funded sector is higher than that in the foreign sector in industrialized countries open economies. There is strong support in this model that the contribution of foreign direct investment is minimal because of lower externalities in the foreign-funded sector. The higher externalities observed in the domestic-funded sector support the apparent reality of the low contribution of the foreign sector in promoting the domestic sector in developed economies; this is consistent with the financial literature that the domestic sector plays a role in promoting the foreign sector in industrialized countries open economies.

## 5 Conclusion

A look at the interaction between the domestic-funded sector and the foreign-funded sector is important in view of the reality of industrialized countries with open markets. The neo classical production function for the two sectors of the economy is used to determine the domestic investment supply and the foreign investment demand functions. The model added the estimated values of the elastic coefficients to evaluate the spillover effect using constant exponential rates from the domestic to the foreign sector and from the foreign to the domestic sector for an in-depth exploration of externalities between the two sectors of the economy. Previous studies on foreign direct investment in the United States focused on examining the home-country consequences of the foreign direct investment; these analyses failed to examine inward direct investment into the United States. Indeed, the model is specialized to conform to industrialized economies with open markets. In a dynamic environment that manifests itself with the extraverted nature of the United States economy, results of macroeconomic policies could be rendered irrelevant without a major investigation on spillover effects from the domestic-funded sector to the foreign-funded sector. The presented analysis put forth externalities between the two sectors of the economy due to their importance to open economies models. From the empirical standpoint, the contribution of foreign direct investment in the United States is minimal and the domestic-funded sector plays a significant role in promoting the foreign-funded sector. The results provided evidence that multinationals allocate their more labor-intensive production to their affiliates in poor countries and concentrate their more capital-intensive or skill-intensive operations in the United States. There is a strong relationship between foreign capital inflow into the United States and economic growth in the two sectors of the economy.

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**Appendix**


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Obs	CAPITALSTOCKS	TOTALOUTPUT	DOMESTICOUTPUT	FOREIGNOUTPUT	TOTALLABOR	DOMESTICLABOR	FOREIGNLABOR
1970	194.0	1038.3	1037.040	1.26	78678	75414.60	3263.4
1971	211.7	1126.8	1125.930	0.87	79367	76174.30	3192.7
1972	241.1	1237.9	1236.550	1.35	82153	78869.10	3283.9
1973	275.5	1382.3	1380.180	2.12	85064	81646.10	3417.9
1974	291.7	1499.5	1496.170	3.33	86794	83175.50	3618.5
1975	299.6	1637.7	1635.140	2.56	85846	82399.10	3446.9
1976	341.2	1824.6	1821.350	3.25	88752	84940.20	3811.8
1977	406.5	2030.1	2027.200	2.90	92017	87862.10	4154.9
1978	489.2	2293.8	2287.950	5.85	96048	91470.10	4577.9
1979	563.4	2562.2	2553.500	8.70	98824	94300.20	4523.8
1980	585.5	2788.1	2771.170	16.93	99303	94991.90	4311.1
1981	649.5	3126.8	3101.610	25.19	100397	96232.70	4164.3
1982	644.5	3253.2	3240.730	12.47	99526	95522.30	4003.7
1983	692.9	3534.6	3524.130	10.47	100834	96803.30	4030.7
1984	809.6	3930.9	3906.140	24.76	105005	100785.9	4219.1
1985	873.2	4217.5	4197.490	20.01	107150	102682.9	4467.1
1986	913.2	4460.1	4424.680	35.42	109597	105196.5	4400.5
1987	942.1	4736.4	4677.930	58.47	112440	107610.9	4829.1
1988	989.2	5100.4	5042.660	57.74	114968	109776.7	5191.3
1989	1044.9	5482.1	5413.850	68.25	117342	111749.2	5592.8
1990	1062.2	5800.5	5752.010	48.49	118793	113355.1	5437.9
1991	1023.6	5992.1	5968.920	23.18	117718	112607.5	5110.5
1992	1071.6	6342.3	6322.490	19.81	118492	113577.1	4914.9
1993	1152.0	6667.4	6616.020	51.38	120259	115408.1	4850.9
1994	1254.4	7085.2	7039.070	46.13	123060	118140.8	4919.2
1995	1345.5	7414.7	7356.900	57.80	124900	119881.5	5018.5
1996	1453.7	7838.5	7751.980	86.52	126708	121425.5	5282.5
1997	1570.0	8332.4	8226.810	105.59	129558	124356.1	5201.9
1998	1709.9	8793.5	8614.470	179.03	131463	125816.9	5646.1
1999	1868.1	9353.5	9064.060	289.44	133488	127460.4	6027.6
2000	2022.0	9951.5	9630.230	321.27	136891	130366.4	6524.6
2001	2022.2	10266.2	10099.18	167.02	136933	130664.7	6268.3
2002	1978.4	10642.3	10557.93	84.37	136485	130559.8	5925.2

2003	2069.1	11142.2	11078.45	63.75	137736	132022.8	5713.2
2004	2276.0	11853.3	11707.33	145.97	139252	133634.9	5617.1
2005	2514.3	12623.0	12510.36	112.64	141730	136064.5	5665.5
2006	2692.2	13377.2	13134.05	243.15	144427	138623.9	5803.1
2007	2722.6	14028.7	13807.53	221.17	146047	139958.3	6088.7
2008	2625.9	14291.5	13981.41	310.09	145362	139037.3	6324.7
2009	2213.0	13939.0	13786.90	152.10	139877	133906.9	5970.1
2010	2233.5	14526.5	14296.50	230.00	139064	133128.6	5935.4

Obs	CAPITALSTOCKS	TOTALOUTPUT	DOMESTICOUTPUT	TOTALLABOR	DOMESTICLABOR	DOMFOR	FORDOM
1970	194.0	1038.3	1037.040	78678	75414.60	2510.295	1.21E-05
1971	211.7	1126.8	1125.930	79367	76174.30	3947.226	7.73E-06
1972	241.1	1237.9	1236.550	82153	78869.10	2793.687	1.09E-05
1973	275.5	1382.3	1380.180	85064	81646.10	1985.636	1.54E-05
1974	291.7	1499.5	1496.170	86794	83175.50	1370.366	2.23E-05
1975	299.6	1637.7	1635.140	85846	82399.10	1948.116	1.57E-05
1976	341.2	1824.6	1821.350	88752	84940.20	1709.267	1.78E-05
1977	406.5	2030.1	2027.200	92017	87862.10	2132.055	1.43E-05
1978	489.2	2293.8	2287.950	96048	91470.10	1192.863	2.56E-05
1979	563.4	2562.2	2553.500	98824	94300.20	895.1925	3.41E-05
1980	585.5	2788.1	2771.170	99303	94991.90	499.2362	6.11E-05
1981	649.5	3126.8	3101.610	100397	96232.70	375.5423	8.12E-05
1982	644.5	3253.2	3240.730	99526	95522.30	792.6405	3.85E-05
1983	692.9	3534.6	3524.130	100834	96803.30	1026.609	2.97E-05
1984	809.6	3930.9	3906.140	105005	100785.9	481.1683	6.34E-05
1985	873.2	4217.5	4197.490	107150	102682.9	639.7973	4.77E-05
1986	913.2	4460.1	4424.680	109597	105196.5	381.0072	8.01E-05
1987	942.1	4736.4	4677.930	112440	107610.9	244.0172	0.000125
1988	989.2	5100.4	5042.660	114968	109776.7	266.3684	0.000115
1989	1044.9	5482.1	5413.850	117342	111749.2	241.9376	0.000126
1990	1062.2	5800.5	5752.010	118793	113355.1	361.7989	8.43E-05
1991	1023.6	5992.1	5968.920	117718	112607.5	785.3842	3.88E-05
1992	1071.6	6342.3	6322.490	118492	113577.1	973.4273	3.13E-05
1993	1152.0	6667.4	6616.020	120259	115408.1	392.7377	7.77E-05
1994	1254.4	7085.2	7039.070	123060	118140.8	465.4057	6.55E-05

1995	1345.5	7414.7	7356.900	124900	119881.5	388.2101	7.86E-05
1996	1453.7	7838.5	7751.980	126708	121425.5	273.2725	0.000112
1997	1570.0	8332.4	8226.810	129558	124356.1	237.6340	0.000128
1998	1709.9	8793.5	8614.470	131463	125816.9	146.7583	0.000208
1999	1868.1	9353.5	9064.060	133488	127460.4	95.51335	0.000319
2000	2022.0	9951.5	9630.230	136891	130366.4	91.42529	0.000334
2001	2022.2	10266.2	10099.18	136933	130664.7	184.4240	0.000165
2002	1978.4	10642.3	10557.93	136485	130559.8	381.6722	7.99E-05
2003	2069.1	11142.2	11078.45	137736	132022.8	530.0278	5.75E-05
2004	2276.0	11853.3	11707.33	139252	133634.9	244.6212	0.000125
2005	2514.3	12623.0	12510.36	141730	136064.5	338.7482	9.00E-05
2006	2692.2	13377.2	13134.05	144427	138623.9	164.7495	0.000185
2007	2722.6	14028.7	13807.53	146047	139958.3	190.4099	0.000160
2008	2625.9	14291.5	13981.41	145362	139037.3	137.5191	0.000222
2009	2213.0	13939.0	13786.90	139877	133906.9	276.4631	0.000110
2010	2233.5	14526.5	14296.50	139064	133128.6	189.5840	0.000161

domfor = spillover effect from the domestic-funded sector to the foreign-funded sector

fordom = spillover effect from the foreign-funded sector to the domestic-funded sector

obs	DYY	DKY	DDD	DFE	DLD	DFL	DDDDY	DDFFY
1970	NA	NA	NA	NA	NA	NA	NA	NA
1971	0.078541	0.015708	0.078948	-0.448276	0.009973	-0.022144	0.078948	-0.448276
1972	0.089749	0.023750	0.089459	0.355556	0.034168	0.027772	0.089459	0.355556
1973	0.104464	0.024886	0.104066	0.363208	0.034013	0.039205	0.104066	0.363208
1974	0.078159	0.010804	0.077525	0.363363	0.018388	0.055437	0.077525	0.363363
1975	0.084387	0.004824	0.084990	-0.300781	-0.009422	-0.049784	0.084990	-0.300781
1976	0.102433	0.022800	0.102237	0.212308	0.029916	0.095729	0.102237	0.212308
1977	0.101227	0.032166	0.101544	-0.120690	0.033256	0.082577	0.101544	-0.120690
1978	0.114962	0.036054	0.113967	0.504274	0.039445	0.092400	0.113967	0.504274
1979	0.104754	0.028959	0.103995	0.327586	0.030012	-0.011959	0.103995	0.327586
1980	0.081023	0.007927	0.078548	0.486119	0.007282	-0.049338	0.078548	0.486119
1981	0.108322	0.020468	0.106538	0.327908	0.012894	-0.035252	0.106538	0.327908
1982	0.038854	-0.001537	0.042929	-1.020048	-0.007437	-0.040113	0.042929	-1.020048
1983	0.079613	0.013693	0.080417	-0.191022	0.013233	0.006699	0.080417	-0.191022
1984	0.100817	0.029688	0.097797	0.577141	0.039515	0.044654	0.097797	0.577141

1985	0.067955	0.015080	0.069411	-0.237381	0.018474	0.055517	0.069411	-0.237381
1986	0.054393	0.008968	0.051346	0.435065	0.023894	-0.015135	0.051346	0.435065
1987	0.058335	0.006102	0.054137	0.394219	0.022436	0.088754	0.054137	0.394219
1988	0.071367	0.009235	0.072329	-0.012643	0.019729	0.069771	0.072329	-0.012643
1989	0.069627	0.010160	0.068563	0.153993	0.017651	0.071789	0.068563	0.153993
1990	0.054892	0.002983	0.058790	-0.407507	0.014167	-0.028485	0.058790	-0.407507
1991	0.031975	-0.006442	0.036340	-1.091890	-0.006639	-0.064064	0.036340	-1.091890
1992	0.055217	0.007568	0.055923	-0.170116	0.008537	-0.039797	0.055923	-0.170116
1993	0.048760	0.012059	0.044367	0.614441	0.015865	-0.013193	0.044367	0.614441
1994	0.058968	0.014453	0.060100	-0.113809	0.023131	0.013884	0.060100	-0.113809
1995	0.044439	0.012286	0.043202	0.201903	0.014520	0.019787	0.043202	0.201903
1996	0.054066	0.013804	0.050965	0.331946	0.012716	0.049976	0.050965	0.331946
1997	0.059275	0.013958	0.057717	0.180604	0.023566	-0.015494	0.057717	0.180604
1998	0.052436	0.015909	0.045001	0.410211	0.011611	0.078674	0.045001	0.410211
1999	0.059871	0.016913	0.049601	0.381461	0.012894	0.063292	0.049601	0.381461
2000	0.060091	0.015465	0.058791	0.099076	0.022291	0.076173	0.058791	0.099076
2001	0.030654	1.95E-05	0.046434	-0.923542	0.002283	-0.040888	0.046434	-0.923542
2002	0.035340	-0.004116	0.043451	-0.979614	-0.000803	-0.057905	0.043451	-0.979614
2003	0.044865	0.008140	0.046985	-0.323451	0.011081	-0.037107	0.046985	-0.323451
2004	0.059992	0.017455	0.053717	0.563266	0.012063	-0.017108	0.053717	0.563266
2005	0.060976	0.018878	0.064189	-0.295898	0.017856	0.008543	0.064189	-0.295898
2006	0.056380	0.013299	0.047486	0.536747	0.018463	0.023711	0.047486	0.536747
2007	0.046441	0.002167	0.048776	-0.099381	0.009534	0.046907	0.048776	-0.099381
2008	0.018389	-0.006766	0.012437	0.286755	-0.006624	0.037314	0.012437	0.286755
2009	-0.025289	-0.029622	-0.014108	-1.038725	-0.038313	-0.059396	-0.014108	-1.038725
2010	0.040443	0.001411	0.035645	0.338696	-0.005846	-0.005846	0.035645	0.338696

dyy = economic growth

dff = output growth rate in the foreign sector

ddd = output growth rate in the domestic sector

dky = growth rate in the capital stocks

dld = labor growth rate in the domestic sector

dfl = labor growth rate in the foreign sector

dfffy = foreign funded sector weighted output growth rate

dddyy = domestic funded sector weighted output growth rate