How does foreign direct investment affect economic growth in China?[1]

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Abstract

How does inward foreign direct investment (FDI) affect a transitional economy? This study attempts to analyze the role of FDI in China's income growth and market-oriented transition. We first identify possible channels through which FDI may have positive or negative effects on the Chinese economy. Using a growth model and cross-section and panel data for the period 1984–98, we provide an empirical assessment, which suggests that FDI seems to help China's transition and promote income growth, and that this positive growth effect seems to rise over time and to be stronger in the coastal than the inland regions.

JEL classification: F21, F23, O53.
Keywords: foreign direct investment, economic growth, transition.

1. Introduction

Since market reforms began in 1978, China has achieved impressive success in economic growth with an average rate of 9.5 per cent in 1978–99, the highest in the world for that period. China's economic achievement seems to owe much to the adoption of radical initiatives encouraging inward foreign direct investment (FDI). From an almost isolated economy, China has become the second largest recipient of FDI in the world (next only to the US) since 1993, with cumulative FDI inflows as much as US$305 billion by the end of 1999 (UNCTAD, 2000). The following indicators may suggest the significance and contributions of FDI to the Chinese economy in 1998: FDI flows constituted 15 per cent of gross fixed capital formation, foreign-invested enterprises produced 15 per cent of total industrial output, and created 44 per cent of China's entire exports (SSB, 1999; UNCTAD, 1999).

While there has been an increasing body of literature on FDI in China (e.g., Lardy 1995; and Pomfret, 1997), systematic treatments of the role of FDI in the Chinese economy seem to have been limited. In particular, few studies have been devoted to empirical analysis of the impact of FDI on China's income growth and market-oriented transition.[2] This study attempts to close the gap by providing a quantitative assessment of the effects of FDI on the Chinese economy. We first identify possible channels through which FDI may affect the Chinese economy and transition. Then using cross-section and panel data from 1984–98, we estimate a growth model in which the direct effects (e.g., raising productivity and promoting export) and external effects (e.g., facilitating transition and diffusing technology) of FDI on the Chinese economy are emphasized.

Two features characterize this study. First, empirical specifications used in this study not only indicate the usual effects of FDI on China's economic growth, but also enable one to analyze the external effects of FDI on the Chinese economic reforms. The importance of FDI in the Chinese economy, combined with China's smooth transition and rapid income growth in the last two decades, seems to suggest that in no other transitional economy has FDI played such a dynamic and significant role (Lardy, 1995; Pomfret, 1997).

Second, estimations are conducted with both cross-section and panel data at the provincial level for more informative and reliable results. Breaking down the entire period (1984–98) into three sub-periods allows us to investigate structural changes over time in the impact of FDI and other growth factors on the Chinese economy. The panel approach allows one to capture province-specific differences that are not reflected in cross-section estimates.

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[2] There are a few exceptions. Using city-level data for 1980–90, Wei (1995) finds positive effects of FDI on the Chinese economy through technology spillovers. A recent study by Zhang (1999) tests the long-term link and short-term dynamics between FDI and Chinese economic growth. Branstetter and Feenstra (1999) provide an empirical analysis using a political economy approach of the effects of FDI and trade on the Chinese economy.

The main results may be summarized as follows. The overall impact of FDI on income growth and the external effect on the transition are significantly positive, and they seem to increase over time. Regional differences, especially due to biased FDI policies, favour the coastal region. The marginal product of foreign capital seems to be significantly larger than that of domestic capital.

2. The role of FDI in China's economic growth and transition

The impact of FDI on the Chinese economy may be analyzed within the framework of both neoclassical theories and dependency theories of economy. We first look at two aspects of the contribution of FDI to the Chinese economy: the usual effects on income growth and the special role in a market-oriented transition. Then we discuss potential negative effects of FDI from the perspective of the dependency theories.

2.1 The impact on economic growth

Standard propositions of the neoclassical theories suggest that FDI is likely to be an engine of host economic growth, because (a) inward FDI may enhance capital formation and employment augmentation; (b) FDI may promote manufacturing exports; (c) by its very nature, FDI may bring into host economies special resources such as management know-how, the access of skilled labour to international production networks, and established brand names; and (d) FDI may result in technology transfers and spillover effects (Markusen and Venables, 1999; UNCTAD, 1992).

In the case of China, the most prominent contribution of FDI has been expanding China's manufacturing exports.[3] Increases in foreign-invested enterprises (FIEs) not only augment China's export volumes, but also upgrade its export structure.[4] While China's exports were ranked as the 26th in the world in 1980, with the volume of US$18 billion and 47 per cent of the exports as manufactured goods, the corresponding numbers in 1998 were 9th in the ranking, US$184 billion, and 89 per cent, respectively. As indicated in Table 1, exports by FIEs in China rose 66.7 per cent annually over 1980–98, and the value of their exports in 1998 (almost all of them as manufacturing goods) were US$88.6 billion,

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[3] The view of exports as an engine of growth has been recognized for a long time in both academic and policy circles (for example, Feder, 1982).
[4] Naughton (1996) argued that China's dualistic trading regime has led to a 'crowding out' of exports of domestic firms by FIEs due to more favourable policies for the latter. This may be true in some particular industries to a certain extent, but the overall effects of FDI on exports seem to have been positive because of China's export-oriented FDI strategy and the relocation of labour-intensive production from Taiwan and Hong Kong to China. In 1999, exports by FIEs (most of them are joint ventures) were US$88.6 billion, comprising 45.5 per cent of China's total exports (Zhang and Song, 2000; Lardy 1995).

comprising 44 per cent of China's total exports in that year (SSB, 1999).

FDI seems also to have enhanced China's economic growth through raising capital formation, increasing industrial output, generating employment, and adding tax revenue. The ratio of FDI flows to gross domestic investment increased from a negligible level in the 1980s to 4 per cent in 1991, and then to 15 per cent in 1998 (SSB, 1999). Table 1 shows that the share of industrial output by FIEs in total industrial output grew from 5 per cent in 1991 to 18.6 per cent in 1997. FDI has also reduced China's unemployment pressure and contributed to government tax revenues. By the end of 1998, FIEs employed 18 million Chinese, comprising 11 per cent of total manufacturing employment. Tax contributions from FIEs rose with FDI flows, and its share in China's total tax revenues increased from 4 per cent in 1992 to 13 per cent in 1997 (SSB, 1998).

Table 1. Importance of FDI and Foreign-invested enterprises (FIEs) in China

	1991	1995	1998
FDI flows as a ratio of gross domestic investment (%)	3.9	15.1	15.2
Exports by FIEs (billions of US dollars)	12.1	46.9	88.6
Share of exports by foreign-invested enterprises in total exports (%)	17.0	31.3	44.1
Share of industrial output by FIEs in total industrial output (%)	5.0	11.7	14.9
Number of employees in FIEs (million persons)	4.8	16.0	18.0
Tax contributions from FIEs as share of total tax revenue (%)	4.1	10.0	13.2

Notes: The numbers of the tax contributions by FIEs in 1991 and 1998 are actually for 1992 and 1997, respectively, due to unavailable data for the two years.
Sources: Computed from *China Statistics Yearbook* by SSB (1997, 1998, and 1999), and *World Investment Report* (1998 and 1999) by UNCTAD.

2.2 The impact on transition

The neoclassical theories argue that markets are usually a better way to organize economic activities than centrally planned economies (Mankiw, 2001). FDI seems to have spillover effects on China's economic transition toward market-oriented systems in the following aspects (Zhang, 1993).

(a) *Diversifying the Ownership Structure.* China's reforms in the ownership structure involved changes from one with predominantly state ownership towards a more desirable mix of state-owned, collective and private ownership. As indicated in Table 2, increasing FIEs have played a significant role in transforming China's ownership structure. In 1992 state-owned enterprises

(SOEs) accounted for 48 per cent of total domestic output, collective enterprises for 38 per cent, and private enterprises (including foreign-invested enterprises), rising from negligible shares in earlier years, for 13 per cent. The proportion of gross industrial output produced by SOEs declined from 78 per cent in 1978 to 34 per cent in 1994 and to 28 per cent in 1998 (SSB, 1999).[5]

(b) *Establishing Market-Oriented Institutions.* FDI in China seems to have stimulated the transition through introducing a market-oriented institutional framework. To effectively attract and utilize foreign capital, China liberalized its FDI regime in the 1980s by establishing special economic zones and coastal open cities. This liberalization exerted constant pressure in the direction of introducing market mechanisms in other sectors. For example, the legal framework specifically pertaining to FDI has prompted numerous laws and regulations governing domestic economic activities as well. This is especially true in relaxing foreign exchange restrictions, establishing a regulatory framework for the protection of intellectual property rights, and reforming accounting systems (Pomfret, 1997).

(c) *Facilitating Reforms of State-Owned Enterprises (SOEs).* FDI in China might have played a unique role in rejuvenating and reforming SOEs either directly through joint ventures with SOEs or indirectly through demonstration effects from the operations of FIEs. Foreign investors are expected to introduce market-oriented management systems, such as incentive schemes, production organization systems, accounting methods and risk management, which are in line with those practiced in market-based economies. Since many FIEs in China are joint ventures with SOEs, their potential impact on SOE reforms should be considerable.

In addition, FDI seems to be conducive to the transition by stimulating competition and fostering China's integration into the world economy. The entry and rise of foreign-invested enterprises are expected to break China's state monopolies and oligopolistic structure. With forward and backward linkages between domestic firms and foreign-invested enterprises, China's integration with the world economy has been deepened. Foreign-invested enterprises also helped promote exports through their established world marketing networks (Zhang and Song, 2000).

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[5] Among China's top 500 manufacturers in 1993, almost 14 per cent (69) were foreign-invested enterprises. Although the number for 1998 is not available, it is likely to have increased since 1993 because FIEs' share in gross industrial output rose from 8 per cent in 1993 to 15 per cent in 1998 (SSB, 1999).

Table 2. Importance of foreign-invested enterprises (FIEs) in China's ownership structure, 1998

	SOEs	Collect-ive	Private	FIEs	Others
Total investment in fixed assets (%)	54.1	14.8	13.2	10.5	7.4
Gross industrial output value (%)*	28.2	38.4	17.1	14.9	0.8
Gross output value of construction (%)*	36.3	58.3	0.4	1.1	4.9
Urban employment (%)	43.8	9.5	15.6	2.8	28.3
Average annual money wage (Yuan of RMB)	7668	5331	8972	10897	6133
Domestic trade (%)*	48.5	21.0	23.0	0.9	6.6

Notes: * the numbers are for 1997.
Sources: *China Statistical Yearbook* (1997, 1998, and 1999) by SSB.

2.3 Negative effects of FDI

The Marxist and dependency approaches may treat FDI made by multinational corporations (MNCs) as one mechanism for exploitation of and gaining control over developing countries by western industrialized countries.[6] Economic arguments of this view suggest that FDI may be detrimental to the Chinese economy, because (a) rather than closing the gap between domestic savings and investment, FDI might actually lower domestic savings and investment; (b) in the long term FDI may reduce China's foreign-exchange earnings on both current and capital accounts; (c) contributions of foreign-invested enterprises' public revenue may be considerably less than it should be as a result of transfer pricing and the variety of investment allowance provided by the Chinese government; and (d) the management know-how and technology provided by MNCs may in fact inhibit developing local sources of these scarce skills and resources due to the foreign dominance in Chinese markets.

A significant criticism of FDI may be conducted at the fundamental level of long-term national welfare. This includes, for example, (a) MNCs may suppress domestic firms and use their advantages in technology to drive out local competitors; (b) MNC activities may reinforce China's dualistic economic structure and exacerbate income inequalities due to their uneven impact on development (Zhang and Zhang, 2000); (c) MNCs may influence government policies in directions unfavourable to China's development by gaining excessive protection, tax rebates, investment allowances, and cheap factory sites and social services; and (d) powerful MNCs may gain control over Chinese assets and jobs

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[6] For more discussions, see Biersteker (1978) and surveys by Helleiner (1989) and Caves (1996).

such that they could exert considerable influence on political as well as economic decisions at all levels in China.

3. Model specifications

Although further theoretical and qualitative insights about the impact of FDI on the Chinese economy would be valuable, empirical analyses are needed as well for a better understanding of the relationship between FDI and Chinese economic growth. Adapting the methodology used in Feder (1982) and Levin and Raut (1997), we may estimate the impact of FDI by specifying an aggregate production function as follows:

$$Y = AL^{\beta_1} K^{\beta_2}, \quad A = B\left[1 + \theta\left(\frac{F}{Y}\right)\right]F^{\alpha} \tag{1}$$

where Y = GDP, L = labour input, K = stock of domestic capital, F = stock of FDI, and A = total factor productivity level. This specification permits total factor productivity (A) to be endogenously determined by the stock of FDI and the share of FDI stock in GDP, as well as exogenous influences represented by the residual productivity factor (B). Following the standard procedure in the literature, we take the natural logarithm, then the first difference of this production function, and finally slightly manipulate terms on the right-hand side. With the addition of a constant term (β_0) and an error term (ε), we obtain the following expression describing the determinants of the growth rate of GDP:

$$\dot{Y} = \beta_0 + \beta_1\dot{L} + \beta_2\left(\frac{I}{Y}\right) + \beta_3\left(\frac{I_F}{Y}\right) + \beta_4\Delta\left(\frac{F}{Y}\right) + \varepsilon \tag{2}$$

where a dot over a variable indicates its rate of growth, and I and I_F are domestic investment and FDI flows, respectively. β_1 represents the output elasticity of labour, β_2 and β_3 are the marginal products of domestic capital and FDI, respectively. Thus influences of externalities of FDI on the transition and technology diffusions are captured by the coefficient of I_F/Y (β_2). The coefficient (β_4) of changes in the ratio of the FDI stock to GDP ($\Delta F/Y$) reflects the superior productivity of foreign-invested enterprises.[7]

Two more variables have been suggested in recent growth models as

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[7] The major postulates of Feder (1982) are made: (a) the economy consists of two sectors, FDI sector and the rest of the domestic economy; (b) the output of the FDI sector generates an externality effect; (c) labour and capital serve as the conventional inputs in both sectors; and (d) production functions and relative marginal products of the inputs differ across the two sectors.

determinants of growth: initial development levels (y_0 as per capita GDP) and human capital (H) (Barro and Sala-i-Martin, 1995). In particular, the models predict a negative link between initial per capita GDP and the long-term growth rate of GDP, and the positive impact of human capital on income growth. Thus the regression model is expanded as follows.

$$\dot{Y} = \beta_0 + \beta_1 \dot{L} + \beta_2 \left(\frac{I}{Y} \right) + \beta_3 \left(\frac{I_F}{Y} \right) + \beta_4 \Delta \left(\frac{F}{Y} \right) + \beta_5 y_0 + \beta_6 H + \varepsilon \qquad (3)$$

Studies of FDI and growth also postulate a positive link between FDI and human capital, since the application of the advanced technology embodied in FDI requires a sufficient level of human capital in host economies (e.g., Borensztein *et al.*, 1998). We incorporate such complementarities between FDI and human capital by assuming A in the aggregate production function (1) is of the following form:

$$A = B \left[1 + \theta_0 \left(\frac{F}{Y} \right) + \theta_1 H \left(\frac{F}{Y} \right) \right] F^\alpha .$$

By applying the same procedure in equation (1) to this function, we have equation (3) to be:

$$\dot{Y} = \beta_0 + \beta_1 \dot{L} + \beta_2 \left(\frac{I}{Y} \right) + \beta_3 \left(\frac{I_F}{Y} \right) + \beta_4 \Delta \left(\frac{F}{Y} \right) + \beta_5 y_0 + \beta_6 H + \beta_7 H \Delta \left(\frac{F}{Y} \right) + \varepsilon . \quad (4)$$

4. The data and the main results

Equation (4) constitutes the basis for our cross-section and panel analyses of the growth effects of FDI at provincial levels for the period 1984–98. The empirical specifications may be modified slightly based on patterns of FDI and economic growth in China. First, there are significant regional variations in economic performance and distribution of FDI within China, as indicated in Table 3. The coastal region enjoys a higher growth rate than the inland region by 1.4–3.9 per cent during 1984–98. At the same time, most FDI (87–89 per cent of total) went to the coastal region.[8] To capture the regional differences in economic performance and the FDI distribution, we include a regional dummy (D) in estimates to control for policy-induced biases of economic growth.

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[8] Researchers have identified various factors to explain the skewed geographic pattern of FDI within China. Among them are the government's biased open-door policy toward the coastal region, higher development levels in the coastal region, and historical and cultural links between provinces and FDI sources (e.g., Guangdong-Hong Kong and Fujian-Taiwan). See Zhang (2001).

Table 3. FDI flows and GDP growth rates in China by province, 1984–98

Provinces	Growth rates of GDP (%)			Shares of FDI in total (%)		
	1984–88	1989–93	1994–98	1984–88	1989–93	1994–98
Coastal Areas	*12.28*	*11.90*	*12.23*	*90.17*	*89.32*	*87.28*
Beijing	11.5	8.6	10.9	8.86	3.77	3.97
Tianjin	9.8	7.4	13.0	2.63	2.09	4.53
Shanghai	9.4	8.7	12.8	11.32	8.83	8.88
Hebei	11.4	11.2	13.1	0.54	1.38	2.27
Liaoning	12.8	7.5	8.8	3.07	4.74	4.43
Shandong	12.3	12.5	12.9	1.31	6.65	6.20
Jiangsu	15.3	12.3	13.4	2.71	9.89	12.75
Zhejiang	15.7	12.4	14.1	1.34	3.08	3.28
Fujian	13.8	15.1	15.6	6.06	11.26	9.84
Guangdong	15.9	16.0	13.1	47.59	31.44	27.21
Hainan	11.8	18.5	7.2	2.76	3.82	2.01
Guangxi	7.6	12.6	11.9	1.98	2.37	1.91
Inland Areas	*10.67*	*7.99*	*10.78*	*9.83*	*10.68*	*12.72*
Jinlin	12.3	6.4	11.2	0.10	0.69	0.96
Heilongjiang	7.6	6.7	9.4	1.05	0.80	1.27
Inner Mongolia	11.6	7.9	10.2	0.16	0.07	0.16
Shanxi	9.6	8.1	10.2	0.11	0.29	0.36
Anhui	11.4	9.0	14.1	0.27	0.67	1.01
Jianxi	11.3	9.6	12.9	0.30	0.68	0.87
Henan	10.6	9.1	12.3	1.20	1.10	1.33
Hubei	11.8	8.9	13.3	0.52	1.70	1.81
Hunan	9.4	8.2	10.8	0.60	1.22	1.60
Sichuan	11.2	8.5	10.0	1.01	1.65	1.64
Guizhou	10.5	7.2	8.5	0.11	0.17	0.12
Yunnan	12.0	8.5	10.1	0.19	0.27	0.39
Tibet	6.4	6.6	13.7	0.00	0.00	0.00
Shaanxi	10.8	7.3	9.4	3.49	0.92	0.88
Gansu	12.1	8.5	9.9	0.20	0.22	0.13
Qinghai	9.2	5.3	8.6	0.00	0.01	0.01
Ningxia	11.9	7.0	10.3	0.00	0.04	0.05
Xinjiang	12.3	11.1	9.2	0.54	0.15	0.11
Nation	*11.96*	*8.10*	*9.54*	*100.00*	*100.00*	*100.00*
Total FDI Flows (billions of US$)				*6.76*	*49.26*	*205.73*

Notes: According to Chinese government, the coastal region includes three municipalities (Beijing, Tianjin, and Shanghai) and nine provinces as in the table. The rest is the inland region (SSB, 1998).
Sources: Data for 1984–95 are taken from *China Regional Economy* (1996) by SSB and data for 1996 through 1998 are from *China Statistical Yearbook* (1997, 1998, and 1999) by SSB.

Second, as shown also in Table 3, growth rates of GDP and FDI flows changed substantially over the fifteen years (1984–98). National GDP grew at the rate of near 12 per cent in the first five years, then slowed down to 8 per cent, and went up again to 9.5 per cent in the last five years. FDI flows are characterized as a boom in the 1990s in contrast to a relatively small amount in the 1980s.[9] To bring out any possible structural variations over time, separate cross-section estimations are to be conducted for three sub-periods: 1984–88, 1989–93, and 1992–97.

Third, panel analyses are to be employed to control for province-specific effects, since the fixed-effects estimation enables us to focus on relationships within provinces over time. To avoid potential problems of time-series data with non-stationarity, cointegration, and autocorrelation, we use average values of all variables for three sub-periods, rather than 15 years of time series (Macnair et al., 1995).

The data were collected for 28 regional units for the period 1984–98, since the information on FDI is not available for many provinces for years before 1984. In addition to 21 provinces, the sample includes three municipalities (Beijing, Tianjin, and Shanghai) and four autonomous regions (Inner Mongolia, Guangxi, Ningxi, and Xinjiang) that have provincial status. The province of Qinghai, the autonomous region of Tibet, and the newly established municipal city of Chongqing are dropped from the sample due to unavailability of the data.

All data on variables used in the estimations are taken from or calculated based on *China Statistical Yearbook* (1997, 1998, and 1999) and *China Regional Economy* (1996) by the State Statistical Bureau (SSB) of China. The growth rate of real GDP for each province is taken as a proxy for $\dot{Y}$. The growth rate of population is used in place of $\dot{L}$, and human capital (H) is measured by shares of secondary school enrolments in total population.[10] The domestic investment-output ratio (I/Y) is computed as nominal gross fixed capital formation divided by the nominal GDP. The FDI-output ratio (I_F/Y) is computed as the ratio of nominal realized FDI flows (in US dollars) to nominal GDP that is converted into US dollars. Data on changes in the ratio of FDI stock to GDP ($\Delta(F/Y)$) are calculated in a two-step procedure. First, data on nominal realized FDI stock in

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[9] The factors that caused the FDI boom in the 1990s included further liberalization of China's FDI regime and the explosive growth of the domestic economy, along with the worldwide rise in FDI outflows in the first half of the 1990s and China's political stability (Lardy, 1995). Another relevant factor is the so-called 'round-trip FDI' between Hong Kong and China. While Hong Kong was returned to China as a special administration area by Britain in 1997, its direct investment in China has still been treated as FDI. It was observed that part of Hong Kong's FDI turned out to be the investment carried by subsidiaries based in Hong Kong but owned by Chinese central or local governments to take advantage of preferential treatment under the name of FDI. While no accurate figures for this type of FDI are available, they were estimated to be not large relative to total HKDI (UNCTAD, 1996).

[10] There is a concern about the growth rate of population as a measurement of $\dot{L}$ due to the inter-province floating population. Unfortunately, no accurate figures on such persons are available. Similarly, data on schooling years of labour forces at provincial levels are incomplete, although they are a better proxy of human capital (H) than student enrolment shares in population.

each province are obtained by accumulating over years, with adjustments based on data on nominal national FDI stock, which are from *World Investment Report* (UNCTAD, various years from 1992 through 1999). Second, we compute the ratio of the nominal FDI stock to nominal GDP and then take differences of the ratio. Per capita real GDP levels in 1984, 1989 and 1994 are used as the initial levels of economic development (y_0) for the three sub-periods. The regional dummy (D) takes the value of one if the province is located in the coastal region and zero for others. For cross-section estimations, growth rates over the relevant periods are obtained by fitting exponential trend equations, and the ratios are computed by taking mean values of the basic variables over the relevant periods.

Table 4. Results of cross-section estimations: 1984–88, 1989–93, and 1994–98

Independent variables	1984–88		1989–93		1994–98	
	Without FDI	**With FDI**	**Without FDI**	**With FDI**	**Without FDI**	**With FDI**
$\dot{L}$	0.73*	0.77**	0.71**	0.69*	0.68	0.63
	(1.88)	(2.33)	(2.26)	(1.84)	(1.49)	(1.67)
I/Y	0.12**	0.13**	0.14*	0.12*	0.12*	0.13*
	(2.87)	(2.28)	(1.77)	(1.88)	(1.72)	(1.91)
y_0	–0.16*	–0.14*	–0.12	–0.11	–0.09	–0.08
	(–1.79)	(–1.85)	(–1.50)	(–1.58)	(–1.25)	(–1.47)
H	0.01	0.008	0.009	0.01	0.01	0.01*
	(1.20)	(1.17)	(1.35)	(1.35)	(1.60)	(1.79)
D	0.16*	0.18**	0.17**	0.21***	0.20**	0.27***
	(1.80)	(2.22)	(2.34)	(3.35)	(2.51)	(3.97)
I_F/Y		0.21		0.25**		0.28**
		(1.63)		(2.66)		(2.46)
$\Delta(F/Y)$		0.16**		0.20***		0.23***
		(2.24)		(4.25)		(4.05)
$H \cdot \Delta(F/Y)$		0.06		0.07*		0.08**
		(1.14)		(1.87)		(2.48)
Adjusted R^2	0.59	0.73	0.60	0.74	0.58	0.73
F-Statistic	12.89	9.46	11.56	16.13	12.45	15.78

Notes: The number of observations is 28 for all estimations. The coefficient estimates of constant terms are omitted to save space. The dependent variable is the average rate of growth of real GDP (%). The asterisks ***, **, and * indicate levels of significance at 1, 5, and 10 per cent, respectively.

Table 5. Results of panel estimations: 1984–98

Independent variables	Model without FDI		Model with FDI	
	Coefficients	*t*-statistics	Coefficients	*t*-statistics
$\dot{L}$	1.06*	1.95	0.98	1.57
I/Y	0.13**	2.30	0.12**	2.89
y_0	–0.14*	–1.93	–0.12*	–1.81
H	0.004	0.74	0.005	0.97
D	0.24**	2.66	0.26***	5.07
I_F/Y			0.31**	2.90
Δ(F/Y)			0.22**	2.53
$H \cdot \Delta$(F/Y)			0.07*	2.07
Adjusted R^2	0.61		0.78	
F-Statistic	31.38		35.60	

Notes: The number of observations is 84 (28 provinces and three periods). The coefficient estimates of constant terms are omitted to save space. The dependent variable is average rate of growth of real GDP (%). The asterisks ***, **, and * indicate levels of significance at 1, 5 and 10 per cent, respectively.

We estimate two variants of equation (4) for the purposes of comparison: one without FDI variables and the other with FDI variables. The main regression results of the two specifications with the cross-section and panel data are presented in Table 4 and Table 5,[11] from which the following points are easily discerned. First, in all relevant cases, the comparison of results from the two models highlights the superior explanatory power of the model with FDI variables over the model without FDI variables. In particular, the adjusted R^2 increases by 23–25 per cent (from 0.58–0.61 to 0.73–0.78) in the cross-section and panel estimations when the specifications including FDI as independent variables are used. This finding suggests that FDI seems to be one of the factors that affected the Chinese economy.

Second, the variable of Δ(F/Y), which indicates the superior productivity of foreign-invested enterprises, has significantly positive coefficients in all relevant estimates. The overall picture of cross-section estimates in Table 4 is similar to that of panel estimates in Table 5. The results are consistent with the widespread belief

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[11] The estimates reported here might be troublesome due to the feedback from the dependent variable. A full-scale treatment of the issue requires causality tests with reasonably long time-series data, which is impossible for the present work due to the limited years covered. Instead, we can test, based on the approach suggested by White (1980), at a simple level whether there are specification errors of the kinds mentioned. The result of White's test indicates that the values of the test statistic are too small to justify non-acceptance of the null hypothesis of correct model specifications, suggesting absence of feedback.

that more productive foreign capital seems to enhance China's economic growth (Lardy, 1995; Pomfret, 1997).

Third, externality effects of FDI (measured by coefficients of I_F/Y) are significantly positive in all relevant cases except the sub-period of 1984–88. These findings thus lend support to the observation that the presence of multinational corporations themselves may not only result in technological diffusion and transfers, but also facilitate China's transition toward a market economy. Moreover, significantly positive coefficients of the interaction variable ($H\Delta(F/Y)$) in most relevant cases suggest that there might exist complementary effects between FDI and human capital.

Fourth, the effects of three FDI variables on the Chinese economy are clearly larger in the 1990s than in the 1980s, as suggested in Table 4. The coefficient of $\Delta(F/Y)$ rises from 0.16 to 0.23 in the three sub-periods, representing an increase of 44 per cent. The coefficient of I_F/Y goes up as well over time from 0.21 to 0.28 (rising by 33 per cent). The same story may be found for the interaction variable ($H\Delta(F/Y)$). The result is anticipated from the consideration that the substantially greater amount of FDI flows during the 1990s than in the 1980s might have led to a growing role of FDI in the Chinese economy.

Fifth, the result of the regional dummy (D) in both the cross-section and panel estimations shows that favourable FDI policies and natural resource conditions are beneficial to economic growth in the coastal region. Rising values of the coefficient of D and its significance over time suggest that the growth effects of FDI induced by policies and regional differences seem to be larger in the coastal region in the 1990s. This is consistent with the findings of recent studies that FDI contributed to China's widening regional income-gap (Zhang and Zhang, 2000).

Finally, the coefficients of $\Delta(F/Y)$ are numerically larger than those of domestic investment (I/Y) in the panel estimates as well as the cross-section estimates, with a greater differential in 1994–98. This result thus supports predictions of FDI theories that the marginal product of FDI should be greater than that of domestic capital, because a multinational firm must possess some special advantages such as superior technology to overcome inherent disadvantages and high costs of foreign production (Caves, 1996; Zhang and Markusen, 1999).

In summary, the overall effects of FDI on the Chinese economy seem to be positive and not negligible. This finding confirms the Chinese government's perception about the role of FDI in the Chinese economy. According to the Chinese official estimations (SCI, July 31, 2001), out of 9.7 per cent of the average growth rate of real GDP in 1980–99, 2.7 per cent came from direct and indirect contributions of foreign-invested enterprises, which constitutes more than a quarter (27.84 per cent) of total growth rate in that period.

Two points are worth noting. First, other factors that affect China's economic growth may exist but were excluded from this investigation. This work, therefore, should not be treated as an exhaustive study of economic growth in China but, rather, as a narrowly focused investigation of the merits of FDI. Second, perhaps

the case of China is somewhat unique in the sense of its advantages in large country-size, strong government, massive FDI from overseas Chinese, and effective FDI strategy, all of which seems to be lacking in many other developing countries and transitional economies. These advantages provided China with great bargaining power over multinational corporations such that China would be able to maximize gains from FDI and to minimize negative effects of foreign-invested enterprises (Zhang, 2000).

5. Concluding remarks

The main purpose of this study is to test empirically the widespread belief about the beneficial growth-effects of increased foreign direct investment in China. An effort has been made to base the present work on reasonable empirical and theoretical foundations. Besides the discussions of potential positive and negative effects of FDI on the Chinese economy, a growth model is specified, and cross-section and panel data for a recent period have been used. Subject to the caveats that are appropriate for studies with aggregate data, the most notable aspect of the regression estimates is a favourable effect of FDI on growth rate of real Chinese GDP. FDI seems to contribute to China's economic growth through direct effects (such as raising productivity and promoting exports) and positive externality effects (such as facilitating transition and diffusing technology). The effects of foreign-invested enterprises in the Chinese economy seem to increase with FDI inflows from the 1980s to the 1990s, and to be larger in the coastal region than in the inland region. Finally, the marginal product of foreign capital seems to be larger than that of domestic capital.

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