ON THE ROLE OF OPENNESS IN THE CHINESE INDUSTRIAL GROWTH PROCESS

- A city-level assessment -

Sylvie Démurger[*]

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Abstract :

This paper is concerned with the empirical relationship between the Chinese open door policy and the ensuing industrial growth process. Using cross-section data relating to Chinese cities throughout the 1988-93 period, we intend to stress the respective impact of foreign investment and export growth on short-term growth performance. The results first highlight the leading role of foreign investment compared to those of domestic factors and exports. Moreover they not only point out the overall predominance of foreign investment but also indicate that foreign investment tends to dominate export growth as an engine of growth. In terms of balance in regional development, they suggest that foreign investment favours a geographically concentrated development.

Key words : industrial growth, foreign investment, exports, China.

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[*] OECD Development Centre (94 rue Chardon Lagache, 75016 Paris, France), Microeconometrics Laboratory (Centre for Research in Economics and Statistics, CREST-INSEE, France) and University of Paris I Panthéon-Sorbonne.

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Introduction

Prior to the first reforms in 1978, China was essentially a closed economy in which external relationships were conducted as part of a mandatory centralised national plan. Consequently, international transactions were a state-ruled monopoly, centrally controlled by the Ministry of Foreign Trade (MOFT) and considered as an instrument of policy, reflecting the need to export domestic products in order to pay for necessary imports. Domestic firms were dealing with one and only one selling price and one and only one purchasing price and were consequently indifferent to production for export or for the domestic market. Without competition, they had no incentive to reduce costs, improve product quality or adopt new technologies.

The decision to reform the foreign trade sector and to allow foreign capital inflow was first announced in December 1978. Although the means and consequences of liberalisation were vague, the authorities clearly thought that it was a key reform to stimulate economic growth, increase productivity and adjust domestic prices to international prices. The main goals of the reforms have been to encourage both domestic and foreign producers to improve the overall productivity directly and through the transfer of advanced technology and managerial ability. On the foreign trade side, the major mechanisms of the policy implemented have been the decentralisation of foreign trade control down to a provincial level[1], the establishment of a foreign exchange retention system[2] and successive devaluations of the exchange rate.

On the foreign investment side, reforms were oriented to attract foreign capital by establishing favourable conditions. The basic objective was to gain access to modern technology and foreign know-how. In 1979, the first law on Chinese-Foreign Joint Ventures was enacted to define foreign firms' rights to invest in China and to cooperate with Chinese counterparts. Other laws were successively enacted to codify all types of foreign direct investment in China[3]. Closely related with the opening to foreign competition and foreign capital, open economic zones were established. These zones have been designed to promote outward-oriented activities and facilitate the import of advanced technologies. Different forms of special economic status areas have successively emerged. In the first stage (1979-80), the Chinese government created four Special Economic Zones (SEZ), considered as "laboratories" for experimenting with market-oriented reforms. In a second stage (1984), special economic status was extended to fourteen coastal Open Cities and in a third stage, which began in 1988, other economic development zones were opened, including Hainan SEZ (1988), Pudong New Area in

[1] Especially by allowing provincial governments to supervise foreign trade activities of local Foreign Trade Corporations (FTC).
[2] This system allows the various entities directly responsible for exports (from producer to provincial government) to keep a share of export revenues in foreign currency.
[3] The main laws on this matter have been those concerning foreign wholly-owned enterprises (1986) and Chinese-foreign co-operative enterprises (1988). For further details on the development of this legal framework, see Fukasaku and Wall (1994).

Shanghai (1990), the Yangtze River Valley (1992) and a number of cities mainly in north-east China. The main difference between these special economic status areas and other cities lies in the relative autonomy granted to the local authorities. In particular, they are allowed to offer preferential conditions to foreign investors[4] and to develop their own infrastructure.

Since its first step towards openness, China has been one of the world's fastest growing economies, enjoying an average annual growth rate of its real GNP of 9.3 per cent between 1979 and 1993[5]. Exports as well as imports grew at an average rate of 16 percent per year from 1978 to 1993[6] and the opening to foreign investors attracted huge amounts of capital, which placed China at the first rank of developing-country foreign investment recipients[7]. In terms of origin, most funds have been brought by overseas Chinese through Hong Kong and Macao. In terms of its distribution, foreign investment has been essentially concentrated in coastal provinces and in export-oriented activities[8].

This paper is concerned with the empirical relationship between the Chinese open door policy and its industrial growth at a city-level. There is a growing number of studies emphasising the main determinants of economic growth in the context of China and most of them point out the driving role of openness. In an earlier paper (Démurger 1996), we highlighted the distinct role of exports and foreign investment in explaining Chinese short-term growth performance. Indeed, we found that, from 1988 to 1991, foreign investment directly contributed to growth while exports played an indirect role through spillover effects. Using cross-city data throughout the 1988-93 period, the following analysis presents new evidence of the inter-relation between growth, exports and foreign investment. It first extends the length of the period under consideration, which contributes to reduce short-term cyclical fluctuations and thus potential biases due to conjunctural phenomena. Within an augmented production function framework, it also reaffirms the central role of foreign investment and establishes a close connection between the impact of exports expansion and that of foreign investment.

The paper is structured as follows. Section 1 contains a brief survey of recent statistical studies on China's growth since the beginning of the reforms. Section 2 develops a simple theoretical framework and Section 3 provides some statistical results based on a city-level data analysis.

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[4] These incentives mainly include a privileged access to input materials and tax concessions (reduced tax rates, tax holidays and preferential deductions).

[5] See Sung et al. (1995, p. 37).

[6] See Lardy (1994, table 2.1, p. 30).

[7] See *Financial flows and the developing countries* (World Bank quarterly), November 1994, p. 14.

[8] See in particular Fukasaku and Wall (1994, pp. 73-77).

1. Openness and growth in China : A survey of recent literature

1. 1. Basic theoretical connections

Until recently, the theoretical links between openness and growth have essentially been investigated within the realm of international trade theory, which focuses on the gains from trade in terms of income level. In this field, the basic prediction about the relation between openness and growth is made by the Heckscher-Ohlin theory of comparative advantages. Under some key assumptions of similar technology among countries, different factor intensities among goods and an absence of international factor mobility, this theory predicts that countries will export goods whose production uses relatively intensively the factor of which the country has a relative abundance. In terms of growth, the main conclusion is that all countries gain from free trade, for it permits an enlarged consumption capacity and an efficiently improved use of production capacities. For less developed countries, it implies that they can speed up their development by concentrating on the production of labour-intensive goods and land-intensive primary goods in order to export them against more capital-intensive imports.

Efficiency gains coming from openness may also be more generally attributed to various modifications generated by export-oriented policies. As emphasised by Balassa (1978), openness not only leads to an efficient reallocation of resources according to comparative advantage and to a better capacity utilisation (as predicted by the Heckscher-Ohlin theory), but it also increases the size of the market in which the domestic firms operate. This has two main implications in terms of growth. On the one side, it means more sales and thus permits the exploitation of economies of scale. On the other side, it means more competitors and thus generates technological improvements and the need for efficient management in response to foreign competition. This relation between openness and growth through mechanisms of competition and technological spillovers has been pointed out by Feder (1982). Using an export-augmented production function, he examines how competition, by the reallocation of resources, may allow the export sector to be an engine of growth. He specifically focuses on two key points which are, on the one hand, the existence of a higher marginal productivity in the export sector and, on the other hand, the presence of inter-sectoral externalities generated by the export sector.

Referring to recent research on “endogenous” growth in which technology diffusion plays an important role in the development process[9], foreign investment, which is a major channel for this diffusion, may also appear as a key factor in the process of industrial growth. Indeed, compared to the neo-classical growth models in which growth in output per capita is explained by the accumulation of capital and by exogenous technical progress, recent developments in growth theory intend to make

technological progress endogenous and the prevalence of externalities and learning-by-doing in these models signals a new role for outward-oriented policies. Among other sources of growth, physical capital accumulation and human capital accumulation provide interesting explanations for the relation between openness and growth. Physical capital accumulation may be a long-term growth factor if one takes into account the existence of increasing returns or positive externalities in the accumulation process. These benefits are likely to occur in a trading world if technological transfers are promoted through equipment goods imports and foreign investment. In the context of a developing country, investment from developed countries can play an important role in the growth process because it is able to transfer not only production knowledge and technology but also managerial skills. Both may create spillovers from foreign-invested firms to domestic firms and thus contribute to improve the marginal productivity of the capital stock in developing countries.

1. 2. Empirical studies on China

As mentioned above, the reform process in China is complex and its main characteristics include trade liberalisation, the development of an attractive legal framework for foreign investment, the establishment of special economic status areas and the creation of a new non-state sector. Chinese economic growth since the implementation of the reforms has been the subject of recent papers which analyse in various ways the specific relationship between openness and growth. These studies insist on the importance of the role which both exports and foreign investment have played in the Chinese growth process. However, the interrelationship between exports expansion, foreign investment and growth has yet to be analysed. This section reviews some recent empirical studies which provide statistical analyses of the relationships between China's openness and economic growth.

Wei (1993a) uses two city-level data sets[10] to determine the respective contributions of export and foreign investment to rapid industrial growth in China and to test the existence of spillover effects coming from exports or foreign investment. Using a simple model with only one input factor (labour), he estimates a single equation relating industrial output growth to foreign direct investment, exports, initial size of industrial sector, human capital stock and labour growth. He finds clear evidence of an export-led growth throughout the 1980-90 period, but in contrast, a foreign investment-led growth in the late 1980s. For both samples, he also finds a significant "spillover effect" between firms inside cities[11]. Finally, he does not find any strong growth difference between "special" cities (Special Economic Zones, Open Cities and Comprehensive Reform Experimenting Cities) and other cities. In a second

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[9] See in particular Grossman and Helpman (1991).

[10] One includes 434 cities for the 1988-90 period, the other, 74 cities for the 1980-90 period.

[11] Wei measures the spillover effect by regressing the industrial output growth on the initial level of independent variables.

paper (1993b), Wei studies more specifically the connection between non-state sector growth and the speed of downsizing state sector and finds that the existence of state firms at the beginning of the transition has been helpful to non-state sector growth, the most dynamic part of the latter being township and village-owned enterprises. But, for cities in which there was already a substantial presence of non-state sector, the state sector appears to be a drag for continuing growth.

Mody and Wang (1994) use panel data on the output of 23 industrial sectors for seven coastal provinces from 1985 to 1989 and emphasise four factors which have contributed to the Chinese growth since the early 1980s. These factors include a set of economic reforms aimed at establishing the basis for a market economy, an active strategy to encourage entrepreneurship, an existing human and physical capital stock, and finally, the speed of growth itself including in particular regional spillover. One interesting conclusion of this statistical investigation is the emphasis on relative backwardness as a significant factor of growth. Mody and Wang indeed find a strongly negative relationship between industrial growth rates and initial per capita income in a province, which supports the hypothesis of a long-term convergence between Chinese provinces. They also find that the growth of an industrial sector in any province was clearly influenced by the growth of the same industry in other provinces throughout the same period, which allows consideration of spillover effects between different provinces. They finally show a significant impact of Guangdong and Fujian's growth on other provinces, confirming the leading role of these provinces.

More specifically, Prime and Park (1995) estimate the role of the expansion of exports in the growth of provincial incomes. They use both cross-sectional and pooled-time series data for 26 provinces between 1985 and 1990. Estimating an export-augmented production function in which the dependant variable is the annual growth rate of nominal GDP, they use three different measures for the export variable : export growth, export share in GDP and percent share of changes in export in GDP. Cross-sectional results show a significant impact of export expansion on GDP growth but longitudinal results show a significant role of exports only for coastal provinces.

2. Modelling the impact of openness

In order to stress the relationship between foreign investment, exports and industrial growth process in China, we use an augmented Feder (1982) type model. The economy is assumed to be composed of two distinct sectors. One sector produces only for the domestic market (N) and the other produces only for the international market (X). As stated earlier, foreign investment is a central mechanism for the transfer of technology and foreign management methods because it permits direct contacts between domestic and foreign entrepreneurs through joint ventures or co-operation agreements. To capture the effects of foreign investment, we introduce both domestic and foreign capital in the production function, which allows for different marginal productivities according to the origin of capital. We thus assume that the total output is produced by means of labour (L), domestic capital (K_d) and foreign capital (K_e). As in Esfahani (1991), exports are introduced in the domestic production function by means of the productivity parameter which depends on the volume of exports. This specification allows us to examine the international factors which influence the total factor productivity without being affected by labour and capital. The rationale is that exports affect growth through positive externalities towards the rest of the economy. Indeed, the domestic-goods sector benefits from openness through the inter-sectoral diffusion of technical and managerial improvements, which tends to enhance the overall productivity of this sector.

Thus, the respective production functions for the domestic-oriented sector and the export sector are :

$$N = F(L_n, K_{dn}, K_{en}) + qX \quad (1)$$

$$X = G(L_x, K_{dx}, K_{ex}) \quad (2)$$

subscripts n and x denoting the corresponding sectors (national or export). F and G are assumed to be constant-returns-to-scale production functions. The inter-sectoral externality θ is incorporated following the specification of Esfahani (1991).

Total output Y and total factor inputs (L, K_d, K_e) in the economy are respectively obtained as follows :

$$Y = N + X$$

$$L = L_n + L_x, \qquad K_d = K_{dn} + K_{dx}, \qquad K_e = K_{en} + K_{ex}$$

All factors are assumed to be fully employed.

Through time derivation of production functions (1) and (2), we get :

$$\dot{N} = F_L \dot{L}_n + F_{Kd} \dot{K}_{dn} + F_{Ke} \dot{K}_{en} + q\dot{X}$$

$$\dot{X} = G_L \dot{L}_x + G_{Kd} \dot{K}_{dx} + G_{Ke} \dot{K}_{ex}$$

where partial derivatives of functions F and G are denoted by capital letter subscripts.

Following Feder, we then assume that the marginal productivity of the three factors of production differs systematically between the two sectors, so that :

$$G_{Kd} / F_{Kd} = G_{Ke} / F_{Ke} = G_L / F_L = 1 + d \quad (3)$$

δ measures the productivity differential between export and non-export sector and is assumed to be constant and positive. As Feder (1982) argues, exporting activities encourage producers to improve their technology and adopt more efficient management techniques to face foreign competition. Moreover, international competition generates a process of "natural selection" among firms, and throughout this process less efficient firms are constrained to adapt or to leave the market. At the end of the process, the remaining firms are those whose marginal factor productivity is higher[12].

We thus get, by substitution :

$$\dot{Y} = F_{Kd}(\dot{K}_{dn} + \dot{K}_{dx}) + F_{Ke}(\dot{K}_{en} + \dot{K}_{ex}) + F_L(\dot{L}_n + \dot{L}_x) + q\dot{X} + d(F_{Kd}\dot{K}_{dx} + F_{Ke}\dot{K}_{ex} + F_L\dot{L}_x) \quad (4)$$

Using assumption (3) yields :

$$F_{Kd}\dot{K}_{dx} + F_{Ke}\dot{K}_{ex} + F_L\dot{L}_x = \frac{1}{1+d}(G_{Kd}\dot{K}_{dx} + G_{Ke}\dot{K}_{ex} + G_L\dot{L}_x) = \frac{1}{1+d}\dot{X}$$

Consequently, we get the expression of the growth rate g_Y :

$$g_Y = \frac{\dot{Y}}{Y} = F_{Kd}\frac{K_d}{Y}\cdot\frac{\dot{K}_d}{K_d} + F_{Ke}\frac{K_e}{Y}\cdot\frac{\dot{K}_e}{K_e} + F_L\frac{L}{Y}\cdot\frac{\dot{L}}{L} + \left(q + \frac{d}{1+d}\right)\frac{X}{Y}\cdot\frac{\dot{X}}{X} \quad (5)$$

For estimation purposes, we follow Feder (1982) and also assume that :

$$F_L \cdot (L / Y) = a, \quad F_{Kd} \cdot (K_d / Y) = b \quad \text{and} \quad F_{Ke} \cdot (K_e / Y) = g$$

where α, β and γ are the respective elasticities of output with respect to labour, domestic capital and foreign capital and are assumed to be constant and positive[13]. Moreover, due to the lack of information on the stock of capital, we follow numerous previous studies in using the share of investment in production as a proxy for the growth rate of capital stock. It comes finally that :

$$g_Y = a\left(\frac{\dot{L}}{L}\right) + b\left(\frac{I}{Y}\right) + g\left(\frac{FI}{Y}\right) + \left[q + \frac{d}{1+d}\right]\left(\frac{\dot{X}}{X}\cdot\frac{X}{Y}\right) \quad (6)$$

where I and FI represent domestic investment and foreign investment respectively.

In section 3, the above equation is estimated, using cross-sectional data on Chinese cities, in the following form :

$$g_Y = b_0 + b_1 g_L + b_2 s_I + b_3 s_{FI} + b_4 g_X + b_5 Y_0 + b_6 GD + u \quad (7)$$

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[12] In particular, using a survey on enterprises located in Guangdong, Fujian and Shanghai, Perkins (1996) shows that export-oriented enterprises have higher total factor productivity growth than non export-oriented ones.

[13] This assumption is in particular verified with a Cobb-Douglas specification (see Esfahani 1991).

where g_Y is the growth rate of real industrial production, g_L the growth rate of industrial labour, s_I the share of domestic investment in industrial production, s_{FI} the share of foreign investment in industrial production, g_X the growth rate of exports multiplied by the share of exports in industrial production and u the error term. As briefly exposed in section 1. 1., we expect the coefficients of s_{FI} and g_X to be positive. Y_0 is the initial level of per capita industrial production (in logarithm). It is entered here to see whether the "convergence phenomenon" highlighted in the growth theory holds in the context of Chinese cities. GD is a dummy for cities belonging to Guangdong province and is included here in order to take into account a potential difference in growth performance for Guangdong cities as compared to other cities. As stated in Sung et al. (1995) " with China's opening in 1979, Beijing designated Guangdong as the pioneer of China's opening and economic reform [and] many of China's economic reforms first started as experiments in the Pearl River Delta" (p. ix). Indeed, the economic take-off of Guangdong has been one of the most impressive among Chinese provinces and it has placed Guangdong in a leading economic position.

Finally, referring to Lucas' (1988) work on the contribution of human capital to economic growth, it would be interesting to distinguish qualified and unqualified labour. Unfortunately, data on human capital in China are relatively scarce. At the city level, the only data available are those on scientific and technical personnel (see Wei 1993a and Démurger 1996) and they are not available after 1991. Moreover, when adding the 1988-91 average growth rate of scientific and technical personnel to equation (7), no significant results were found either to support Lucas' thesis or to allow an interpretation in terms of inefficiency in the allocation of skilled labour.

3. Empirical analysis

3. 1. The data

The data set comes from the Chinese editions of the *Chinese Urban Statistics Yearbook* (1989 to 1994), published by the State Statistical Bureau[14]. The available statistics provide annual economic data for a sample of at least 434 cities and surrounding counties under their administration. However, data for some variables have not been collected for all the cities, which renders the effective sample size much

[14] *Zhongguo Chengshi Tongji Nianjian*. The length of the period studied (1988-93) has been determined by data availability. Before 1989, industrial gross output value is not available in RMB yuan and the deflator used for real value is not mentioned. Moreover, some variables for openness are missing. This period includes a period of "retrenchment" (1988-91) during which the authorities had to face economic and political instability and a period of "acceleration" (1992-93) in the implementation of reforms. See Bell & al. (1993) for further details.

smaller than 434. Actually, the estimated set for which data are available contains only 107 cities. These cities mainly belong to coastal provinces[15], which may induce a bias in the following analysis.

Due to data availability at a city level, we used total population as a proxy for labour force and exports of foreign trade corporations as a proxy for total exports[16], the main implication of the latter being the possibility of underestimating the role of exports in industrial growth. The share of foreign investment in industrial production is computed from data on foreign direct investment in US dollars, converted into RMB using the official exchange rate published by the International Monetary Fund[17]. All current values expressed in RMB are deflated by a provincial overall retail price index computed in the *China Statistical Yearbook* 1989 and 1994[18]. The data on growth rates and other explanatory variables are used as the 1988-93 averages[19]. Table 1 provides sample means for the key variables.

Table 1 : Descriptive statistics

Variable	*Symbol*	*Mean*	*Standard deviation*
Growth rate of real industrial production	g_Y	0.0886	0.0615
Growth rate of population	g_L	0.0234	0.0608
Share of investment in fixed assets in industrial production	s_I	0.1410	0.0629
Share of foreign investment in industrial production	s_{FI}	0.0268	0.0396
Growth rate of exports (multiplied by the share of exports in industrial production)	g_X	0.0121	0.0264
Log of per capita industrial production in 1988	Y_0	7.7105	0.7390

Note : The number of observations in our sample is 107. All variables are expressed as annual averages over the 1988-93 period.

[15] Only 28 cities are located in central and eastern provinces.

[16] According to Wang (1993, p. 118), at a national level, exports by foreign trade corporations represented 84 percent of total exports in 1988.

[17] *International Financial Statistics Yearbook*, 1995.

[18] Unfortunately, industrial production deflators are not available at the provincial level.

[19] For the cities of Tianjin and Guangzhou (Guangdong), the growth rate of exports has been computed as a 1988-92 average because data for the 1993 year were not available.

3. 2. Inter-urban growth differences

Table 2 displays results of the estimation of equation (7) partly and as a whole. Dealing with the domestic factors of production, the two first rows indicate a positive contribution of labour and an insignificant contribution of domestic investment to industrial growth. Indeed, the estimated coefficient for population growth is significant at the one percent level and generally close to 0.5, which, compared to the usual findings, seems to be realistic[20]. On the contrary, the coefficient associated with domestic investment as a share of industrial production does not appear significant when foreign investment is included and even tends to be negative. As already emphasised by Prime and Park (1995), some possible explanations may come from measurement errors in investment but this may also be expressed in terms of inefficiency in the allocation of domestic capital. Indeed, it seems important to stress that during the whole period, domestic investment has essentially been turned towards state-owned enterprises which are less dynamic entities in the Chinese economy. In average, 70 percent of the total investment in fixed assets has been done by state-owned enterprises, without any downward tendency.

Before turning to exports and foreign investment contributions to industrial growth, it is interesting to note that, as indicated in table 2, the influence of the initial industrial size in a city (measured by Y_0) is weakly significant but tends to stress a kind of "divergence phenomenon" rather than a "catch-up" phenomenon. Indeed, the positive coefficient suggests that cities with a higher initial level of industrial production have a higher growth rate. This result can be linked to the idea of a growing inequality between cities enjoying the benefits from the reform process and those lagging behind.

In relation to this result, table 2 also shows that the Guangdong dummy is significant and positive, which suggests that cities located in Guangdong province tend to have grown faster than other cities in our sample throughout the 1988-93 period. This result appears consistent with the fact that cities in Guangdong province, and particularly the Special Economic Zones of Shenzhen, Zhuhai and Shantou, have been among the most dynamic cities in China (see Démurger 1996). Moreover, in terms of exports and foreign investment, Guangdong province has a very special status because of its geographical and cultural proximity to Hong Kong[21]. Among others, geographical proximity and family ties are indeed considered as specific determinants of investment decisions from overseas Chinese in Hong Kong, Taiwan and Singapore. Finally, in terms of industrial structure, it may be argued that Guangdong cities have benefited from their relative backwardness in the pre-reform period in the sense

[20] Feder's (1982) cross-sectional analysis for semi-industrialized countries reports a population growth coefficient of 0.7-0.8 and Wei's (1993a) analysis on Chinese cities from 1988 to 1990 finds a coefficient of 0.6.

[21] The influence of Hong Kong in the rapid development of SEZs in Guangdong province has been important. As emphasised by Sung (1991), Hong Kong plays a role "not only as financier, investor, consumer, supplier, middleman, and technical consultant, but also as a catalyst in China's economic reforms and trade liberalisation" (p. 26).

that, as stated by Mody and Wang (1994), they "carried a less onerous burden of earlier state investments" (p. 4)[22].

Table 2 : Openness and industrial growth (1988-93)

	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)	(2.7)	(2.8)
g_L	0.48**	0.537**	0.559**	0.553**	0.572**	0.562**	0.543**	0.540**
	(7.066)	(7.404)	(7.381)	(7.253)	(7.278)	(7.239)	(6.592)	(6.722)
s_I	0.214*	0.001	-0.086	-0.061	-0.047	-0.017	-0.011	-0.006
	(1.96)	(0.007)	(-0.732)	(-0.509)	(-0.315)	(-0.115)	(-0.064)	(-0.039)
g_X	0.386**	0.158	0.249	0.227	0.123	0.107	0.782*	0.733
	(3.407)	(0.922)	(1.921)	(1.625)	(0.474)	(0.439)	(1.978)	(1.772)
s_{FI}		0.603*	0.439*	0.453*	0.898**	0.928**	1.354**	1.443**
		(2.461)	(2.476)	(2.555)	(2.622)	(2.741)	(4.099)	(4.617)
GD			0.056**	0.056**	0.031	0.031*	0.015	
			(4.424)	(4.618)	(1.894)	(2.106)	(0.756)	
Y_0				0.007		0.013	0.018*	0.018*
				(1.063)		(1.860)	(2.474)	(2.417)
$s_{FI}*g_X$							-11.566*	-10.551*
							(-2.046)	(-2.045)
Estimation method	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Obs.	107	107	107	107	107	107	107	107
Adj. R^2	0.3226	0.4115	0.4927	0.4945	0.4405	0.4424	0.3579	0.3455

Notes : The regressions also include an intercept which is not reported. Figures in parentheses are t-statistics calculated using the White heteroskedastic-consistent covariance matrix. * denotes significant at the 5 % level and ** denotes significant at the 1 % level.
OLS : Ordinary Least Squares, IV = Instrumental Variables Method (the additional instrumenting variables are the initial values of the exports growth, foreign investment and domestic investment variables and their square value).

More specifically, the ordinary least squares results set out in regression (2.1) present the estimates of equation (7) with labour, domestic capital and export growth included as the only explanatory variables. It indicates that, using a usual Feder type equation without foreign investment, the coefficient associated with the export variable appears significantly positive. This first result tends to corroborate Prime and Park's (1995) findings about a positive correlation between export expansion and economic growth in China. However, it does not appear to be robust in our framework. Indeed, when

[22] Comparing Guangdong and Shanghai economic growth patterns, Lardy (1992) also argues that "Guangdong manufacturing firms were on average only half the size of Shanghai's" and that "they were much less likely to be

adding the share of foreign investment in industrial production and estimating the whole equation (7) (regressions (2.2) to (2.4)), the coefficient for the export variable turns out to be weakly significant and even insignificant. Besides, regressions (2.2) to (2.4) show that the coefficient for foreign investment is significant at the five percent level and relatively high compared to that of the export variable. These results point out the importance of an open-door policy in terms of foreign capital and technology inflows and provide more support for foreign investment-led growth than for export-led growth. Moreover, they suggest that the contribution of exports to industrial growth is dominated by that of foreign investment in the sense that the former only appears significant when the latter is omitted. Indeed, the impact of exports expansion seems to be partly due to an omitted variable bias, which highlights a potentially interesting connection between exports and foreign investment in China. This issue requires further analysis.

One possible explanation for the behaviour of the export variable may lie in the fact that, if Chinese foreign trade has been liberalised, by the end of the 1980s, exports covered by mandatory planning still accounted for 45 percent of total exports. Thus, while actively promoting exports, China at the same time required export licenses for a large number of goods. Actually, most export goods still depend on local Foreign Trade Corporations, which introduces some bias in the open-door policy. A second explanation is that, compared to other small, outward-oriented Asian countries, China's openness has been motivated by a need for access to external technical information rather than a need to enlarge market size and benefit from scale economies. This fundamental characteristic may explain the weak impact of exports on Chinese industrial growth. Indeed, the potential of development in the domestic market may be much more stimulating for producers than the acquisition of international market shares. Due to China's size, one may think that inward-oriented cities have a potential growth at least as large as outward-oriented cities. Indeed, even if Chinese producers exploit their comparative advantages to export, China's share in the international market may not increase very rapidly or easily because of the relative rigidity of international demand. On the other hand, along with industrial growth, China has experienced an improvement in its standard of living, which allows domestic demand to grow very fast and thus, favours producers oriented to domestic consumption[23].

Turning to foreign investment, it is of interest to distinguish between two effects on growth resulting from this particular type of capital. First, foreign investment contributes to physical capital accumulation and thus to growth. Second, foreign investment constitutes a major channel for advanced technology and know-how diffusion from industrialised countries to developing countries. If it is more efficient than domestic investment, it can also increase the overall factor productivity. Indeed, as

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state-owned". Guangdong firms are consequently capable of "responding more quickly to changing international market conditions" (p. 712).

emphasised in Borensztein et al. (1995), "domestic firms have better knowledge and access to domestic markets ; if a foreign firm decides to enter the market, it must compensate for those advantages of domestic firms. It is most likely that a foreign firm that decides to invest in another country enjoys lower costs than its domestic competitors deriving from higher productive efficiency" (p. 18). Using foreign and domestic investment simultaneously in our estimations is a way to control the "accumulation effect" and to stress the "productivity effect" through the comparison of the respective coefficients. This specification constitutes an important modification to Wei's (1993a) estimation of the role of foreign investment in the Chinese urban industrial growth where domestic investment (as an explanatory variable) is omitted. As Balasubramanyam and al. (1996) argue, in statistical terms, the computation of "beta coefficients" is a way to measure the respective importance of domestic and foreign investment by their individual contributions to the calculated value of the industrial growth rate. The "beta coefficient" equals the estimated coefficient of the regressor times its standard deviation divided by the standard deviation of dependent variable[24]. The beta coefficients associated with foreign and domestic investment in regression (2.4) are 1.307 and -0.121, which offers good support for a greater importance of foreign investment in the Chinese industrial growth[25]. Our result may consequently be interpreted as a signal for the presence of other benefits than the simple accumulation of capital resulting from the inflow of foreign capital.

The above results have been derived from ordinary least squares regressions. However, it should be noticed that there may be endogeneity problems. In fact, in a growing economy, it is likely that domestic demand for goods does not grow as rapidly as their production, thereby encouraging producers to turn to foreign markets in order to sell their goods. In the case of endogenous determination of exports, the export growth variable is likely to be correlated with the error term, thus causing the OLS to be inconsistent. In the same way, if foreign investment leads to output growth, how successfully the economy grows may also greatly influence the behaviour of foreign investors when minimising their risks and maximising their profit. In the case of China, it may be important to consider this type of behaviour because, since the implementation of reforms, the evolution of foreign investment seems to have been closely linked to the political and economic conditions of the country. Gujarati (1995, pp. 672-673) suggests a modified Hausman specification test to assess the simultaneity bias that may be present in the OLS estimate. When implementing this test on our sample[26], we found that exports,

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[23] The best examples for this recent evolution may be found in the strong increase in the demand for consumption goods such as televisions, refrigerators and hi-fi products. For instance, the number of televisions for 1 000 households increased from 4 in 1980 to 692 in 1993.

[24] See Goldberger A. S. (1964) *Econometric Theory*, John Wiley & Sons, Inc, pp. 197-198.

[25] Using cross-section data on 46 developing countries (without China), Balasubramanyam et al. (1996) show that "as far as export promotion countries are concerned, it is foreign direct investment and not domestic investment which acts as a driving force in the growth process" (p. 101). Our result thus tends to corroborate this finding in the context of China.

[26] This procedure first involves the estimation of reduced-form equations for g_X, s_{FI} and s_I with the initial values of g_X, s_{FI} and s_I and their square value as predetermined variables. In a second step, the predicted values of g_X, s_{FI} and s_I are included

foreign investment and domestic investment are jointly endogenously determined. Thus, in order to avoid endogeneity problems, we re-estimated equation (7) using instrumental variables. Lagged endogenous variables are usually used as instrumental variables. However, due to data limitations, we have controlled for endogeneity by using as instruments the initial values of endogenous variables and their square values. The corresponding results are given in regressions (2.5) and (2.6). As may be seen from these regressions, instrumental variable estimations yield similar results to their OLS counterparts. In particular, the estimated coefficient associated with foreign investment is still significantly positive and even higher whereas the export variable remains insignificant. The estimated parameters in regressions (2.5) and (2.6) indicate that across the whole sample, output elasticity of foreign investment exceeds that of labour, while those of domestic investment and exports are insignificantly different from zero.

To further analyse the interrelationship between exports expansion, foreign investment and industrial growth, we finally tried to test whether the influence of export growth on industrial growth depends upon the relative size of foreign investment. To do so, it is useful to introduce an interaction term computed as the product of s_{FI} and g_X in equation (7). This specification, reported in regressions (2.7) and (2.8), shows that the coefficient for the interaction term is negative and significant at the five percent level, which suggests that the marginal effect of exports growth on industrial growth is reduced where foreign investment is relatively high. It indicates that foreign investment would be a substitute to exports as a growth factor and thus tends to corroborate our findings on their respective contribution to growth. Moreover, among cities which had a high share of foreign investment in 1988, most of them registered a decreasing share of exports in their total output during the 1988-93 period. This phenomenon has been particularly true in Guangdong province, which has also been the most dynamic area in terms of industrial growth. It therefore confirms the idea of a form of substitution from exports to foreign investment as an engine of industrial growth.

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in the original equation (7) as additional explanatory variables. The hypothesis that the coefficients for those additional variables are all zero is then tested using an F-test. The computed F-ratio is 6.37 and has a F-distribution with 3 and 97 degrees of freedom. It is thus clearly significant at the one percent level, indicating that g_X, s_{FI} and s_I are jointly endogenous.

Conclusion

This paper has investigated the role played by openness in the Chinese industrial growth process during the 1988-93 period. Using cross-section data relating to a sample of 107 Chinese cities, we tested the impact of both foreign investment and exports expansion on short-term growth performance. To start off, results suggest that the main mechanism by which openness affected industrial growth has been the access to foreign capital. Indeed, controlling for simultaneous interactions, we found clear evidence of a foreign investment-led growth rather than an export-led growth. In relation to this result, we also stressed the relative inefficiency of domestic investment in promoting growth compared to that of foreign investment.

These findings highlight an interesting phenomenon which helps towards understanding the Chinese growth process. Indeed, they not only point out the overall predominance of foreign investment but also indicate that foreign investment tends to dominate export growth as an engine of industrial growth. The kind of dualism between foreign investment and exports already highlighted in Démurger (1996) is thus corroborated here.

This conclusion represents the most interesting finding of the paper. However, it should be noted that the statistical investigation is based on a short-term period and thus, conclusions for a longer term perspective would require further research. In this way, the use of panel data at a disaggregated level would be of interest to further analyse the inter-relationship between exports expansion, foreign investment and growth. In particular, without time series data, it was not possible to implement causality tests and rigorously establish the direction of the connection between industrial growth and openness variables.

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