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The opening policy in China Simulations of a macroeconometric model

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Abstract

With a macroeconometric model, this paper attempts to study the implications of the opening up of China on its economic development, on the economic policy choices, and on the world economy. Two kinds of simulations are implemented: a reduction in the inflow of FDI to evaluate the importance of FDI promotion and a devaluation to assess the effect of the exchange rate policy. The results suggests that the recent policy choices — no devaluation pledge and concessions to enter the WTO — are beneficial to the Chinese economic development. © 2001 Society for Policy Modeling. Published by Elsevier Science Inc.

Keywords: Chinese economy; Economic transition; Macroeconometric model

1. Introduction

Since the beginning of the reforms in 1978, China has known an impressive economic development (real output has grown by 8.3% per annum). The progress in the Chinese economic reforms is undoubtedly the main reason for the Chinese takeoff. However, explaining why reforms have led to this impressive growth requires a more attentive investigation. Reforms have aimed to achieve two main goals: the marketisation of the internal economy and the opening up towards the rest of the world.

This paper, through the building of a macroeconometric model, aims to explain what the driving forces that have led China to move from a backward

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centrally planned economy to a major actor of the world economy are. It emphasises the role of the opening up in the Chinese success not simply by its dynamic effect on economic activity but, above all, by its impact on technology transfer that narrows the technological gap between rich and poor nations. The opening up of China has been realised through the growing role attached to trade and, since the 1990s, through the huge amounts of inward foreign direct investment (FDI) that China has attracted.

The immersion of China in the world economy has raised several questions, both at the Chinese and the global levels. Two recent events have put forward the impact of the Chinese opening up. First, the reduction in FDI inflows from 1998 has emphasised the importance of the foreign capital attraction policy and the role of this capital in the Chinese economic development. Second, the Asian crisis in 1997–1998 has stressed the opportunity for China to devalue its currency and the fear of such a decision for the world economy. Simulations of the model have been realised to investigate, first, the implications of reductions in FDI inflows and, second, the impact of a devaluation of the Chinese currency. To assess the effects of such a devaluation on the world economy, China's model has been introduced in a multicountry model, the National Institute Global Econometric Model (NiGEM).

Section 2 presents the structure of the model, the specification of the equations and the values of the parameters. Section 3 gives the results of simulations realised to show the role of external variables in the Chinese economy and the growing importance of China in the world economy. Section 4 offers some concluding remarks.

2. Presentation of the model

2.1. General structure

The model consists of two interrelated blocks. The external block is made up of equations for import and export prices, exports and imports of goods and services, and a modelling of the FDI determinants. Competitiveness, defined as the ratio of world to domestic prices, is a central variable in this block. The internal block consists of a supply-side group of equations (goods supply, labour demand, real wages, and capital stock), a demand-side group of equations (consumption, investment, and total demand), a money demand equation, and a domestic price equation. The government sector is present but only under the form of some trivial identities.

Three driving forces are active in this model. First, the wealth effect plays a role in the consumption behaviour of the households. As net foreign assets enter the definition of financial wealth, the wealth effect assures a first link between the internal and external blocks of the model. Second, price competitiveness is also central. Any undervaluation of the Chinese currency has a positive effect on growth through its effect on exports and wealth (via its impact on current account). Again, the link between internal and external blocks is highly related

and feedback effects are likely to play a crucial role in the simulation exercises. Finally, inflationary pressures (defined as the gap between supply and demand) play a large role in the price system and can then influence competitiveness.

2.2. Data and estimation techniques

The model uses quarterly data, and the equations are generally estimated for a period between 1984 and 1995, that is, the period of the dramatic transformation and the opening up of the Chinese economy. Due to data availability reasons, some relationships have been able to be estimated on a longer sample period (from 1980 to 1997). Data come from the State Statistical Bureau (*China Statistical Yearbook* and *Chinese Monthly Statistics*). Concerning the estimations, the Error-Correction Model technique has been used to specify the general form of the equations. To take into consideration regime shifts, the model features some China-specific variables that could represent the transforming aspect of the economy. However, despite the use of these specific variables, some instability remained in preliminary estimations of the different relationships. In the estimation period, for a major part of the relationships, an instability occurs in the third quarter of 1988 suggesting the presence from this date of a regime shift. This date corresponds to a leadership change and to a serious inflationary period. As suggested by Gregory and Hansen (1992), dummy variables have been used to account for this regime shift. These dummies take into consideration both changes in the intercept of the relationship and in the slope of the regressors. More details on the estimations of the model's equations are available in Dées (1999).

2.3. Specification

Table 1 presents the different equations that form the model.

2.3.1. External block

The external block is a key part of the model. It investigates how competitiveness and foreign investment affect the Chinese external trade. Trade prices are treated as a weighted geometric average of world prices and domestic prices (Eqs. (1) and (2)). Trade volumes are explained by a demand term and a price competitiveness term (Eqs. (3) and (4)). The stock of FDI is also added to the two equations. As FDI embodies technology and can then improve the technological level of the Chinese industry, the presence of FDI in the trade equations is able to take into account non-price competitiveness. To close the model of foreign trade an equation for FDI is added (Eq. (5)). Generally, two main reasons lead firms to move their production abroad: reaching a market and/or benefitting from low production costs. Hence, Chinese FDI is assumed to be determined by two components: the size of the internal market (proxied by Chinese real GDP) and cost advantages (summarised here by real exchange rate). Table 2 summarises the long-run estimates of the foreign trade model. In addition to trade balance (Eq.

Table 1
The model structure

External block

(1) $P^{X} = \Phi_1(eP^{W}, P)$

(2) $P^{M} = \Phi_2(eP^{W}, P)$

(3) $X = \Phi_3(Y^{W}, P^{X}/eP^{W}, \mathrm{FDI})$

(4) $M = \Phi_4(Y, P/P^{M}, \mathrm{FDI})$

(5) $\mathrm{FDI} = \Phi_5(Y, eP_{W}/P)$

(6) $\mathrm{TB} = P^{X}X - P^{M}M$

(7) $\mathrm{CA} = r^{W}\mathrm{NFA} + \mathrm{TB}$

(8) $\mathrm{NFA} = \mathrm{NFA}_{-1} + \mathrm{CA}$

Supply side

(9) $Q^{*} = \gamma\left[s(K)^{(1-1/\sigma)} + (1-s)(L\,TP)^{(1-1/\sigma)}\right]^{\sigma/1-\sigma}$

(10) $\mathrm{TP} = \lambda_{\mathrm{TIME}}\mathrm{TIME} + \lambda_{\mathrm{FDI}}\ln(\mathrm{FDI}) + \lambda_{M}\ln(M/Y)$

(11) $L = \Phi_6(Q^{*}, W/P, \mathrm{TP})$

(12) $W/P = \Phi_8(Q/L)$

(13) $K = (1-\delta)K_{t-1} + I/P + \Delta FDI$

(14) $K^{*} = \Phi_7(Q)$

Demand side

(15) $C = \Phi_9(Y - T, \mathrm{FW})$

(16) $\mathrm{FW} = \mathrm{M1} + D + e\mathrm{NFA}$

(17) $I/P = \Phi_{10}(K/K^{*})$

(18) $Q = \Phi_{11}(Y + eP^{M}M/P)$

Prices and money

(19) $P = \Phi_{12}(W, L/Q^{*}, P^{M}, Q/Q^{*}, \mathrm{M1}/Y)$

(20) $\mathrm{M1}/P = \Phi_{13}(Q, \Delta P)$

Government and GDP

(21) $G = \Phi_{14}(Y)$

(22) $T = \Phi_{15}(Y)$

(23) $D = D_{-1} + G - T - \mu\Delta\mathrm{M1}$

(24) $Y = C + I + \Delta\mathrm{FDI} + G + e\mathrm{TB}$

Endogenous variables

P^{X}: export prices
P^{M}:import prices
X: export volume
M: import volume
FDI: stock of foreign direct investment
TB: trade balance
CA: current account
NFA: net foreign assets
Q^{*}: desired industrial output
TP: technical progress
L: labour
W: wages

(*continued on next page*)

Table 1 (*continued*)

Endogenous variables	
K^*: desired capital stock	K: actual capital stock
C: consumption	FW: financial wealth
I: investment	Q: actual industrial output
P: domestic prices	M1 : narrow money aggregate
G: government expenditure	T: government receipts
D: government debt	Y: GDP
Exogenous variables	
P^W: world prices	e: nominal exchange rate
Y^W: world demand	r^W: world interest rate
priv: privatisation indicator	
Parameters	
γ_0, γ_1: scale parameters of the production function	s: distribution parameter of the production function
σ: elasticity of substitution of the production function	λ_{TIME}, λ_{FDI}, λ_M: technical progress parameters
δ: depreciation rate of capital	μ: percentage of public debt monetized by the government

(6)), a current account (Eq. (7)) is also introduced, defined as the sum of trade balance and the interest payments received on net foreign assets (Eq. (8)).

2.3.2. Supply side

The supply side of the model is centred on an industrial production function built according to the following CES form in which technical progress is only labour augmenting:

$$Q^* = \gamma\left[s(K)^{(1-1/\sigma)} + (1-s)(L\mathrm{TP})^{(t-1/\sigma)}\right]^{\sigma/1-\sigma}$$

Table 2
Long-run elasticities of external part equations

Endogenous variables	Foreign price	Domestic price	Foreign demand	Domestic demand	Relative price	FDI
Export price	0.72[a]	0.28[a]				
Import price	0.87[a]	0.13[a]				
Exports (goods)			1.33		− 0.93	0.14
Exports (services)			1.00[b]		− 0.92[c]	0.28
Imports (goods)				1.04	1.04	0.15
Imports (services)				1.00[b]	0.80[c]	0.57
FDI				1.47	− 0.25	

[a] The sum of the coefficient is constrained to unity.
[b] Demand elasticities of trade of services are assumed to be equal to 1.
[c] Real exchange rate is the relative price indicator of trade of services.

where Q^*, K, L, and TP respectively denote potential industrial output (a trend output), capital, industrial labour force, and labour-augmenting technical progress. γ, σ, and s respectively corresponds to the scale parameter, the elasticity of substitution, and the factor distribution parameter.

This production function is useful to study the sources of technical progress in China. Two different kinds of technical progress sources are investigated: an external source, which affects the productivity of production factors, and an internal source, which affects the organisation of production as a whole. First, the factors affecting productivity are assumed to come from abroad. Following Barrell and Pain (1997), technical progress is a function of the stock of FDI in real terms, together with an exogenous element proxied by a linear time trend and imports over GDP (Eq. (10)). This specification for technical change seems more satisfactory than the traditional time trend. Technical progress is then affected by technological transfer from abroad via FDI and imports of capital and machinery. Second, the internal source of progress is a specificity of a transitional economy. The organisation of production is able to improve relative to the degree of liberalisation of the economy. To introduce this internal source, the scale parameter (γ), constant in a market economy, is assumed to be varying in a transitional economy. This scale parameter is specified as a linear function of the liberalisatioin degree : $\gamma = \gamma_0 + \gamma_1 \text{priv}$, where priv is the privatisation indicator measured as the share of private enterprises in total industrial production. The larger the private sector, the more efficient the utilisation of the production factors and the larger the quantity produced in the economy. The introduction of this variable takes into account the specificity of the Chinese economy in which the role of the state sector is still important.

The estimation of the production function has been realised in two steps. In the first step, estimates of the elasticity of substitution (σ) and the coefficients of labour-augmenting productivity (λ_{TIME}, λ_{FDI}, and λ_M) have been obtained by using the labour demand equation implied by the marginal productivity condition that the marginal product of labour should equal its (mark-up adjusted) real wage.

$$\partial Q^*/\partial L = \gamma^{(1-1/\sigma)}(1-s)Q^{*(1/\sigma)}(L\text{TP})^{-(1/\sigma)}\text{TP} = \beta(W/P)$$

where β denotes the mark-up and W and P denote money wage and domestic prices. Taking its log–linear form and replacing TP by its specification yields:

$$\ln(L/Q^*) = -\sigma\ln\beta + (\sigma-1)\ln(\gamma) + \sigma\ln(1-s) - \sigma\ln(W/P) + (\sigma-1)(\lambda_{\text{TIME}}t + \lambda_{\text{FDI}} + \lambda_M\ln(M/Y))$$

Estimation results are presented in Table 3. The role of FDI in technical progress is significant only in the 1990s, which is easily explained by the large-scale expansion of FDI since 1990. Openness (import share in GDP) is significant throughout the period, meaning that technology transfer via imports has played a large role in the Chinese technical progress.

Table 3
Labour demand long-term coefficients

Variables	Corresponding production function parameters	Long-run coefficients
ln(Q^*)		1[a]
ln(W/P)	σ	0.304
TIME	λ_{TIME}	0.026
ln(FDI)	λ_{FDI}	0.016[b]
ln(M/Y)	λ_M	0.206

[a] Imposed by the theoretical structure of the model.
[b] From 1990Q1 to 1994Q4.

The second step aims at integrating the specification of the scale parameter (γ) in the production function (Eq. (9)). The parameter σ and the variable TP have been already defined during the first step and the distribution parameter (s) is calculated from wage bill and the value of output. This second step is then a mix between estimation and calibration, since only the scale parameters (γ_0 and γ_1) are estimated. The result is quite sensible since it indicates that output scale increases with privatisation ($\gamma_1 > 0$). Thanks to a better organisation of production, economic liberalisation has brought efficiency gains, which have had significant effects on economic activity. This production function defines the industrial production determined by supply conditions, called desired output here.

These two steps are sufficient to determine the supply side of the model. Labour demand has been already determined by the first step (Eq. (11)). Real wage is just defined so as to grow like labour productivity (Eq. (12)). The actual stock of capital (K) is defined as the accumulation of investment adjusted for depreciation according to the perpetual inventory method (Eq. (13)) with a constant depreciation rate equal to 10% per annum. Finally, desired capital stock (K^*) is defined as the stock required to match the supply and the demand for industrial goods (Eq. (14)) by solving the production function for capital with actual output Q instead of desired output Q^*.

2.3.3. Demand side

Each household is assumed to determine its consumption level as a function of disposable income and financial wealth (Eq. (15)). This is the classical representation of the real balance effect, which states that the value of net financial wealth affects consumers' expenditures. Financial wealth is defined as the sum of narrow money, government debt, and net foreign assets (Eq. (16)). Expecting that in the long run, the ratio of net wealth to disposable income stabilises, the wealth and the income elasticities sum to 1 and are independent both of time and of the net financial wealth level. This implies that both the consumption income ratio and the wealth income ratio are constant in the long run. Considering this assumption, estimates of the consumption function for China give a share for after-tax income equal to 84% (the share of net wealth is then equal to 16%).

Domestic investment is assumed to be a function of the adjustment between desired and actual stock of capital (Eq. (17)). The estimation of this function gives a long-run elasticity of real investment to the ratio of actual to desired capital equal to one-third.

Finally, Eq. (18) defines actual output (Q) as an error correction between output and total final expenditures (the sum of GDP and imports in domestic currency):

$$\Delta\ln(Q) = 0.43_{[3.11]} - 0.12_{[-3.04]}[\ln(Q)_{-1} - \ln(Y + eP^{M}M/P)_{-1}] + 0.55_{[8.89]}\Delta\ln(Y + eP^{M}M/P)_{-1}$$

$$R^2 = .69 \qquad \text{Sample : } 1980Q2 - 1995Q1 \ (t \text{ stat into brackets})$$

2.3.4. Domestic prices and money demand

Pricing behaviour of firms is characterised by a mark-up model (Eq. (19)), where domestic prices depend on world prices and on unit labour costs (wage bill divided by desired output).

In addition, an inflationary pressure term takes into account the importance of controlled prices in the price level. The greater the preponderance of controlled prices in total prices, the weaker the link between price changes and capacity levels. The inflationary pressure indicator is defined as the ratio of actual to desired industrial output (Q/Q^*). Following Commander and Corricelli (1991), an indicator of excess purchasing power in consumer markets is also introduced to account for demand-side pressure for relative price adjustment on the part of the authorities (this indicator is defined by the change in money stock relative to the change in nominal GDP). The inclusion of both an inflationary pressure indicator and an explicit purchasing power variable is an attempt to pin down the particular excess demand features of a centrally planned economy when controlled and market prices coexist and when the planners monitor their relative price. To take into account the structural change after the inflation episode of 1988, a second intercept is added (equal to 1 only from 1988Q4). Concerning the import prices, their influence on the Chinese inflation are significant only from 1988Q4. Before 1988, world prices did not significantly influence the Chinese price system. This gives the following results:

$$\Delta\ln(P) = -0.003_{[-0.76]} + 0.03_{[5.96]}\delta + 0.12_{[4.34]}\ln(\mathrm{ULC}_{-1}/P_{-1}) + 0.08_{[3.06]}\ln(P^{m}_{-1}/P_{-1})\delta + 0.46_{[3.75]}\ln(Q_{-1}/Q^{*}_{-1}) + 0.09_{[3.01]}\Delta\ln(\mathrm{M1}_{-1}/\mathrm{GDP}_{-1})$$

$$R^2 = .63 \qquad \text{Sample : } 1984Q1 - 1994Q4 \ (t \text{ stat into brackets})$$

where ULC, P^{m}, and M1, denote unit labour costs, import prices, and narrow money. δ is a dummy variable equal to 0 before 1988Q4 and 1 afterwards.

In the long run, the Chinese domestic prices were only influenced by unit labour costs until the end of 1988. From 1989, they have been influenced both by

unit labour costs (for 60%) and by import prices (for 40%). The effect of inflationary pressures is significant and the coefficient of inflationary pressures is quite high. This allows any departure of output from its trend to have a strong role in the model since it will be cancelled over time by increases in prices. This equilibrating mechanism indicates that the internal restructuring of the Chinese economy is quite successful since it should be absent in purely planned economy. Finally, the excess purchasing power in consumer markets has a significant effect on inflation reflecting the coexistence of administered and market prices in the Chinese price system.

Money demand is modelled according to the specification defined by Cagan (1956), where real money balances are a log–linear function of income and inflation (Eq. (20)). Following the previous studies on money demand in China (e.g., Girardin, 1996) money demand is estimated only from 1989. Prior to this date the estimation of the money demand function displays some inconsistent results suggesting that the behaviour of the Chinese agents follows other specifications (e.g., the long-run income elasticity exhibits high values). However, from 1989, the conventional money demand function seems to be consistent with the Chinese series and features sensible coefficients (long-run coefficients of output and inflation are respectively equal to 0.97 and 0.71):

$$\begin{aligned}\Delta\ln(\mathrm{M1}/P) = {} & -1.11_{[-4.26]} - 0.06_{[-5.68]}\delta_t - 0.35_{[-4.86]}\ln(\mathrm{M1}/P)_{-1} \\ & + 0.34_{[-4.90]}\ln(Q)_{-1} - 0.25_{[-2.83]}\Delta 4\ln(P)_{-1} \\ & + 0.72_{[2.98]}\Delta\ln(Q) + 0.63_{[2.74]}\Delta^2 4\ln(P)_{-1}\end{aligned}$$

$$R^2 = .82 \qquad \text{Sample : } 1989\mathrm{Q}1 - 1996\mathrm{Q}4 \ (t \text{ stat into brackets})$$

where M1 is the nominal balances of the Chinese narrow money aggregate, P the general retail price index, Q is real income proxied by real industrial production, $\Delta 4\ln(P)$ is the annual inflation rate in log and the dummy $\delta_t = 0$ before 1993Q1 and 1 afterwards. The results shows that the inflationary episode of 1993–1994 has implied a change in the intercept of the money demand function. Only the constant has changed, the long-run structure staying stable between 1989 and 1997.

2.3.5. Government equations

The aim of this model is not to provide a model of government's behaviour. First, it is too complicated. Second, it is not central in the building of the model since the government is present only to link some relationships (fiscal debt is one of the component of net wealth, fiscal expenditures, and tax feed domestic demand). Then, some basic fiscal rules are defined. Fiscal expenditures and tax are assumed to grow in line with nominal GDP (Eqs. (21) and (22)). Government debt (Eq. (23)) is defined by the accumulation of fiscal deficits reduced by a part of the debt, which has been monetized (imposed here to 5%; a reasonable percentage if we refer to the Chinese recent economic history).

3. The assessment of the opening up effects

To assess the role of the opening up on the Chinese economy, two different shocks have been simulated. The first simulation studies the impact of a reduction in FDI on the Chinese economy (Eq. (24)). The second simulation aims at showing the effects of a devaluation on the main domestic variables. As this shock is able to have a large impact on the world economy, this devaluation has been resimulated once introduced the model of China in a multicountry model.

3.1. The impact of a permanent reduction in FDI inflows

The first simulation aims at assessing the impact of a reduction in the inflow of FDI on the main Chinese economic variables. The model presented here, by taking into account the effect of FDI on trade, domestic capital, and technical progress, is likely to understand the different channels through which FDI can affect the Chinese economy. A permanent reduction of 50% in FDI inflows is simulated. This simulation confirms the positive role that FDI has played on the Chinese economy and indicates which are the key variables that transmit FDI effects on the economy as a whole. Table 4 presents first the effect of FDI reduction on output (actual and desired) and on price level. A 50% reduction in FDI inflows has a negative effect on the long-run output (around 25% for potential output and around 20% for actual output after 10 years). As the effects on actual output are much more limited compared to those on potential output, the inflationary pressures rise and, as a consequence, the domestic prices increase (around 20% deviation from the base level). In the very long run, the effects on desired and actual outputs should be equal. However, after 10 years, the reduction in the flow of FDI is not completely reflected in the stock of FDI. This explains why some variables does not return to the baseline after 10

Table 4
The effects of a 50% reduction in FDI inflows (percent change from base — Q for quarter and Y for year)

	Initial	1st Q	2nd Q	3rd Q	1st Y	2nd Y	5th Y	10th Y
FDI	−50	−50	−50	−50	−50	−50	−50	−50
Real output	−1.4	−3.1	−4.4	−5.2	−5.7	−6.0	−14.4	−19.8
Real output trend	−1.3	−2.6	−3.7	−4.7	−5.7	−9.1	−19.3	−24.4
Domestic prices	0	0	−0.5	−1.1	−1.8	0	+15.3	+22
Export volume	0	−5.0	−7.0	−8.0	−8.5	−9.1	−9.2	−9.3
Import volume	0	−7.6	−12.0	−14.6	−16.2	−17.0	−12.2	−11.3
Real exchange rate[a]	0	−0.01	+0.5	+1.2	+1.8	−0.1	−13.3	−18.1
Current account[b]	−0.3	+0.9	+1.8	+2.5	+3.0	+3.2	+1.3	+1.0

[a] An increase in the real exchange rate means an improvement of competitiveness (it is calculated as a ratio of world prices in US dollar to domestic prices).

[b] As % of GDP (difference from base).

years. The results also show the effects of FDI reduction on trade variables and on competitiveness. All the trade variables suffer from the reduction in FDI. The main result is that imports are more sensitive to this reduction than exports. FDI would imply a reinforcing of import dependency leading to a stronger response on the import side compared to the export side. The effect of FDI reduction on external balance is then positive but are limited by a deterioration of price competitiveness. After 10 years, current account gains one point of percentage of GDP. Three main conclusions emerge from this simulation. First, FDI has a long-run effect on output, especially on the supply side by improving technology transfer and production capacity. The second conclusion concerns the effect of FDI on the price level. FDI seems to have helped to make China immune from the "Big Bang"-style inflationary crisis. By improving supply conditions, FDI has played a role in the price system by restricting excess demand. Third, if FDI promotes Chinese trade, its effect on imports is larger than on exports. The effect on the balance of payments is then negative. It is, however, limited in the long run since FDI, on the other side, have a positive effect on competitiveness by its action on domestic prices.

3.2. The effects of a Chinese devaluation

This simulation studies the impacts of a devaluation of 20% of the Chinese currency (the Renminbi or RMB). As shown in Table 5, the response of the domestic variables to a devaluation is fast. The impact on real GDP is positive in the short run. A devaluation would imply an increase of 6.1% in real GDP after two quarters and 4.7 after 1 year (a gain of around 3 percentage point of growth). It remains slightly positive afterwards and is almost absorbed after 5 years. A similar pattern is found for domestic prices, which converge rapidly towards the initial 20% devaluation. The pattern of prices implies that competitiveness is not durably affected by a devaluation. Yet, in the short run, the devaluation has a positive impact on exports and a negative one on

Table 5
The effects of a 20% devaluation of the RMB (percent change from base — Q for quarter and Y for year)

	Initial	1st Q	2nd Q	3rd Q	1st Y	2nd Y	5th Y	10th Y
Nominal exchange rate	+20	+20	+20	+20	+20	+20	+20	+20
Real output	+2.1	+4.7	+6.1	+5.9	+4.7	+0.9	+0.8	0
Domestic prices	0	+1.7	+6.9	+13.6	+19.7	+24.1	+20.2	+20
Exports volume	+14.8	+12.7	+5.2	+2.7	+2.0	+0.6	0	0
Imports volume	−5.2	−12.8	−11.4	−3.8	−0.5	−0.2	0	0
Real exchange rate[a]	+20	+17.9	+12.2	+5.6	+0.2	+0.1	0	0
Current account[b]	+4.3	+5.3	+3.4	+1.2	+0.7	+0.1	0	0

[a] An increase in the real exchange rate means an improvement of competitiveness (it is calculated as a ratio of world prices in US dollar to domestic prices).

[b] As % of GDP (difference from base).

imports. As a result, the effect on the external account is quite large. After 1 year, current account benefits from an extra 0.7% of GDP. This effect vanishes in the long run as competitiveness gains reduce. This simulation indicates the limited role that the authorities could play on competitiveness via a devaluation. Devaluation has an effect on output but only in the short run. In the long run, due to the response of prices, competitiveness remains at the same level and output is not affected by the change in currency value. This kind of response is present in every market economy. This simulation suggests then that the transformation of the Chinese economy does not allow it to use the exchange rate as a tool to durably influence price competitiveness, but only as a short-term stabilisation variable.

3.3. The Chinese devaluation and the world economy

To assess the impact of the Chinese devaluation on the world economy, the Chinese model has been integrated in a multicountry model (the NiGEM). NiGEM is a 1500-equation macroeconometric model covering the whole of the world economy, but focusing particularly on the major industrial countries (23 detailed country models). The other countries are pooled into different zones covering OPEC, East Asia, Latin America, Africa, China, developing Europe, and miscellaneous developing countries for which only trade volumes and prices are modelled. For the simulation, the current NiGEM's model of China has been replaced by the model presented here. To be more realistic, in addition to the fall of 20% in the RMB, the exchange rates in the East Asia block (which includes Hong Kong) have also been devalued by the same rate. Table 6 presents the results of this simulation for China and for the major economies (the US, Japan, and the European Union).

Because the devaluation does not concern only China anymore, the impact of a such a shock is longer lived on the Chinese economy. As shown by the effect on the real exchange rate, the gain in competitiveness for China is in this case larger and remain positive for about 4 years. For the other economies, such a devaluation in Asia reduces their relative import prices. Compared to base

Table 6
The effects of a 20% devaluation of the Asian currencies (RMB included) (percent change from base — Q for quarter and Y for year)

	Initial	1st Q	2nd Q	3rd Q	1st Y	4th Y
China's real exchange rate	+10.2	+12.4	+13.5	+13.1	+7.9	+0.8
US relative import prices	−2.1	−2.5	−2.8	−2.7	−1.7	−0.2
US export volume	−0.07	−0.18	−0.063	−0.02	−0.01	−0.01
Japan's relative import prices	−3.0	−4.2	−4.3	−3.9	−2.2	+0.1
Japan's export volumes	−0.22	−0.55	−0.18	−0.04	−0.02	−0.02
EU relative import prices	−1.2	−1.5	−1.7	−1.4	−1.0	−0.2
EU export volume	−0.04	−0.11	−0.04	−0.01	−0.01	0

values, relative import prices decrease by 1% in Europe, 1.7% in the US, and 2.2% in Japan after 1 year. The effects on export volumes are negative but short-lived. As already shown by Barrell, Pain, and te Velde (1998), which realised a similar simulation, the consequences are broadly similar to those implied by the Asian crisis in 1997, with a reduction in growth and inflation in the major economies. After 1 year, growth in Japan is about 0.5 percentage points lower compared to base values. Due to the decrease in import prices, inflation is reduced in the US and in Japan by 0.25% for around 2 years.

4. Concluding remarks

The aim of this macroeconometric model is to understand the last 20 years of the reforming Chinese economy. It emphasises the role of external factors promoted by the opening policy implemented in 1979 by Deng Xiaoping. The opening up of China is one of the main phenomenon studied by this model and a special care is accorded to the impact of the dramatic increase in FDI that has occurred since the beginning of the 1990s.

If devaluation has some effects on the Chinese economy, it is only in the short run. In the long run, due to a strong response of prices, competitiveness remains stable after a devaluation. On the contrary, inflows of FDI have a positive effect on the Chinese economy in the long run, especially on output and on competitiveness.

The general conclusion of these simulations is that the Chinese authorities can play a positive role on external competitiveness and then on growth not by devaluating the Chinese currency but by attracting inward FDI. These bring evidence that by attracting FDI, China has found a successful way to sustain growth, to limit inflation, and to improve competitiveness. Thanks to the effects of competitiveness on FDI, a virtuous circle seems to have played a positive role on the Chinese economic success. The recent events show that this virtuous effect is central in the Chinese economic policy choices. During the Asian crisis, in 1997–1998, the authorities refrained from devaluating the RMB and, in 1999, the concessions made to enter the WTO proved that openness is central in China's development strategy. By entering the WTO, China expects to stimulate its foreign trade and, above all, to promote new FDI inflows.

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