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The Integration of China and Hong Kong into the World Economy: A Prototype Global Econometric Model

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中國及香港與世界經濟的連繫：
一個初步的全球計量模型

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摘要

中國自一九七八年之開放經濟改革成爲了學術研究的焦點。我們把兩個分別屬於中國及香港的宏觀計量模型，與國際貨幣基金組織的 MULTIMOD 世界模型加以連接；並在這篇文章裏發表其結果。一體化的全球模型，提供了途徑，讓我們可以分析中國、香港和世界其他地區的相互作用效應。通過假設性的模擬測試，我們發現香港經濟相當受到來自中國及世界其他地區的沖擊。不過，中國經濟及香港經濟的連繫，高於世界的其他地區，特別是經濟合作及發展組織(簡稱經合組織)的國家。香港對中國的沖擊，效果大於經合組織；而經合組織內國家的互相影響，亦遠比中國的強烈。總言之，分析的結果顯示通過了開放政策，中國加強了與週邊經濟特別是香港的聯繫，但她距離完全融入世界經濟，還有一段很長的路程。

The Integration of China and Hong Kong into the World Economy: A Prototype Global Econometric Model

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Abstract

Since 1978, China's open-economy reform process has been a subject of increasing academic interest. In this paper, we report the results of linking our two recent macroeconomic models of China and Hong Kong into a well-known world model, the MULTIMOD (Mark II), developed by the IMF. The integrated overall "global" model then provides a general vehicle for the analysis of the spillover effects among the three blocs of economies of China, Hong Kong and the rest of the world. Based on the counterfactual simulations conducted on this integrated model, we explore the extent of influence of the three blocs of economies on each other. The major findings of the paper are that Hong Kong's economy is quite vulnerable to the external shocks from both China and the rest of the world, due to her close integration with the world economy. However, the Chinese economy is more integrated with the Hong Kong economy than with the rest of the world, especially with the OECD countries. An adverse shock such as a reduction in outward processing from Hong Kong would hit the Chinese economy more heavily than a shock from policy changes in the OECD countries. On the other hand, the OECD economies are much less affected by the shocks from China than those from their own countries. The findings suggest that although China through her open policy has been increasingly linked to her neighbouring economies such as Hong Kong, there is still a long way to go for her to fully integrate into the world economy.

JEL Classification: C51, F47, F15.

Keywords: foreign capital, economic integration, China's open policy, Hong Kong.

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1. Introduction

For almost three decades after 1949, the Chinese economy remained largely closed to the outside world. Foreign trade was suppressed and foreign investment was virtually invisible because the government pursued an essentially autarkic strategy based on the Stalinist model and a belief in "self reliance" (Hu and Ma, 1999).

Since the late 1970s, in an attempt to modernise and develop the economy, the Chinese government has pursued an "open policy". The important role of foreign trade in the economy has begun to be acknowledged by the policy-makers. During the years 1979-1996, China greatly expanded the volume of international trade, broadened the range of her trading partners and diversified the commodities she sold. The ratios of exports and imports to GDP have been rising consistently over time. Manufactured goods also account for a larger percentage in Chinese exports (Table 1). The open door policy has stimulated China's economic relations with not only Hong Kong and Japan, but also the USA, the EU, and other developed and developing countries (Table 2). As China became an active player in the international economy, her share in world trade increased from 0.9% in 1980 to 2.9% in 1995 and her ranking in the world league climbed from the 26th to 11th for the corresponding years.[1]

In 1994, the actual amount of foreign capital used in China was US$43.213 billion, against a total fixed asset investment of Renminbi 1637.033 billion (*China Statistical Yearbook*, 1995). At the average of Rmb8.5/US$ for the newly unified exchange rate, the ratio of foreign capital used to total fixed investment would be about 20%. One qualification is of course that not all foreign capital used went into fixed investments. On the other hand, gross output by

foreign-invested enterprises (FIEs) was estimated to be 11% of the national total (*Guoji shangbao*, 1 April 1995).

It is well recognised that Hong Kong plays a crucial role in channelling Chinese exports/imports to/from the international markets. Hong Kong also provides the major source of foreign direct investment to China. In fact, the largest source of foreign investments in China has been that from Hong Kong. As Table 3 shows, out of the total of 167,505 FIEs that were formed in 1979-1993, those originated from Hong Kong numbered 108,914, or 63.8%. In terms of registered capital, Hong Kong's share was 72.7% (of the total of US$142.92 billion).

The opening of the Chinese economy has dramatically changed Hong Kong's production structure. A massive process of relocating manufacturing plants from Hong Kong to China has taken place. About 5 million employees in southern China are reportedly working directly or indirectly for Hong Kong, compared with the total work force of about 3 million in the territory itself. Hong Kong now handles the traffic of over half of China's external trade, and its container port at Kwai Chung is one of the busiest in the world. Hong Kong is China's largest "outside investor", accounting for over 60% while China had become Hong Kong's third largest by 1994.

2. Econometric Attempts

The amazing opening of the Chinese economy has however not been analysed with too much rigourous quantitative research. The present authors have tried to fill the gap with two econometric attempts. Through building and simulating a large-scale macro-model of China,

[1] Statistical Yearbook of China, 1995.

Tsang and Ma (1997) find that Hong Kong capital notably improved China's trade balance with the rest of the world and stimulated her economic growth. On the other hand, Ma, Tsang and Tang (1998) find that China factor significantly improved Hong Kong's economic performance and played a stabilisation role in Hong Kong's financial system.

Most of the quantitative research in the literature has been based on the *single* country macro-modelling framework. This framework has its advantages as the researchers can focus on the country in study and also can decompose the influential factors into individual effects. It nevertheless has its serious limitations. For example, it neglects the feedback effect of a shock originated from a country, say, China, when the shock feeds back to China after it affects a neighbouring economy, say, Hong Kong, since the latter is closely linked to the former through various economic and financial channels.

Although Tsang and Ma (1997) and Ma, Tsang and Tang (1998) opened up the Chinese model and the Hong Kong model to outside influence, they still did not allow for the feedback effect. The impacts of the China-HongKong economic interactions on the world economy, and vice versa, were also not considered.

As mentioned in Section 1, China's open policy has affected to various extents economies in the rest of the world. Other than Hong Kong, Taiwan has also been deeply involved (Jones, King and Klein, 1993). The term "Greater China" was coined to describe the triangular linkages among the three economies (Tsang, 1996). As Tables 2 and 3 show, other economies in the Asian region, e.g. Japan, as well as those in the West, e.g. the US and Europe have also been having remarkably expanding economic relationships with China in terms of trade and investment.

In this paper, we report the findings of a forward step in econometric modelling. We have integrated our two macromodels of China and Hong Kong (Tsang and Ma, 1997; Ma, Tsang and Tang, 1998) into a well-known world model, the MULTIMOD (Mark II), developed by the IMF (Masson, *et al*, 1990). The overall world model then provides a general vehicle for the analysis of the spillover effects among the three blocs of economies of China, Hong Kong and the rest of the world.

Section 3 that follows outlines the structures of the three models of China, Hong Kong and the MULTIMOD (Mark II). Section 4 conducts some counterfactual simulations to explore the extents of influence of the three blocs of economies on each other. Finally, section 5 concludes.

3. Structures of the models of China, Hong Kong and the MULTIMOD

All three models in fact have a broadly consistent common structure which can be conveniently summarised by the following five blocs:

1. Demand side
    a. consumption
    b. investment and capital stock
    c. trade
    d. government sector
2. Supply side
3. Labour market
4. Prices
5. Financial sector

The China model

The structure of the China model is summarized in Figure 1. There are all together 77 equations, of which 32 are behavioural equations and 45 are identities (see Tsang and Ma (1997) for a detailed list of equations). The model aims at capturing some of the peculiar features of the Chinese economy under reform and has to tackle various data problems, e.g. the prevalence of MPS accounting at the time of our modelling.

In bloc one, the largest section of the model where expenditure equations are contained, the SNA components are derived, disaggregated and estimated. The private consumption function has a familiar formulation, but it is estimated in *real* terms, whereas nominal public consumption is modelled on an *ad hoc* basis, because of the lack of solid theoretical basis, as a function of the recurrent expenditure of the government.

The investment functions present a challenge. The reform process has been characterized by an unfolding process of decentralization, which was periodically interrupted by government intervention. The government has two major tools: (1) control of public expenditure; and (2) administrative influence on bank credit. Hence we explain public investment (investment by state-owned and collective units) by a collection of variables, ranging from government investment expenditure and loans for fixed investments by banks, to foreign investments and enterprises' "self-owned funds". It is conceivable that in the cyclical fluctuations towards a more market-oriented system, the relative magnitudes of the variables would change. But data limitations in such an annual model prevent us from performing varying-coefficient techniques.

As for private fixed investment, which has been dominated by residents' investments in housing, particularly in the rural areas, we specify it as a function of incomes of farmers and

individuals and its own lag. Even by 1993, it only accounted for about 13% of total fixed investments.[2]

We estimate nominal equations for all investment decisions, in contrast to the private consumption function which is in real terms. This reflects the asymmetrical conditions that consumers and enterprises face in a typical centrally planned economy, as analyzed by Kornai (1980). While the enterprises and units operate until a "soft budget constraint", the consumer's budget is relatively "hard". Moreover, given the complex considerations for the determinants of investments in the reform process, it is not easy to find suitable deflators for all the variables.

Exports are separated into those of goods and of non-factor services, mainly because of problems in China's statistics (see Bi (1994), pp.102-108; World Bank, (1990); (1992)). In the function of the exports of goods, relative prices, export subsidies (which officially stopped in 1991), imports of means of production, and lagged exports, and world exports are used as arguments. However, export subsidies have to be taken out for estimation reasons and its data quality is problematic anyway (see Appendix B, Tsang and Ma, 1997). Exports of non-factor services are modelled on an *ad hoc* basis, as a function of their goods counterpart.

Again because of data problem, we have to follow the Chinese practice of disaggregating imports into those of means of production (productive goods) and of means of livelihood (non-productive goods). In the specification of the former, arguments include relative price, domestic output, foreign direct investment and exports, the reasoning being that quite a significant portion of foreign direct investments was in the form of "investments-in-

[2] Some readers may be wondering how foreign investments feature here. In Chinese statistics, investments are classified according to three types of ownership: (1) state-owned, (2) collective,

kind", and that some of the imports are just for the purpose of outward processing for foreign enterprises. The function of the imports of non-productive goods has a simpler formulation, its arguments including only disposable incomes and relative price.

In bloc two, the supply side bloc, real GDP is disaggregated into the output of three sectors: (i) agriculture, (ii) industry, and (iii) service. These data are in line with Chinese statistics and available for the period after 1978. Real agricultural output is specified as a function of sown areas, horse power of agricultural machinery and the extent of natural disaster, other than lagged output. The absence of labour in the this equation is justified by the widespread observation of surplus labour in the Chinese agricultural sector. Real industrial output is modelled more like the normal production function with industrial labour and productive capital stock as the arguments. Most services in China are still labour-intensive, facilitating the circulation and distribution of agricultural and industrial output. Hence the specification of the real output of the service sector equation is conceived to be determined by labour input as well as the correlated demands generated by agricultural and industrial output. The empirical support for the sectoral interdependence in China can be found in, for example, Bhalla and Ma (1990).

In bloc three, the labour market, the number of agricultural labourers is not modelled because it is assumed to be non-binding, as discussed above. The sizes of the industrial and service labour force are determined by sectoral output level, the total labour force and their own lagged value. Finally, the wage rate is modelled in real terms and as a function of non-agricultural productivity and its own lag.

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and (3) individual; whereas foreign investments are treated only as a source of finance.

In bloc four, the deflator for the primary sector is defined as a function of the output level and its size compared with non-agricultural output, the state procurement price, as well as its own lag. The inclusion of the relative size variable is motivated by the general observation that rising income, as represented by expansion in industrial output, is often followed by an increase in the demand for agricultural products, in particular food (Yu, Xue and Shi (1990))[3] The industrial deflator enlists, other than the industrial output level and the lagged price, the wage rate and public investments as arguments. The deflator for service output, on the other hand, is determined by lagged price, productivity, and the wage rate. The deflator for exports has lagged price, world exports, and the exchange rate as its explanatory variables.

Finally, in the financial sector, bloc five, public finance is assumed to be exogenous, while the functions for M0 and M2 are specified in real terms. However, real money demand stability cannot be easily assumed in an centrally planned economy undergoing liberalization and still exhibiting various forms of disequilibria. In the context of China, there have been practical factors which add to the difficulties of distinguishing money supply from money demand. For example, the Chinese government systematically put pressure on the banking system to finance its fiscal deficits (Li and Ma (1996)), resulting increases in M0 or M2, which might not be willingly demanded by the public, who nonetheless have had few real alternatives for savings and investments. Such a financing practice was discontinued only with the reforms of 1994 (Tsang (1995)). In a way, the process of money being reluctantly held by the public was like "buffer-stock" money, but not particularly "transitory" or "voluntary" in nature.

Given all the above considerations, while we choose in this annual model to specify the

[3] According to the paper by Bai, Zhu and Wang in Yu, Xue and Shi (1990, pp.348-376), the Engle coefficient was between 0.5 and 0.6 for a majority of a sample of urban households in

equations for both money definitions in real terms, we do it in a mixed supply-cum-demand fashion. Actually, one can say that a number of other equations in our model is also specified in such a fashion, e.g. the investment equation, on the basis of a disequilibrium perspective.

Real M0 has as its arguments the number of bank branches (a proxy for both monetization and the level of banking development), the inflation rate, and real disposable incomes, while real M2 are to be explained by the inflation rate, real disposable incomes, fiscal deficits in real terms, and ASTBK (in real terms), which is a proxy for the banking sector's balance-sheet constraint.

ASTBK is defined here as the sum of the banking sector's loans and net foreign assets *minus* the net deposits of the government and the own funds of the banks. As the authors of the Moriguchi-Tang Model (Wang, et al., 1993, chapter 2) argue, such a variable of adjusted bank assets approximates (but does not equal to) M2 in the aggregate banking balance sheet and represents the ability of the banking sector to create money.[4] The assumption here is that Chinese banks want to create money as much as their balance sheet allows, not an entirely rational mode of behaviour, but so dramatically brought to focus again in the financial chaos of 1993 (Tsang, 1994). Its inclusion is consistent with our strategy to explain the monetary aggregates as a combination of supply and demand factors.

Moreover, to investigate the open-economy nature of the Chinese economy, we pay

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1985.

[4] Our definition of ASTBK differs slightly from Moriguchi-Tang in that we add net foreign assets of the banks, not just the foreign exchange balance, to their ability to create money. The item has become increasingly important since the late 1990s. Indeed, one reason for the monetary aggregates to rise so quickly in 1994 was attributed by many commentators to the record inflow of capital into China, which flooded the banks with foreign exchange which they

particular attention to a component of ASTBK, which is NFAB, the net foreign assets of the banks. Given the characteristics of China's exchange rate system, capital inflows into the country would swell the banks' assets as foreign currencies were to be converted into the Renminbi. Banks' ability to increase credit would therefore increase. We estimate a function for the change in NFAB in which it is explained by foreign investments and the trade balance.

We also model a feedback mechanism on the banking sector's ability to lend: the total receipts of bank credit (AR) which describes the banks' funding source as constrained by M2. In specifying the equation of total bank loans, we use the acceleration mechanism with AR as one of the explanatory variables, while for that of loans for fixed investment, data problems (see Appendix B of Tsang and Ma (1997)) force us to resort to an *ad hoc* formulation.

The Hong Kong model

The structure of the Hong Kong model is summarized in Figure 2. There are all together 56 equations, of which 38 are behavioural equations and 18 are identities (see Ma, Tsang and Tang (1998) for an explanation of key equations).

In the first bloc on the demand side, the domestic components of Hong Kong's GDP are modelled. Private consumption is determined by disposable incomes, inflation, real interest rate, and the Hang Seng stock price index (a proxy for the wealth variable). We also add in a variable - Hong Kong's direct investment in China - to capture the effect on local consumption of the repatriation of Hong Kong's windfall profit in relocating manufacturing to China[5].

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had to convert into Renminbi. See Tsang (1995).

[5] Hong Kong's disposable income is based on GDP, not GNP.

Private investment is disaggregated into private investment in building and construction, private investment in plant and equipment, real estate developers' margin, and transfer costs of land and building.

Private investment in plant and equipment is presumed to be influenced by domestic demand, domestic exports and real interest rate, while private investment in building and construction is determined by real money balances, domestic demand, and property prices. Hong Kong is quite unique among the world economies, in that property developers have a dominant role in domestic investments. They provide services in initiating a property development project, monitoring its actual construction, and marketing the finished product. Their "value-added" in the process is calculated as real estate developers' margin, which in this model is explained by suppy and demand prices as well as the real interest rate.

Hong Kong's external trade is extensively specified. Both domestic exports and re-exports are divided into three components: (1) *bona fide* exports to China; (2) exports to China for outward processing; and (3) exports to non-China destinations (the rest of the world). This modelling strategy is motivated by the complex trade relations between Hong Kong and China. On the import side, retained imports are treated in detail, with individual equations for different SITC items. Exports and imports of services are dealt with by two behavioural equations.

Bloc two looks at the supply side of the model. Long run or potential output is determined by a production function. So capacity utilisation (the ratio of actual to potential output) can vary. In the labour market, bloc three, wages are subject to an augmented Phillips curve. In bloc four, domestic prices are determined in such a way that the higher the capacity utilisation the greater the inflation pressure. Prices are also influenced by rentals and

international factors. To highlight the importance of the property sector in Hong Kong, we also specify regression equations for the rental index and property prices.

Bloc five focuses on the monetary sector. Various definitions of the money supply are handled. A crucial variable is the "net overseas interbank liabilities" of Hong Kong. As explained in Data Appendix A of Ma, Tsang and Tang (1998), it is a proxy of capital inflow into Hong Kong under balance of payments accounting. The bilateral capital flows between Hong Kong and China are assumed to be exogenous, while the capital inflow from the rest of the world is regressed against Hong Kong's and China's GDP: highlighting the important financial position of Hong Kong as the centre of managing and re-directing capital flows to China. Capital inflow is supposed to influence both Hong Kong's demand and time deposits (but not savings deposits), thus influencing the size of money supply M2. The interest rate and the exchange rate are exogenously determined, reflecting the fact the Hong Kong adopted the linked exchange rate system which pegged the HK dollar to the US dollar in October 1983.

The MULTIMOD: the world model

The MULTIMOD is a world macromodel developed by the IMF (see Masson (1990) for a detailed list of equations). The MULTIMOD framework is designed to explain the main expenditure categories and production flows in each country, from which employment, investment, prices, interest rates and exchange rates are determined. Financial markets, trade flows, and capital flows (including loans and interest payments) are included. Trade is divided between markets for primary commodities and manufactured goods. Perfectly flexible prices clear the commodity markets, where demands are driven by activity levels and supplies in prices and a predetermined capacity. Manufactured goods are produced and traded everywhere.

Aggregate demand is then built up from consumption (based on current and expected future earnings, asset values), investment (based on market evaluations of firms' current and expected future earnings), trade and the net fiscal position. This determines output in the short run.

Long run or potential output is determined by a production function, so capacity utilisation (the ratio of actual to potential output) can vary. Domestic output prices are subject to a Phillips curve, such that the higher the capacity utilisation the greater the inflation pressure. So there is no absolute output constraint, and prices change by an amount depending on the remaining spare capacity and the state of the labour markets. Prices are therefore partly sticky and partly forward looking, depending on wage contracts, international competitiveness and capacity utilisation.

In the government sector, exchange rates are determined by open interest parities and the expected depreciations consistent with a complete model solution. A preassigned monetary growth rate is targeted with interest rates set to gradually reduce the gap between actual and targeted money growth. Likewise tax rates adjust to eliminate the gap between actual and targeted debt levels, subject to an intertemporal budget constraint. A full description of MULTIMOD's properties and simulation characteristics is given in Masson et al (1990), and comparisons with other models are discussed in Bryant et al (1993).

The linkages of the three models

In order to focus our research, we have combined OECD countries into a single bloc of economy. All variables of OECD countries are denominated in US dollars.

To link the China and Hong Kong models to MULTIMOD, we decompose the developing countries bloc of the MULTIMOD into three parts: China, Hong Kong and the rest of developing countries. From the discussion of the structures of the three models, there are **three** channels through which the economies are interdependent: (1) the trade channel, (2) the direct investment channel, and (3) the monetary channel. Both the second and the third channels concern the flows of direct investment capital (we neglect portfolio capital because of the lack of data).

4. Simulating the integrated model

With the full model established, we proceed to carry out some counter-factual simulation exercises to explore the interaction among the economies of China and Hong Kong with the rest of the world. Due to data limitations, e.g. data on Hong Kong's outward processing were available only from 1989 onwards, we have restricted the time frame of the simulations to the period of 1987-1991.

We have conducted three types of shocks to the model: a) the China factor, b) the Hong Kong factor, and c) policy shocks from the OECD countries. The simulation results are shown in Tables S1 to S7. The figures represent the percentage deviation of the value of the key variables from their historical baseline (i.e. their actual value in the past).

1) The China factor

Three simulations have been conducted to examine the impact of the China factor on the world economy including China herself. First we estimate the impact of a hypothetical transfer

all China's investment in Hong Kong to outside of Hong Kong. Table S1 presents the effects on the world economy if all these investments had been transferred back to China. The simulation reveals that Hong Kong's GDP by 1991 would have been about 3.2% lower than the actual value in that year. Among the constituents of GDP, Hong Kong's consumption would have been hit hardest, followed by investment. Some adverse impact would have been generated on the labour market as well as a 3% deflationary effect in the form of lower prices. The biggest effect would have been a destabilization in Hong Kong's financial market: real M2 would have fallen about 12.9% below the historical baseline by 1991. However, the effect on the Chinese economy is rather modest. It would have generated some 1.5% increase in the real M2 and small expansionary effects on GDP and employment in the industrial and service sectors. The spillover effects on the OECD countries, all of them contractionary, would have been even smaller than those on China.

The second simulation presented in Table S2 shows the effects on the world economy if all the Chinese investments in Hong Kong had been transferred to OECD countries. The simulation reveals that the impact on the economies of China and Hong Kong would have been very similar to that of the previous simulation, although the magnitudes for Hong Kong turn out to be slightly smaller than the previous case. This can be explained by the small positive spillover effect from the OECD countries which would have benefited only slightly from Chinese investment.

Table S3 shows the effect of a hypothetical reduction of 50% of the bilateral trade between China and OECD countries. The simulation reveals that China's GDP in 1991 would have been about 0.16% lower than the actual value in that year. Among the constituents of GDP, investments would have been fallen by 0.7% and consumption by 0.18%. But little

impact would have been generated on imports. There would have been a small inflationary effect in the form of slightly higher prices. In the labour market, employment would have dropped by about 0.06% and 0.09%. The "biggest" impact would have been the destabilization effect on China's financial market: real M2 would have fallen about 1% below the historical baseline. The negative spillover effects to Hong Kong are certainly more visible. It "hardest" hit sector would have been the trade sector. Both exports and imports of Hong Kong would have fallen 3.5% by 1991, generating a moderate contractionary effect on the whole of Hong Kong's economy. Similar effects can also be found for the OECD countries although the magnitudes would have been much smaller. These results bear out the fact that Hong Kong has been playing the important role of serving as China's *entrepot* in her trade with the outside world since the launching of the reform.

2) The Hong Kong factor

Two simulations have been conducted to examine the Hong Kong factor on the world economy. First we estimate the impact of a hypothetical transfer all Hong Kong's investment in China to OCED countries (Table S4). The simulation reveals that Hong Kong's GDP in 1991 would have been about 1.8% lower than the actual value in that year. Among the constituents of GDP, trade sector would have been hit hardest: a fall of 15% for both imports and exports. Consumption and investment would have fallen by 2.1% and 1% respectively. There would have been a small deflationary effect of 2%. In the labour market, employment would have dropped by about 0.23%. The biggest impact would have been the destabilization effect on Hong Kong's financial market: real M2 would have moved cyclically around the historical baseline. The effects on the OECD countries would have been some slightly expansionary effects on real GDP and money. However, the negative effects on Chinese economy would

have only been moderate, partly thanks to the positive spillover effects from the OECD countries.

The second simulation examines the impact of a hypothetical cut of all Hong Kong's outward processing in China (Table S5). This simulation turns out to be the most devastating effects on the 3 economies. It shows that Hong Kong's GDP in 1993 would have been about 10% lower than the actual value in that year. Consumption would have plunged 12.6%, followed by the fall of investment of 9.8%. Imports and exports would have contracted by 12% to 13%. There would have been a big deflationary effect in the form of a 10% drop in prices. In the labour market, employment would have dropped by about 2.5%. Regarding Hong Kong's financial sector, real M2 would have fallen about 13% below the historical baseline. Similar effects would have happened in the Chinese economy and the OECD economies. The magnitudes involved, though much more moderate than the Hong Kong case, would have been for their own cases bigger than those of all the previous simulations.

3) Policy shocks from the OECD countries

Here two simulations have been conducted to gauge the effects of a tightening of fiscal and monetary policies in OECD countries, respectively, on the world economy.

In the simulation of a reduction of the fiscal expenditure by 3% of GDP in OECD countries (Table S6), it reveals that OECD's GDP in 1991 would have been about 0.8% lower than the actual value in that year. Investments and consumption would have been hit by 0.7% and 2.7% respectively in 1991. There would have been some deflationary effect. The biggest spillover impact would have been the negative effect on Hong Kong's economy. The GDP

would have been fallen by 4.4% and in the financial market the real M2 would have fallen about 5.7% below the historical baseline. However, the Chinese economy would have only suffered a modest contractionary effect.

Table S7 indicates that an increase of interest rate by 3% in OECD countries will affect the economies of both OECD and Hong Kong badly. Their GDP, price level, real money supply would have all fallen sharply. Hong Kong's employment level would also have decreased by 0.5%, whilst the Chinese economy would have been again much less affected.

In conclusion, we find that Hong Kong's economy is quite vulnerable to the external shocks due to her close integration with the world economy. The Chinese economy is quite robust to these outside shocks other than Hong Kong. This seems to suggest that China still has a long way to go to integrate her economy into the world economy fully.

5. Conclusion

In this paper, we linked up the two macromodels of China and Hong Kong into a well-known world macromodel, the MULTIMOD (Mark II), developed by the IMF. The integrated world model then provides a general vehicle for the analysis of the spillover effects among the three blocs of economies of China, Hong Kong and the rest of the world.

Based on the counterfactual simulations conducted on this integrated world model we tried to explore the extent of influence of the three blocs of economies on each other. The major findings of the paper are that Hong Kong's economy is quite vulnerable to the external shocks both from China and the rest of the world, due to her close integration with the world economy.

However, Chinese economy is more integrated with the Hong Kong's economy than with the rest of the world, especially the OECD countries. An adverse shock such as a reduction in the outward processing from Hong Kong would hit the Chinese economy more heavily than a shock from the policy changes in the OECD countries. On the other hand, the OECD economies are much less affected by the shocks from China than those from their own countries. That seems to suggest that although China has been increasingly to integrate with her neighbouring economies such as Hong Kong, she still has a long way to go to integrate her economy into the world community fully.

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shan, are gratefully acknowledged by the authors.

Table 1. International Trade of China

Year	Exports/GDP (%)	Imports/GDP (%)	Share of Manufactured Goods in Exports (%)
1980	6.1	6.7	47.5
1985	9.5	14.8	35.9
1990	16.9	14.6	61.6
1991	19.0	16.8	75.7
1992	19.2	18.2	78.7
1993	18.0	19.6	80.6
1994	19.9	19.0	82.3
1995	21.9	19.0	85.2

Sources: Figures for 1980-1992 are from: UN, Handbook of International Trade and Development Statistics, pp. 143, 1992 and pp. 143-149, 1993; figures for 1993 to 1995 are computed using data from UN: International Trade Statistics, 1995 and IMF: International Financial Statistics, 1996.

Table 2. China's Trade by Selected Exports Destinations and Imports Sources (%)

1995	**Share of China's Exports**			**Share of China's Imports**			**Share of Total Trade**		
Partner	**1985**	**1990**	**1995**	**1985**	**1990**	**1995**	**1985**	**1990**	**1995**
Japan	**22.3**	**14.6**	**19.1**	**35.7**	**14.2**	**22.0**	**30.4**	**14.4**	**20.5**
USA	**8.5**	**8.5**	**16.6**	**12.2**	**12.2**	**12.2**	**10.8**	**10.2**	**14.6**
Hong Kong	**26.2**	**43.2**	**24.2**	**11.2**	**6.5**	**6.5**	**17.0**	**35.7**	**15.9**
the EU-12	**8.7**	**10.0**	**12.9**	**15.8**	**17.0**	**16.1**	**13.0**	**13.2**	**14.4**
Australia	**0.7**	**0.7**	**1.1**	**2.6**	**2.5**	**2.0**	**1.9**	**1.6**	**1.5**
NIEs-3[a]	**7.6**	**4.4**	**8.9**	**2.8**	**5.8**	**21.6**	**4.7**	**5.0**	**14.9**
ASEAN-4[b]	**2.7**	**2.9**	**3.7**	**2.1**	**4.0**	**4.5**	**2.3**	**3.4**	**4.1**
Rest of World	**23.3**	**15.7**	**13.5**	**17.6**	**17.3**	**15.1**	**19.8**	**16.4**	**14.2**
World Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Notes:
[a] NIEs-3 comprises Singapore, Taiwan and the Republic of Korea. [b] ASEAN-4 comprises Philippines, Indonesia, Malaysia and Thailand. Source : IMF Direction of Trade, 1980-1995

Table 3 Foreign Direct Investments in China 1979-1993

	No. of FIEs	%	Registered Capital (US$ bn)	%
Hong Kong	108914	63.8	103.94355	72.7
Taiwan	20612	12.3	13.22722	9.3
USA	11554	6.9	8.16857	5.7
Japan	7096	4.2	5.19846	3.6
Macau	4116	2.5	4.12917	2.9
Singapore	3037	1.8	3.33048	2.3
S. Korea	2321	1.4	1.31762	0.9
Canada	1595	0.9	1.02232	0.7
Thailand	1361	0.8	1.62186	1.1
Australia	1269	0.8	0.96327	0.7
Total	167507	100.0	142.92248	100.0

Note: FIEs--foreign-invested enterprises.

Source: *Jingji Yanjiu Cankao*, Beijing, China, 12 October 1994.

Figure 1 : The Structure of the China Model

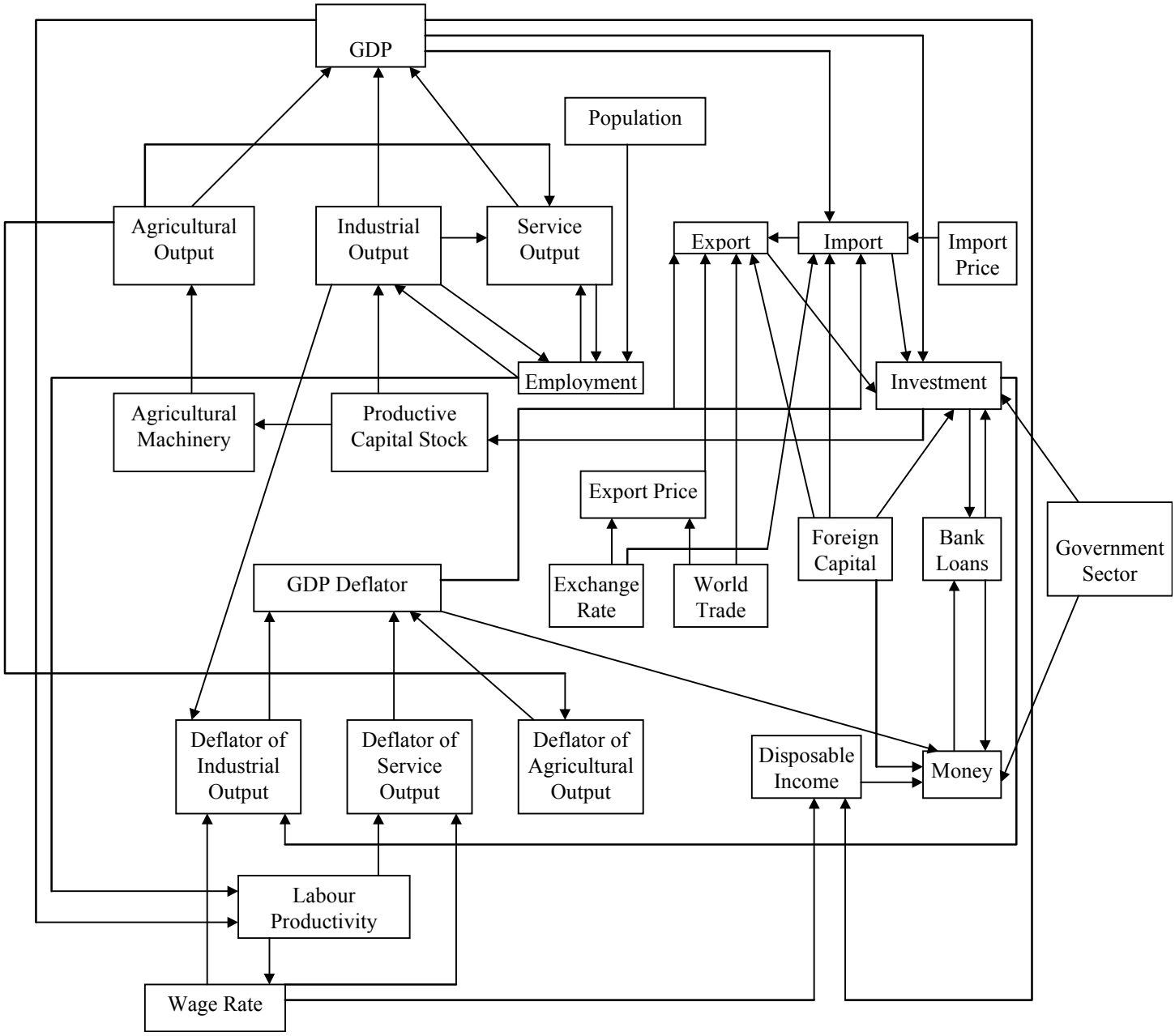

Figure 2 The Structure of the Hong Kong Model

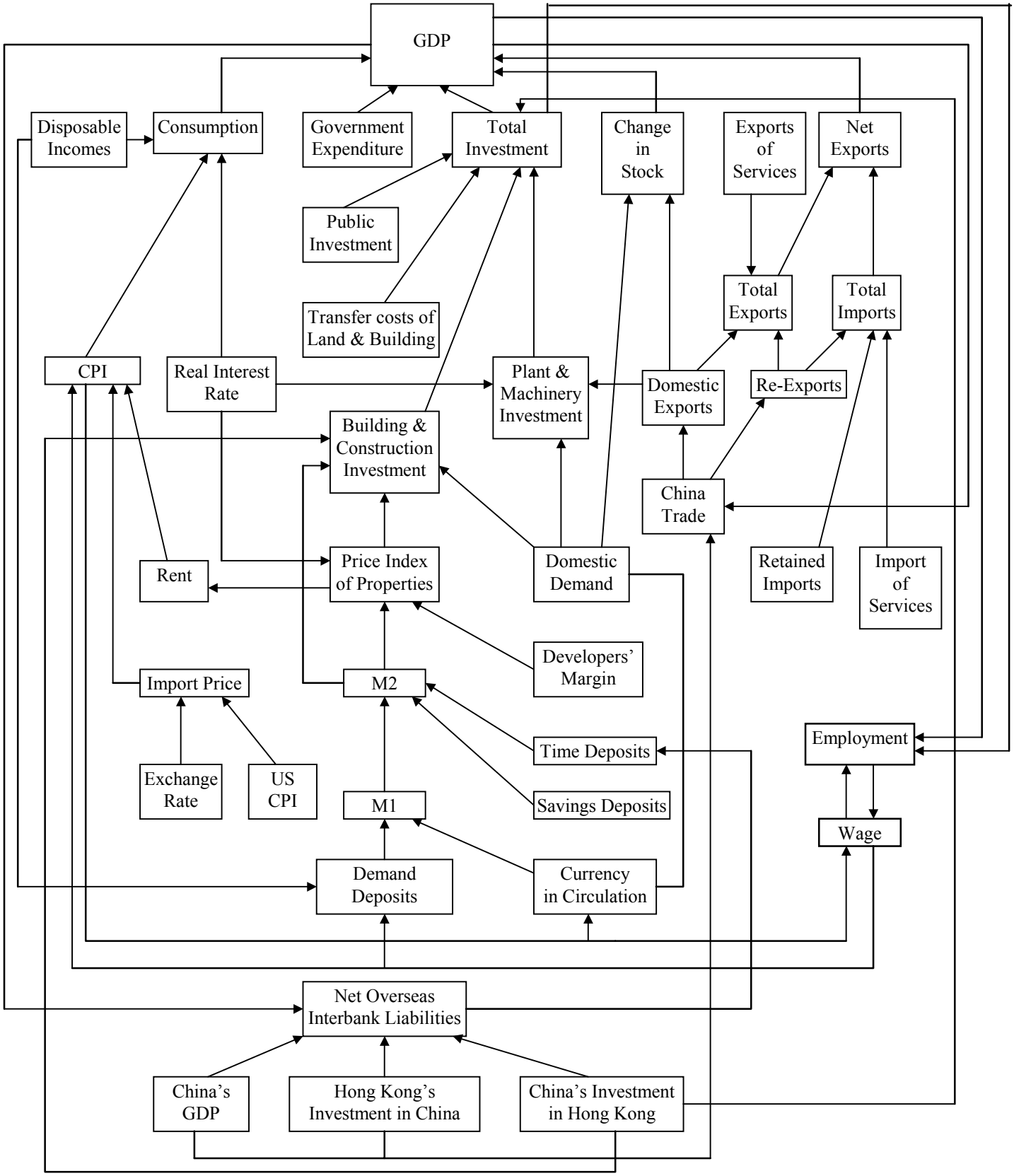

Table S1 All Chinese investments in HK were transferred back to China

China

	GDP	consump	invest	export	import	price	employ. industry	Employ. service	M0	M2
1987	0.000	0.003	0.009	0.005	-0.001	-0.009	0.000	0.000	0.000	0.589
1988	0.015	-0.022	-0.091	-0.050	0.020	0.091	0.005	0.008	0.029	0.578
1989	0.022	-0.021	-0.113	-0.108	-0.040	0.113	0.008	0.013	-0.306	0.239
1990	0.021	0.008	-0.027	-0.053	-0.021	0.027	0.008	0.012	0.026	0.721
1991	0.030	0.034	0.059	0.088	0.053	-0.058	0.011	0.017	0.171	1.540

Hong Kong

	GDP	consump	invest	export	import	price	employ.	M1	M2
1987	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	-3.316
1988	-0.685	-1.709	-0.417	0.076	-0.245	-0.444	-0.099	-2.890	-6.471
1989	-1.758	-3.633	-1.812	0.153	-0.556	-1.372	-0.210	-5.091	-7.574
1990	-2.423	-4.487	-3.132	0.283	-0.605	-2.189	-0.352	-5.900	-9.850
1991	-3.248	-6.032	-3.891	0.512	-0.519	-2.983	-0.638	-6.225	-12.911

OECD

	GDP	consump	invest	export	import	price	M0
1987	0.000	0.000	0.000	0.001	0.000	0.000	0.000
1988	-0.001	-0.001	0.000	-0.008	-0.004	0.000	0.000
1989	-0.004	-0.002	-0.001	-0.020	-0.008	0.000	-0.001
1990	-0.005	-0.002	-0.002	-0.024	-0.009	-0.001	-0.002
1991	-0.006	-0.002	-0.002	-0.030	-0.011	-0.002	-0.002

Notes:
GDP: *real GDP*; consump: *real private consumption*; invest: *real private investment*;
export: *total real export*; import: *total real import*;
employ. industry: *industrial employment*; employ. service: *service sector employment*;
employ.: *total employment*; Mi (i=0,1,2) : *real Mi*

Table S2 All Chinese investments in HK were transferred to OCED countries

China

	GDP	consump	invest	export	import	price	employ industry	employ service	M0	M2
1987	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1988	0.000	0.000	0.001	-0.001	-0.001	0.000	0.000	0.000	0.000	0.000
1989	0.000	0.000	0.002	-0.004	-0.002	0.000	0.000	0.000	0.000	0.000
1990	0.000	0.000	0.003	-0.003	0.000	-0.001	0.000	0.000	0.001	0.001
1991	0.000	0.001	0.003	-0.001	0.001	-0.002	0.000	0.000	0.002	0.002

Hong Kong

	GDP	consump	invest	export	import	price	employ.	M1	M2
1987	0.013	0.009	0.007	0.002	-0.002	0.008	0.002	0.001	-3.305
1988	-0.655	-1.684	-0.396	0.078	-0.250	-0.420	-0.096	-2.846	-6.430
1989	-1.711	-3.585	-1.777	0.181	-0.532	-1.331	-0.206	-5.015	-7.506
1990	-2.358	-4.416	-3.084	0.299	-0.595	-2.129	-0.347	-5.830	-9.765
1991	-3.157	-5.934	-3.824	0.466	-0.574	-2.900	-0.630	-6.139	-12.797

OECD

	GDP	consump	invest	export	import	price	M0
1987	0.022	0.011	0.000	0.000	0.039	0.002	0.004
1988	0.028	0.013	0.000	-0.009	0.039	0.005	0.009
1989	0.028	0.009	0.000	-0.022	0.035	0.010	0.012
1990	0.036	0.006	0.000	-0.029	0.050	0.017	0.015
1991	0.053	0.006	0.000	-0.040	0.080	0.025	0.018

Notes:
GDP: *real GDP*; consump: *real private consumption*; invest: *real private investment*; export: *total real export*; import: *total real import*;
employ industry: *industrial employment*; employ service: *service sector employment*; employ: *total employment*; Mi (i=0,1,2) : *real Mi*

Table S3 A reduction of 50% of the trade between China and OECD countries

China

	GDP	consump	invest	export	import	price	employ industry	employ service	M0	M2
1987	0.000	0.016	-0.792	0.044	0.000	-0.055	0.000	0.000	0.000	0.088
1988	0.001	-0.167	-0.743	0.050	0.000	0.544	0.001	0.000	0.175	-0.478
1989	-0.046	-0.335	-0.457	0.071	0.000	1.087	-0.016	-0.025	-1.937	-0.940
1990	-0.105	-0.332	0.071	0.084	0.000	1.020	-0.039	-0.060	-1.319	-1.016
1991	-0.158	-0.180	-0.702	0.109	0.000	0.355	-0.058	-0.089	-0.330	-0.583

Hong Kong

	GDP	consump	invest	export	import	price	employ.	M1	M2
1987	-0.021	-0.015	-0.025	-1.324	-1.474	-0.014	-0.005	-0.009	-0.019
1988	-0.120	-0.093	-0.045	-1.474	-1.567	-0.084	-0.021	-0.101	-0.133
1989	-0.136	-0.142	-0.069	-2.115	-2.297	-0.130	-0.020	-0.416	-0.268
1990	-0.209	-0.245	-0.099	-2.777	-2.940	-0.192	-0.037	-0.172	-0.260
1991	-0.288	-0.308	-0.160	-3.493	-3.607	-0.271	-0.061	-0.292	-0.365

OECD

	GDP	consump	invest	export	import	price	M0
1987	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1988	-0.001	0.000	0.000	-0.004	-0.002	0.000	0.000
1989	-0.001	0.000	0.000	-0.006	-0.002	0.000	0.000
1990	-0.001	0.000	0.000	-0.004	-0.001	0.000	0.000
1991	0.000	0.000	0.000	-0.002	0.000	0.000	0.000

Notes:
GDP: *real GDP*; consump: *real private consumption*; invest: *real private investment*; export: *total real export*; import: *total real import*;
employ industry: *industrial employment*; employ service: *service sector employment*; employ: *total employment*; Mi (i=0,1,2) : *real Mi*

Table S4 A transfer all Hong Kong's investment in China to OCED countries

China

	GDP	consump	invest	export	import	price	employ industry	employ service	M0	M2
1987	0.000	0.000	0.008	-0.014	-0.010	0.001	0.000	0.000	0.000	-0.001
1988	0.000	0.022	-0.998	-8.665	-10.978	-0.071	0.000	0.000	-0.002	0.144
1989	0.002	-0.220	1.980	-14.576	-9.881	0.717	0.001	0.001	0.232	-0.830
1990	-0.037	-0.103	5.318	-14.767	-5.590	0.348	-0.014	-0.020	-2.545	-0.247
1991	-0.032	0.651	2.814	-8.932	-1.237	-2.091	-0.013	-0.019	1.767	1.950

Hong Kong

	GDP	consump	invest	export	import	price	employ.	M1	M2
1987	-0.250	-0.181	-0.267	-1.291	-1.426	-0.162	-0.044	-0.064	1.283
1988	-2.098	-4.429	-1.040	-15.251	-17.358	-1.443	-0.308	-0.483	0.585
1989	-2.692	-2.155	-2.407	-12.329	-13.106	-2.476	-0.301	-6.827	-2.744
1990	-1.858	-2.327	-1.529	-13.489	-14.303	-2.270	-0.216	-3.851	-1.930
1991	-1.769	-2.106	-0.965	-14.528	-14.934	-1.973	-0.237	3.700	0.437

OECD

	GDP	consump	invest	export	import	price	M0
1987	0.017	0.008	0.095	-0.002	0.029	0.001	0.003
1988	0.021	0.010	0.120	-0.022	0.026	0.004	0.007
1989	0.018	0.005	0.112	-0.020	0.022	0.008	0.009
1990	0.013	-0.002	0.094	-0.014	0.015	0.011	0.008
1991	0.012	-0.008	0.101	-0.005	0.021	0.014	0.006

Notes:
GDP: *real GDP*; consump: *real private consumption*; invest: *real private investment*;
export: *total real export*; import: *total real import*;
employ industry: *industrial employment*; employ service: *service sector employment*;
employ: *total employment*; Mi (i=0,1,2) : *real Mi*

Table S5 A cut of all Hong Kong's outward processing in China

China

	GDP	consump	invest	export	import	price	employ industry	employ service	M0	M2
1987	0.000	0.118	-4.937	0.110	0.000	-0.391	0.000	0.000	0.000	0.569
1988	0.007	-1.287	-2.213	-2.409	0.000	4.314	0.006	0.003	1.262	-3.913
1989	-0.333	-1.875	-0.771	-5.475	0.000	6.337	-0.120	-0.182	-14.007	-5.306
1990	-0.648	-1.418	-4.329	-4.715	0.000	4.264	-0.242	-0.371	-2.973	-4.538
1991	-0.876	-1.016	-10.429	-0.112	0.000	1.816	-0.325	-0.500	0.802	-3.627

Hong Kong

	GDP	consump	invest	export	import	price	employ.	M1	M2
1987	-3.699	-2.708	-3.840	-10.366	-11.316	-2.413	-0.771	-0.938	-3.322
1988	-6.217	-5.597	-6.502	-11.581	-12.024	-5.218	-1.112	-13.788	-10.472
1989	-8.251	-9.675	-7.704	-11.778	-12.540	-7.593	-1.303	-14.469	-12.921
1990	-9.601	-11.683	-9.122	-13.486	-14.375	-9.275	-1.872	-9.318	-12.758
1991	-10.329	-12.589	-9.826	-12.757	-13.418	-10.213	-2.534	-11.757	-13.509

OECD

	GDP	consump	invest	export	import	price	M0
1987	-0.004	-0.002	0.000	-0.027	-0.011	0.000	-0.001
1988	-0.012	-0.006	-0.002	-0.066	-0.027	-0.002	-0.003
1989	-0.016	-0.007	-0.006	-0.083	-0.031	-0.004	-0.005
1990	-0.015	-0.005	-0.007	-0.074	-0.023	-0.007	-0.007
1991	-0.012	0.000	-0.003	-0.074	-0.020	-0.010	-0.007

Notes:
GDP: *real GDP*; consump: *real private consumption*; invest: *real private investment*;
export: *total real export*; import: *total real import*;
employ industry: *industrial employment*; employ service: *service sector employment*;
employ: *total employment*; Mi (i=0,1,2) : *real Mi*

Table S6 A reduction of fiscal expenditure by 3% of GDP in OECD countries

China

	GDP	consump	invest	export	import	price	employ	employ industry	employ service	M0	M2
1987	0.000	0.000	0.014	-0.024	-0.018	0.001	0.000	0.000	0.000	-0.002	
1988	0.000	0.003	0.009	-0.019	-0.004	-0.010	0.000	0.000	-0.003	0.009	
1989	0.001	0.005	-0.018	0.052	0.051	-0.017	0.000	0.000	0.035	0.016	
1990	0.002	0.003	-0.101	0.145	0.078	-0.010	0.001	0.001	0.016	0.010	
1991	0.002	-0.011	-0.167	0.189	0.066	0.038	0.001	0.001	-0.013	-0.035	

Hong Kong

	GDP	consump	invest	export	import	price	employ.	M1	M2
1987	-1.630	-1.184	-0.918	-0.234	0.296	-1.059	-0.213	-0.136	-1.408
1988	-3.321	-2.862	-2.257	0.991	1.903	-2.706	-0.266	-5.481	-4.945
1989	-4.473	-4.942	-3.481	2.294	3.032	-4.143	-0.219	-7.719	-6.917
1990	-4.837	-5.975	-4.155	4.255	4.710	-4.887	-0.174	-4.636	-6.597
1991	-4.430	-5.791	-4.022	5.861	6.025	-4.789	-0.033	-3.330	-5.722

OECD

	GDP	consump	invest	export	import	price	M0
1987	-2.742	-1.314	0.120	0.022	-4.763	-0.216	-0.531
1988	-2.938	-0.892	-1.600	0.120	-4.038	-0.645	-1.054
1989	-2.453	-0.104	-1.211	0.292	-2.971	-1.148	-1.246
1990	-1.674	-1.385	-0.341	0.508	-2.022	-1.612	-1.059
1991	-0.781	-2.720	-0.736	0.723	-1.199	-1.955	-0.596

Notes:
GDP: *real GDP*; consump: *real private consumption*; invest: *real private investment*;
export: *total real export*; import: *total real import*;
employ industry: *industrial employment*; employ service: *service sector employment*;
employ: *total employment*; Mi (i=0,1,2) : *real Mi*

Table S7 An increase of interest rate by 3% in OECD countries

China

	GDP	consump	invest	export	import	price	employ	employ industry	employ service	M0	M2
1987	0.000	0.000	0.001	-0.002	-0.001	0.000	0.000	0.000	0.000	0.000	
1988	0.000	0.000	0.006	-0.011	-0.007	0.000	0.000	0.000	0.000	0.000	
1989	0.000	0.001	0.009	-0.017	-0.007	-0.004	0.000	0.000	0.001	0.003	
1990	0.000	0.002	0.000	0.008	0.017	-0.008	0.000	0.000	0.012	0.007	
1991	0.001	0.003	-0.046	0.066	0.041	-0.009	0.000	0.000	0.010	0.008	

Hong Kong

	GDP	consump	invest	export	import	price	employ.	M1	M2
1987	-0.111	-0.080	-0.063	-0.019	0.017	-0.072	-0.014	-0.010	-0.096
1988	-0.823	-0.628	-0.501	0.063	0.301	-0.572	-0.077	-0.428	-0.832
1989	-2.177	-1.845	-1.436	0.561	1.125	-1.697	-0.143	-2.806	-2.753
1990	-3.918	-3.756	-2.729	2.157	2.944	-3.333	-0.269	-5.683	-5.276
1991	-6.133	-6.431	-4.556	4.896	5.640	-5.451	-0.511	-7.051	-8.153

OECD

	GDP	consump	invest	export	import	price	M0
1987	-0.191	-0.251	-0.560	0.002	-0.333	-0.015	-0.976
1988	-1.209	-1.669	-3.187	0.016	-2.023	-0.123	-2.536
1989	-2.427	-3.518	-5.660	0.072	-3.724	-0.398	-4.259
1990	-3.543	-5.208	-7.864	0.197	-5.136	-0.873	-5.787
1991	-4.272	-6.306	-9.181	0.403	-5.984	-1.520	-6.860

Notes:
GDP: *real GDP*; consump: *real private consumption*; invest: *real private investment*;
export: *total real export*; import: *total real import*;
employ industry: *industrial employment*; employ service: *service sector employment*;
employ: *total employment*; Mi (i=0,1,2) : *real Mi*

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