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Entrepot trade and fixed exchange rate regimes: the United States–Hong Kong–China trade triangle

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Introduction

Since the outbreak of the currency crisis in Asia in 1997, the Hong Kong dollar (HK\$) has been under severe pressure. The market was expecting Hong Kong to eventually switch from the US\$ zone to the Chinese *renmenbi* (RMB) zone, and, thus, to demolish the US\$–HK\$ peg. Although the speculative attacks were eventually deterred, the crisis has sparked substantial debate in relation to whether the US\$–HK\$ peg is sustainable and beneficial for Hong Kong. One criticism of the prevailing system is that pegging the HK\$ to a strong US\$ will weaken the export competitiveness of Hong Kong. However, the government has pronounced that, because Hong Kong trade is dominated by entrepot trade, the choice of the nominal anchor is irrelevant to export competitiveness.

In the literature of monetary standards, trade is considered a major factor in determining the nominal anchor. A typical proposition being if a small country decides to peg its currency to a foreign currency, it should choose the currency of its largest trading partner, or, if there is no single dominant partner, a basket of the currencies of its major partners. The rationale is, *ceteris paribus*, a more stable exchange rate will enhance trade and investment. Therefore, pegging to the largest trading partner, or to a basket of major partners will maximise benefits. If the small country has a weak capacity to conduct stabilising macroeconomic policies, pegging the domestic currency to a reputed currency also helps strengthen its credibility. However, it can work the opposite way in that, the peg amplifies the spill-over effects of domestic disturbances in the anchor country.

The literature on choices of exchange regimes for small open economies is extremely rich. In most studies direct trade is assumed and indirect trade is ignored. Such an assumption is justifiable for most countries, as indirect trade is usually negligible compared with direct trade. However, the situation is significantly different for Hong Kong. In 1996, the total value of Hong Kong re-exports was about 5.6 times that of direct exports, placing Hong Kong at the top of the world list of re-exporting countries. In terms of value-added, the contribution of re-exports to the gross domestic product (GDP) is about 2.5 times that of direct exports.

The distinct trade structure of Hong Kong adds new aspects to the old topic of the choice of monetary standards. It raises the question of whether entrepot trade affects, and even changes, the choice of the nominal anchors for small open economies under fixed exchange rate regimes. At first glance, there is a fundamental difference between direct trade and entrepot trade in that the former involves only two countries, and therefore a single exchange rate, while the latter involves three countries, and two exchange rates. Unless its trading partners peg their currencies together, the entrepot can not expect to gain the benefits of exchange rate stability on both sides. Involving one more trading partner also creates additional channels for transmitting disturbances across countries, making the choice of the 'optimal' nominal anchor less obvious than in the case of purely

direct trade. Indeed, this paper argues that, trade structure can dramatically change the impacts of exogenous shocks on economies.

Studies of entrepot trade are limited. Hsia (1984), Sung (1988), Soesastro (1992) and Sung (1995) are the few studies of the entrepot trade of Hong Kong and Singapore. Regarding the choice of exchange rate regime for entrepots, Tom (1989) and Tom (1964) are the only two noticeable studies. However, both focused on the situation for Hong Kong before the 1950s.

This paper examines how entrepot trade affects the impacts of exogenous shocks on a small open economy, and, thus, its choice of the nominal anchor, should it decide to adopt a fixed exchange rate regime. The indirect trade between the United States, Hong Kong and China, as well as the controversy between the US\$–HK\$ and RMB–HK\$ pegs are the focus of the paper. In 19?? the RMB was effectively pegged to the US\$ and the capital account of China was still not fully convertible. This paper aims to illustrate the importance of trade structure in the consideration of exchange rate regime. The findings are also applicable to other major trading partners of Hong Kong, such as Japan and the European Union (EU), as well as to China in the near future. In the broader sense, this study is also relevant to those countries importing substantially to export, as well as to those pursuing a similar indirect trade led development strategy as Hong Kong. For example Cyprus, which is a transitional economy, is the second largest entrepot in terms of the ratio of re-exports to direct exports.

The paper is organised as follows. The next section provides some empirical evidence of the indirect trade between the United States, Hong Kong and China, the third outlines a three-country model to examine the issue, the fourth section discusses the results and the last section presents the conclusions.

Indirect trade triangle of the United States–Hong Kong–China

Entrepot trade, or indirect trade, is normally defined as re-exporting imports from one country to others without changing the basic physical contents of the imports. The role of the entrepot is therefore mainly to provide trade-related services for manufacturing countries, such as communication, transportation, financing, insurance, marketing and packaging. Due to the value-added of the entrepot, particularly the marketing and packaging services, consumers may consider re-exports to be distinct goods from the direct exports of manufacturing countries.

There are only a handful of countries that have substantial re-export sectors, compared to their direct export sectors (Table 1). Of the top eight entrepots whose data are available, only the first four countries have ratios larger than 0.1. Moreover, only Hong Kong, Singapore, Cyprus, and the United States show steadily rising trends, with the performance of Hong Kong the most outstanding. In 1996, the gross value of Hong Kong re-exports was about 5.6 times that of direct exports (Figure 1). Since the late 1980s Hong Kong direct exports have stagnated. On the other hand, re-exports started to pick up in the mid-1980s, and quickly outperformed direct exports by the late 1990s, when China was launching open door policies and economic reforms. Nevertheless, in real terms, the growth rate of Hong Kong re-exports has been declining since 1992, while that of direct exports is actually negative (Table 2). The dramatic decline in growth rate may be due to

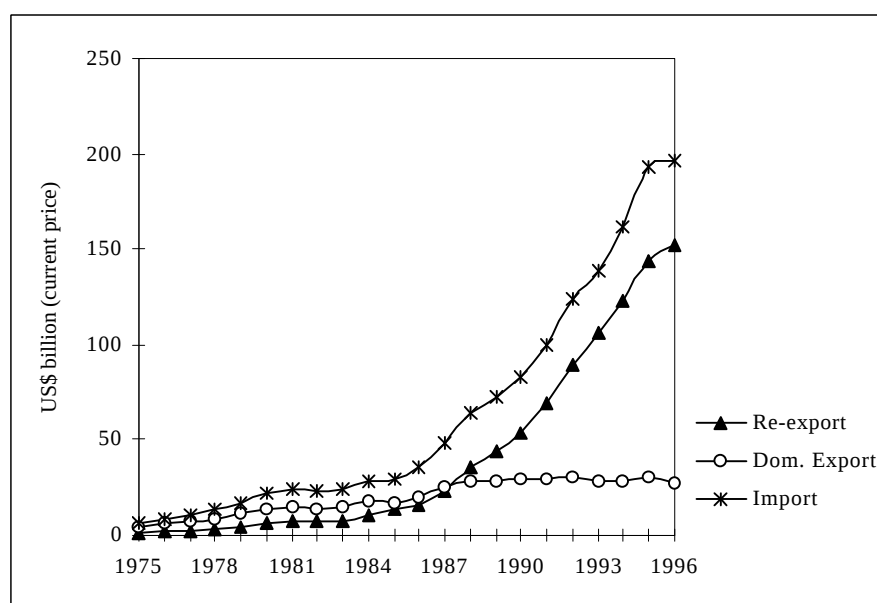
several reasons. First, the unusually high growth in the mid-1980s and early 1990s could be a 'correction' of the long-term suppression of indirect trade between China, Hong Kong and other countries. Thus the low growth rate in the late 1990s is a 'normal' level. In fact, 6 to 7 per cent annual growth rate is very high in international standards. Second, following the deepening of the economic reform, China's exporters may be increasingly able to develop their own direct export networks.

Table 1 The ratio of gross value of re-exports to direct exports, selected countries

	Hong Kong	Cyprus	Singapore	Jordan	USA	Australia	New Zealand	Dominica
1980	0.44	-	0.61	0.40	0.02	0.03	0.04	0.04
1985	0.81	-	0.54	0.20	0.03	0.03	0.03	0.08
1990	1.83	0.66	0.52	0.15	0.05	0.07	0.04	0.04
1991	2.31	0.78	0.54	0.27	0.05	0.07	0.05	0.05
1992	2.95	0.96	0.56	0.25	0.05	0.10	0.04	0.01
1993	3.69	1.09	0.58	0.22	0.06	0.09	0.04	-
1994	4.27	1.17	0.66	0.24	0.06	0.05	0.04	0.02
1995	4.80	1.33	0.70	0.24	0.07	0.06	0.04	0.04
1996	5.59	-	0.71	-	-	-	-	-

Source: *Yearbook of Statistics of Singapore*; International Economic Data Bank, The Australian National University, Canberra.

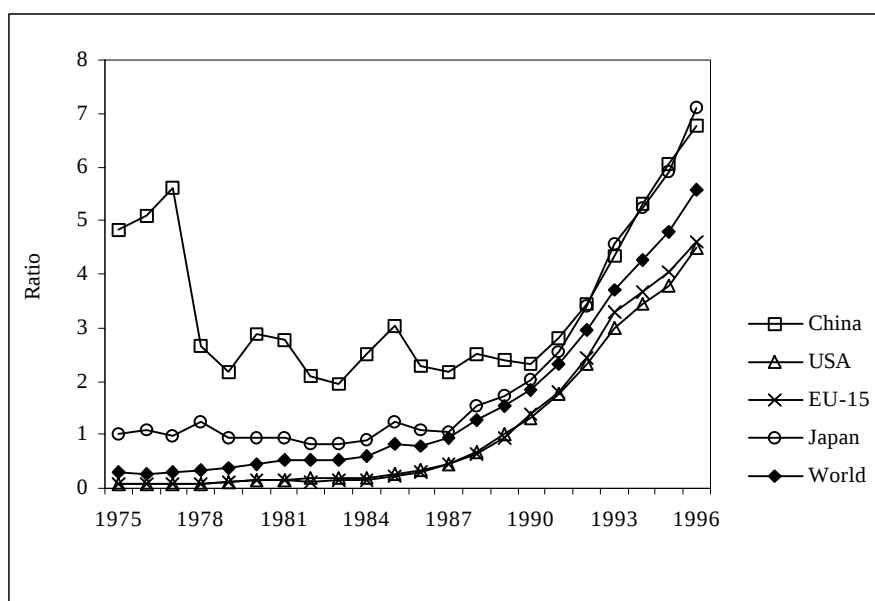
Figure 1 Growth of re-exports, indirect exports and imports of Hong Kong



Note: Figures are in current values.

Source: Hong Kong Census and Statistics Department, website: <http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm>.

Figure 2 Ratio of re-exports to Hong Kong's indirect exports to other countries



Source: Hong Kong Census and Statistics Department, website: <http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm>; for 1980–95, UNCOMTRADE, International Economics and Statistical Data Base, The Australian National University, Canberra.

Table 2 Growth rate of the visible trade of Hong Kong

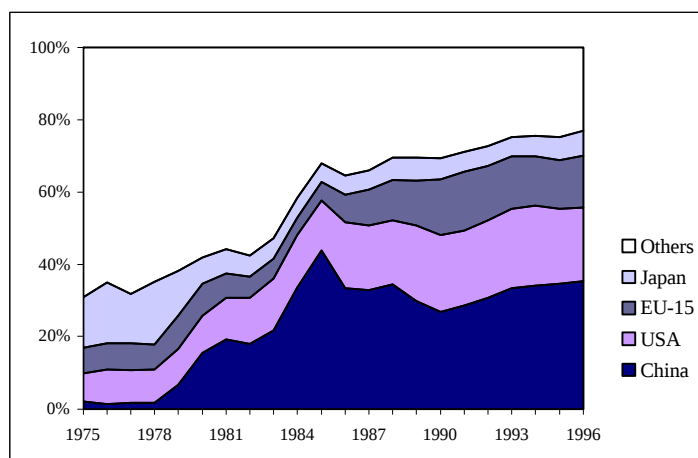
	Domestic exports	Re-exports	Total exports	Imports
1991	0.5	26.6	17.4	19
1992	0.1	28.3	19.8	22.3
1993	-4.5	19.6	13.5	12.8
1994	-2.3	13.8	10.4	14
1995	1.9	14.3	12	13.7
1996	-8.4	7.5	4.8	4.3
1997	2.2	6.8	6.1	7.2
1996 I	-7.4	7.5	4.9	5.2
1996 II	-9	6.5	3.9	2.3
1996 III	-9.8	8	4.9	3.4
1996 V	-7.2	8	5.4	6.5
1997:Q1	-3.9	5.5	4	6.4
1997:Q2	-0.1	7.3	6.1	6.9
1997:Q3	5.9	4.2	4.4	7.1
1997:Q4	5.6	10.3	9.6	8.2
1998: January	-9.3	-1.4	-2.5	-11.3

Note: The figures are annual growth rates, unless specified otherwise, and measured in real terms.
Source: The Financial Services Bureau, the Government of Hong Kong; web site: http://www.info.gov.hk/hkecon/trade_gd/index.htm.

Re-exports are important for Hong Kong not only in terms of gross values, but also in terms of value-added. It was estimated that the value added by Hong Kong in its re-exports is about 12.5–14.4 per cent (Sung 1988).¹ Since Hong Kong virtually does not produce any raw materials, its value-added in the direct exports is far lower than 100 per cent. Sung (1988) estimated that the value-added of Hong Kong in manufacturing goods during the 1977–84 period was only about 30 per cent. Since the gross value of the re-exports of Hong Kong is about 5.6 times that of direct exports, the total value-added of the former is about 250 per cent of the latter.

Trade with China, has been growing in significance relative to other countries, for both direct and indirect exports, and imports from Hong Kong (Figures 3, 4 and 5). The second most important trading partner is the United States, followed by the EU and Japan. Hong Kong's re-exporting has increasingly concentrated on the big four partners. The shares of China in the direct exports and imports of Hong Kong show similar though much less dramatic trends, whereas the total shares of the big four countries have changed only marginally. Figure 6 represents the degree of dependence of China, the United States and the world as a whole, on the entrepot services of Hong Kong. 'China-USA' is the ratio of China's indirect exports via Hong Kong to direct exports to the United States, and so forth. The larger the ratio, the more the manufacturing country relies on Hong Kong for its exports to the destination country. It can be seen that Chinese products make more use of Hong Kong than either United States products or those of the world as a whole. The hump shape of the 'China-USA' curve is due to the fact that since the early 1990s the direct exports of China have grown faster than re-exports. The ratio of 'China-USA' is

Figure 3 Share of Hong Kong's re-exports by destination countries

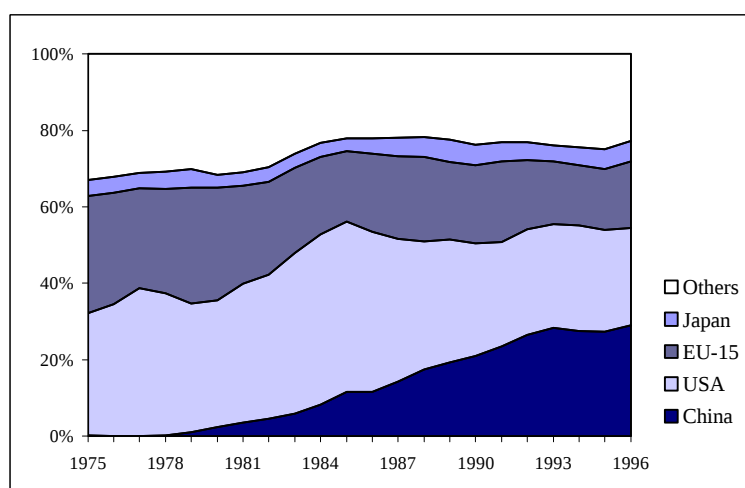


Source: Hong Kong Census and Statistics Department, website: <http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm>; for 1980–95, UNCOMTRADE, International Economics and Statistical Data Base, The Australian National University, Canberra.

much larger than 'China-World', implying that Chinese products make use of Hong Kong as a springboard to the US market more than to elsewhere. Similarly, the United States makes use of Hong Kong as its trading port mainly for the Chinese market.

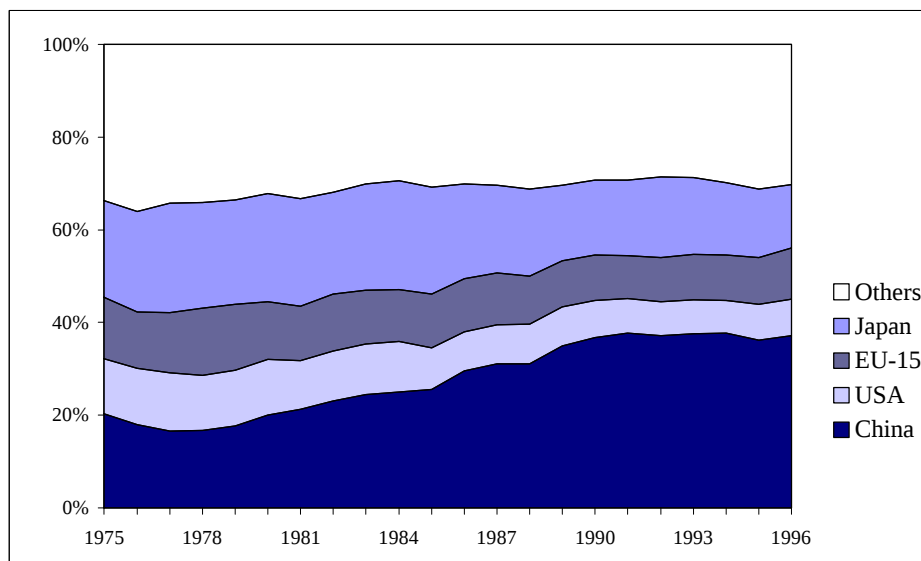
All the empirical evidence indicates that since the early 1980s the significance of entrepot trade for Hong Kong has been increasing dramatically, relative to direct exports. The emerging role of Hong Kong as an entrepot is a result of the opening up of the Chinese economy and the division of labour between the two economies. As an entrepot, Hong Kong facilitates trade between the United States and China more than between other countries. Combining the data represented in Table 1 and Figures 3 to 6, it can be inferred that, the United States–Hong Kong–China triangle constitutes one of the largest indirect trade blocs in the world.

Figure 4 Share of Hong Kong's direct exports by destination countries



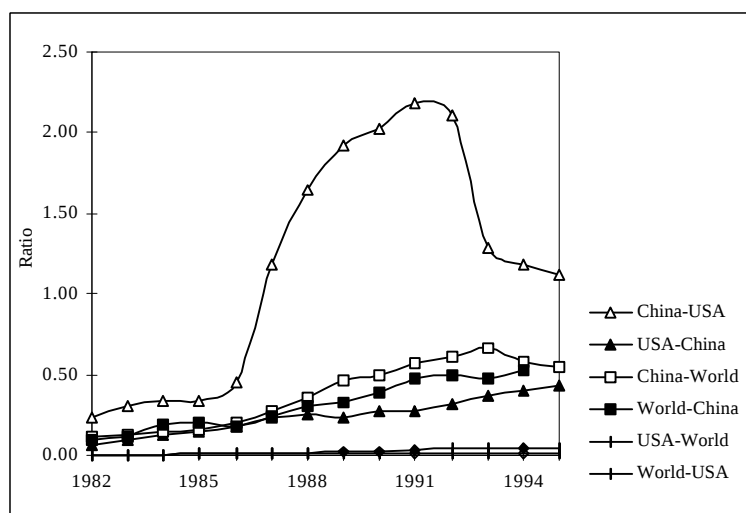
Source: Hong Kong Census and Statistics Department, website: <http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm>; for 1980–95, UNCOMTRADE, International Economics and Statistical Data Base, The Australian National University, Canberra.

Figure 5 Share of Hong Kong's imports by source countries



Source: Hong Kong Census and Statistics Department, website: <http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm>; for 1980–95, UNCOMTRADE, International Economics and Statistical Data Base, The Australian National University, Canberra.

Figure 6 Ratio of indirect exports to re-exports via Hong Kong (source country to destination country)



Source: Hong Kong Census and Statistics Department, website: <http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm>; for 1980–95, UNCOMTRADE, International Economics and Statistical Data Base, The Australian National University, Canberra.

Three-country indirect trade model

The models in the literature of exchange rate regimes mostly fall into two categories. The first is a two-country model, such as the classic Dornbusch (1976) model, and the second one is a multicountry model, such as the Multimod, MSG2 and MX3 models of Gagnon, Masson et al. (1996). Two-country models restrict the choice of exchange rate regime for a small country between either a globally fixed or a globally floating regime. Under such 'all or nothing terms,' a fixed regime will internalise all the disturbances from the big country (Kenen 1984). On the other hand, the complexity of multicountry models makes them less appealing for theoretical studies. This paper uses a three-country model as a balance between the two extremes. Three-country models are not popular in the literature, possibly because they still are quite complex, and, it is common to impose some simplifying assumptions onto them. For example, Sedio (1971) used a partial equilibrium three-country model to examine the balance-of-payments for Canada. Lane (1990) assumed purchasing power parity in his study of strategic issues of exchange rate arrangements. As pointed out by Kenen (1984), imposing purchasing power parity onto the model precludes the effects of real exchange rate variations. Another common simplifying assumption is that one country is small, so that the movements of the two big countries are independent of the former, examples include Argy, McKibbin et al. (1989) and Son (1987). The model of Son (1987) has a feature that the small country imports intermediate goods for its production from the two big countries. It is somewhat similar to entrepot trade in the sense that the output of the small country relies on the outputs of the other countries. But it does not allow exports with and without intermediates to exist parallel with each other. Therefore, it is not quite suitable for examining the interaction between trade structures and exchange rate regimes.²

The model of this paper is based on Argy, McKibbin et al. (1989) which is a precise refinement of Marston (1984). The model is a static, three-country indirect trade model. It consists of two big countries B and C , and one small entrepot A . There are three markets in each country: goods, money, and labour. However, since this paper focuses only on the short-run scenario, the labour market is omitted. Because, as will be seen soon, in this model, trade structures have effects on the results when there are real exchange rate movements. A plausible and simple way to introduce such movements is to fix the prices, such that purchasing power parity does not hold. Supply shocks also can induce real exchange rate movements in the long run. Nevertheless, trade structures tend to have either no effect or ambiguous effects on the results under supply shocks. As a result, the modeling exercise emphasises demand shocks. Countries are linked by trade and capital flows, domestic agents hold only foreign bonds but no foreign currencies. Capital is assumed to be perfectly mobile internationally, so the real interest rates are equalised across all the countries by arbitrage. Every country produces one distinct good, for all the purposes of domestic consumption, direct exports and indirect exports. There are eight routes of trade: six routes of direct trade between the three countries and two routes of indirect trade between B and C via A . The notations of the model are listed in Appendix Table A1.

Note that nominal exchange rates are defined such that if e_b^a increases, $A\$$ is appreciating against $B\$$. θ_i are the trade structure parameters. If θ_i increases, the exports of A to B are increasingly dominated by the direct exports, and so forth. Indirect exports

are composed of the outputs of both the manufacturing country and the entrepot. For example, if θ_5 increases, the value-added of A increases relative to that of C in their indirect exports to B . In this model, θ_j are exogenously determined. In a more 'completed' model, θ_j can be determined by endowments, subsidy and taxes and so forth.

Goods market

The aggregate demand equations are derived from a simple utility maximisation process. For example, the utility maximisation problem confronted by a representative agent i in A is given by

$$\max U_i^a (C_i^a, C_i^b, C_i^c) = (C_i^a)^{\sigma_1} (C_i^b)^{\sigma_2} (C_i^c)^{\sigma_3} \text{ subject to} \quad (1)$$

$$s_i P^a Y_i^a = P^a C_i^a + P^b e_b^a C_i^b + P^c e_c^a C_i^c$$

where C_i^a , C_i^b and C_i^c are the consumption of the domestic products, the imported goods from B and C respectively; $\sigma_1 + \sigma_2 + \sigma_3 < 1$; and s_i is the saving rate. The utility functions are assumed to be a Cobb-Douglas function. Labour supply is not incorporated into the consumption decision-making process as wage is fixed in the short run.

The maximisation problem confronted by a representative agent j in B is given by

$$\max U_j^b (C_j^b, C_j^c, C_j^{ac}) = (C_j^b)^{\sigma_4} (C_j^c)^{\sigma_5} (C_j^a)^{\sigma_6} \text{ subject to} \quad (2)$$

$$s_j P^b Y_j^b = P^b C_j^b + P^c e_c^b C_j^c + [(1-\theta_5)(P^c e_c^b) + \theta_5(P^a e_a^b)] C_j^{ac}.$$

The expression for the agent in B is different from that in A . First, as B and C are big countries, following Argy, McKibbin et al. (1989), the direct exports of A are assumed to be negligible in the consumption of the agent in B . Second, besides the domestic outputs and the direct exports from C , the agent also consumes the indirect exports from C . The price of the indirect exports is the sum of the prices of the manufacturing output and the trading services respectively, weighted by their shares of value-added in the indirect exports.

Solving all the problems, obtains the individual demand equations which can be aggregated and transformed into linear logarithm forms for small changes

$$y_d^a = \Omega y^a - \lambda r^a + \mu^a + \kappa_1 [\Omega y^b - \eta(p^a - e_b^a - p^b)] + \kappa_2 [\Omega y^c - \eta(p^a - e_c^a - p^c)] \quad (3)$$

$$+ (1-\kappa_1) \{ \Omega y^b + \eta[(1-\theta_6)(p^b - e_c^b - p^c) - \theta_6(p^a - e_b^a - p^b)] \}$$

$$+ (1-\kappa_2) \{ \Omega y^c - \eta[(1-\theta_5)(p^b - e_c^b - p^c) + \theta_5(p^a - e_c^a - p^c)] \}$$

$$y_d^b = \Omega y^b - \lambda r^b + \mu^b + \kappa_3 [\Omega y^c - \eta(p^b - e_c^b - p^c)] \quad (4)$$

$$+ (1-\kappa_3)\{\Omega y^c - \eta [(1-\theta_5)(p^b - e_c^b - p^c) + \theta_5(p^a - e_c^a - p^c)]\}$$

$$y_d^c = \Omega y^c - \lambda_1 r + \mu^c + \kappa_4[\Omega y^b + \eta(p^b - e_c^b - p^c)] \quad (5)$$

$$+ (1-\kappa_4)\{\Omega y^b + \eta[(1-\theta_6)(p^b - e_c^b - p^c) - \theta_6(p^a - e_b^a - p^b)]\}.$$

For simplicity, the income elasticities of all countries are set to be the same, and so are the price and interest elasticities respectively. All the items weighted by $(1-\kappa_i)$ are indirect export items, that is, the last two terms in equation (3) are the re-exports of A to B and C respectively. All the items weighted by κ_i are direct export items. $\kappa_1[\Omega y^b - \eta(p^a - e_b^a - p^b)]$ is the direct export of A to B . κ_i are constructed in such a way to guarantee that, all the countries are trading with each other for any values of θ_i within the range of $[0, 1]$. For instance, if the size of the indirect export sector of B contracts, its direct export sector expands correspondingly. The value-added of direct exports is assumed to be 100 per cent. This setting is indeed to maintain a constant base for the export sector of each country and essential when comparing the outcomes under different trade structures. Due to the Cobb-Douglas utility functions, there is no price substitution between the direct and indirect exports from the same manufacturing country. It implies that once the goods pass through the entrepot, they are viewed as different products by consumers. This can be considered as a result of the packaging and marketing services of the entrepot. It should be noted that, when real exchange rates are constant, changing the trade structures, (θ_i) , has no effects on the aggregate demands. It thus gives real exchange rate a key role in driving the model.

Proportional marking

Up to now it has been assumed that the entrepot marks the price of its trade services according to the domestic production cost. However, this is not necessarily the case. For example, in the case of financial and insurance services, the entrepot is likely to mark the price (partially) according to the value of the imported goods. That is, for the items of re-exports, p^a becomes $\tau_1(p^b + e_b^a)$ if the imports are from B , and $\tau_2(p^c + e_c^a)$ if from C , τ_1 and τ_2 are within $(0, \infty)$. Suppose τ_1 and τ_2 are equal to 1, then equations 3–5 become

$$y_d^a = \Omega_1 y^a - \lambda_1 r + \mu^a + \Omega(y^b + y^c) \quad (3a)$$

$$- \kappa_1 \eta(p^a - e_b^a - p^b) - \kappa_2 \eta(p^a - e_c^a - p^c) + (\kappa_2 - \kappa_1) \eta(p^b - e_c^a - p^c)$$

$$y_d^b = \Omega_4 y^b - \lambda_2 r + \mu^b + \Omega y^c - \eta(p^b - e_c^b - p^c) \quad (4a)$$

$$y_d^c = \Omega_6 y^c - \lambda_3 r + \mu^c + \Omega y^b + \eta(p^b - e_c^b - p^c) \quad (5a)$$

The indirect export items in equation 3 now reduce into $(\kappa_2 - \kappa_1) \eta(p^b - e_c^a - p^c)$, and those in equation 4 and 5 cease to exist. The exchange rate of the entrepot has no role in determining the re-exports, because proportional marking eliminates the rigidity in real

exchange rates due to the exchange rate fluctuations of the domestic currency. If $\kappa_1 \equiv \kappa_2$, then indirect exports are sheltered from the fluctuations of all the nominal exchange rates, because the impacts on the re-exports to *B* and *C*, respectively, cancel each other. In the case of marketing, the services of the entrepot could be (partially) priced according to the domestic production cost of the destination country. It can be easily shown that, under this circumstance, the exchange rate of *A*, again, has on effects on its re-exports. More importantly, the finding is independent of the model structure or elasticities.

The policy implications of proportional marking is twofold. On the one hand, the role of the exchange rate regime of the entrepot in determining its re-exports is significantly curtailed by proportional marking. On the other, if the entrepot adopts proportional marking, it will be less vulnerable to exchange rate fluctuations than if it conducts only direct trade. As a consequence, the model assumes that the entrepot marks the price of its trading services according to the domestic production cost.

Assuming goods marking clear, and using composite parameters, equations 3–5 can be rewritten as

$$y^a = -\alpha_1 r + \alpha_2 \mu^a + \alpha_3 (y^b + y^c) - \alpha_4 (p^a - e_b^a - p^b) - \alpha_5 (p^b - e_c^b - p^c) \quad (3b)$$

$$y^b = -\alpha_1 r + \alpha_2 \mu^b + \alpha_3 y^c - \beta_4 (p^a - e_b^a - p^b) - \beta_5 (p^b - e_c^b - p^c) \quad (4b)$$

$$y^c = -\alpha_1 r + \alpha_2 \mu^c + \alpha_3 y^b - \epsilon_4 (p^a - e_b^a - p^b) + \epsilon_5 (p^b - e_c^b - p^c) \quad (5b)$$

Money market

Money markets are of standard specifications, including continuous market clearing

$$m^a = y^a - \phi r + p^a + \pi^a \quad (6)$$

$$m^b = y^b - \phi r + p^b + \pi^b \quad (7)$$

$$m^c = y^c - \phi r + p^c + \pi^c \quad (8)$$

To simplify the model, income elasticities of money demand are set to one. It implies the velocities of money are constant. Moreover, domestic output prices rather than CPIs are used in the money demand functions.

Analytical results

There are several combinations of exchange rate regimes between the three countries. For the purpose of this study, the most relevant case is that *B*\$ and *C*\$ are floating and *A*\$ is pegged to either one of them. We take this as the primary case, in order to assess how trade structures affect the choice of the nominal anchor if the entrepot decides to adopt a

fixed exchange rate regime. If B\$ and C\$ are pegged together, then pegging A\$ to either one of them will be equivalent.

The results for the primary case are summarised in Table 4. Results of other regimes will be briefly explained at the end of the section. In Table 4, 'X' denotes the impact of the corresponding shock on the output of the entrepot, that is, X is equal to $dy^a/d\mu^a$ for the first column, and ' $dX/d\theta_i$ ' denotes the influence of the trade structure parameter on the impact. The last four rows are the estimations of the opportunity costs of pegging A\$ to C\$ and to B\$, respectively. 'V' stands for the variance of the difference of dy^a between the two regimes. A question mark indicates that the sign of the result is ambiguous; a bracket indicates that the sign of the result is very likely but not absolutely necessarily the one in the bracket.

Table 4 Impacts of exogenous shocks on the output of the entrepot, and the influence of trade structures on the impacts

Regime	μ^a	μ^b	μ^c	π^a	π^b	π^c
A\$ pegs to B\$	+	?	(+)	0	(-)	?
$dX/d\theta_1$	0	-	+	0	-	+
$dX/d\theta_4$	0	(+)	(-)	0	(+)	(-)
$dX/d\theta_6$	0	?	?	0	?	?
A\$ pegs to C\$	+	(+)	?	0	?	(-)
$dX/d\theta_2$	0	+	-	0	+	-
$dX/d\theta_3$	0	(-)	(+)	0	(-)	(+)
$dX/d\theta_5$	0	?	?	0	?	?
peg to C\$ – peg to B\$	0	(+)	(-)	0	(+)	(-)
$dV/d\theta_1$ and/or $dV/d\theta_2$	0	+	+	0	+	+
$dV/d\theta_4$ and/or $dV/d\theta_3$	0	(-)	(-)	0	(-)	(-)
$dV/d\theta_5$ and/or $dV/d\theta_6$	0	?	?	0	?	?

Note: $X = dy^a/d(\text{shock})$; V = the variance of the difference of dy^a between pegging A\$ to B\$ and to C\$ respectively; a question mark indicates that the sign of result is ambiguous; a bracket indicates that the sign is very likely but not absolutely necessarily the one in the bracket.

Note that when A\$ is pegged to B\$, θ_2 , θ_3 , and θ_5 have no effects on the impacts of shocks, neither do θ_1 , θ_4 , and θ_6 when A\$ is pegged to C\$. θ_1 , θ_4 , and θ_6 determine the trade structures between A and B, while θ_2 , θ_3 , and θ_5 determine that between A and C. When A\$ is pegged to B\$, the exchange rates of A\$ and B\$ versus C\$ move at the same proportion. Therefore, the prices of the direct exports and re-exports of A to C also move at the same proportion, that is why the relative size of the two export items is irrelevant.

The results of the two fixed exchange rate regimes are like mirror images. This is because the elasticities of all the countries are the same, so that a shock from B under the currency area of B\$ is equivalent to a shock from C under the currency area of C\$, and so forth. Therefore, the following discusses the detailed results of the currency area of B\$ only. Furthermore, Table 4 only reports the results of expansionary real demand shocks and contractionary nominal shocks. The results of contractionary real demand and expansionary nominal shocks are the reverse of their counterparts.

Domestic shock of A

A nominal shock from A itself, π^a , has no impact on its outputs, as A\$ is pegged to B\$. The impact of a real shocks from A itself, $dy^a/d\mu^a = (1-\Omega_1)^{-1}$, is a typical short-run result for small countries in the Mundell-Fleming model. The result is independent of the choice of the nominal anchor as well as the trade structures, as all $dX/d\theta_i$ are equal to zero. This is because the shocks from the small country do not affect the exchange rate between the two big countries. Whereas A\$ is pegged either to B\$ or to C\$, so the exchange rate of A is also fixed. Additionally, in the short-run, prices are rigid. Therefore, there are no real exchange rate movements at all. Since the effects of the changes of trade structures come from real exchange rate movements, in this case the trade structures have no effects on the results.

Expansionary real demand shock from B

$$dy^a/d\mu^b = \alpha_2(\alpha_6 \varepsilon_5 - \alpha_5)(\varepsilon_5 + \beta_5)^{-1} \quad (9)$$

where $\alpha_6 = (2\Omega\phi - \lambda)[\phi - (2\Omega\phi - \lambda)]^{-1}$.

Strictly speaking, the sign of $dy^a/d\mu^b$ is ambiguous. On the one side, the larger incomes in B and C cause a higher demand for the direct exports of A. Offsetting this is a higher world interest rate. Regarding the entrepot trade, the appreciation of B\$ and A\$ against C\$ raises the indirect exports of C to B, but reduces those in the opposite direction. Overall, $dy^a/d\mu^b$ is likely to be positive. It, in turn, requires α_6 , and in this case $\alpha_6 \varepsilon_5 - \alpha_5$, to be positive. The condition on α_6 is assumed to hold for the rest of the paper.

To examine how the trade structures affect the results, $dy^a/d\mu^b$ are differentiated with respect to the trade structure parameters. Let $X_1 = dy^a/d\mu^b$

$$dX_1/d\theta_1 = -\alpha_2(1-\theta_6)(d\kappa_1/d\theta_1)(2 + \kappa_4\theta_6 - \theta_6)^{-1} < 0 \quad (9a)$$

$$dX_1/d\theta_4 = \alpha_2[\alpha_6\theta_6 + \theta_6(\kappa_1 + \theta_6 - \kappa_1\theta_6)](d\kappa_4/d\theta_4)(2 + \kappa_4\theta_6 - \theta_6)^{-2} > 0 \quad (9b)$$

$$dX_1/d\theta_6 = \alpha_2\{\alpha_6[\theta_6(d\kappa_4/d\theta_6) + \kappa_4 - 1] - (2 + \kappa_4\theta_6 - \theta_6)(1-\theta_6)(d\kappa_1/d\theta_6) + \theta_6(\kappa_1 + \theta_6 - \kappa_1\theta_6)(d\kappa_4/d\theta_6) - 2 + \kappa_1(1+\kappa_4)\}(2 + \kappa_4\theta_6 - \theta_6)^{-2} > < 0. \quad (9c)$$

where $d\kappa_1/d\theta_1 = \theta_6[\theta_1 + (1-\theta_1)\theta_6]^{-2} > 0$ $d\kappa_4/d\theta_4 = (1-\theta_5)[1 - \theta_6(1-\theta_4)]^{-2} > 0$

$$d\kappa_1/d\theta_6 = -\theta_1(1-\theta_1)[\theta_1 + \theta_6(1-\theta_1)]^{-2} < 0 \quad d\kappa_4/d\theta_6 = \theta_4(1-\theta_4)[1 - \theta_6(1-\theta_4)]^{-2} > 0$$

$dX_1/d\theta_1$ is negative, implying that an increase in the share of gross output of the direct exports in the total exports of A to B unambiguously dampens the impact of the real shock on its output. As B\$ appreciates against C\$, the demand of B for the exports of C increases, leading to a higher demand for the trade services of A. If the re-exports to B

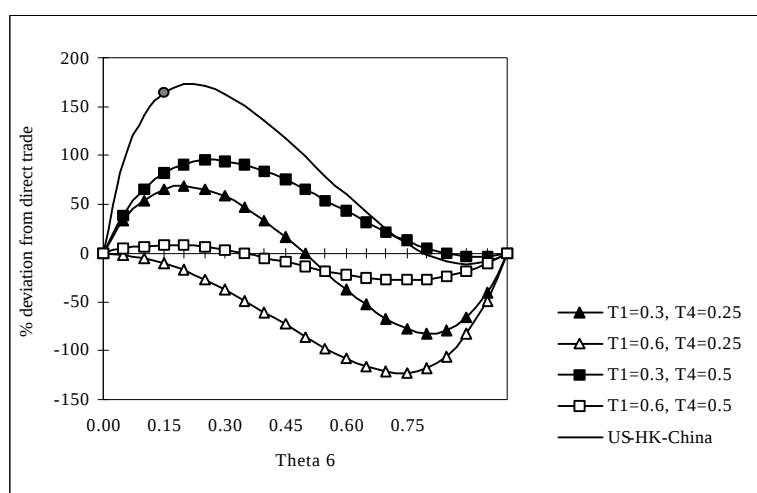
make up a smaller proportion in the total exports of A to B , the pressure on the trade service of A will be correspondingly lower.

Second, $dX_1/d\theta_4$ is positive, meaning that an increase in the share of gross output of the direct exports in the total exports of C to B will amplify the impact on A . At first glance this appears to contradict the previous result in the sense that, a larger share of direct trade of C should lower the demand for the trade services of A . The positive result is due to the income effects of C . Since the price of the indirect exports of C are composed of the output prices of A and C , the impact of the appreciation of $B\$$ on the indirect exports of C is less than on its direct exports. Therefore, the larger the share of direct exports in the total exports of C to B , the larger the rise of income in C which, in turn, increases the demand of C itself for the exports of A .

Third, the sign of $dX_1/d\theta_6$ is ambiguous. This is because, on the one side, the larger the value-added of A in its re-exports to B , the smaller the impact of the appreciation of $B\$$ on the re-exports, as the impact is diluted by the appreciation of the value-added of A . It thus lowers the output of A . On the other side, a larger share of value-added raises the demand for the output of A in every unit of the re-exports. Therefore the overall result is ambiguous.

Figure 7 provides a graphical illustration of equations 9a–9c. The figure is a plot of the percentage deviation of X_1 from the benchmark case of purely direct trade. In this figure, the value of α_6 is set to 1.2 which gives $dy^a/d\mu^b$ a positive sign. The four curves are corresponding to different values of θ_1 and θ_4 ; T_1 and T_4 stand for θ_1 and θ_4 respectively.

Figure 7 Change of the impacts of expansionary real demand shock from B on the output of A with trade structures



Note: 'T1' stands for Theta 1; 'T4' stands for Theta 4. Alpha 30 = 1.2.

At the two ends of the curves, θ_6 is equal to 0 and 1, respectively, which are virtually the benchmark case. When θ_1 is small, changes of θ_6 have much larger effects on X_1 , as changes of the re-exports have greater significance on total exports. As θ_6 goes up, the

movements of the curves are not definite, and depend on the value of the two other trade structure parameters, reconfirming the earlier discussion.

In the lowest curve United States–Hong Kong–China, the figures used are very close to the average values of their trade structure parameters, namely θ_1 is equal to 0.15, θ_4 equal to 0.4, and the circular point is corresponding to that θ_6 is equal to 0.15. It can be seen that, at the circular point, the impact is amplified by over 150 per cent! This reveals that the trade structure of Hong Kong is quite ineffective in sheltering its output from the real demand shocks from the anchor country. Obviously, this finding is sensitive to the actual values of various elasticities, as well as to the accuracy of the model in representing the economies. Nevertheless, it demonstrates how sensitive the outcome can be with respect to the trade structures.

Expansionary real demand shock from C

$$dy^a/d\mu^c = X_2 = \alpha_2 (\alpha_6 \beta_5 + \alpha_5) (\epsilon_5 + \beta_5)^{-1} \quad (10)$$

$$dX_2/d\theta_1 = (1-\theta_6)(d\kappa_1/d\theta_1)[(1-\Omega)(2+\kappa_4\theta_6-\theta_6)]^{-1} > 0 \quad (10a)$$

$$dX_2/d\theta_4 = -\alpha_2\theta_6(d\kappa_4/d\theta_4)[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](2+\kappa_4\theta_6-\theta_6)^{-2} < 0 \quad (10b)$$

$$dX_2/d\theta_6 = -\alpha_2 \{ \alpha_6 [\theta_6 (d\kappa_4/d\theta_6) + 2\theta_6 - 1] - (2 + \kappa_4\theta_6 - \theta_6) (1-\theta_6)(d\kappa_1/d\theta_6) \} \quad (10c)$$

$$+ \theta_6 [\theta_6 + \kappa_1(1 - \theta_6)](d\kappa_4/d\theta_6) - 2 + \kappa_1(1 + \kappa_4) \} (2 + \kappa_4\theta_6 - \theta_6)^{-2} > < 0.$$

The value of $dy^a/d\mu^c$ is unambiguously larger than $dy^a/d\mu^b$ by $2\alpha_2\alpha_5(\epsilon_5 + \beta_5)$. This is because as A\$ is pegged to B\$, an expansionary real demand shock from C will incur depreciating pressure on A\$. So both the income and substitution effects work in the same direction to raise the output of A.

The signs of the derivatives of $dy^a/d\mu^c$ are just the opposite of $dy^a/d\mu^b$. Indeed, the explanations are just the reverse of $dy^a/d\mu^b$. Since now C\$ appreciates against B\$ and A\$, reducing the relative size of re-exports in the total exports of A to B can lessen the negative effects of the appreciation of C\$ on the total exports. As a result, $dX_2/d\theta_1$ is positive. $dX_2/d\theta_4$ is negative, because the exports and thus the income of C are lowered by a stronger C\$. Therefore increasing the share of the direct exports of C to B will amplify the negative income effects of C on A. Third, since A\$ is pegged to B\$, the larger the share of value-added of A, the smaller the change of the relative price between the indirect exports to and the domestic goods of B. On the other side, a larger share of valued-added will increase the demand for the output of A. So overall, the sign of $dX_2/d\theta_6$ is ambiguous.

Contractionary nominal shock from *B*

$$dy^a/d\pi^b = X_3 = [\alpha_6(\varepsilon_5 - \alpha_3\beta_5) - (\varepsilon_5 + \beta_5)\alpha_3 - (1+\alpha_3)\alpha_5](\varepsilon_5 + \beta_5)^{-1} \quad (11)$$

$$dX_3/d\theta_1 = -(1 + \alpha_3)(1-\theta_6)(2 + \kappa_4\theta_6 - \theta_6)^{-1}(d\kappa_1/d\theta_1) < 0 \quad (11a)$$

$$dX_3/d\theta_4 = \theta_6(1 + \alpha_3)[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](2 + \kappa_4\theta_6 - \theta_6)^{-2} \\ (d\kappa_4/d\theta_4) > 0 \quad (11b)$$

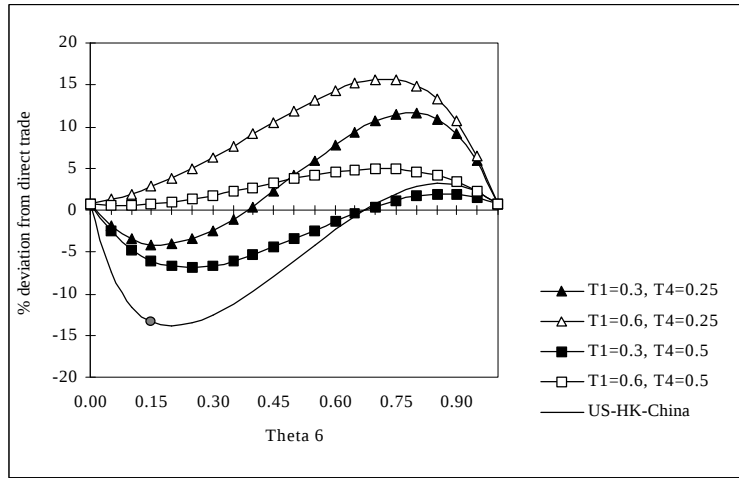
$$dX_3/d\theta_6 = (\alpha_6+1)\alpha_3[(d\kappa_4/d\theta_6)\theta_6+\theta_6-1] \quad (11c)$$

$$+ (\alpha_6-\alpha_3)[\theta_6(d\kappa_4/d\theta_6)+\kappa_4(2+\kappa_4\theta_6-\theta_6)-1-\theta_6(1+\kappa_4\theta_6-\theta_6)] \\ - (1+\alpha_3)\{[(d\kappa_1/d\theta_6)(1-\theta_6)+1-\kappa_1](1+\kappa_4\theta_6-\theta_6) - \\ [\kappa_1+(1-\kappa_1)\theta_6][\theta_6(d\kappa_4/d\theta_6)+\theta_6-1] \} > < 0.$$

Strictly speaking the sign of $dy^a/d\pi^b$ is ambiguous. On the one hand, the exports of *A* and *B* to *C* are suppressed by the appreciation of their currencies. Along with this is a higher world interest rate. On the other hand, a higher income in *C* increases the demand for the exports of *A*. Overall $dy^a/d\pi^b$ is likely to be negative. The signs of the derivatives are the same as $dy^a/d\mu^b$. This is because, for both the expansionary real demand shock and contractionary nominal shock, *B*\$ and *A*\$ appreciate against *C*\$. So, the directions of the movements of real exchange rates, and hence the signs of the derivatives, are also the same. However, it does not mean that the effects of trade structures on the impacts are the same in both cases. This is because the value of $dy^a/d\pi^b$ is likely to be negative, so a positive derivative actually implies that the impact of the nominal shock is attenuated rather than amplified.

Figure 8 provides a graphical illustration of equations 11a–11c. The changes of the trade parameters are the same as Figure 6. Setting α_6 to be 1.2 gives $dy^a/d\pi^b$ a negative sign. Therefore, a larger value of θ_1 amplifies the impact, shifting the curves upward; whereas a higher value of θ_4 attenuates the impact, shifting the curves downward. Again, the effects of changes in θ_6 are ambiguous. In contrast to the case of real demand shock, the trade structure of the United States–Hong Kong–China is actually effective in sheltering the output of Hong Kong from the nominal shocks from the anchor country, even if the percentage change is much smaller than the former.

Figure 8 Change of the impacts of contractionary nominal shock from B on the output of A with trade structures



Note: 'T1' stands for Theta 1; 'T4' stands for Theta 4. Alpha 30 = 1.2.

Contractionary nominal shock from C

$$dy^a/d\pi^c = X_4 = [\alpha_6(\beta_5 - \alpha_3 \varepsilon_5) - (\varepsilon_5 + \beta_5)\alpha_3 + (1+\alpha_3)\alpha_5](\varepsilon_5 + \beta_5)^{-1} \quad (12)$$

$$dX_4/d\theta_1 = (1 + \alpha_3)(1-\theta_6)(2 + \kappa_4\theta_6 - \theta_6)^{-1} (d\kappa_1/d\theta_1) > 0 \quad (12a)$$

$$dX_4/d\theta_4 = -\theta_6(1 + \alpha_3)[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](2 + \kappa_4\theta_6 - \theta_6)^{-2} (d\kappa_4/d\theta_4) < 0 \quad (12b)$$

$$dX_4/d\theta_6 = (\alpha_6+1)\alpha_3[(d\kappa_4/d\theta_6)\theta_6+\theta_6-1] \quad (12c)$$

$$+ (\alpha_6-\alpha_3)[\theta_6(d\kappa_4/d\theta_6)+\kappa_4(2+\kappa_4\theta_6-\theta_6)-1-\theta_6(1+\kappa_4\theta_6-\theta_6)]$$

$$+ (1+\alpha_3)\{[(d\kappa_1/d\theta_6)(1-\theta_6)+1-\kappa_1](1+\kappa_4\theta_6-\theta_6) -$$

$$[\kappa_1+(1-\kappa_1)\theta_6][\theta_6(d\kappa_4/d\theta_6)+\theta_6-1] \} > 0.$$

Similarly to the case between $dy^a/d\mu^b$ and $dy^a/d\mu^c$, the value of $dy^a/d\pi^c$ is unambiguously larger than $dy^a/d\pi^b$ by $2\alpha_5(1+\alpha_3)(\varepsilon_5 + \beta_5)^{-1}$. This is because the substitution effect on A is stronger when C\$ appreciates than when its anchor currency B\$ appreciates. Again, the signs of the derivatives of $dy^a/d\pi^c$ are the same as those of $dy^a/d\mu^c$, but since the signs of $dy^a/d\pi^c$ and $dy^a/d\mu^c$ themselves are likely to be opposite, the trade structures have opposite effects on the impacts in the two cases.

Opportunity cost of choosing the nominal anchor

The last few subsections examine the net cost for A to peg its currency to a foreign currency under various shocks. Nevertheless, in terms of choosing the nominal anchor, it is the opportunity cost rather than the net cost that matters. The variances of the differences of the impacts between the two fixed exchange rate regimes are used as estimations of the opportunity cost. For a real shock from B , the variance of the difference between the two regimes is given as follows.

$$\begin{aligned}
 V_1 &= \text{Var} [(dy^a/d\mu^b)_{C\$} - (dy^a/d\mu^b)_{B\$}] \\
 (13) \\
 &= \alpha_2^{-2} \{ \alpha_6 [(2 + \kappa_3 \theta_5 - \theta_5)^{-1} - (1 + \kappa_4 \theta_6 - \theta_6)(2 + \kappa_4 \theta_6 - \theta_6)^{-1}] \\
 &\quad + [(\kappa_1 + \theta_6 - \kappa_1 \theta_6)(2 + \kappa_4 \theta_6 - \theta_6)^{-1} + (\kappa_2 + \theta_5 - \kappa_2 \theta_5)(2 + \kappa_3 \theta_5 - \theta_5)^{-1}] \}^2. \\
 dV_1/d\theta_1 &> 0 \quad dV_1/d\theta_3 < 0 \quad dV_1/d\theta_5 >> 0 \\
 dV_1/d\theta_2 &> 0 \quad dV_1/d\theta_4 < 0 \quad dV_1/d\theta_6 >> 0
 \end{aligned}$$

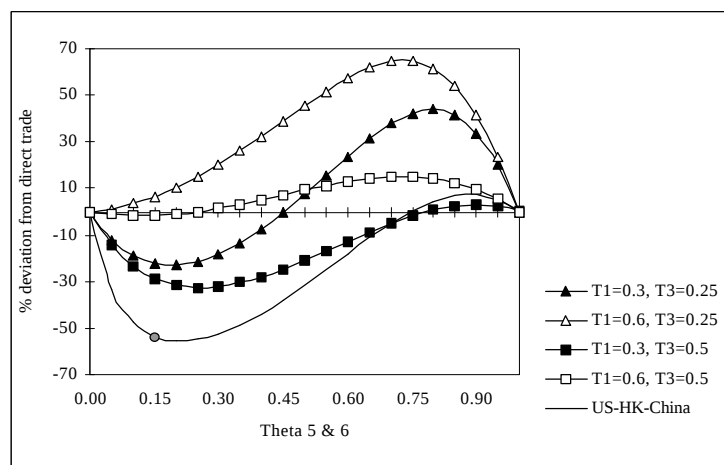
It should be noted that the difference between the outcomes of the two currency areas, $[(dy^a/d\mu^b)_{C\$} - (dy^a/d\mu^b)_{B\$}]$, is always positive for any values of the trade structure parameters within their ranges, as long as α_6 is positive. That is, for a real demand shock from B , pegging $A\$$ to $C\$$ has a larger expansionary effect than pegging to $B\$$. The result is virtually a reflection of the difference between $dy^a/d\mu^c$ and $dy^a/d\mu^b$ under the currency area of $B\$$. To reduce the opportunity cost of choosing either $B\$$ or $C\$$ as the anchor currency, it is necessary to increase the shares of indirect exports in the total exports of A to B and C respectively, and increase the shares of direct exports of B and C in their total exports. The effects of the shares of value-added of A in its re-exports are ambiguous.

To visualise the impacts of the trade structures on the opportunity cost, the percentage deviations of V_1 from the benchmark case of purely direct trade is plotted in Figure 9. For simplicity, θ_1 is set to be equal to θ_2 , θ_3 equal to θ_4 , and θ_5 equal to θ_6 , and α_6 equal to 1. So $T1 = 0.3$ means θ_1 and θ_2 are equal to 0.3, $T3 = 0.25$ means θ_3 and θ_4 are equal to 0.25 etc., and the figures on the x-axis are θ_5 and θ_6 . An increase in θ_1 and θ_2 raises the deviations dramatically, especially when θ_5 and θ_6 are large. More importantly, when θ_1 and θ_2 are equal to 0.6, most of the two white curves are above the x-axis. This implies that, an inappropriate trade structure can increase the opportunity cost to the entrepot for choosing the anchor country among its trading partners.

Second, as θ_3 and θ_4 increase, the deviations are reduced substantially, again, particularly when θ_5 and θ_6 are large. This means that, choosing an anchor country with a relatively large direct export sector helps to stabilise the domestic economy. As normally large countries have relatively large direct trade sectors, this finding is consistent with a common assertion that, *ceteris paribus*, pegging the domestic currency to that of a larger country has larger stabilising effects. Again, the effects of changes of θ_5 and θ_6 are ambiguous. At the circular point of 'United States–Hong Kong–China', the variance is

reduced by over 50 per cent. The outcome is mainly attributed to the fact that, the relative size of the direct export sector of Hong Kong is small, and its value-added in the re-exports is also small.

Figure 9 Variance of the difference between pegging A\$ to B\$ and to C\$ for a real shock from B



Note: 'T1' stands for Theta 1 and Theta 2; 'T3' stands for Theta 3 and Theta 4. US-HK-China' stands for the actual figures. Alpha 30 = 1.

The variance of the difference between the two currency areas for a monetary shock from B is given by

$$V_2 = \text{Var} [(dy^a/d\pi^b)_{C\$} - (dy^a/d\pi^b)_{B\$}] \quad (14)$$

$$= \{(\alpha_6 - \alpha_3)[(2 + \kappa_3 \theta_5 - \theta_5)^{-1} - (1 + \kappa_4 \theta_6 - \theta_6)(2 + \kappa_4 \theta_6 - \theta_6)^{-1}]$$

$$+ (1 + \alpha_6) \alpha_3 [(2 + \kappa_4 \theta_6 - \theta_6)^{-1} - (\kappa_2 + \theta_5 - \kappa_2 \theta_5)(2 + \kappa_3 \theta_5 - \theta_5)^{-1}]$$

$$- (1 + \alpha_3)[(\kappa_1 + \theta_6 - \kappa_4 \theta_6)(2 + \kappa_4 \theta_6 - \theta_6)^{-1} - (\kappa_2 + \theta_5 - \kappa_2 \theta_5)(2 + \kappa_3 \theta_5 - \theta_5)^{-1}]\}^2.$$

$$dV_2/d\theta_1 > 0 \quad dV_2/d\theta_3 < 0 \quad dV_2/d\theta_5 > 0$$

$$dV_2/d\theta_2 > 0 \quad dV_2/d\theta_4 < 0 \quad dV_2/d\theta_6 > 0$$

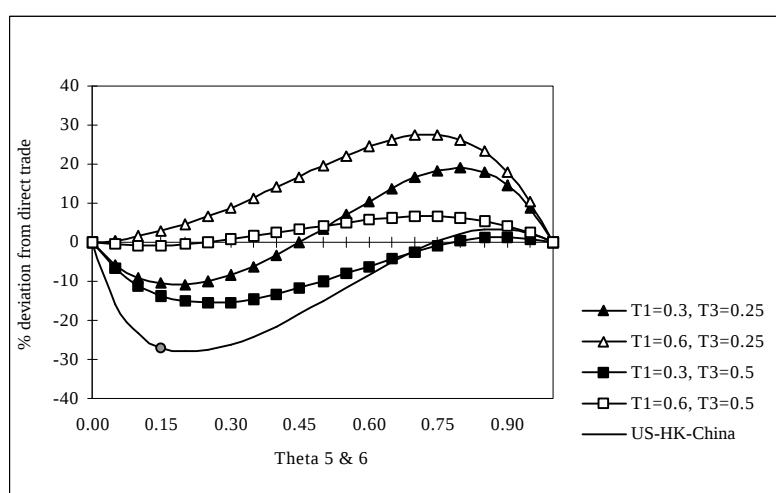
It can be seen that, the conditions on the trade structures to minimise V_2 are the same as for V_1 . A plot of V_2 as shown in Figure 10. In the figure, α_6 and α_3 are set to be 1 and 1.2, respectively. The effects of the trade structure on V_2 are similar to that on V_1 . Again, the

trade structure of the United States–Hong Kong–China trade triangle is quite effective in lowering the opportunity cost.

Last, but not the least, the above findings, and Figures 8 and 9 remain unchanged for contractionary real demand and expansionary nominal shocks, respectively. Additionally, the model assumes the value-added of the entrepot in its direct exports is 100 per cent, while the true figure for Hong Kong is around 30 per cent, only about twice of the re-exports. On that account the direct export sector of Hong Kong is somewhat like a re-export sector, implying that the conclusions about entrepot trade will be further strengthened in the case of Hong Kong.

Overall the results seem to suggest the opportunity cost of the entrepot choosing the nominal anchor is significantly reduced as far as the impacts of demand shocks are concerned. Nevertheless, it does not mean the entrepot is definitely better off by conducting indirect trade. This is because, the smaller difference between the two fixed exchange rate regimes is achieved by increasing the impacts under one regime and reducing that under the other. For example, if the real demand shocks from *B* dominate those from *C*, and *A*\$ is pegged to *B*\$, then *A* will be better off if it exports to *B* directly only. In other words, in the case where indirect trade reduces the opportunity cost of choosing the nominal anchor, at the same time it also could increase the net cost of fixing the domestic currency if the entrepot chooses the regime that actually incurs a lower cost under direct trade.

Figure 10 Variance of the difference between pegging A\$ to B\$ and to C\$ for a monetary shock from B



Note: 'T1' stands for Theta 1 and Theta 2; 'T3' stands for Theta 3 and Theta 4. US–HK–China' stands for the actual figures. Alpha 30 = 1.

A\$ is pegged to a basket of B\$ and C\$

In this and the following subsections, the results for several other cases are discussed briefly.

Pegging A\$ to a basket of B\$ and C\$ is actually to maintain an effective exchange rate of A\$ constant. The outcome is merely a weighted sum of the results of the two fixed exchange rate regimes respectively. It is known that the signs of the derivatives for various trade structure parameters under the two regimes are just opposite. Therefore, *ceteris paribus*, the net outcomes depends on the relative weight of the two currencies in the basket.

A\$ is floating

The impacts of both foreign and domestic shocks on A as well as the influences of the trade structures on the impacts are ambiguous when A\$ is floating. This is because, as the exchange rate of A is flexible, the changes of the prices of re-exports involves the movements of two exchange rates. Therefore it affects the re-exports of A in both directions and significantly raises the ambiguity of the results.

B\$ and C\$ are pegged together

If A\$ is pegged to B\$ or C\$, the change of the output of A is independent of the trade structure. This is because, when prices are fixed and B\$ and C\$ are pegged together, pegging A\$ to either one will give the same result: a globally fixed regime. If A\$ is floating, as before, the solution of y^a tends to be ambiguous.

Long-run scenario

The results for the long-run scenario crucially depend on whether the specification of the supply side preserves the property of money neutrality which exists in the demand side. If money neutrality is preserved, then all exchange rate regimes deliver the same results. This is because, the only distinctions between various exchange rate regimes are the amounts of money supplies (Argy 1990). If money is neutral in the long-run, then exchange rate regime is also neutral. Therefore, there is no trade off between regimes in terms of output fluctuations.

Second, the conclusions about the output in the short-run also can be applied to the price level in the long-run, if money is neutral in the long-run. This is because, in this Mundell-Fleming type model, in the short-run, when prices are rigid, outputs adjust to maintain market equilibria, while in the long-run, the adjustments are passed fully to the prices. As a result, if a certain trade structure attenuates the impact of a demand shock on the output of the entrepot in the short-run, it also has a similar effect on the price level in the long-run. This result is important, as in direct trade models, it is commonly asserted that fixed exchange rate regimes will import inflation from the anchor countries into the domestic economies. The finding of this paper suggests that this major disadvantage of fixed exchange rate regimes can be lessened by appropriate trade structures.

Conclusions

Several important conclusions can be drawn from the modeling exercise of this paper. First, the method of price marking is crucial, if the entrepot services are priced in

proportion to the output price of either trading partner, the exchange rate regime of the entrepot becomes irrelevant in determining the re-exports. Second, when purchasing power parity does not hold, the impacts of exogenous shocks depend on the trade structures considerably. In particular, the impacts of exogenous shocks can be attenuated substantially by appropriate trade structures, and so can the opportunity costs of choosing one foreign currency or the other as the anchor currency.

It is not clear whether entrepot trade increases or decreases the net cost for Hong Kong to peg the HK\$ to the US\$. It depends on which price marking method as well as what types of shocks dominate. However, the opportunity cost of choosing either the US\$ or the RMB as the nominal anchor for the HK\$ is substantially reduced by indirect trade.

Endnotes

¹ The upper bound value is the estimation of the author based on the data of Sung (1995).

² If the time lag between the intermediates being imported and the final goods being exported is large, and the exchange rates have changed significantly during the interval, the situation of trade with intermediates and entrepot trade will be quite different.

Table A1 **Definitions of symbols and composite parameters**

Symbol	Definition and notes
y_d^i	real aggregate demand of country i
y^i	real output of country i
p^i	domestic output price of country i
m^i	nominal supply of country i
μ^i	expansionary real demand shock in country i
π^i	contractionary nominal shock in country i
r	the world real interest rate
Ω	income elasticity of consumption
λ	interest elasticity of investment
η	price elasticity of exports
ϕ	interest elasticity of money demand
θ_1	share of gross output of the direct exports in the total exports of A to B
θ_2	share of gross output of the direct exports in the total exports of A to C
θ_3	share of gross output of the direct exports in the total exports of B to C
θ_4	share of gross output of the direct exports in the total exports of C to B
θ_5	share of value-added of A in its re-exports to C
θ_6	share of value-added of A in its re-exports to B
	Note: $\theta_j \in [0,1]$, $j = 1-6$
κ_1	$= \theta_1[\theta_1 + \theta_6(1-\theta_1)]^{-1}$; share of total value-added of the direct exports in the total exports of A to B
κ_2	$= \theta_2[\theta_2 + \theta_5(1-\theta_2)]^{-1}$; share of total value-added of the direct exports in the total exports of A to C
κ_3	$= \theta_3[1-\theta_5(1-\theta_3)]^{-1}$; share of total value-added of the direct exports in the total exports of B to C
κ_4	$= \theta_4[1-\theta_6(1-\theta_4)]^{-1}$; share of total value-added of the direct exports in the total exports of C to B
e_j^i	price of \$i in terms of \$j
e_c^a	$= e_b^a + e_c^b$; price of A\$ in terms of C\$
α_1	$= \lambda(1-\Omega)^{-1}$
α_2	$= (1-\Omega)^{-1}$
α_3	$= \Omega(1-\Omega)^{-1}$
α_4	$= [\kappa_1 + \kappa_2 + (1-\kappa_1)\theta_6 + (1-\kappa_2)\theta_5]\eta(1-\Omega)^{-1}$
α_5	$= (\kappa_1 + \theta_6 - \kappa_1\theta_6)\eta(1-\Omega)^{-1}$
β_4	$= (1-\kappa_3)\theta_5\eta(1-\Omega)^{-1}$
β_5	$= \eta(1-\Omega)^{-1}$
ε_4	$= (1-\kappa_4)\theta_6\eta(1-\Omega)^{-1}$
ε_5	$= (1 + \kappa_4\theta_6 - \theta_6)\eta(1-\Omega)^{-1}$

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