Export Tax Rebates and Real Exchange Rate Devaluation: China's Experience in Recent Asia Financial Crisis

- A Computable General Equilibrium Analysis

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Abstract

This paper analyzes the relation between real exchange rate devaluation and export tax rebates based on China's experience in recent Asian financial crisis by a 47 sector single country China CGE model which differentiates processing and normal trade explicitly. Two simulation scenarios are conducted. In the first scenario, we depreciate China's real exchange rate exogenously in the order of 5 percent, and endogenously solve its global trade balance. Base on a study published by Institute of International Economics in 1998, such a real devaluation would be sufficient for China to re-attain its pre-crisis competitiveness in global market. In the second scenarios, we fix China's real exchange rate in the pre-crisis level, but allow China's export rebate rate adjust endogenously to achieve a global trade balance for China same with that in the first scenario. The simulation results indicate a 30 percent increase of export tax rebate rate or a 55 percent increase of government export tax rebate expense from the base year have a similar impact of 5 percent real exchange rate devaluation in terms of restoring China's export competitiveness.

I. Introduction:

The financial turmoil that broke out in July 1997 ravaged the Asian economies for almost two years. Most of their currency has suffered dramatic devaluation. By the end of 1998, Indonesia's currency value fell by 70 percent, while currencies dropped by more than 30 percent in Thailand, Malaysia, the Philippines, and South Korea. China is the notable exceptions. However, as other countries in the region undergo currency depreciation, the countries that do not flow will experience deterioration in competitiveness and fall in its exports. Given the possibility of a Chinese devaluation may initiate another round of financial turbulence and competitive devaluation throughout the region, China did not follow her neighboring Asian countries to devaluate its currency. Instead she implemented a policy of import intermediate input duty rebate, i.e. giving tax refund on the imported materials that used in the production of exportable goods. This policy helps China to keep its export prices relative low so that to maintain its competitive edge in the world market.

This paper studies the relation between export tax rebate policy and real exchange rate devaluation based on China's recent experience by a 47 sector single country China CGE model which differentiates processing and normal trade explicitly. We are looking for in what extend this export rebate policy plays a similar role in keeping China's export competitiveness as exchange rate devaluation.

Rest of the paper is organized as follows. Section 2 presents the major structural features of the China CGE model used in this study. Section 3 describes the industrial and trade structure and market openness of Chinese economy based on information contains in the base data. Section 4 outlines how the simulation scenarios are designed, and

section 5 presents the simulation results and section 6 ends the paper with some concluding remarks.

II. Structure of the numerical model

The China CGE model we constructed for this study is an extension of the CGE model that had been used to analyze the income distribution consequences of trade and tax reform (Wang and Zhai, 1998), the economy-wide implications of China's WTO accession (Development Research Center, 1998), and its potential impact on urban unemployment (Zhai and Wang, 2002). The model has its intellectual roots in the group of single-country, applied general equilibrium models used over the past two decades to analyze the impact of trade policy reform (Dervis, de Melo and Robinson, 1982; de Melo, 1988; Shoven and Whalley, 1992; de Melo and Tarr, 1992). It began as a prototype CGE model developed for the Trade and Environment Program of the OECD Development Center (Beghin, et al., 1994). However, significant modifications have been made to capture the major features of the trade and tax system in the Chinese economy, especially in modeling institutional features of China's trade regime. A more complete description of the model is provided in the appendix. The main features of the model are summarized in this section.

As pointed out by Naughton (1996), China had established two separate foreign trading regimes by 1986-87. The CGE model explicitly treats them both. One is the "processing trade" or "export promotion" regime, which is extremely open and is participated in by most foreign-owned and many domestic firms. Under this regime producers process and assemble imported intermediate goods, turning them into finished products for export; these imported goods are exempt from tariffs and value-added taxes.

The other regime consists of ordinary trade carried out under traditional, though increasingly reformed, taxes and regulations. Since 1990 the first regime has grown rapidly, now accounting for more than half of all exports.

We assume that there are two types of competitive firm - *ordinary firms* and *export processing firms* - that produces the same product in the same industry. The products of ordinary firms are assumed to be sold on the domestic market or to be exported to rest of the world maximizing profits, while products of the export processing firm is for exports only. We also assume the export by ordinary firms and exports processing firms are heterogeneous, a CES aggregation function with relative high substitute elasticities is employed to form the composite exports. In other words, we assume the buyers of rest of the world choose a mix between the two types of exports to minimize their cost.

All sectors are assumed to operate under constant returns to scale and cost minimization. Production technology is represented by a nest of constant elasticity of substitution (CES) functions. At the first level, output results from two composite inputs: a composite of primary factors plus energy inputs, and an aggregate non-energy intermediate input. At the second level, the split of non-energy intermediate bundle into intermediate demand is assumed to follow the Leontief specification, i.e. there is no substitution among non-energy intermediate inputs. At the same level, the value-added plus energy component is decomposed into aggregate labor and energy-capital bundle. At the third level, aggregate labor is further split into rural and urban labor inputs. And the energy-capital bundle is decomposed into energy and capital-land bundles. At the fourth level, the energy bundle is made up of 3 types of base fuel components, and capital-land is split into capital and land in agricultural sector. Finally, at the fifth level,

all intermediate inputs are Armington composite of domestic produced products and imported intermediate goods.

Imports are differentiated by types and uses in the model. The first type is ordinary imports, which is operated under the ordinary trade regime, subjected to import tariff and nontariff barriers and used as intermediate, investment and final consumption. The second type is duty-free imports, which are raw materials and components and used as intermediate inputs to produce processing exports only. The third type is also duty-free imports, including investment goods for foreign invested enterprises and export processing firms, some intermediate products for ordinary firms and final consumption goods for government or household through various channel such as donation or smugglings. Therefore, there are seven categories of imports for each sector classification in our model.

Seven types of Armington (1969) goods with different prices are specified. They are composite intermediate goods used by ordinary firms, composite intermediate inputs used by export processing firms, composite final products used by rural and urban households, and composite products used in other final demands, including government spending, gross investment and other public consumptions. A two-level nested CES aggregation function is specified for each Armington composite except intermediates used by export processing forms, which is represented by a one-level CES function. At the top level, agents choose an optimal combination of the aggregate domestic good and an imports aggregate, which is determined by a set of relative prices and the degree of substitutability. At the second level of the nest, the imports aggregate is further split into ordinary imports and other duty-free imports again as a function of the relative import

prices and the degree of substitution between the two import types. Stock change is assumed as a demand for domestic produced products only.

The difference between domestic price and world price are modeled in two parts: tariff and non-tariff barriers. NTB is treated as the tariff equivalent, which creates a pure rent to households. In the export market, China's textile and apparel exports face MFA quota constraints in world market. We model this quota as an export tax equivalent that is added to the domestic export price. The quota premium is assumed to be obtained by enterprises. In the simulations, the MFA quotas are exogenous, with export tax rates adjusted endogenously to clear the market.

All commodity and factor markets, except urban labor market, are assumed to clear through market prices. For urban labor, we adopt the market-equilibrium specification of Harris and Todaro(1970), in which the wage is assumed fixed relative to a GDP deflator (which is the numeraire of the model). This reflects the rigidity of urban unskilled labor markets and the abundant supply of unskilled labor in the Chinese economy. Urban unemployment is endogenous, adjusting to clear the market.

Migration from rural to urban areas is modeled by assuming imperfect labor mobility, which reflects the policy and institution factors that limit labor movement as well as the location preferences of residents. The movement of labor between rural and urban areas is determined by the relative expected wage (defined as the product of wage and employment rate in this model) and a constant elasticity of transformation[1].

[1] The combination of Harris-Todaro labor market equilibrium condition and CET specification of imperfect rural-urban labor migration reflects the double transition simultaneously going on in the Chinese economy: the transition from a backward rural economy to a modern industrialized economy (the HT model), and the

Capital is assumed partially mobile across sectors, reflecting difference in the marketability of capital goods across sectors. Rural labor is assumed perfectly mobile across sectors, with 77 percent of it agricultural in the base year. Urban labor is assumed not employed in agriculture, but perfectly mobile across non-agricultural sectors. Furthermore, within non-agricultural sectors, rural and urban labor can be substituted for each other in production. Thus agricultural labor could become non-agricultural either through migration or through rural industrialization.

The CGE model used in this analysis was calibrated to a 47 sector 1997 Chinese Social Accounting Matrices (SAM) developed by Development Research Center (DRC) (DRC) at the State Council from the most recent input-output table of China and detailed trade data from China' Customs. Some key parameters of the model – essentially substitution and income elasticities – were derived from a literature search. All other parameters – mainly shift and share parameters – are calibrated in the base year using the key parameters and the base year data. The model is implemented by the General Algebraic Modeling system (GAMS; Brooke, et. al. 1988) and solved in levels. A detailed algebraic specification of the model is available from the author upon request.

III. Structure of China's Foreign Trade Sector, the role of export rebate in China's exports

This section analyzes the basic features of industrial and trade structure and market openness of Chinese economy based on information contains in the base year SAM. The purpose of this analysis is to provide an overview of the institutional features of China's

transition from a planned economy to a market economy (the institutional constraints for rural labor migration in labor market).

foreign trade and the role of processing exports and duty free imports in China's export growth to facilitate the understanding of simulation results reported later.

Table 1 summarizes this information in 47-sector details. For each sector, the base year data for shares of output, employment, imports, exports, trade dependence, and the share of ordinary trade in intermediate, investment and final consumption and related nominal/actual tariff rate are reported. As may be seen in columns 1 through 4, the data are notably asymmetric among the shares of output, employment, and trade. For example, the crop sectors account for 40 percent of China's employment but only produce 6.4 percent of its output and account less than 2 percent of China's total trade. While textile and apparel industries employ 2.1 percent of China's labor force, but produce 6.5 percent of its total output and account for more than 21 percent of the country's total exports. Another notable case is China's electronics industry, it only account for 0.5 percent of China's employment, but produce 11.5 percent of its total exports.

(Insert table 1 here)

Export dependency is very high for instruments, apparel, articles for culture education and sports (including toys), electronics and leather products as more than one third of their products depend on foreign markets. Export dependency is also quite high in textile, electrical machinery, rubber, plastic, and metal products but very low in most primary sectors except crude oil and natural gas. The sectors with the largest shares in imports are manufactured intermediates such as chemicals and textiles, or capital and technology intensive manufactures such as electronics and special equipment. The instruments and electronics sectors have both highest export and import dependency,

reflecting the fact that a large percentage of production in those sectors represents processing and assembling products from abroad, i.e. processing trade.

The trade balances by industry in column 13 reflect China's comparative advantage. China is a net exporter of labor-intensive manufactures and a net importer of capital-intensive manufactures. The largest share of the trade surplus in China comes from apparel and textile, followed by toys, sporting goods and leather products. In food and agricultural sectors, China is net importer of grain mill and vegetable oil, but has trade surplus of other agricultural products.

Processing trade is the most rapidly expanding portion of China's foreign trade. It accounted for more than 49 percent China's total exports and 46 percent of China's total imports in 1997, together with other 22 percent imports mainly as investment goods used by foreign invested enterprises, the duty free imports made up nearly 70 percent of China's total imports in 1997. It was more important for manufactured goods than primary products. For instance, more than 90 percent of China's electronics, about 80 percent of China's iron and steel, electric machinery and instruments exports, and more than two thirds of China's leather, toys and sporting goods, paper products, chemical fibers and rubber and plastic exports were processing exports. The high shares of processing exports in these sectors require a large volume of raw materials, components, and semi-processed products imported from abroad as their inputs. Column 9 in Table 1 shows that in the sectors of textiles, apparel, and leather products the ordinary imports were only about 1 percent of its total imports; the rest were used for the production of processing exports. Most imports of paper products, building materials, chemicals, basic metal and metal products, instruments, machinery and electronics were also used by

foreign or joint-venture companies as intermediate inputs to produce processing exports. Consistent with such a pattern, about 97 percent China's imports were for intermediate and investment use, final consumption products only made up 3.1 percent of China's total imports.

Another notable feature of the base year trade data is the significant differences between China's nominal tariff rate and the actual collected rate. It is well known that China's tariff collection is significantly below its nominal tariff level because of a large volume of processed trade, extensive import duty exemptions and widespread smuggling (World Bank, 1994; Bach, *et al.*, 1996). Columns 20 and 21 of Table 1 provide the nominal tariff rate and actual collected rate for all products. The ratio varies dramatically across sectors, ranging from more 12 5 in textiles and leather products to less than 1.5 in automobiles. In general, the more export-oriented sectors have a higher ratio because of tariff exemptions applied to their imports of intermediate inputs.

China's tariff structure is typical of that of developing countries in providing high protection for the manufacturing sectors, especially manufacture of final-consumption goods. Those products usually have a highest nominal tariff rate (column 18). But in aggregate, China's actual tariff rate is moderate. Automobiles are subject to the highest tariff, the actual collected rate is 33 percent. The tariff rates in other manufactures are also relatively high, but their effects are limited because the share of duty imports (ordinary imports) is very small and concentrate on imports for final consumption, which was only 3 percent of China's imports in 1997.

All firms pay value-added taxes (VAT) for their purchased intermediate inputs and production factors and obtain tax rebate when their outputs sold to foreign market.

However, since there is no tariff or VAT on imports used for producing processing exports, export processing firms do not get VAT rebate for their imported inputs when they export final products. They only obtain VAT rebate for their purchased domestic intermediate goods and their factor payments. Therefore, the last two columns in table 1 shows that ordinary firms obtain a higher VAT rebate rate for their exports than export processing firms (about 2-3 times higher).

VI. Simulation Design

Two simulation scenarios are conducted using the model. In the first scenario, we depreciate China's real exchange rate exogenously in the order of 5 percent, and endogenously solve its global trade balance. Base on a study published by Institute of International Economics in 1998, such a real devaluation would be sufficient for China to re-attain its pre-crisis competitiveness in global market[2]. In the second scenarios, we fix China's real exchange rate in the pre-crisis level, but allow China's export rebate rate adjust endogenously to achieve a global trade balance for China same with that in the first scenario.

For each of the two scenarios, our CGE model generates results regarding the change in real GDP, terms of trade, balance of trade, the volume of processing and normal exports, imports for intermediate, investment and final consumption as well as

[2] "As developing Asia depreciates, Chinese exports to developed-country fall. China could recoup the loss in competitiveness with relatively small real devaluations-on the order of 1-6 percent in real terms, depending on the magnitude of real depreciations experiences elsewhere in Asia. However, give the relative small direct impact of the crisis on China, and the possibility of a Chinese devaluation igniting another round of financial turbulence and competitive devaluations throughout the region, the use of other tools of macroeconomic management by China would be preferable." Page 58, in *Global Economic Effects of the Asian Currency Devaluations* by Marcus Noland, Li-Gang Liu, Sherman Robinson and Zhi Wang, Institute of International Economics,

government tariff revenue, the real wage paid to each production factor, and change in prices and production structure of the Chinese economy. However, those estimates should be regarded as outcomes from conditional simulation only. In reality, actual trade and output patterns are affected by many more factors such as other domestic macroeconomic and income policies.

V. Major Simulation Results

Major macro economic impacts of the two simulation scenarios are sumerized in Table 2. General pattern of the change of the major macro economic variables are quite similar for the two simulation scenarios, because a real exchange rate depreciation and an increase of export rebate rate have a similar impact to increase exports and reduce ordinary and other imports (but increase processing imports as a result of increase of processing exports), thus achieve the same amount of trade surplus, which means leading to other countries thus reduces current consumtion or domestic investment in exchange for future consumption or investment overseas. Therefore, there are decreases in real consumption and domestic investment in both scenarios, although the magnitute of decreses are not the same. Compare the change of trade over different production modes and uses, different quantitative patterns emerge: ordinary exports increase nearly 6 percent than processing exports in the real devaluation scenario while processing exports expand about 9 percent more than ordinary exports in the tax rebate rate increase scenario. At the same time, imports for consumption decline the most in scenario I while imports for domestic investment decline the most in scenario II. As a concequence, the impact on government revenue from trade is different in the two scenarios: althought

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Washington DC, July 1998.

export rebate expenditure increase as China's export increase as a results of real devaluation, tariff revenue stay almost the same as base year while when export rebate rate increase, tariff revenue decline because a larger portion of imports become duty free via processing export firms.

Above aggregate impact show that althought increase export rebate rate may involve slightly higher cost in terms of government budget, but it is able to achieve macro effects similar to currency develuation. However, assessing aggregate effects alone provides little insight into the factors shaping these aggregate outcomes. Therefore, it is neccesary to investigate the chnges in production and trade at the sectoral level to find out the shift of economic structure induced by the two different tools of macroeconomic management.

Insert Table 2 Impact of Real devaluation and Export Tax Rebate Policy: Major Macroeconomic Results

Tables 3 and 4 illustrate the extent of structural change induced by the two types of macro economic management tools by reporting the percent change in output , expors and imports across production modes and uses. The results shows that exchange rate devaluation increase China's exports in every sector for both ordinary and processing products because Chinese goods become cheaper relatively to exports from other countries. In the meantime, it also reduces China's ordinary and other imports in every sector because imports become relatively more expensive. However, processing imports still increase despite the relative higher price in order to meet the inceased demand for processing exports in the world market. In other words, the impact of currency devaluation is relatively equally distributed to every sector in the economy. While when export tax rebate rate increase, however, its production and trade impacts are different

across sectors. Therefore, for a similar macro economic results, the micro and sector level impact could be very different.

Insert Table 3 -- Impact of Real devaluation and Export Tax Rebate Policy: Production and Processing Trade

Insert Table 4 -- Impact of Real devaluation and Export Tax Rebate Policy: Imports

VI. Conclusion remark

This paper analyzes the economic consequences of real exchange rate devaluation and increase export tax rebates by a 47-sector single country China CGE model with explicitly separated processing and normal trade. Two simulation scenarios are conducted. In the first scenario, we depreciate China's real exchange rate exogenously in the order of 5 percent, and endogenously solve its global trade balance. Base on a study published by Institute of International Economics in 1998, such a real devaluation would be sufficient for China to re-attain its pre-crisis competitiveness in global market. In the second scenarios, we fix China's real exchange rate in the pre-crisis level, but allow China's export rebate rate adjust endogenously to achieve a global trade balance for China same with that in the first scenario. The simulation results indicate a 30 percent increase of export tax rebate rate or a 55 percent increase of government export tax rebate expense from the base year have a similar aggregate impact of 5 percent real exchange rate devaluation in terms of restoring China's export competitiveness in the world market. However, the micro and sector level impact of those two policy instruments are quite different. Currency devaluation distributes the impacts relative evenly across the trade sectors, while increase export tax rebate rate enable Chinese government in promoting certain export-oriented sectors such as manufactured good in the economy.

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