วารสารเศรษฐศาสตร์ธรรมศาสตร์ Thammasat Economic Journal
ปีที่ 29 ฉบับที่ 3 กันยายน 2554 Vol.29, No.3, September 2011

Who Gains and Who Loses from the Exchange Rate System in Vietnam?[1]

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Abstract

As in many other developing countries, the imposition of foreign exchange controls to stabilize the nominal exchange rate and a long-lasting dollarisation phenomenon in Vietnam have caused an unofficial exchange market to emerge. A de facto system of multiple exchange rates operates in practice, where official exchange rates coexist with a free market exchange rate.

Literature on multiple exchange rate (MER) regimes suggests that MERs can serve for the balance of payments purpose as well as a method of raising implicit taxes on exporters who are required to surrender foreign exchange earnings to the central bank through the exchange system. This paper attempts to identify the benefits and costs of the government and economic sectors under a MER system in Vietnam.

Using a static partial equilibrium framework modified from Rosenberg and De Zeeuw (2001) and Hori and Wong (2008), this study estimates the equilibrium exchange rate that would prevail in a unified exchange market. This rate is more depreciated than the current official rate by about 5-8 percent in the period 2007-09. Using the estimated equilibrium rates, the net efficiency losses in the export market are calculated at 6.3 percent, 5.2 percent and 8.5 percent in 2007, 2008 and 2009 respectively while importer market has net efficiency gains.

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[1]This article is extracted from my Ph.D. dissertation at the Faculty of Economics, Thammasat University. I am grateful to Professor Arayah Preechametta and Associate Professor Vimut Vanitcharearnthum for many valuable comments and suggestions given to this study.

Public importers often enjoy higher gains than their private counterparts do. In total, public firms gain 05-0.6 percent of GDP in 2009 from international trade under this exchange rate system while the private sector bears a cost of 0.2 percent of GDP. Unification of these segmented exchange markets would lead to an expansion of trade openness by 27 percent of GDP while narrow trade deficit by 0.7 percent of GDP in 2009. Exchange rate reform towards a convertible currency would eliminate exchange profits for the government. Therefore, such reform should be gradually implemented and coordinated by fiscal adjustment.

Key words: Multiple Exchange Rates, Efficiency Costs, Vietnam

JEL Classification: E42, F31

1. Introduction

Since the initiation of economic reforms in late 1980s, the exchange rate system in Vietnam has experienced different episodes due to macroeconomic fluctuations. The stability of nominal official exchange rate during the sub-period 1999-2007 is noticeable because it seems to contradict to the State Bank of Vietnam's (SBV) de jure declaration of a managed floating regime. Under the SBV's exchange rate management policy and imposition of foreign exchange controls, there have been three exchange rates co-existed: a central or reference rate determined by the SBV, commercial bank exchange rate in the official exchange market and a free market exchange rate. Although the exchange rate premium of between the official and free markets has not been very high as in the case of many less developed economies, the black market for foreign exchange in Vietnam is quite persistent and the size of this market is believed to be large given the degree of dollarisation in the economy.

Literature on multiple exchange regime (MER) indicates that the usual purpose of a MER system is to cope with overall balance of payments problems, but essentially MERs are also considered an instrument of subsidization and taxation. The officially declared MER regimes have long been recognized to be one of quasi-fiscal activities of central banks (Mackenzie and Stella, 1996). This is because MERs are adopted as an imposition of implicit

taxes on exporters, bringing considerable revenue to central banks in the form of exchange profits and directly affecting public finance (Sherwood, 1956; de Vries, 1965, Huizinga, 1996; Agenor and Ucer, 1999). As a tax instrument, though being implicitly imposed, MERs may cause some benefits and losses to different agents in the economy.

The objective of this paper is to identify and measure potential exchange benefits to the central bank (thus the government) as well as potential efficiency effects on exporters and importers in public and private sectors of the Vietnam's economy under a MER system. The results could bring some implications on the likely effects of foreign exchange market unification. Relevant literature on MER systems is reviewed in the following section 2. Section 3 presents the background of Vietnam's exchange rate policy, foreign exchange restrictions and an overview of its segmented exchange markets. An understanding of the market structure helps to set up the analytical framework for welfare analysis in section 4. It is based on a static partial equilibrium model in a small open economy, modifying the one developed by Rosenberg and De Zeeuw (2001), extended by Hori and Wong (2008) which allow calculations of efficiency gains/losses from a MER system. These modifications take into accounts specific features of Vietnam exchange markets highlighed in section 3. Section 5 then provides baseline calculation results of the government's exchange profits and efficiency losses/gains of exporters and importers in the period 2007-09. A sensitivity of the analysis is also presented. Section 6 concludes while offering some policy discussions.

2. Related Literature

The early literature on MER regimes indicates that MERs perform both exchange and monetary function (de Vries, 1965 and IMF, 1999). Essentially, a MER regime is considered an instrument of balance of payments policy as well as a method of raising tax revenue or providing subsidization through the exchange system. For the balance of payments purpose, MERs can prevent large exchange rate depreciations from affecting the domestic price of essential commodities, or prevent sudden pressures on the capital account from affecting trade

and international reserves. For the fiscal purpose, MER practice has long been regarded as one of the quasi-fiscal activities of central banks or public financial institutions. Countries with MERs often require the surrender or repatriation of export proceeds to banks which are equivalent to a tax on exporters when the official exchange rate applied is more appreciated than the market rate. This implicit tax is usually named "exchange profits" accrued to central banks. In both a system of multiple official exchange rates (legal) and a system with parallel exchange rates (illegal black market), central banks can collect this tax (Mackenzie and Stella, 1996).

Countries with an underdeveloped tax structure more often rely on MERs to generate exchange profits to cover budget deficits. Hausmann (1997) analyses the MER system in Venezuela during 1983-85 when four different exchange rates co-existed in the country's exchange market. The government imposed an exchange rate of 4.3 Bolivars per U.S. dollar on traditional exports (oil and iron ore) vis-a-vis a parallel market rate at 280 percent premium. This policy helped to reverse a current account deficit of US$ 4.2 bil in 1982 to a surplus of US$ 4 bil in 1983 and at the same time accumulated exchange profits of 3.6 percent of non-oil GDP. The contribution of exchange profits continued to enlarge in 1983-84, improving fiscal deficit to a surplus of 4.8 percent of GDP. Thailand also introduced a MER system after the World War II during the period 1947-55 when a fixed official exchange rate of 12.5 baht per U.S. dollar applied to proceeds from rice exports and 20 percent of rubber and tin exports as well as government payment transactions and some essential imports. Meanwhile, a fluctuating free market rate at 20 baht per dollar was applied to the rest 80 percent export proceeds from rubber and tin and ther remaining payment transactions. Taxing the exporters' profit showed to be more efficient than other quantitative trade controls which were previously applied in the kingdom (Yang, 1957). Export surplus was quickly restored, allowing a substantial accumulation of exchange reserves and bringing exchange profits to the government budget, approximated at 10-18 percent of the total revenue during 1949-52.

With respect to the welfare analysis of a MER system, literature is found in general to be based on a static and partial equilibrium framework under the classic real trade theory approach. It is often involved determining the equilibrium exchange rate and shadow exchange rate in the presence of trade and foreign exchange restrictions. One of the very first works, to our knowledge, is Tarr (1990) dealing with the second-best foreign exchange policy in Poland. A partial equilibrium model developed in the paper estimates the effects of distorted trade policy on welfare under different trade elasticities, export and import subsidies, and surrender/retention ratios of foreign exchange earnings. The analysis is based on the concept of net consumers' and producers' surplus, using the measurement of Harberger triangles upon calculating equilibrium and shadow exchange rates. The results show that maximum social benefit would derive from removal of the full range of distortions. The study concludes full retention of foreign exchange by exporters in the absence of other distortions would provide social benefits equivalent to 8 percent of GDP in 1988.

Rosenberg and De Zeeuw (2001) looks at welfare effects of Uzbekistan's foreign exchange regime with a formally introduced system of MER and restrictions on current account transactions. The net welfare loss or excess burden due to the foreign exchange regime is derived from a framework in Rosenberg, Ruoco and Wiegard (1999), using also a static partial equilibrium model. With formally available data, the equilibrium exchange rate is defined as a weighted average of rates in different foreign exchange market. Using data in 1997-99 with assumed trade elasticities, the study shows that Uzbekistan's quasi-fiscal MER regime generates identifiable welfare losses of 2-8 percent of GDP on import markets and up to 15 percent on export markets. The regime, additionally, transfers about 16 percent of GDP from exporters to importers.

More recently, a study by Hori and Wong (2008) measures efficiency costs of Myanmar's MER regime which consists of an official exchange rate and an informal parallel market exchange rate. The model developed in the paper is more explicit, separating public and private sector, thus extending the model in Rosenberg and De Zeeuw (2001). It also

introduces foreign exchange quota on public imports as a specific feature of Myanmar's exchange market, as well as treating the observed private market clearing exchange rate and the unobservable equilibrium exchange rate different. Using data of Myanmar for three fiscal years from 2004/05 to 2006/07, the results indicate that the equilibrium exchange rate under a unified market could be around 400-500 kyat per U.S. dollar, compared to the parallel market rate of 1000-1100 kyat. Under a unified exchange market with a new equilibrium exchange rate, trade openness could increase to more than 20 percent from only 1 percent of GDP measured under the current system. The total net efficiency loss caused by the current MER regime is estimated at about 14-17 percent in GDP in 2006/07.

3. Overview of Vietnam Exchange Rate System and Foreign Exchange Markets

3.1 Overview of Exchange Rate Policy

Following a comprehensive economic reform towards a market economy which took place in 1989, the development of exchange rate policy in Vietnam can be separated in five sub-periods as depicted in Figure 1. The first sub-period from late 1989 to 1991 was considered an episode of floating exchange rates with large depreciations of the nominal exchange rate. The second started from September 1991 when the SBV adopted a fixed exchange rate regime in order to create a nominal anchor to curve inflation and stabilize the economy. In 1994, the two foreign exchange transaction floors were replaced with an inter-bank foreign exchange market in which the SBV remained influential as the "last seller and buyer" of foreign exchange. As a result, the official exchange rate remained stable at Vietnam dong (VND) 10,000-11,000 per U.S. dollar with a band of 0.5-1 percent for commercial bank transactions.

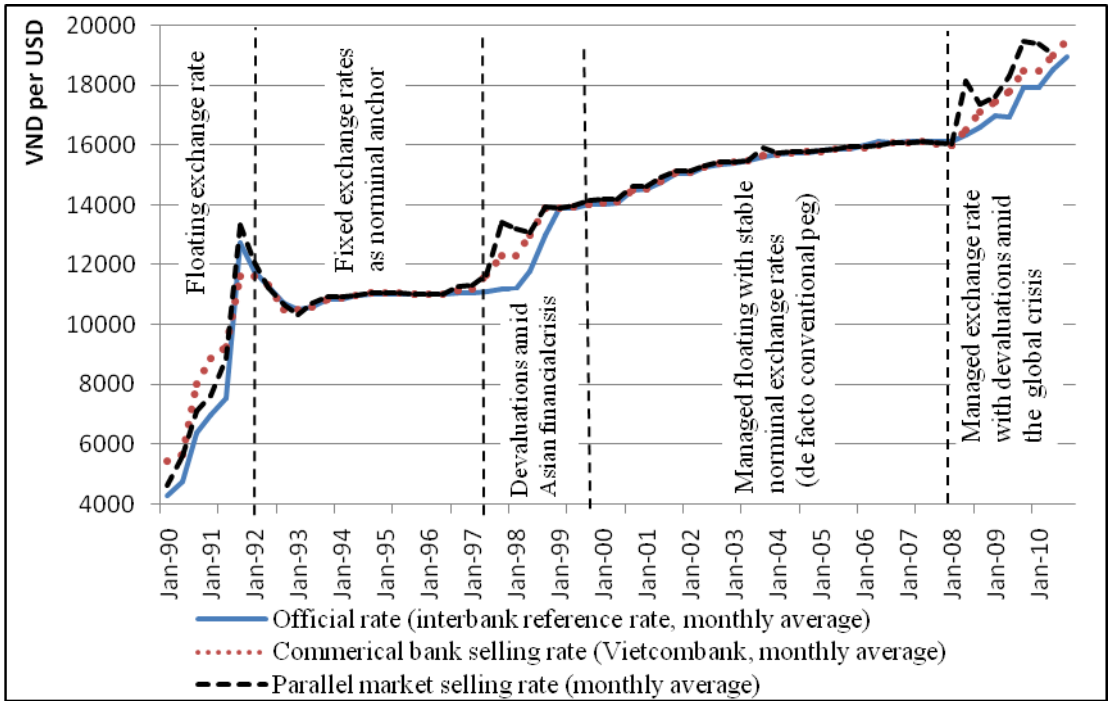
The third sub-period 1997-1999 was during the Asian financial crisis when VND was devalued several times, 10.2 percent in 1997 and 5.6 percent in 1998. Exchange rates in the parallel market were soaring (SBV, 1997 and 1998). At the same time, the trading band was

widened to 5 then 10 percent in October 1997, before narrowed to 7 percent in August 1998 when the crisis was getting calm.

The forth sub-period was marked by a foreign exchange regulation on February 26, 1999 when the SBV introduced a managed floating exchange rate regime. Under this regime, the official exchange rate set by the SBV is equal to the average interbank market rate of the previous day. Credit institutions then set the trading exchange rate with customers within a 0.1 percent band around the official rate. The band was kept unchanged at ±0.25 percent from July 2002 until December 2006. In spite of official declaration, according to the IMF de facto classification, Vietnam's exchange rate regime in this period was classified to the category of *conventional pegged* arrangement, , effective from 1st January 2005 (IMF, 2006). The rate of depreciation was kept within 1 percent as announced by SBV governor.

Figure 1

Official exchange rate, bank rate and parallel market rate (1990-2010)



Source: Nguyen and Nguyen (2009); SBV and Vietcombank

The last sub period began in early 2008 when the SBV started allowing several episodes of devaluation. The largest devaluation of 9.3 percent was recently in February 2011. Soaring inflation rates in combination with VND depreciations have earmarked this period with lots of macroeconomic turbulences. Exchange rate bands have also been continuously extended to ±5% in March 2009. The IMF in early 2009 classified the exchange rate system of Vietnam for 2008 as "other managed arrangement", then reclassified as "stabilized" against the US dollar, effective from 1st January 2009 (IMF, 2010).

3.2 Foreign Exchange Controls and the Segmented Exchange Markets

It is well documented in the literature that in many developing economies, the unofficial parallel exchange market emerges in response to government restrictions in the official market. Foreign exchange controls are often set up besides trade restrictions in order to protect the official reserves and to maintain an overvalued exchange rate. Vietnam is not exceptional. Since 1998, the most relevant foreign exchange control measures for current account transactions have been foreign exchange surrender requirement and foreign exchange rationing.

Foreign exchange surrender requirements

Following the Asian financial crisis, strict controls were released in September 1998 imposing foreign exchange surrender requirements up to 80 percent of export proceeds. A year later, the ratio lowered to 50 percent, and then further reduced in May 2001 to 40 percent (IMF, 2002). It was cut down to 30 percent in May 2002, and eliminated in April 2003 as per the commitment of Vietnam to the IMF and World Bank. The latest ordinance on foreign exchange management promulgated in December 2005. The regulation still requires a full repatriation, although it states a full liberalization of all current account transactions and indicates no specification of foreign exchange surrendering. According to this regulation, residents with foreign currency revenue obtained from exports and from other current revenue sources overseas must remit such revenue into a foreign currency account opened at an authorized credit institution in Vietnam. Partial repatriation of the export revenue is in fact

prohibited and exporters' revenue is permitted to use only for legal imports or other justified foreign currency payments. Withdrawing export proceeds in foreign currency cash is out of the question, let alone making transactions in a free market. Consequently, the only choice for many exporters is to hold foreign exchange in deposit accounts, especially during the time with a sizable difference between commercial bank's and the free market exchange rates.

Foreign exchange rationing

Foreign exchange rationing is among the most stringent exchange restrictions maintained in Vietnam until these days. There has been a scarcity of foreign exchange over years causing restrictions on imports. Favours are often granted to capital equipment and materials for production while consumption and luxury goods are unprivileged. The composition of import consists of a large share of intermediate inputs and raw materials (60-70 percent), capital goods such as equipment and machinery (20-30 percent), beside a smaller percentage of consumer goods of less than 10 percent. A big share of intermediate materials belongs to petroleum products, fertilizer, iron and steel which are mainly under controls of state enterprises. In general, exchange rationing is favourable to the public sector. Le Quoc Ly (2004) indicates that instead of allowing the most efficient industries and firms to compete for scarce resources of foreign exchange for imports, the authorities undertook the task of rationing the amount of foreign exchange available administratively to inefficient businesses, mostly in the public sector. (Vo et al., 2000) claims that foreign exchange rationing measure supports the attainment of three goals: mobilizing foreign exchange for the needs of mainly state own enterprises, containing imports of consumer goods and prodding invested enterprises into sourcing inputs domestically while exporting outputs.

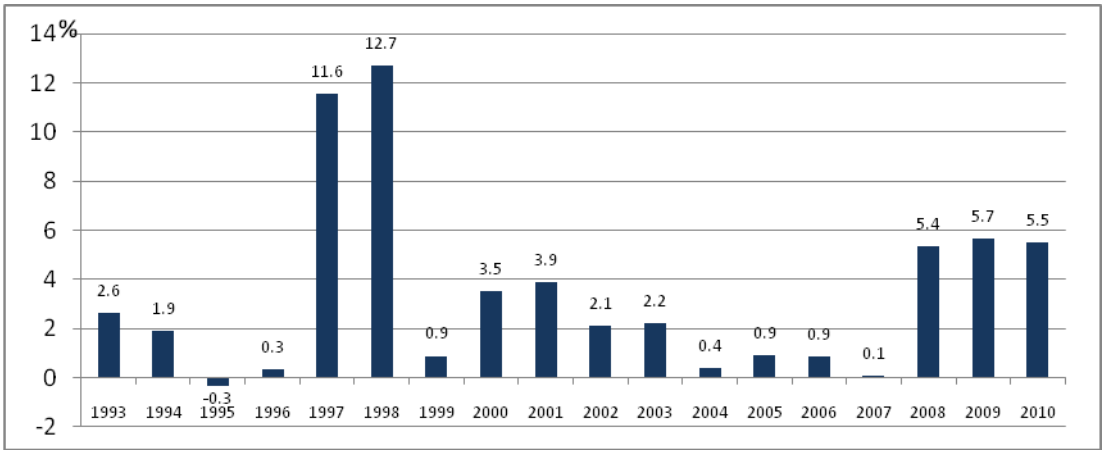
Segmented foreign exchange markets

In response to the prevalence of the above-mentioned exchange controls, the foreign exchange market in Vietnam is segmented, including official markets and a parallel market. There are, in fact, two official markets. One is the inter-bank foreign exchange market considered as a primary market. The other is a market between commercial banks and their

clients (individuals and business enterprises), which may be regarded as a retail secondary market. Spot transactions are still dominant in the primary market (SBV, 2008) where the SBV intervenes significantly market as the last buyer/seller in order to keep the reference rate stable. For example, it accounted for 65 percent of the total transaction in 2000 and 68 percent in 2001 (SBV, 2001). The stability of interbank rate after the Asian crisis was reflected by small rates of depreciation (figure 2), which was 1 percent in 2004-06 and even 0.08 percent in 2007 (SBV, various years). A reverse trend started in 2008.

Figure 2

Annual depreciation rate of Vietnam dong (1993-2010)



Source: IMF (1993-2005); and author's own calculations from SBV data (2006-2010)

The secondary official exchange market between banks and clients is essentially regulated by the SBV-determined trading bands, thereby setting lower bound and upper bound that commercial banks are permitted to deal with customers. Those bands obviously prevent the banks' exchange rate from adjusting to market forces. With such a stable nominal exchange rate, real exchange rate performance in some episodes has shown a symptom of overvaluation. The real exchange rate was around 2.4 percent above its medium-term equilibrium level for the period 1990-2008 (IMF, 2009). The overvaluation of the local

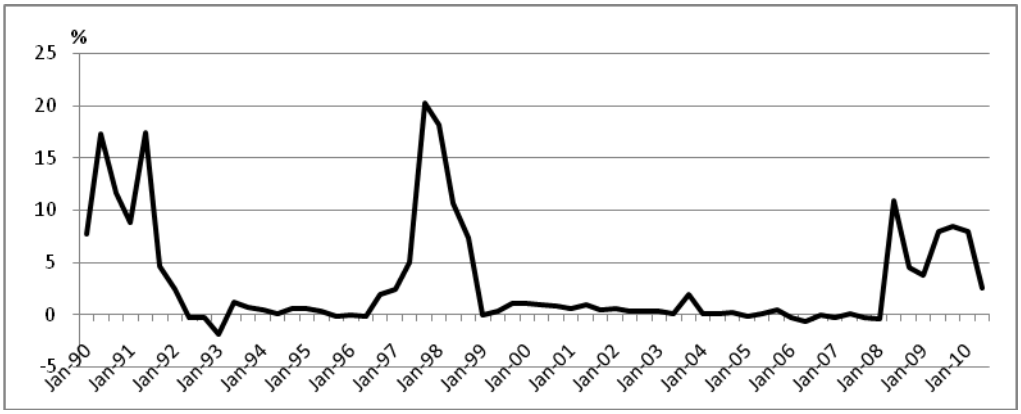
currency is also evidenced by the fact that the selling rate of commercial banks has been mostly set at the upper bound.

Regarding the market size, by comparing the market transaction volume to official figure of international trade, Nguyen and Nguyen (2009) estimated this ratio for 2006 at 60 percent. The official foreign exchange market in Vietnam is, therefore, rather shallow and underdeveloped. This also suggests that official markets cover only a small part of the total demand and supply for foreign exchange in trade transactions and the unofficial market might play a role.

The unofficial market for foreign exchange by law in Vietnam is illegal but tolerated by authorities. Foreign exchange agents and private exchange desks are recognized under the SBV's regulations. Therefore, instead of calling it a black market, authorities often refer to the parallel or free market. The difference between rates has not been very large as shown in Figure 3. Large exchange rate premium of over 5 percent is only observed in some periods, for example, before the economic stabilization in 1990-91, during the Asian financial crisis and lately from 2008.

Figure 3

Parallel exchange rate premium (1990-2010)



Source: SBV (1993-2006); Nguyen and Nguyen (2009) and own updates. The relative size of the parallel market to the official market in Vietnam, however, is not small, though a precise measuring is impossible. Nguyen Van Tien (2002) estimated the black market

accounts for about 20 percent of total foreign exchange transaction volume. Participants in this market consist of thousands of privately-run foreign exchange transaction desks, jewelry shops, and the likes around the country but mostly in big cities.

In countries with exchange controls and an overvalued official exchange rate, a foreign exchange black market often plays two important roles. First, it provides foreign exchange for current account transaction demand which cannot be financed in the official market. Second, it plays a capital account function, providing a means to shift private portfolios between domestic and foreign assets, especially under capital controls. These are also applicable in case of Vietnam.

Sources of current account supply and demand for foreign exchange

The primary source of foreign exchange supply to the parallel market in Vietnam is counted on private remittances, mostly from over 3 million oversea Vietnamese (*Vietkieu)*. Recent data in 2007-09 indicates the remittance amount of US$ 6-7bil annually, equivalent to 10-13 percent of the country's total exports. Moreover, flows of remittances through unofficial channels add to the supply, approximately in the range of US$1.5-3 bil per year (IMF, 2006). On the demand side, the black market can potentially finance a portion of current account transactions, particularly when official foreign exchange sales are administratively rationed, favouring state enterprises. As a result, the parallel market plays a role in providing foreign exchange for unsatisfied legal imports and illegal imports.

A market for foreign assets

A history of hyperinflation in the early years of economic reforms induced people to hold US dollars and gold as a store of value to protect their assets from depreciations. Foreign currency holdings by households and individuals can be in the form of bank deposits or cash (foreign bank notes). Banking regulations allow individuals to deposit foreign currency from whatever sources, thereby attracting foreign exchange into the banking system. Multiple channels of unofficial foreign exchange sources make it difficult to measure precisely the degree of foreign notes hold by households. In 1995, the IMF' calculation showed that there

were about USD 2.5 billion of foreign currencies and USD 3 billion hold in gold by the public. Unteroberdoerster (2002) estimates the quantity of USD banknotes to be around 3 billion in 2000, which was approximately 10 percent of GDP. A study by Nguyen Thi Hong (2004) calculates cash inflows of foreign currency into circulation of nearly USD 3.5 billion for the period 1996-2001

There is widespread evidence of dollarisation in Vietnam. Using US dollar as a means of exchange and unit of account (domestic price quoting in US dollar) is prevalent. Possessing foreign currency of individuals is recognized by law. Our calculation for the degree of dollarisation shows that foreign currency deposits accounted for about one third of total deposits in the second half of 1990s and suddenly jumped to 37 percent in 1999 before staying at a higher level of over 40 percent in early 2000s.

4. Analytical Framework for Welfare Analysis of a MER System

4.1 Preliminary Considerations

In this section, we present an analytical framework for welfare analysis modified from Hori and Wong (2008) and extended from Rosenberg and De Zeeuw (2001) which allows calculations of efficiency gains/losses from a MER system. Our modifications take into accounts characteristics of Vietnam exchange markets and incorporate the dollarisation phenomenon in the economy. From the analysis of Vietnam's segmented exchange markets in section 3, we consider the following facts:

- Export proceeds of both public and private exporters are repatriated through the banking system. There is almost no export under-invoicing and we assume no export smugglings/leakage to the free market.
- Public importers are given priority in access to official foreign exchange through rationing regulations. We, therefore, assume that public import demand is always satisfied in the official market.

- Private importers can only access to the remaining part of rationed foreign exchange in the official market. We introduce the foreign exchange supply constraint (quota) explicitly on private imports. Import smugglings and a part of legitimate private demand for imports are channeled through the free market.
- Foreign currency holding is an important part of foreign exchange demand in the unofficial market whereas private remittances are the main source of supply.
- Net capital inflows and debt servicing of the government are considered.

4.2 The Modified Model

This analytical framework considers a small open economy with export and import goods, taking international prices at P$ (measured in foreign currency) as given. The framework is derived from a static equilibrium model with an assumption of constant price elasticity functions for import and export markets. There are three main economic agents in the model, namely, the government (with a central bank), exporters and importers. Moreover, those traders may belong to either the public or the private sectors. The main role of the government and its central bank in this model is to regulate the official exchange market by requiring exporters to repatriate their export proceeds to central banks and ration foreign exchange to public importers and government payment transactions.

The exchange rate system and foreign exchange rationing

An official exchange rate E_{OF} is managed by the government, often at an overvalued level, measured in units of domestic currency (Vietnam dong) per unit of foreign currency (U.S. dollar). All exporters are required to sell their export earnings to the central bank (which assumed to consist of commercial banks as well) for domestic currency at the official exchange rate. This follows the current regulations on foreign exchange in Vietnam. A parallel (free or black) market for foreign exchange co-exists with the official market. The parallel exchange rate E_{PA} are determined by supply and demand forces in this market, and measured in unit of domestic currency per dollar. We assume in most of the case, the parallel market rate is often higher than the official rate ($E_{PA} > E_{OF}$).

The official foreign exchange market is rationed as follows: a certain amount of surrendered export earnings is set aside for public sector imports, debt servicing for public and publicly guaranteed external debt and official reserves accumulation, the rest is administratively allocated to the private sector, being sold at the official exchange rate. Import demand of public firms is, thereby, supposed to be always satisfied in the official market while import demand of private firms is imposed with an exchange quota. As a result, the private sector has an excess demand for foreign exchange at the official rate to finance its imports, forcing them to rely on the black foreign exchange market. Again, this specification adapts features of the foreign exchange markets in Vietnam. Private firms choose its imports in the unofficial market following the market price of foreign exchange.

The export supply and import demand functions are specified as below.

The total export supply function of public and private exporters as a whole:

$$P^X = BX^{\beta} \qquad \text{with } \beta > 0 \text{ and } B > 0 \qquad (1)$$

where P^X stands for the exported good's price measured in domestic currency (Vietnam dong), X is the volume of exports and B is a scaling parameter. Parameter β represents the price elasticity of export supply. Both β and B are greater than zero to ensure a positive relationship between the quantity supplied and price. Further, it is assumed that the share of public exports in total exports is u with $0 \leq u \leq 1$.

The import demand functions are specified similarly but separately for public and private importers – as a result of the foreign exchange rationing regulation. Public and private import volumes are denoted as M^U and M^R respectively. The corresponding prices of imported goods in domestic currency are P^{Mu} and P^{Mr}. We assume the same price elasticity of import demand in both sectors for simplicity, represented by parameter α. A_u and A_r again are scaling parameters.

$$P^{Mu} = A_u\left(M^U\right)^{-\alpha} \qquad \text{with } \alpha > 0 \text{ and } A_u > 0 \qquad (2)$$

$$P^{Mr} = A_r\left(M^R\right)^{-\alpha} \qquad \text{with } A_r > 0 \qquad (3)$$

The division of private imports channeled by different exchange markets due to foreign exchange controls requires further specification of equation (3) as:

$$P_{OF}^{Mr} = A_{r1}\left(M_{OF}^{R}\right)^{-\alpha} \quad \text{in the official market } (A_{r1} > 0) \text{ and} \qquad (4)$$

$$P_{PA}^{Mr} = A_{r2}\left(M_{PA}^{R}\right)^{-\alpha} \quad \text{in the parallel market } (A_{r2} > 0) \qquad (5)$$

All prices P are measured in domestic currency (Vietnam dong). X and M denote volume of exports and imports, respectively. Superscripts *U* and *R* specify the public and private sectors while subscripts OF, PA corresponds to the official and parallel exchange markets. A_{r1} and A_{r2} are scaling parameters of each import demand function of private agents. Parameters α, β indicate price elasticities of exports supply (ε_p^X) and import demand (ε_p^M) respectively. For simplicity, we assume these parameters are the same for both sectors.

$$\varepsilon_p^X = \frac{1}{\beta} \qquad \text{and} \qquad \varepsilon_p^M = -\frac{1}{\alpha}$$

Export market

The implicit tax on exporters (denoted as *tax*) is equivalent to the exchange rate premium between exchange rates in the parallel (E_{PA}) and official market (E_{OF}).

$$tax = 1 - \frac{E_{OF}}{E_{PA}} \quad \text{or} \quad E_{OF} = (1 - tax)E_{PA}$$

Under a small open economy assumption, exchange rates determine the domestic price of export goods in Vietnam dong terms, basing on the fixed world price $P\$^X$ in dollar terms.

$P_{OF}^X = P\$^X E_{OF}$ (under the official exchange rate)

$P_{PA}^X = P\$^X E_{PA}$ (under the parallel free exchange rate)

$P_{EQ}^X = P\$^X E_{EQ}$ (under the unified equilibrium exchange rate). The subscript EQ implies an equilibrium level.

The amount of implicit tax paid by exporters to the government will be:

$$T = \left(P_{PA}^X - P_{OF}^X\right)X_{OF} = \text{tax}P_{PA}^X X_{OF} \qquad (6)$$

The welfare loss for exporters (public and private as a whole) due to an implicit export tax is defined as exporters' surplus occurred under the unified (equilibrium) exchange market net of such surplus under the official market:

$$\mathrm{NWL}(X) = \left[P^X_{EQ}X_{EQ} - \int_0^{X_{EQ}} BX^{\beta}\,dX\right] - \left[P^X_{OF}X_{OF} - \int_0^{X_{OF}} BX^{\beta}\,dX\right] = \frac{\beta}{\beta+1}\left(P^X_{EQ}X_{EQ} - P^X_{OF}X_{OF}\right) \quad (7)$$

With a share *u* of the public sector in total exports, the corresponding welfare loss for public exporters and private exporters can be defined as:

$$\mathrm{NWL}\left(X^U\right) = u\left[\frac{\beta}{\beta+1}\left(P^X_{EQ}X_{EQ} - P^X_{OF}X_{OF}\right)\right] = \frac{\beta}{\beta+1}\left(P^X_{EQ}X^U_{EQ} - P^X_{OF}X^U_{OF}\right) \text{ and} \quad (8)$$

$$\mathrm{NWL}\left(X^R\right) = (1-u)\left[\frac{\beta}{\beta+1}\left(P^X_{EQ}X_{EQ} - P^X_{OF}X_{OF}\right)\right] = \frac{\beta}{\beta+1}\left(P^X_{EQ}X^R_{EQ} - P^X_{OF}X^R_{OF}\right) \quad (9)$$

Official import market

Due to a foreign exchange rationing scheme in the official market, private importers face an exchange quota (M^{R1}_{Qot}) determined by authorities while public importers are prioritized in buying scarce dollars from the central bank. This regulation prevents a market clearing exchange rate to occur. Instead, there is a shadow exchange rate E_{SD} for import quota and a shadow price of imported goods (P^{Mr}_{SD}) in domestic currency. Similar to the domestic price of export goods, the domestic price of imported goods is determined by exchange rates, taking the world price($P\$^M$) as given.

$$P^{Mr}_{SD} = P\$^M E_{SD} = A_{r1}\left(M^{R1}_{Qot}\right)^{-\alpha} \text{ or} \quad (10)$$

$$E_{SD} = \frac{A_r\left(M^{R1}_{Qot}\right)^{-\alpha}}{P\$^M} \quad (11)$$

The implicit subsidies rate (denoted as *sub)* given to importers with access to official foreign exchange is analogous to implicit export tax rate: $sub = 1 - \frac{E_{OF}}{E_{PA}}$

The subsidies amount granted by the government to importers is given by:

$$S = \left(P^M_{PA} - P^M_{OF}\right)M_{OF} = sub\, P^M_{PA}M_{OF} \quad \text{where} \quad (12)$$

$$M_{OF} = M^U_{OF} + M^{R1}_{Qot} \quad (13)$$

Similarly to the welfare loss incurred by exporters, there is welfare gain for importers in the official market owing to implicit import subsidies. The gains are measured by the

difference between importers' surplus under the official market and those under a unified exchange market where a unique equilibrium exchange rate would exist. These gains are calculated separately for private and public firms as follows:

$$NWL(M^U) = \left[\int_0^{M^U_{OF}} A_u (M^U)^{-\alpha} dM^U - P^M_{OF} M^U_{OF}\right] - \left[\int_0^{M^U_{EQ}} A_u (M^U)^{-\alpha} dM^U - P^M_{EQ} M^U_{EQ}\right]$$

$$= \frac{\alpha}{1-\alpha}\left(P^M_{OF} M^U_{OF} - P^M_{EQ} M^U_{EQ}\right) \quad (14)$$

$$NWL\left(M^{R1}_{Qot}\right) = \left[\int_0^{M^{R1}_{Qot}} A_{r1} (M^{R1})^{-\alpha}\, dM^{R1} - P^M_{OF} M^{R1}_{Qot}\right] - \left[\int_0^{M^{R1}_{EQ}} A_{r1} (M^{R1})^{-\alpha}\, dM^{R1} - P^M_{EQ} M^{R1}_{EQ}\right] = \frac{1}{1-\alpha} P^M_{SD} M^{R1}_{Qot} - P^M_{OF} M^{R1}_{Qot} - \frac{\alpha}{1-\alpha} P^M_{EQ} M^{R1}_{EQ}$$

$$= \quad (15)$$

Unofficial import market

A market clearing exchange rate in the free market is obviously different from the official rate and possibly from the equilibrium unified rate. Therefore, the net welfare gain or loss of private importers in the parallel market can be measured similarly as a difference in surpluses:

$$NWL\left(M^R_{PA}\right) = \left[\int_0^{M^{R2}_{PA}} A_{r2} (M^{R2}_{PA})^{-\alpha}\, dM^{R2} - P^M_{PA} M^{R2}_{PA}\right] - \left[\int_0^{M^{R2}_{EQ}} A_{r2} (M^{R2})^{-\alpha}\, dM^{R2} - P^M_{EQ} M^{R2}_{EQ}\right] = \frac{\alpha}{1-\alpha}\left(P^M_{PA} M^{R2}_{PA} - P^M_{EQ} M^{R2}_{EQ}\right) \quad (16)$$

Net welfare loss by sector

For simplicity but without loss of generality, we assume that the world prices of imports and exports are the same $P\$^X = P\$^M = 1US\$$. Domestic prices of export and import goods, therefore, equal to the corresponding exchange rates.

The government can collect exchange profits from trade transactions through the exchange system, equivalent to the implicit export tax revenue net of implicit import subsidy:

$$T - S = tax P^X_{PA} X_{OF} - sub\ P^M_{PA} M_{OF} \quad (17)$$

Since $tax = sub = 1 - \frac{E_{OF}}{E_{PA}}$, equation (17) can be rewritten as:

$$T - S = (1 - \frac{E_{OF}}{E_{PA}}) E_{PA} (X_{OF} - M_{OF}) = tax E_{PA} (official\ trade\ balance) \quad (18)$$

More strictly, if we also take into account the net capital inflows into the banking system (assumed as a part of the central bank) as well as debt-servicing costs (denoted as De) paid by the treasury, the government can obtain additional welfare gain from the multiple exchange system in two folds. One is from implicit exchange tax on capital inflows in foreign currencies. The other is from implicit subsidy to itself when the government can get access to cheaper foreign exchange in the official market to service public external debt, including interest and amortization payments. This is very similar to the way that public importers are subsided. In this respect, the implicit subsidies are a part of domestic budget balance effects as described in Kaufmann and O'Connel (1997). We define exchange profits (ExProf) as a gain implicitly collected by the government (and the central bank) through all exchange transactions in the official market as follows:

$$\text{ExProf} = (E_{SD} - E_{OF})(X_{OF} - M_{OF} + K_{OF} + De) \tag{19}$$

The public sector (firms): within the public sector, welfare losses of exporters can be offset by welfare gains of importers, making the public net the welfare loss as:

$$\text{NWL}(U) = \text{NWL}(X^U) - \text{NWL}(M^U) = \frac{\beta}{\beta+1}\left(P^X_{EQ}X^U_{EQ} - P^X_{OF}X^U_{OF}\right) - \frac{\alpha}{1-\alpha}\left(P^M_{OF}M^U_{OF} - P^M_{EQ}M^U_{EQ}\right) \tag{20}$$

The private sector: since importers in this sector trade in both foreign exchange markets, thus the net welfare loss of the sector will be the welfare loss of private exporters net of the welfare gain of importers in each exchange market:

$$\text{NWL}(R) = \text{NWL}\left(X^R\right) - \text{NWL}\left(M^{R1}_{OF}\right) - \text{NWL}\left(M^{R2}_{PA}\right) \tag{21}$$

$$= \frac{\beta}{\beta+1}\left(P^X_{EQ}X^R_{EQ} - P^X_{OF}X^R_{OF}\right) - \frac{1}{1-\alpha}P^M_{SD}M^{R1}_{Qot} + P^M_{OF}M^{R1}_{Qot} - \frac{\alpha}{1-\alpha}\left(P^M_{PA}M^{R2}_{PA} - P^M_{EQ}M^R_{EQ}\right)$$

If we consider the economy as a whole, adding up the net welfare losses of the government, public firms and the private sector will provide the net welfare loss from trade of the whole economy: NWL = - (T - S) + NWL (U) + NWL (R).

Substitute equations (18), (20) and (21) into the above identity, one can have:

$$NWL = -taxE_{PA}(X_{OF} - M_{OF}) + \left[\frac{\beta}{\beta+1}\left(P^{X}_{EQ}X^{U}_{EQ} - P^{X}_{OF}X^{U}_{OF}\right) - \frac{\alpha}{1-\alpha}\left(P^{M}_{OF}M^{U}_{OF} - P^{M}_{EQ}M^{U}_{EQ}\right)\right] + \left[\frac{\beta}{\beta+1}\left(P^{X}_{EQ}X^{R}_{EQ} - P^{X}_{OF}X^{R}_{OF}\right) - \frac{1}{1-\alpha}P^{M}_{SD}M^{R1}_{Qot} + P^{M}_{OF}M^{R1}_{Qot} - \frac{\alpha}{1-\alpha}\left(P^{M}_{PA}M^{R2}_{PA} - P^{M}_{EQ}M^{R}_{EQ}\right)\right]$$

$$= -taxE_{PA}(X_{OF} - M_{OF}) + \frac{\beta}{\beta+1}\left(P^{X}_{EQ}X_{EQ} - P^{X}_{OF}X_{OF}\right) + \frac{\alpha}{1-\alpha}\left(P^{M}_{EQ}M_{EQ} - P^{M}_{OF}M^{U}_{OF} - P^{M}_{PA}M^{R2}_{PA}\right) - \frac{1}{1-\alpha}P^{M}_{SD}M^{R1}_{Qot} + P^{M}_{OF}M^{R1}_{Qot} \quad (22)$$

This equation shows that the net welfare loss of the society from international trade will be equivalent to welfare losses incurred by exporters minus net welfare gains of importers and part of exchange profits (from trade transactions only) of the government. The net welfare loss (or gain) of exporters (or importers) depend on trade elasticities and changes in export and import volume resulted from a unification of two foreign exchange markets. Meanwhile, the government is making loss from trade if the trade balance is in deficit causing implicit subsidies to be larger than implicit tax. However, considering exchange profits in broader terms, the government may gain from the present dual exchange rate system when capital inflows turning the government into a net buyer of foreign exchange.

4.3 Marketing Clearing Conditions and the Equilibrium Exchange Rate

In this modified model, we also take into account capital inflows and dollarisation phenomenon of the economy as exogenous factors to our partial equilibrium models. The sources of supply and demand for foreign exchange in the official and free markets in Vietnam are summarised as follows.

Official foreign exchange market

Supply	*Demand*
• Exports of goods and services (public and private firms) (X) • Capital inflows (FDI, portfolio investments, official foreign aid, external loans) (K_{OF})	• Official imports of goods and services (M) • Debt servicing costs of the public sector (De) • Accumulation of external reserves (ΔR)

Parallel/Free foreign exchange market

Supply	*Demand*
• Private remittances (K_{PA}^{R}) • Foreign tourists' expenditure	• Unsatisfied official imports and import smugglings (M_{PA}^{R2}) • Foreign currency holding (bank deposits and banknotes) – dollarization (F_{PA})

Therefore, to clear the official market, the total imports of the public and private sectors should be financed by export earnings, net capital inflows (K_{OF}) subtracted by the central bank's foreign reserves accumulations (ΔR) and the government's external debt servicing costs denominated in foreign currency.

$$M_{OF}^{U} + M_{Qot}^{R1} = X + K_{OF} - \Delta R - De \quad (23)$$

The market clearing condition in the free market, is:

$$M_{PA}^{R2} + F_{PA} = K_{PA}^{R} \quad (24)$$

K_{PA}^{R} represents the supply of foreign exchange for the free market, basically from private remittances either illegal or legally transmitted through the banking system since people can withdraw foreign notes and sell in the black market. F_{PA} denotes for the flows of foreign currency holding in people's asset portfolio, which may include foreign currency bank deposits as well as "under pillow" foreign cash.

In the scenario with exchange rate unifications, these two foreign exchange markets are pooled and the equilibrium condition is:

$$X + K - \Delta R - De = M + F \quad (25)$$

where $M = M^{U} + M^{R1} + M^{R2}$; $X = X^{U} + X^{R}$ and $K = K_{OF} + K_{PA}^{R}$

It should be noted that all export and import volumes in the above equation are those under a single equilibrium exchange rate E_{EQ}. Under our static partial equilibrium model, we make an assumption that foreign asset demand (F) and capital inflows (K), and debt servicing costs (De) are exogenous. Our understanding from the literature with portfolio approach to exchange rate such as Lizondo (1984), Kharas and Pinto (1989), and Pinto (1990) is that portfolio composition of holding domestic and foreign currencies is influenced by inflation and interest rate differentials between the two currencies and the rate of depreciation. Since the current model is static, this factor is simply ignored.

Using the supply and demand functions in equations (1)-(5), the equilibrium exchange rate (E_{EQ}) could be derived from the following equation:

$$\left(\frac{P_{EQ}^{X}}{B}\right)^{1/\beta} + K - \Delta R - De = \left(\frac{P_{EQ}^{Mu}}{A_u}\right)^{-1/\alpha} + \left(\frac{P_{EQ}^{Mr1}}{A_{r1}}\right)^{-1/\alpha} + \left(\frac{P_{EQ}^{Mr2}}{A_{r2}}\right)^{-1/\alpha} + F \quad (26)$$

With an assumption of unit foreign price for both export and import, one has $P_{EQ}^{X} = P_{EQ}^{Mu} = P_{EQ}^{Mr1} = P_{EQ}^{Mr2} = E_{EQ}$. Since K, ΔR and De are observable exogenous variables, we denote the term as a constant $C = K - \Delta R - De - F$. We can solve for the equilibrium exchange rate once we know trade elasticities (α and β) and four scaling parameters (A_u, A_{r1}, A_{r2} and B).

$$\left(\frac{E_{EQ}}{B}\right)^{1/\beta} - \left(\frac{E_{EQ}}{A_u}\right)^{-1/\alpha} - \left(\frac{E_{EQ}}{A_{r1}}\right)^{-1/\alpha} - \left(\frac{E_{EQ}}{A_{r2}}\right)^{-1/\alpha} + C = 0 \quad (27)$$

The shadow exchange rate for private imports in the official market is estimated as in equation (11). Then the size of foreign exchange quota M_{Qot}^{R1} imposed to private importers can be calculated using equation (23).

4.4 Net Efficiency Cost (Relative to Trade Value) and Trade Openness

Efficiency costs of the export market

Equation (7) indicates the welfare loss in the export market. Dividing this welfare loss by the value of exports evaluated at the parallel market clearing price, that is, $P_{PA}^{X}X_{OF}$, the net efficiency loss of exporters can be obtained:

$$\frac{NWL(X)}{P_{PA}^{X}X_{OF}} = \frac{\beta}{\beta+1}\left(\frac{E_{EQ}}{E_{PA}}\right)^{\frac{1+\beta}{\beta}}(1-\text{tax})^{-\frac{1}{\beta}} - \frac{\beta}{\beta+1}(1\text{- tax}) \qquad (28)$$

This net efficiency loss in the export market, applied similarly to public and private exporters, is a function of the implicit tax, the price elasticity of export supply and the ratio of the equilibrium exchange rate to a free market clearing exchange rate.

Efficiency costs of the import market

Since public importers can often get access to foreign exchange at the official exchange rate which is usually overvalued (lower than the equilibrium exchange rate), they have net efficiency gain (i.e. welfare gains relative to import value at the free market rate). This can be derived analogously to that of public exporters:

$$\frac{NWL(M^{U})}{P_{PA}^{M}M_{OF}^{U}} = \frac{\alpha}{-\alpha+1}\left(\frac{E_{OF}}{E_{PA}}\right) - \frac{\alpha}{-\alpha+1}\left(\frac{E_{EQ}}{E_{PA}}\frac{M_{EQ}^{U}}{M_{OF}^{U}}\right) = \frac{\alpha}{-\alpha+1}(1-\text{sub}) - \frac{\alpha}{-\alpha+1}\left(\frac{E_{EQ}}{E_{PA}}\right)^{\frac{-1+\alpha}{\alpha}}\left(\frac{1}{1-\text{sub}}\right)^{-\frac{1}{\alpha}} \qquad (29)$$

This net efficiency gain is a function of an implicit subsidy rate, price elasticity of import demand and the equilibrium exchange rate relative to the parallel market clearing exchange rate.

For private importers, a calculation of net efficiency gain is different because their transactions are carried out in both exchange markets. The total private imports evaluated at the parallel market price are $P_{PA}^{M}M^{R} = P_{PA}^{M}\left(M_{Qot}^{R1} + M_{PA}^{R2}\right)$, thus:

$$\frac{NWL\left(M^{R}\right)}{P_{PA}^{M}M^{R}} = \frac{NWL\left(M_{OF}^{R1}\right)+NWL\left(M_{PA}^{R2}\right)}{P_{PA}^{M}\left(M_{Qot}^{R1}+M_{PA}^{R2}\right)} \qquad (30)$$

$$= \left(\frac{E_{SD}+(1-\alpha)E_{OF}}{(1-\alpha)E_{PA}}\right)\frac{M_{Qot}^{R1}}{M_{Qot}^{R1}+M_{PA}^{R2}} + \left(\frac{\alpha}{1-\alpha}\right)\frac{M_{PA}^{R2}}{M_{Qot}^{R1}+M_{PA}^{R2}} - \frac{E_{EQ}}{E_{PA}}\frac{M_{EQ}^{R}}{M_{Qot}^{R1}+M_{PA}^{R2}}$$

Equation (30) shows that in addition to factors affecting the net efficiency gain of public importers, the net efficiency gain/loss of private importer also depends on the share of

import volume channeled through the parallel exchange market as well as the shadow exchange rate.

Government's exchange profits and the economy efficiency costs, trade openness

The exchange profits implicitly collected by the central bank and the government are measured by equation (19). It should be noted that those profits come from both trade and capital transactions in the exchange market. To make it more intuitive, exchange profits/loss is expressed in percentage of GDP as $\frac{ExProf}{GDP}$.

The total efficiency loss of the whole economy from trade relative to GDP can also be calculated using the formula $\frac{NWL}{GDP}$. The other ways is to compare export efficiency loss and import efficiency gains relative to GDP from the import market as a whole (Hori and Wong, 2008).

Change in trade openness due to foreign exchange unification can be measured as $\frac{X_{EQ}+M^{U}_{EQ}+M^{N}_{EQ}}{GDP_{EQ}} - \frac{X_{OF}+M^{U}_{OF}+M^{K1}_{Qot}+M^{K2}_{PA}}{GDP}$ where GDP_{EQ} is a new GDP adjusted for import and export values at a single equilibrium exchange rate. Similarly, change in trade deficit (in percentage of GDP) can be defined by the formula $\frac{X_{EQ}-(M^{U}_{EQ}+M^{N}_{EQ})}{GDP_{EQ}} - \frac{X_{OF}-(M^{U}_{OF}+M^{K1}_{Qot}+M^{K2}_{PA})}{GDP}$.

4.5 Data and Parameter Estimation

Data description

The period of interest for data calculation is 2007-09. This period is selected because it represents the two different but important exchange rate regimes in recent years. The year 2007 was under the de facto conventional peg with stable nominal exchange rate and small exchange rate premium in the parallel market (0.27 percent). Meanwhile, year 2008 marked a period of exchange instability. The foreign exchange market experienced more fluctuations with several episodes of devaluation in 2009 and with a larger exchange rate gap (7.3 percent) between the two exchange markets,

Data on exchange rates comes from the SBV annual reports. Import and export values and GDP in US dollar and Vietnam dong is from the General Statistical Office and the IMF. Net capital inflows are calculated following statistical annual data on the balance of payments

from the International Financial Statistics (IFS). Data on public external debt and its servicing costs are collected from the World Development Finance.

Parameter estimation

Finding roots for the equilibrium exchange rate as specified in equation (27) requires an approximation of scaling parameters of export and import functions. From the export supply function in the official market:

$$B = \frac{p^X}{X^\delta} = \frac{(p^X)^{\delta+1}}{(p^X X)^\delta} = \frac{(E_{OF})^{\delta+1}}{(p^X X)^\delta} \quad (31)$$

Since the official exchange rate and total export revenue in terms of domestic currency are observable, parameter B can be calculated. The share of public exports (u) is not readily available from Vietnam's statistics. However, total exports are reported with disaggregation in the domestic sector and foreign invested sector. We, therefore, take this data as a basic and use the GDP share of state and non-state domestic sectors additionally to further disaggregate domestic sector exports. The estimation gives a value range for parameter u in the case of Vietnam in 0.19- 0.203 for the period 2007-09, and an average of 0.21 for the period 2000-09.

From the import demand function of public importers in the official market, one has:

$$A_u = \frac{p^{Mu}}{(M^U)^{-\alpha}} = \frac{(p^M)^{-\alpha+1}}{(p^M M^U)^{-\alpha}} = \frac{(E_{OF})^{-\alpha+1}}{(p^M M^U)^{-\alpha}} \quad (32)$$

The above equation requires an observable value of public imports. From the official statistics, we found no exact data on public sector's imports in Vietnam. We must use a similar method of estimation as used above for public export share to obtain public import share.

Analogously, from the import demand function of private importers in the unofficial market, parameter A_{r2} can be derived:

$$A_{r2} = \frac{p^M_{PA}}{(M^R_{PA})^{-\alpha}} = \frac{(E^M_{PA})^{-\alpha+1}}{(p^M_{PA} M^R_{PA})^{-\alpha}} \quad (33)$$

There is, in practice, no precise records of private imports channeled through the parallel exchange market. From equation (24), one may derive M_{PA} as a difference between private net capital inflows into this market and the demand for holding foreign currency F_{PA} if

we assume these two variables have reliable records. Moreover, data on direction of trade between Vietnam and its trading partners can provide another way for double-checking. Data provided by the IMF on the direction of trade allows a comparison between officially recorded imports into Vietnam by the country's customs and official exports of trading partners to Vietnam. This difference provides estimation on the size of unofficial and smuggled private imports.

The private import demand scaling parameter A_{r1} cannot be derived from the demand function in equation (4) because the official exchange rate is not applicable and shadow exchange rate is unknown. In another model used for Myanmar, Hori and Wong (2008) assume the ratio of imports conducted through the official and free exchange market is made. Applying this approach in our present model, we assume that under the parallel market clearing price level, the portion of unofficial private import compared to official import demand is v (v>0). This parameter can be approximated using our above calculation of unofficial imports.

$$M_{pA}^{R2} = v(M_{pA}^{U} + M_{pA}^{R1}) \quad (34)$$

As a result, parameter A_{r1} can be derived with an assumption of a constant price elasticity of the import demand function:

$$A_{r1} = \left(\frac{1}{v} A_{r2}^{\,1/\alpha} - A_{u}^{\,1/\alpha}\right)^{\alpha} \quad (35)$$

Regarding trade elasticities, to our knowledge, in the case of Vietnam, there is no study specifically estimating these parameters directly at the aggregate level as well as for specific commodities. The only study which mentions and uses export supply and import demand elasticities are Nguyen Khac Minh (2000) and Jeong et al. (2009). No detailed method of estimation is presented in those studies. The range for parameter provided are, 0.5 to 0.9 for export elasticity and -1.2 to -1.5 import elasticity. We can also borrow from other literature estimating those parameters for East Asia or developing countries with similar trade composition to carry out a sensitivity analysis. For example, Rosenberg and De Zeeuw (2001) explores the welfare effects of Uzbekistan's foreign exchange regime with three assumed values 0.5, 1 and 1.5 for both import and export elasticities. Bahmani-Oskooee and Kara

(2005) estimates export elasticity at 0.4 and 1 respectively for 7 developing countries and overall 28 countries. Similarly, import elasticity is estimated at 0.5 and 1.2 on average correspondingly for these two groups of countries. Once we have the estimated valued for four scaling parameters and trade elasticities, we can solve for equilibrium conditions in equation (27) numerically, using Matlab, for example.

5. Empirical Results

5.1 Baseline Results

In our baseline calculations, export and import price elasticities are assumed with high values 1.5 and -1.5 respectively ($\alpha=\beta=2/3$). These conjectural elasticities seem to be consistent to our assumption of a small open economy. Other parameters are approximated using Vietnam's actual data as follows: share of public exports u=0.2; ratio of private imports in the parallel market to total official imports v=0.1.Table 1 in Appendix reports the estimated welfare effects and efficiency costs of different markets and sectors in the period 2007-09 under our baseline assumptions. The equilibrium exchange rate calculated from the demand and supply for foreign exchange is shown on the second line of the table, as well as the conceptual shadow exchange rate for private importers in the official market. The equilibrium exchange rate is estimated at VND 18,434 per U.S. dollar in 2009, which is a little higher than the parallel market rate but considerably higher (8 percent) than the official rate applied in the banking system. For 2007 and 2008, the free market rate was very close to the official rate, the estimated equilibrium exchange rates are 5 and 6 percent respectively higher than official levels.

The shadow exchange rate for private imports in the official market due to an imposition of exchange rationing is approximated at VND 18,832 per US dollar in 2009, reflecting a large difference (10.4 percent higher) compared to the official rate. However, estimated shadow exchange rates are lower than the equilibrium rates in 2007-08, keeping a modest gap from official rates of 2 percent in 2008 and 0.2 percent in 2007. This finding

implies that when the exchange rate premium between the official and parallel exchange rates is large, foreign exchange rationing tends to be more severe, resulting in a larger difference between the official rate and shadow exchange rate that actually faced by private importers.

The first column of table 1 shows the welfare losses or gains in monetary term, resulted from the MER system, of public and private exporters and importers measured in billions of Vietnam dong in 2009. The second column indicates efficiency effects which are the relative welfare gain/loss to the corresponding trade values measured in percentage . These effects are measured as the ratio of welfare gain/loss relative to the respective trade values in each market evaluated at the parallel exchange rate (as defined in section 4.4). A similar order applies to the years 2007-08. As analysed in the framework, lower official rates than free market rates implicitly create a loss for exporters. This applies to both public and private exporters because of the assumption of a single export market in the case of Vietnam. The positive efficiency effects on export market suggest net efficiency losses for public and private exporters at 8.5 percent of their respective export values in 2009, and 5.2 and 6.3 percent in 2007 and 2008.

In the import markets, net efficiency gain of public importers is larger than that of private importers, 7.1 versus 6.6 percent in 2009. This is because all public imports are conducted in the official exchange market with implicit subsidies from the government whereas only a part of private imports is benefited from such subsidies. The remaining part of private imports conducted in the unofficial market has much less welfare gain because the equilibrium exchange rate is slightly higher than the parallel market rate. In other case when the free market rate is higher than the estimated equilibrium rate, then unofficial private importers will bear some efficiency losses.

Moreover, as the exchange premium between official and parallel rates getting smaller, the sectoral difference in net efficiency gains of importers is narrowed, as in 2007 and 2008. In any case, nevertheless, the overall net efficiency gain of import markets is often lower than the net efficiency loss of the export market, implying a total net efficiency loss

from trade to the economy. The loss caused by the MER system in 2007-08 is 0.5-0.6 percent but becomes larger at 1.8 percent in 2009. These results suggest that when exchange rate differential between the two markets gets bigger, total efficiency loss from trade to the economy can be more serious.

In this partial equilibrium framework, we also try to investigate the net welfare loss/gain resulted from trade transactions by different sectors of the economy. The welfare loss of public exporters and welfare gain of public importers are added up in monetary terms. A similar procedure is applied to the private sector and the economy as a whole. The results show that public sector gains 0.5-0.6 percent of GDP from trade transactions under the current MER system. Meanwhile, the private sector bears a cost of 0.2 percent in GDP in 2009. In 2007-08, as the two exchange rates getting closer, private sector has some gain 0.3-0.4 percent of GDP in 2008 and 2007 respectively but they are lower than those of public importers. This indicates an evidence that the MER regime is designed to benefit the public sector, sometimes at the cost of the private sector.

In regards to the government's gains or losses from implicit taxes and subsidies resulted from a MER system, we consider two separate estimates. The first one only looks at the difference between implicit taxes collected from exporters and implicit subsidies provided to official importers. This estimate implies a loss to the government because the official trade balance was in deficit all over the period 2007-09. In the second estimate, we take into account the net capital inflows through the official market as well as servicing costs for public external debts and use the shadow exchange rate in the official market to calculate implicit exchange profits/losses, as suggested in Kaufmann (1997) and Agenor and Ucer (2001). Results are now opposite showing that the government can gain from the MER system as long as it is a net buyer of foreign exchange. This implicit exchange profits for the government and central bank (given in equation (19)) is estimated at 0.08 and 0.02 percent of GDP respectively for 2009 and 2007. This amount of net implicit tax collected through the exchange system seems to be small but in relative to other sources of budget revenue, one may see that it is not

negligible. For example, in 2009, exchange profits are equivalent to 0.4 percent of total tax revenue, 10 percent of individual income tax, 23 percent of grant aid and as much land and housing tax). We believe that this numbers is underestimated because it has not taken into account government imports which are also benefited from low-price foreign exchange. In fact, government imports might have been incorporated into public firms' import, so that one part of exchange profits of the government is hidden in the gains of public importers. Unfortunately, there is no reliable source of information to separate those implicit gains between the government and public enterprises.

In 2008, the central bank was selling net of foreign exchange, thus making loss from the system. However, our estimate of exchange profits in 2007 shows a positive number although exchange rate premium was very small. This results supports the literature's suggestion that the government can make implicit exchange profits although there is little margin between official and black market rates, or even the central bank sells and buys foreign exchange at the same rate.

In calculating the total net welfare gain/loss from international trade of the economy as a whole, we first estimate the government's net welfare loss from trade (taxes minus subsidies) to add up with those of public and private traders. The total net welfare loss of the economy from trade under the MER system is 0.33 percent in GDP in 2009. In 2007-08, with smaller exchange rate gaps, there are net welfare gains of 1 percent and 0.62 percent of GDP respectively.

In exploring the effects of foreign exchange market unification on the overall GDP and trade performance, we need to adjust nominal GDP due to a difference between the official and estimated equilibrium exchange rates. The results in the last three rows of table 1 in Appendix show that foreign exchange market unification could have very positive effects. Trade openness under a unified exchange market could increase by 9 percent in 2007 and by 27 percent in 2009, compared to the current situation with a segmented exchange markets. At

the same time, trade deficit could be largely improved, narrowing by 0.7 percent of GDP in 2009, 1.2 percent in 2008 and 6.1 percent in 2007.

Adjustments to nominal GDP also show that if there is a single exchange rate, GDP can be enhanced, by 0.7 percent in 2009 and 5.5 per cent in 2007. This estimation may look counter-intuitive because one might expect a larger impact when a wider exchange premium is eliminated as in 2009. However, real data provides an explanation. The adjustment on GDP has removed the current trade deficit from GDP components before adding a new estimation for trade balance at a single equilibrium exchange rate. While the trade deficit in 2007 is recorded at very a high level of 14.6 percent of GDP, the deficit in 2009 is only 8.5 percent (General Statistical Office, 2010). At the same time, the new trade balance at the equilibrium exchange rate is almost the same for both years.

5.2 Sensitivity Analysis

This section aims at analyzing the sensitivity of the baseline results to parameter changes. First, we allow small and medium values of trade elasticities in the range (0.5 to 1) and compare the new result to baseline calculations with high elasticities. Second, we check the results by allowing one of the two basic parameters (u and v) to take a higher or lower values than those in the baseline estimation. In exploring the effects of dollarisation in the asset market to efficiency costs, we try a different value for variable F (demand for foreign currency holding) by restricting this demand to foreign currency deposits which is officially recorded in the banking system while excluding public holding of foreign bank notes.

Changes in trade elasticities

Table 2 in Appendix reports the estimated equilibrium exchange rates and net efficiency losses in four cases of different elasticities. Case 1 and 2 indicate simultaneously low and medium import and export elasticities. Case 3 explores the effects of high import demand with low export supply elasticity and vice versa in case 4.

It is observed that when trade elasticities instantaneously increase (case 1, 2[2]. and baseline) the equilibrium exchange rate tends to be lower (more appreciated). Intuitively, with an appreciating equilibrium exchange rate, the net efficiency loss of exporters is reduced, from 17.7 percent to 10.7 then 8.5 percent in 2009. Net efficiency gains of importers follows the same trend. In all cases, net efficiency losses in the export market are higher than net efficiency gains in the overall import market. The total net efficiency loss from trade can also be simply defined as the difference between the export market's net efficiency loss and the import market's net efficiency gain. One might say that the total net efficiency loss of the economy on average (of all cases) 2.8 percent in 2009 and around 1.6 percent for 2007-08. This is because import efficiency gains do not adequately offset export efficiency losses.

Comparing case 1 and case 3, one can see that a higher import demand elasticity (1/α) (i.e., a higher demand for foreign exchange in the import market at the equilibrium exchange rate) would lead to a higher (more depreciated) level equilibrium of exchange rate. This would result in a higher efficiency gain in the import market for both private and public importers but at the same time increase efficiency losses of exporters with more intensified effects, thus increasing the total net efficiency loss in total (from 2.7 to 5.7 percent of GDP in 2009).

On the other hand, results from increasing export supply elasticity (1/β) in case 4 indicate that higher export supply elasticity could make the equilibrium exchange rate lower (more appreciated). As a result, both the net efficiency loss of exporters and the net efficiency gains of importers decline considerably, approximately by half, as (1/β) changes from 0.5 to 1.5. Overall, the total net efficiency loss of the two trade markets also reduces, from 2.7 to 1.8 percent in 2009 and 1.2 to 0.5 percent in 2008.

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[2] Note that in the case with α=1, the formula for welfare gain of importers is different because the integral of an inverse function is in natural logarithm form. However, the outcome is basically the same, for example: $\mathrm{NWL}\ (M^U = \int_{M^U_{EQ}}^{M^U_{OF}} A_u \frac{1}{M^U}\, dM^U + \left(P^M_{EQ}M^U_{EQ} - P^M_{OF}M^U_{OF}\right) = A_u \ln\left(\frac{M^U_{OF}}{M^U_{EQ}}\right) + \left(P^M_{EQ}M^U_{EQ} - P^M_{OF}M^U_{OF}\right)$

From a sectoral perspective, if we assume that welfare effects of exporters and importers can be summed up to calculate sectoral net welfare as percentage of GDP, one can see that the public sector is often more benefited than the private sector in all cases with different elasticities. While public firms as a whole can always gain from the current exchange rate system from 0.5 to 2 percent of GDP, private firms bear losses or marginally gain. As indicated from the baseline results, our sensitivity analysis confirms the hypothesis that the MER system in Vietnam is more benefited to the public sector than the private sector.

It is noticeable that shadow exchange rates to private sector imports in the official market seem to be insensitive to changes in elasticities. This variable, as defined in our framework, is more dependent on the exchange quota. The government's implicit exchange profits, as a result, are almost unchanged as trade elasticities vary.

In most of the cases, exchange rate unification and would lead to a narrower trade deficit as percentage of GDP. Case 2 with low export supply and import demand elasticities indicates a widening trade deficit for 2008-09 in a unified foreign exchange market. This evidence supports the Marshall-Lerner condition that the trade balance would improve following a devaluation only when the sum of trade elasticities greater than 1. In all remaining cases, unifying segmented foreign exchange markets would result in a more depreciated equilibrium exchange rate. This rate, in turn, would mitigate the daunting problem of trade deficit and at the same time further enhance the economy's trade openness. The degree of openness is calculated, on average, at 20, 25 and 30 percent for 2007, 2008 and 2009 respectively.

Change in other parameters

In addition to conjectural import demand and export supply elasticities, we also assume in our model other parameters regarding sectoral shares, namely public export share (u), and the ratio of private unofficial imports in the parallel market to total official imports (v). Table 3 in Appendix reports changes in net efficiency losses as those parameters vary for the year 2009. A change in the public sector export share (u) does not alter efficiency costs of

both public and private exporters in relative to their export revenue. It is because of the single export market assumption. However, welfare of public and private exporters does change in monetary terms, proportionally to a change in share. It, therefore, affects the net gain and loss of each sector. Intuitively, the public sector's efficiency gains in relative to the nominal GDP would increase (from 0.6 to 1.2 percent in 2009) as its share in total exports lowers from 20 to 10 percent, simply because of less implicit tax paid to the government while implicit subsidies to public importers are unchanged.

Conversely, an increase in the share of private unofficial imports in the free market would lead to a significantly higher equilibrium exchange rate while leaving the shadow rate unchanged. Exporters, therefore, have to bear higher efficiency costs due to a wider gap between the equilibrium and the official exchange rate at which they have to sell their foreign exchange proceeds to commercial the banks. It causes a larger difference (6.5 percent versus 1.8 percent) between the efficiency losses in the export market and efficiency gains in the import market, implying a larger loss to the economy as a whole.

Finally, if our calculation ignores the public holdings of foreign cash, thus approximates the demand for this type of foreign asset are merely the officially recorded foreign currency deposits, it would result in a much lower (more appreciated) equilibrium exchange rate at 17,513 dong per US dollar in 2009. This rate is still larger than the official rate of the same year by 2.6 percent but lower than the free market rate by 4.3 percent. Under this equilibrium level, both export efficiency losses and import efficiency gains reduce and their difference is smaller, making a smaller efficiency loss from trade to the economy. This finding implies that although the demand for dollar asset is influenced by financial factors such as interest rates of the two currencies and inflation rate, it could have an important role in determining the equilibrium exchange rate, thereby, affecting the efficiency of trade markets.

6. Concluding Remarks and Policy Implications

One of the visible effects of the Asian financial crisis on Vietnam economy was a problem of balance of payments and trade deficits. External and internal imbalances posed a dilemma to the monetary authority. A cross-the-board devaluation of the local currency was not feasible due to a large outstanding external debt, mostly public and publicly guaranteed debt as well as a potential pass-through to domestic inflation. A low level of international reserves also limited the ability of the central bank to defend a conventional fixed exchange rate regime. This dilemma urged the authorities to seek for an appropriate exchange rate system.

An important policy change in exchange rate management in 1999 to maintain a stable official exchange rate and the imposition of strict foreign exchange and capital controls have led to an emergence of the unofficial parallel exchange rate system. A black (or parallel) market for foreign exchange operates along the official market. In spite of an official declaration of managed floating exchange rate regime, a de facto MER system has been operating in Vietnam in practice.

A MER regime, particularly a dual exchange rate system, has been discussed in the literature as a quasi-fiscal instrument. On this fiscal respect, our calculation of implicit exchange profits for the government in Vietnam is estimated at 0.08 to 0.1 percent of GDP during the period 2007-09. It does not seem to be large, but considerable in comparison with other sources of revenue which are officially recorded, especially under the situation of chronic fiscal deficits and an underdeveloped tax system. We believe this number is underestimated because it is difficult to identify reliable data on government imports which also enjoys implicit benefits of a MER system. This portion of exchange profits is possibly hidden in the public enterprises' gains from subsidised imports.

Given the fiscal advantages of MERs to the government, the system also causes some costs to the economy. Using a static partial equilibrium framework, this study estimates equilibrium exchange rates that would prevail in a unified foreign exchange market. This rate

is more depreciated than the official rate of the same year at about 5-8 percent during the period 2007-09. The estimated equilibrium rates allows for a calculations of efficiency losses/gains by different sectors under the MER system. Basically, exporters are losers and importers are gainers.

Net efficiency losses in the export market were 6.3 percent, 5.2 percent and 8.5 percent in 2007, 2008 and 2009 respectively where importers have net efficiency gains. However, public importers are often benefited with higher gains than private counterparts. In total, public sector gains 05-0.6 percent of GDP international trade under this system while the private sector bears a cost of 0.2 percent of GDP in 2009. The efficiency costs to the economy resulted from international trade under this MER system is estimated at over 0.3 percent of GDP in the same year. These results confirm a hypothesis that this distorted exchange rate system has been designed to benefit the public sector, sometime at the cost of the private sector.

Our model allows some measurement of the impact of exchange rate unification on trade and the economy. Unification of these segmented foreign exchange markets would lead to an expansion of trade openness by 27 percent of GDP and at the same time narrow trade deficit by 0.7 percent of GDP in 2009.

Results from this study could make a potential contribution to the current policy debate on choosing a proper exchange rate regime for Vietnam's economy. It provides a piece of evidence on the efficiency gains and losses of the economy's exporters and importers due to the exisiting unofficial MER system. To our knowledge, such estimation has not been so far calculated in Vietnam. This work, therefore, brings a different aspect on economic efficiency of into the exchange rate policy considerations.

Taking all benefits and costs incurred to the economy into account, it seems to be rational to move forwards to exchange rate unification. However, the exchange rate reform in Vietnam seems to be difficult to be implemented overnight. A sudden adoption of a floating regime could probably destroy market confidence seriously. Historical lessons proved for the

loss of public credibility and soaring inflation following each devaluation episode. Therefore, a “big-bang” approach may cause adverse effects. More importantly, as long as foreign exchange controls are in place, the black market remains in one way or another in spite of administrative crackdown.

Recent movements of the SBV towards a greater flexibility of the exchange rate with more regular devaluations show that the advantages of an unofficial MER may have been reducing. The economic conditions in late 2000s have been changing, more capital inflows are pouring into the countries relaxing the strains for foreign exchange although they are often volatile. Fiscal reforms after ten years have gained significant improvements. There have been several positives in the tax system in recent years with higher contributions from direct taxes, although the fiscal balance is still in noticeable deficits. In addition, deeper economic integrations of the economy into the world have forced the authorities to gradually relax foreign exchange controls and trade restrictions (WTO commitments and other bilateral and multilateral agreements). The fiscal and balance of payments roles of an MER system, is therefore, might have been mitigated.

Moreover, recent changes in the exchange rate policy suggest that a MER system cannot substitute for a devaluation adjusting the exchange rate to its long-run equilibrium. The issue of ineffective allocation driven by distorted price for foreign exchange has come into concerns. This process seems to be consistent with suggestion in the literature of the “best route” for economies with MERs to follow gradual approach. Its means discrete devaluations are accompanied by gradual lax in foreign exchange rationings and the pace of exchange rate reforms is set by the speed of fiscal reform (Pinto, 1989). The process at the same time will remove preferences given to the public sector in a direction towards a less-distorted and fully-fledged market economy.

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APPENDIX

Table 1: Net efficiency losses estimate under the baseline parameters (2007-09)

			2009					2008					2007		
Exchange rates	Official	Parallel	Premium	Shadow	Equilibrium	Official	Parallel	Premium	Shadow	Equilibrium	Official	Parallel	Premium	Shadow	Equilibrium
(VND per US.Dollar)	17065	18311	7.3%	18832	18434	16456	16699	1.5%	16803	17278	16083	16115	0.2%	16129	17056
Sector/Market	Welfare loss(+)/gain(-) in billions of VND		Efficiency loss(+)/gain(-) relative to trade		Efficiency loss(+)/gain(-) relative to GDP	Welfare loss(+)/gain(-) in billions of VND		Efficiency loss(+)/gain(-) relative to trade		Efficiency loss(+)/gain(-) relative to GDP	Welfare loss(+)/gain(-) in billions of VND		Efficiency loss(+)/gain(-) relative to trade		Efficiency loss(+)/gain(-) relative to GDP
Public sector exports	19284		7.9%			12012		5.1%			11121		6.3%		
Public sector imports	-29624		-7.1%			-20002		-4.8%			-18408		-5.8%		
Net of public sector	**-10340**				**-0.6%**	**-7990**				**-0.5%**	**-7288**				**-0.6%**
Private sector exports	77136		7.9%			48048		5.1%			44483		6.3%		
Private sector imports	-73848		-6.6%			-52582		-4.7%			-49074		-5.8%		
Net of private sector	**3288**				**0.2%**	**-4534**				**-0.3%**	**-4592**				**-0.4%**
Gov. subsidies for trade	12535				0.76%	3343				0.23%	360				0.03%
Total net welfare (trade)	**5483**				**0.33%**	**-9181**				**-0.62%**	**-11519**				**-1.01%**
Gov. Exchange profits	-1388				-0.08%	1153				0.08%	-199				-0.02%
Adjusted GDP (% of official GDP)					100.7%					101%					105.5%
Change in trade openess (% of GDP)					27.3%					17.2%					8.9%
Change in trade deficit (% of GDP)					-0.7%					-1.2%					-6.1%

Source: Author's own calculations

Table 2: Sensitivity of Estimated Net Efficiency Losses to Assumed Trade Elasticities

Assumed elasticity parameters	Equilibrium exchange rate (VND per USD)	Shadow exchange rate (VND per USD)	Net efficiency loss(+)/gain(-) relative to trade value (%)						Net efficiency loss(+)/gain(-) relative to nominal GDP (%)					Adjusted GDP (% of nominal GDP)	Increase in trade openess (% of GDP)	Improve in trade deficit (% of GDP)
			Public exports	Public imports	Private exports	Private imports	Overall imports	Difference (export & import)	Public sector	Private sector	Gov. net subsidy	All sectors (from trade)	Implicit exchange profits			
Baseline case with high elasticities: 1/α=-1.5 and 1/β=1.5																
2007	17056	16129	6.3	-5.8	6.3	-5.8	-5.8	0.6	-0.6	-0.4	0.03	-1.0	0.02	106	8.9	-6.1
2008	17278	16803	5.2	-4.8	5.2	-4.7	-4.7	0.5	-0.5	-0.3	0.23	-0.6	-0.08	101	17.2	-1.2
2009	18434	18832	8.5	-7.1	8.5	-6.6	-6.7	1.8	-0.6	0.2	0.76	0.3	0.08	101	27.3	-0.7
Sensitivity analysis (u, v unchanged)																
Case 1: Low elasticities 1/α=-0.5 and 1/β=0.5																
2007	19142	16129	19.9	-18.2	19.9	-18.2	-18.2	1.7	-2.0	-1.3	0.03	-3.2	0.02	104	32.9	-4.8
2008	18751	16804	14.4	-13.3	14.4	-13.2	-13.3	1.2	-1.5	-1.0	0.23	-2.3	-0.08	100	34.2	0.2
2009	19968	18859	17.7	-15.2	17.7	-14.9	-15.0	2.7	-1.4	-0.4	0.76	-1.1	0.08	100	36.7	0.2
Case 2: Medium elasticities 1/α=-0.9 and 1/β=1																
2007	17639	16129	9.6	-9.3	9.6	-9.3	-9.3	0.3	-1.1	-1.0	0.03	-2.07	0.02	104	17.1	-4.8
2008	17690	16804	7.4	-7.2	7.4	-7.1	-7.1	0.3	-0.9	-0.7	0.23	-1.37	-0.08	100	22.7	-0.2
2009	18835	18848	10.7	-9.2	10.7	-8.8	-8.9	1.8	-0.9	-0.09	0.76	-0.20	0.08	100	28.7	-0.2
Case 3: High import demand elasticity 1/α=-1.5 and low export supply elasticity 1/β=0.5																
2007	19712	16129	23.8	-21.0	23.8	-19.4	-19.8	4.0	-2.2	0.2	0.03	-1.93	0.02	128	-15.6	-25.2
2008	20744	16803	27.7	-23.5	27.7	-22.0	-22.4	5.3	-2.3	0.6	0.23	-1.49	-0.08	132	-17.1	-28.1
2009	21547	18832	27.9	-22.4	27.9	-22.1	-22.2	5.7	-1.8	0.3	0.76	-0.77	0.08	122	3.0	-19.7
Case 4: Low import demand elasticity 1/α=-0.5 and high export supply elasticity 1/β=1.5																
2007	17588	16129	10.0	-9.1	10.0	-9.1	-9.1	0.9	-1.0	-0.6	0.03	-1.6	0.02	105	23.2	-5.7
2008	17610	16804	7.4	-6.8	7.4	-6.7	-6.7	0.7	-0.8	-0.4	0.2	-1.0	-0.08	101	26.5	-0.9
2009	18501	18859	9.0	-7.7	9.0	-7.0	-7.2	1.8	-0.7	0.2	0.8	0.2	0.08	101	28.9	-0.7

Source: Author's own calculations

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Table 3: Sensitivity of Estimated Net Efficiency Losses to Assumed Public/Private Shares (2009)

Assumed elasticity parameter	Equilibrium exchange rate (VND per USD)	Shadow exchange rate (VND per USD)	Net efficiency loss(+)/gain(-) relative to trade value (%)						Net efficiency loss(+)/gain(-) relative to nominal GDP (%)				
			Public exports	Public imports	Private exports	Private imports	Overall imports	Difference (export & import)	Public sector	Private sector	Gov. net subsidy	All sectors	Implicit exchange profits
Baseline case with u=0.2, v=0.1 and C=8.7													
2009	18434	18832	8.5	-7.1	8.5	-6.6	-6.7	1.8	-0.6	0.2	0.76	0.3	0.08
Keeping high trade elasticities unchanged													
Change in public export share (u)													
u=0.3	18434	18832	8.5	-7.1	8.5	-6.6	-6.7	1.8	-0.04	-0.4	0.8	0.3	0.08
u=0.1	18434	18832	8.5	-7.1	8.5	-6.6	-6.7	1.8	-1.2	0.8	0.8	0.3	0.08
Change in private unofficial imports (v)													
v=0.2	19007	18832	12.4	-7.1	12.4	-5.6	-5.8	6.5	-0.8	-0.1	0.8	-0.2	0.08
Change in demand for US dollars as asset (F), thus constant C													
C=20.9	17513	18832	2.7	-2.4	2.7	-1.2	-1.5	1.1	-0.2	0.6	0.8	1.2	0.08

Source: Author's own calculations

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