THREE ESSAYS IN TOURISM, TRADE, AND ECONOMIC GROWTH

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THREE ESSAYS IN TOURISM, TRADE, AND ECONOMIC GROWTH

Ka Ming Cheng

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Ka Ming Cheng

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DISSERTATION ABSTRACT

THREE ESSAYS IN TOURISM, TRADE, AND ECONOMIC GROWTH

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This dissertation consists of three chapters in tourism, trade, and economic growth. Chapter one investigates the short and long run effects of the change in the nominal exchange rate on the US tourism trade balance, focusing on the J-curve effect following currency devaluation. The export revenue and import expenditure functions are estimated separately to capture the dynamics of the time path of each individual function to an exchange rate shock with structural vector autoregressive methodology. Although empirical results cannot statistically confirm a J-curve effect in tourism trade of the United States, the approach utilizing disaggregated trade data avoids the aggregation bias of data across all industries. There is a paucity of empirical studies on the balance of trade in tourism in the literature, and the present study fills this gap by providing an

economic model to analyze the effect of the nominal exchange rate on the US trade balance in tourism.

Chapter 2 examines the determinants on Hong Kong tourism demand for the top three major tourist arrival countries, namely Mainland China, Taiwan and Japan; with an error correction model. Specifically, this chapter will examine the effects of relaxing of the visa requirement, the launch of Individual Visit Scheme, for Mainland Chinese tourists in 2003. Empirical results show that tourists are income elastic and consider international tourism a luxury good. Tourists are more sensitive to the change of the nominal exchange rate than the change in the foreign price level. The positive effect of the launch of Individual Visit Scheme for Mainland Chinese tourists outweighs the adverse impact of the Severe Acute Respiratory Syndrome (SARS) on tourism demand for Hong Kong.

Chapter 3 analyzes the impacts of trade openness, tourism, investment, and human capital investment on economic growth in Mauritius. Aggregate and disaggregated measures of these determinants examine their effects on economic growth. The use of the error correction methodology can capture the dynamics of the output growth to the specific determinants of growth. Empirical results indicate positive effects of the Export Processing Zone, tourism, investment, and human capital investment. The strategic tourism marketing policy aimed at high spending tourists has led to economic growth.

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TABLE OF CONTENTS

LISTS OF TABLES

LISTS OF FIGURES

CHAPTER 1

THE NOMINAL EXCHANGE RATE AND TRADE BALANCE IN US TOURISM: IS THERE A J-CURVE EFFECT?

1. Introduction

The response of the trade balance following currency devaluation may exhibit a J-curve pattern that has been examined with aggregate trade data, bilateral trade data, and disaggregated trade data at the industry or commodity levels. Bahmani-Oskooee and Ratha (2004a) review the previous studies of the existence of J-curve effect. Results are mixed.

More recent studies investigate the J-curve with disaggregated trade data in specific industries or commodities. No study has examined the tourism sector. The US ranks first in international tourism receipts and second in tourism spending (UNWTO World Tourism Barometer, 2008). There has been a significant growth in international tourism over the last three decades and international tourism receipts have become a major income source of some countries.

Most studies on trade adopt either the elasticity approach or trade balance approach. Studies adopting elasticity approach estimate the price elasticities directly from the export and import demand functions (Houthakker and Magee, 1969; Goldstein

and Khan, 1978; Rosenweig and Koch, 1988; Senhadji, 1998a; Senhadji and Montenegro, 1999). Studies using trade balance approach estimate the trade balance function to examine the J-curve phenomenon and an improvement of trade balance that satisfies the Marshall-Lerner condition (Magee, 1973; Bahmani-Oskooee, 1985; Rose and Yellen, 1989; Onafowora, 2003).

The purpose of this chapter is to study the short- and long-run effects of the change of the nominal exchange rate on the US tourism trade balance, specifically the J-curve effect following currency devaluation. Instead of estimating the export and import demand functions, or the trade balance function, this chapter will estimate the export revenue and import expenditure functions separately with structural vector autoregressive methodology. The strength of estimating the two functions separately is that it can capture the short-run and long-run dynamics of the time-path of each individual function to an exchange rate shock instead of only examining the net change of the trade balance.

The outline of this chapter is as follows. Section 2 discusses the theoretical framework of the export revenue and import expenditure models in tourism. Section 3 reviews the literature on the short-run J-curve effect on the trade balance. Section 4 discusses the econometric model. Section 5 discusses stationarity analysis of the variables and reports empirical results of the econometric model. Section 6 concludes the chapter.

2. The Theoretical Framework

International tourism is a luxury good with income elasticity thought to exceed unity (Harrop, 1973; Rosensweig, 1988; Crouch, 1994; Song, Witt and Li, 2009)

implying that people would spend an increasing share of income on international tourism when income increases. International and domestic tourism are imperfect substitutes since domestic tourist attractions may not be a perfect substitute for tourist attractions abroad, especially for cultural heritage, food, and natural resource attractions. Decisions to travel abroad are affected by income and the cost of international relative to domestic tourism.

A representative consumer in the home country maximizes utility subject to the income constraint Y. A consumer chooses to consume international tourism, domestic tourism, and other goods according to preferences and constrained by income. The home consumer maximizes $U(t_h^*, t_h, g)$ subject to $Y = Ep_h^*t_h^* + p_ht_h + p_gg$ where t_h^*, t_h, and g are the quantities of international tourism, domestic tourism, and other goods, Ep_h^*, p_h, and p_g are their prices, and Y is income. Note that p_h^* is the price of international tourism in the foreign currency and E is the nominal exchange rate of foreign currency in terms of domestic currency.

Assume the price of all other goods, p_g, is constant and does not affect the demand for international and domestic tourism. The demand for international tourism would then depend on income and prices of international and domestic tourism.

The demand for international tourism in general functional form is written

$$t_h^* = t_h^*(Y, Ep_h^*, p_h) \qquad (1.1)$$

If international tourism is a luxury good, home consumers have a non-homothetic utility preference for international tourism. When income increases, people would spend an increasing share of income on international tourism. A depreciation of domestic currency or a fall in the price of international tourism will lead to a higher quantity

demanded for international tourism. The demand for international tourism rises when the price of domestic tourism increases since international and domestic tourism are substitutes.

The present trade model adopts a two-country partial equilibrium model with imperfect substitutes that assumes imports and domestic goods are imperfect substitutes (Goldstein and Khan, 1985; Rose and Yellen, 1989). There are two arguments supporting for this assumption. First, it is observed that there are two-way trading between countries and the imports and domestic goods coexist in the domestic market (Goldstein and Khan, 1985). Rhomberg (1973) argues that if the hypothesis of perfect substitutes is true, each country will be either an importer or exporter of a good but not both. Magee (1975) further argues that either the imports or domestic goods will swallow up the whole domestic market when the cost of producing each good is constant or decreasing. Second, there is a significant and persistent price differential for the same good in different countries which implies that the "law of one price" does not seem to hold (Goldstein and Khan, 1985). The home country is the United States (US) and the foreign country is the Rest of the World (ROW).

On the supply side, assume an infinitely elastic supply of international tourism in a perfectly competitive market of international tourism at home (the US) and abroad (the ROW). The supply of import tourism to the US is infinitely price elastic since there are numerous tourist attractions around the world and the market is competitive. Goldstein and Khan (1978) argue that this assumption may not be valid for the supply of export in a single country unless idle capacity exists in the export sector. However, this assumption still can apply for the supply of export tourism to the ROW since the US is a large

country with many tourist attractions and idle capacity always exists to meet an increase in world tourism demand. Indeed, this infinitely elastic supply assumption is invalid only for those small open economies with limited tourism resources. Based on this assumption, the price of international tourism to the ROW (p_h^*) faced by home tourists and the price of international tourism to the US (p_f) faced by foreign tourists are constant and the only price variation is due to the nominal exchange rate (E). The price of domestic tourism abroad (p_f^*) faced by foreign tourists and the price of domestic tourism at home (p_h) faced by home tourists are also determined in perfectly competitive markets based on the same rationale as above. Therefore prices p_h^*, p_h, p_f^* and p_f are assumed exogenous in the present model.

The supply of international tourism in each country is

Home country (US): $S_x = S_x(p_f)$ (1.2)

Foreign country (ROW): $S_x^* = S_x^*(Ep_h^*)$ (1.3)

On the demand side, national demand for international tourism in each of the two countries is:

Home country (US): $D_m = D_m(Y, Ep_h^*, p_h)$ (1.4)

Foreign country (ROW): $D_m^* = D_m^*(EY^*, p_f, Ep_f^*)$ (1.5)

For the home country, the quantity demanded for international tourism (D_m) is positively related to home income (Y) and negatively related to the price of international tourism in the domestic currency (Ep_h^*). For the foreign country, the quantity demanded for international tourism (D_m^*) is positively related to foreign income (EY^*) and negatively related to the price of international tourism in the foreign currency (p_f).

In equilibrium, the prices and the quantities of international tourism in the two countries are determined by the supply and demand equilibrium,

$$D_m = S_x^* \text{ and } D_m^* = S_x \quad (1.6)$$

An export revenue model of the home country in general functional form can then be derived from (1.5) as:

$$X = X(Y^*, E) \quad (1.7)$$

Export revenue in tourism (X) is in the home currency. Prices p_f and p_f^* are exogenous. The export revenue in tourism (X) is positively related with foreign income in the home currency (Y*). A depreciation of the home currency, or an increase in the nominal exchange rate (E), raises the foreign income in the home currency and results in a higher demand for international tourism to the home country. An increase in the nominal exchange rate causes a rise in export revenue in home currency given the export supply of tourism is infinitely elastic. Figure 1.1 illustrates the change of the export revenue due to a rise of the nominal exchange rate.

The import expenditure model of the home country in general functional form can be derived from (1.4) as:

$$M = M(Y) = M(Y, E) \quad (1.8)$$

Import expenditure on tourism (M) is in the home currency. Given that p_h and p_h^* are exogenous, home tourists with higher income spend more income in international tourism. The import expenditure on tourism (M) is positively related with home income in the home currency (Y). A depreciation of the home currency, that is a rise in E, lowers effective home income in the foreign currency and deteriorates the purchasing power for international tourism. In other words, a weaker home currency implies a higher price of

international tourism and results in a lower quantity demanded for international tourism. The effect of the nominal exchange rate on the import expenditure depends on the price elasticity of import demand. Figure 1.2 illustrates the change of the import expenditure due to a rise of the nominal exchange rate.

The export revenue and import expenditure models are estimated with the following log-linear equations:

$$\ln X_t = \theta_0 + \theta_1 \ln Y^*_t + \theta_2 \ln E_t + \varepsilon_t \quad (1.9)$$

$$\ln M_t = \phi_0 + \phi_1 \ln Y_t + \phi_2 \ln E_t + \nu_t \quad (1.10)$$

The definitions of the variables are summarized in Table 1.1.

In the export revenue model, a rise in the ROW income or a rise in the nominal exchange rate (depreciation of US dollars) will raise the value of exports in tourism (in US dollars). In the import expenditure model, an increase in the US income or depreciation of US dollars will raise the value of imports in tourism (in US dollars) given a price inelastic import demand. However, it should be noted that depreciation will lower the value of imports in tourism in the ROW currency. Since the value of imports in tourism in the ROW currency equals $\frac{M}{E}$, a rise in E will lead to a fall in $\frac{M}{E}$ but M might rise.

For a devaluation to raise the trade balance, the Marshall-Lerner condition must hold. The condition is that the sum of the absolute values of the elasticities of export demand and import demand exceed unity given balanced trade initially. The Marshall-Lerner condition is

$$|\eta_x|\left(\frac{X}{M}\right) + |\eta_m| > 1 \quad (1.11)$$

where η_x is the elasticity of export demand and η_m is the elasticity of import demand.

Export revenue in tourism (X) is the product of the quantity of export in tourism (t_f) and the price of domestic tourism (p_f). The import expenditure on tourism (M) is the product of the quantity of import in tourism (t_h*) and the price of international tourism in term of home currency (Ep_h*). The export revenue of the home country is defined as:

$$X = p_f t_f \tag{1.12}$$

Import expenditure of the home country is defined as:

$$M = Ep_h^* t_h^* \tag{1.13}$$

To derive the Marshall-Lerner condition for the present model, totally differentiate the export revenue equation (1.12) and the import expenditure equation (1.13) as

$$dX = p_f dt_f + t_f dp_f \tag{1.14}$$

$$dM = Ep_h^* dt_h^* + p_h^* t_h^* dE + Et_h^* dp_h^* \tag{1.15}$$

Assume that the supply prices (p_f and p_h*) of international tourism do not change given the supply curves are perfectly elastic over the range of quantity change. Therefore both dp_f and dp_h* equal zero.

Utilize the definitions of the elasticity of export and import demand as

$$\eta_x = \frac{\left(dt_f / t_f\right)}{d\left(p_f / E\right) / \left(p_f / E\right)} \tag{1.16}$$

$$\eta_m = \frac{\left(dt_h^* / t_h^*\right)}{d\left(Ep_h^*\right) / \left(Ep_h^*\right)} \tag{1.17}$$

where (p_f / E) is the price of international tourism to US in ROW currency and (Ep_h*) is the price of international tourism to ROW in US dollars.

Equation (1.16) can be expanded as $\eta_x = \frac{\left(dt_f / t_f\right)}{\left(\left(Edp_f - p_f dE\right)/E^2\right)/\left(p_f / E\right)}$.

Since $dp_f = 0$, we have

$$\eta_x = \frac{\left(dt_f / t_f\right)}{-\left(dE/E\right)} \tag{1.18}$$

Equation (1.18) can be rearranged as

$$dt_f = -\left(\frac{dE}{E}\right)\eta_x t_f \tag{1.19}$$

Substitute (1.19) into (1.14) to rewrite dX in terms of export demand elasticity η_x, to find

$$dX = -\left(\frac{dE}{E}\right)\eta_x p_f t_f$$

$$dX = -\left(\frac{dE}{E}\right)\eta_x X \tag{1.20}$$

Next, equation (1.17) can be expanded as $\eta_m = \frac{\left(dt_h^* / t_h^*\right)}{\left(dp_h^* E + p_h^* dE\right)/\left(Ep_h^*\right)}$.

Since $dp_h^* = 0$, we have

$$\eta_m = \frac{\left(dt_h^* / t_h^*\right)}{\left(dE/E\right)} \tag{1.21}$$

Equation (1.21) can be rearranged as

$$dt_h^* = \left(\frac{dE}{E}\right)\eta_m t_h^* \tag{1.22}$$

Substitute (1.22) into (1.15) to rewrite dM in terms of import demand elasticity η_m, to find

$$dM = \left(\frac{dE}{E}\right)\eta_m E p_h^* t_h^* + E p_h^* t_h^* \left(\frac{dE}{E}\right)$$

$$dM = \left(\frac{dE}{E}\right) M\left(\eta_m + 1\right) \tag{1.23}$$

The balance of trade in tourism, B, is defined as B = X – M and the change in the trade balance, dB, is defined as

$$dB = dX - dM. \tag{1.24}$$

Substitute (1.20) and (1.23) into (1.24), to find

$$dB = -\left(\frac{dE}{E}\right)\eta_x X - \left(\frac{dE}{E}\right) M\left(\eta_m + 1\right)$$

For devaluation to improve trade balance, dB > 0, the condition is

$dB = -\left(\frac{dE}{E}\right)\eta_x X - \left(\frac{dE}{E}\right) M\left(\eta_m + 1\right) > 0$, which implies

$$\left(\frac{dE}{E}\right)\eta_x X + \left(\frac{dE}{E}\right) M\left(\eta_m + 1\right) < 0,$$

$$\eta_x X + M\left(\eta_m + 1\right) < 0,$$

$\eta_x X + M\eta_m < -M$, and finally

$$\eta_x\left(\frac{X}{M}\right) + \eta_m < -1 \tag{1.25}$$

We may restate the elasticities in absolute value to get the Marshall-Lerner condition (1.11) as below:

$$|\eta_x|\left(\frac{X}{M}\right) + |\eta_m| > 1$$

The advantage of estimating a log-linear equation is that the coefficients are elasticities of the relevant variables. The estimated coefficient θ_2 of the nominal exchange rate in (1.9) is the elasticity of export tourism revenue while the estimated

coefficient ϕ_2 in (1.10) is the elasticity of import tourism expenditure. From (1.20) and (1.23), we can derive the elasticity of export tourism revenue and the elasticity of import tourism expenditure as

$$\theta_2 = \frac{(dX/X)}{(dE/E)} = -\eta_x \tag{1.26}$$

$$\phi_2 = \frac{(dM/M)}{(dE/E)} = (\eta_m + 1) \tag{1.27}$$

Restate the Marshall-Lerner condition (1.11) in terms of θ_2 and ϕ_2 from (1.26) and (1.27) as below:

$$|-\theta_2|\left(\frac{X}{M}\right) - |\phi_2| > 0 \tag{1.28}$$

In earlier studies, the balance of trade is measured by the difference between export revenue and import expenditure, that is (X – M) (Rose, 1991; Bahmani-Oskoosee and Malixi, 1992) or the ratio of net exports to national income, $\frac{(X-M)}{GDP}$ (Demirden and Pastine, 1995; Senhadji, 1998b). Haynes and Stone (1982) propose the trade balance as the ratio of a country's imports to exports (or exports to imports). Some researchers follow this definition of trade balance in their recent trade studies (Bahmani-Oskoosee and Brooks, 1999; Boyd, Caporale and Smith, 2001; Onafowora, 2003). The advantage of using the ratio of exports to imports is that it is a unit-free measure and also the ratio can be in real terms or nominal terms. The trade balance is then defined as $B = \frac{X}{M}$. Take logarithms on both sides, we get

$$\ln B = \ln X - \ln M \tag{1.29}$$

Substitute (1.9) and (1.10) into (1.29),

$$\ln B = (\theta_0 - \phi_0) + \theta_1 \ln Y^*_t - \phi_1 \ln Y_t + (\theta_2 - \phi_2)\ln E_t + (\varepsilon_t - \nu_t) \quad (1.30)$$

Then we may estimate the trade balance model with the following equation:

$$\ln B_t = \eta_0 + \eta_1 \ln Y^*_t + \eta_2 \ln Y_t + \eta_3 \ln E_t + \mu_t \quad (1.31)$$

where $\eta_0 = (\theta_0 - \phi_0)$, $\eta_1 = \theta_1$, $\eta_2 = -\phi_1$, $\eta_3 = (\theta_2 - \phi_2)$ and $\mu_t = (\varepsilon_t - \nu_t)$. In this trade balance model, a rise in the ROW income will improve the trade balance while a rise in the US income will deteriorate the trade balance. A depreciation will raise the trade balance given the sum of the absolute value of the elasticities of export and import demand exceed unity. If η_3 is positive ($\eta_3 > 0$) and statistically significant, it satisfies the Marshall-Lerner condition.

In the present study, instead of estimating a trade balance model, the export revenue and import expenditure models are estimated individually. Since the trade balance is a ratio of exports to imports, an improvement in trade balance due to devaluation may be the result of the following five different scenarios:

(1) a rise in exports with a fall in imports,

(2) a large rise in exports with a smaller rise in imports,

(3) a rise in exports with no change in imports,

(4) no change in exports with a fall in imports,

(5) a smaller fall in exports with a large fall in imports.

The weakness of the trade balance model is that the net change of the trade balance cannot provide detailed adjustment dynamics of individual export revenue and import expenditure functions to an exchange rate shock. Besides, the income effect on

the export revenue (X) or the import expenditure (M) in the trade balance model can be a result of the change of both the foreign income (Y*) and the domestic income (Y).

By estimating export revenue and import expenditure model separately, we can trace the change of the time-path of the export revenue and import expenditure after devaluation and derive the trade balance afterward. We can also separate the income effects from the US and the ROW.

Some trade studies estimate the export and import demand elasticities directly from the export and import demand functions by using aggregate trade data. Export and import volume indices (Goldstein and Khan, 1978; Rosenweig and Koch, 1988) or real exports and imports (Houthakker and Magee, 1969; Senhadji, 1998a; Senhadji and Montenegro, 1999) are used as proxy variables for the quantity of exports and imports. The real exports (imports) is derived by deflating the value of exports (imports) with aggregate price indices, such as unit value indices, wholesale price indices or export (import) price indices. The major shortcoming of using volume indices or deflating the value of exports (imports) with price indices is the aggregation bias across different goods and results in unreliable estimates of the export and import demand elasticities (Goldstein and Khan, 1985). Utilizing the disaggregated trade data in specific industries or commodities, that is the quantity of a particular commodity, may avoid this aggregation bias. Indeed, this is a common practice in consumer demand studies of a specific good if the quantity data is available. However tourism is a good in various qualities and attributes. No actual quantity data of tourism is available.

Since the data of export tourism revenue and import tourism expenditure is available in the present study, the elasticities of export tourism revenue (θ_2) and import

tourism expenditure (ϕ_2) can be obtained by estimating the export revenue and import expenditure functions separately. Then the elasticities of export tourism demand (η_x) and import tourism demand (η_m) can be derived afterward from equations (1.26) and (1.27).

3. The Literature

The J-curve effect is a phenomenon that the trade balance is worsened at the beginning of currency devaluation but improved after some adjustment lag. The US trade balance turn around from a surplus in 1970 to a deficit in 1971. US officials determined to correct the situation by devaluing the dollar in 1971. The situation had not improved and even became worse the following year.

Magee (1973) argues that there exists a J-curve effect due to lag structure following currency devaluation. He attributes the effect to (1) the currency-contracts period: a deterioration of trade balance occurs when the share of import contract is larger than the share of the export contract dominated in foreign currencies, (2) the pass-through period: consumers are willing to change their purchases of foreign goods only when the price of the imported goods change in terms of domestic currency after a devaluation, and (3) the quantity adjustment period: a successful "pass-through" leads to the quantity adjustment and results an improvement of trade balance.

Junz and Rhomberg (1973) also argue that the trade effect in response to the devaluation is composed of five lags. First, consumers and sellers have a recognition lag of devaluation. Second, business have a decision lags in placing new orders. Third, there is a delivery lag of payments being recorded when the goods are actually delivered. Fourth, there is a replacement lag until inventories of materials are used up. Fifth, there

is a production lag for producers to be convinced by the profit incentives to expand the supply of existing products or new products. All these business decisions affect the demand for imports and exports. Magee (1973) and Junz and Rhomberg (1973) provide reasonable answers to the short-run deterioration and long-run improvement in the trade balance following currency devaluation.

According to the Marshall-Lerner condition, the necessary and sufficient condition for an improvement of the trade balance following currency devaluation depends on whether the sum of the absolute value of the elasticities of export and import demand exceed unity. The J-curve phenomenon proposed by Magee (1973) sparks a vast amount of studies on the short-run and long-run dynamics that trace the time-path of the trade balance after devaluation. In the short-run, both export and import demand elasticities are inelastic and the sum is less than unity which deteriorates the trade balance. However, in the long-run, the elasticities become more elastic and the sum exceeds unity which improves the trade balance.

The earlier studies of J-curve effect are usually employing aggregate trade data (Laffer, 1976; Salant, 1976; Miles, 1979; Himarios, 1985; Bahmani-Oskooee, 1985; Rosensweig and Koch, 1988; Flemingham, 1988; Noland, 1989; Wassink and Carbaugh, 1989; Mahdavi and Sohrabian, 1993; Backus, Kehoe and Kydland, 1994; Hoque, 1995, Sehadji, 1998b; Gupta-Kapoor and Ramakrishnan, 1999; Lal and lowinger, 2002; Hacker and Abdulnasser, 2003). Later studies employ bilateral trade data (Rose and Yellen, 1989; Marwah and Klein, 1996; Shirvani and Wilbratte, 1997; Bahmani-Oskooee and Brooks, 1999; Wilson, 2001; Bahmani-Oskooee and Goswami, 2003; Bahmani-Oskooee and Ratha, 2004b) and more recent studies investigate sector-specific responses to

devaluation (Meade, 1988; Doroodian, Jung and Boyd, 1999; Yazici, 2006; Ardalani and Bahmani-Oskooee, 2007).

Researchers have used different econometric modeling to test the exchange rate effect on the trade balance; however, the empirical results on J-curve effect are mixed. Bahmani-Oskooee and Brooks (1999) examine the bilateral trade data of the US and six major trading partners by using autoregressive distributed lag (ARDL) approach and find there is no J-curve effect in the short run. Boyd, Caporale and Smith (2001) adopt structural cointegrating vector autoregressive distributed lag (VARDL) model and the generalized impulse response functions to investigate eight OECD countries and the results show evidence of J-curve effect. Onafowora (2003) examines the bilateral trade of three ASEAN countries to the US and Japan by the methodology of vector error correction model (VECM) and the generalized impulse functions. He suggests that Marshall-Lerner condition holds in the long-run and a short run J-curve effect. Akbostanci (2004) investigates the J-curve hypothesis of the Turkish data by an error correction model and the generalized impulse response methodology. The results do not support the J-curve hypothesis. Narayan (2004) applies ARDL approach and the impulse response analysis to capture the J-curve effect. The result indicates New Zealand's trade balance exhibits a J-curve pattern. Gomes and Paz (2005) use VECM model to examine the J-curve effect and Marshall-Lerner condition and find the condition holds and the J-curve effect exists in the Brazilian trade balance.

Instead of a J-curve, Backus, Kehoe, and Kydland (1994) find an asymmetric shape of the cross-correlation function for net exports and the term of trade for a set of OECD countries and report this finding the S-curve. Senhadji (1998b) confirms the S-

curve effect with a large set of less developed countries (LDCs). Bahmani-Oskooee and Ratha (2007) argue that the use of aggregate US trade data and the terms of trade do not provide strong empirical support of the S-curve. However, by using disaggregated US bilateral trade data and the cross-correlation function, they find stronger results in support of the S-curve.

Doroodian, Jung and Boyd (1999) investigate the J-curve effect for US agricultural and manufactured sector using the Schiller lag model. They report a J-curve effect for agricultural sector but not for manufactured sector. Yazici (2006) examines the J-curve hypothesis in Turkish agricultural sector by multiplier-based model with a lag structure and reports that agricultural trade balance improves initially, then deteriorates, and then improves again. He concludes that there is no J-curve effect and devaluation even worsens the trade balance of agricultural sector in the long-run. Ardalani and Bahmani-oskooee (2007) use export and import data at sixty six industries in the US and find the J-curve effect only in six industries by using error correction mechanism. The use of disaggregated trade data in industry level or commodity level is proposed by Doroodian, Jung and Boyd (1999) and Ardalani and Bahmani-Oskooee (2007). The advantage of using disaggregated trade data can avoid the aggregation bias of data that combine all traded goods across all industries.

In the present paper, we investigate the short- and long-run dynamics of the export revenue and import expenditure in tourism of the US after devaluation. Although the US has had a huge trade deficit in the last three decades, it has enjoyed a trade surplus in tourism over the last twenty years. Many studies have explored the dynamics of the US trade balance to dollar devaluation (Magee, 1973, Rosensweig and Koch, 1988;

Wassink and Carbaugh, 1989; Rose and Yellen, 1989; Moffett, 1989; Mahdavi and Sohrabian, 1993; Demirden and Pastine, 1995; Bahmani-Oskooee and Brooks, 1999; Bahmani-Oskooee and Ratha, 2004b). To the best of my knowledge, no study has investigated the US trade balance in tourism sector. Socher (1986) mentions that tourism as a trading service has not been explicitly discussed in the theory of international trade.

The major difference between traditional trade and tourism is that tourists have to visit the importing destination country. Rising tourism receipts have had a significant effect on the balance of trade of many developing and developed countries over the last three decades. A series of studies (Hazari and Ng, 1993; Hazari, 1995; Hazari and Nowak, 2003; Hazari and Sgro, 2004) incorporate tourism into the traditional trade theory to explore the effects of the development of tourism on domestic welfare and economic growth.

Tourism receipts and payments are components of the balance of goods and services in the international current accounts. Tourism receipts are the major source of income in some countries, such as Mauritius, Spain, and Turkey. In the US, tourism receipts contributed 5% of export revenue in 2007 and the country ranks first in the international tourism receipts and second in tourism spending.

In earlier studies, many researchers adopt unrestricted VAR or VECM methodology that assumes interdependence of the variables. That is the trade balance, home income, foreign income and exchange rate will affect each other. In the present paper, we use Structural Vector Autoregressive (SVAR) model and the impulse-response functions to estimate and trace the time-path of the export revenue and import expenditure in tourism sector after devaluation. Since tourism trade is a small fraction of

international transaction, its contemporaneous effect on the exchange rate is negligible. Though foreign income may affect the exchange rate in the long-run, its short-run effect, in one or two quarters, is small. Besides, tourism trade is not contemporaneously affected by foreign income growth since most tourists usually plan for international travel at least one quarter ahead. Restrictions are imposed in the SVAR modeling based on the above prior knowledge.

4. The Econometric Model

Consider the following Structural Vector Autoregressive (SVAR) process of integrated variables of interest.

$$\mathbf{A}\mathbf{y}_t = \mathbf{B}(L)\mathbf{y}_{t-1} + \mathbf{u}_t, \tag{1.32}$$

where $\mathbf{A}$ is an $m \times m$ square matrix, $\mathbf{y}_t$ is an $m \times 1$ vector of m difference stationary variables, $\mathbf{B}(L)$ denotes a matrix lag polynomial, and $\mathbf{u}_t$ is $m \times 1$ vector of m structural shocks. We assume that each shock has zero mean, unit variance, and mutually independent each other. That is,

$$E\mathbf{u}_t = \mathbf{0} \text{ and } E\mathbf{u}_t\mathbf{u}_t^{'} = \mathbf{I}, \tag{1.33}$$

where $\mathbf{0}$ is an $m \times 1$ null vector and $\mathbf{I}$ is an $m \times m$ identity matrix.

The structural form system of equations (1.32) can be represented by the following reduced form system of equations.

$$\mathbf{y}_t = \mathbf{C}(L)\mathbf{y}_{t-1} + \boldsymbol{\varepsilon}_t, \tag{1.34}$$

where

$$\mathbf{C}(L) = \mathbf{D}\mathbf{B}(L),\ \boldsymbol{\varepsilon}_t = \mathbf{D}\mathbf{u}_t, \text{ and } \mathbf{D} = \mathbf{A}^{-1} \tag{1.35}$$

Combining (1.33) and (1.35), we obtain the following relation.

$$E\boldsymbol{\varepsilon}_t\boldsymbol{\varepsilon}_t' = E\mathbf{D}\mathbf{u}_t\mathbf{u}_t'\mathbf{D}' = \mathbf{D}\mathbf{D}' = \boldsymbol{\Sigma}, \tag{1.36}$$

where $\boldsymbol{\Sigma}$ is a variance-covariance matrix from the reduced form VAR (1.34).

Note that to just-identify the system, we need $m(m-1)/2$ identifying assumptions. We employ a conventional approach proposed by Sims (1980) and utilize the Choleski decomposition of $\boldsymbol{\Sigma}$ to obtain $\mathbf{D}$. This approach can be useful when we have a certain prior knowledge on short-run relations between the variables of interest.

Once we obtain the least squares estimates $\mathbf{C}(L)$ and $\boldsymbol{\Sigma}$ from the reduced form (1.34), we recover the structural form VAR (1.32) using the identified contemporaneous matrix $\mathbf{D}$. Then, we implement the impulse-response analysis for the structural shocks in the system.

5. Empirical Results

Data of the export revenue and import expenditure in tourism, including travel spending and air fare, are from the US International Transactions Accounts of the Bureau of Economic Analysis. The nominal exchange rate index is the Federal Reserve nominal major currencies index. The Federal Reserve Board constructs the nominal major currencies index which is trade weighted index including seven currencies, the euro, Canadian dollar, Japanese yen, British pound, Swiss franc, Australian dollar, and Swedish krona.

US income is the US nominal GDP and the ROW income is the sum of the nominal GDP of the five major trading countries including United Kingdom, Canada, Japan, France and Germany. The five countries are also the major tourist arrival

countries to the US. The nominal GDPs are extracted from the International Financial Statistics of International Monetary Fund. The period of study is 1973 Q1 – 2007 Q4 (quarterly data).

Stationarity of variables is pretested to check whether the variables are stationary series converging to steady state levels. The results of the unit root test from conventional augmented Dickey-Fuller (ADF) tests of the variables are summarized in Table 1.2. The number of lags is chosen by the Schwarz Information Criterion (BIC).

The ADF test with an intercept fails to reject the null hypothesis of a unit root for all level variables except the US income (Y). With the intercept and time trend, the ADF test does not reject the null hypothesis of a unit root for all level variables. However if more lags are added to the US income variable, the ADF test fails to reject the unit root null hypothesis. Besides, the Y series in level appear non-stationary by visual inspection of the plots of the variables series in Figure 1.3.

The ADF tests reject the unit root null hypothesis for all differenced variables. The results indicate all variables are integrated in the first order. Plots of differences of the variable series in Figure 1.4 (a, b, c, d, e) appear stationary.

Since all variables are I(1) series, first differencing can remove nonstationarity of the variables. Then we proceed to construct a SVAR with differenced variables for estimation.

We first consider an export revenue model of tourism, that is, $\mathbf{y}_t = [\Delta E_t \ \Delta X_t \ \Delta Y_t^*]'$. The order of $\mathbf{y}_t$ is chosen by the following. First, we assume that the nominal exchange rate is not contemporaneously affected by either tourism export or foreign income (demand) shocks. We believe that this is a reasonable assumption

because tourism takes a small fraction of total foreign exchange transaction volume. Foreign income growth may affect the nominal exchange rate when it is related with productivity differentials. Even if it is the case, such causality may arise only in the long-run. Because we use quarterly data, we believe that our assumption is not crucially problematic. Second, we assume that tourism export is not contemporaneously affected by foreign income (demand) growth. This should not be a problem if most tourism demand is predetermined at least one quarter in advance.

From our **D** estimates, we have the following contemporaneous relations of each innovation and structural shock.

$$\underset{}{\varepsilon_t^E} = \underset{(0.0008)}{0.0146u_t^E}$$

$$\underset{}{\varepsilon_t^X} = \underset{(0.0044)}{0.0030u_t^E} + \underset{(0.0056)}{0.0558u_t^X}$$

$$\underset{}{\varepsilon_t^{Y^*}} = \underset{(0.0038)}{-0.0162u_t^E} + \underset{(0.0029)}{0.0034u_t^X} + \underset{(0.0022)}{0.0381u_t^{Y^*}}$$

Standard errors are reported in brackets and obtained from 10,000 nonparametric bootstrap simulations from empirical distribution. The choice of k = 4 is determined by the Akaike information criterion (AIC).

Next we estimate D with the diagonal element estimates being normalized to one with $Eu_t u_t^{'}$ becomes a diagonal matrix with non-unity variances. Then the contemporaneous relations of each innovation and one percent structural shock are obtained. Estimated export revenue response functions are reported in Figure 1.5. The

estimated response functions to one percent structural shock and the confidence intervals are obtained by taking 5% and 95% percentiles from 10,000 bootstrap simulations.

When there is a one percent positive exchange rate shock, export tourism revenue decreases contemporaneously, then increases after one quarter and converging to equilibrium after six quarters, which exhibits a lagged effect to the exchange shock. The short-run exchange rate elasticity of export tourism revenue is statistically insignificant while the long-run exchange rate elasticity is marginally insignificant. Export tourism revenue exhibits a robust positive response to a positive foreign income shock and its own shock.

Next, we consider an import expenditure model of tourism, that is, $\mathbf{y}_t = [\Delta E_t \ \Delta M_t \ \Delta Y_t]'$. The order of the variables can be similarly justified as above. Both Akaike information criterion (AIC) and Schwarz Information Criterion (BIC) choose k = 1 but to remove any remaining serial correlation, we choose k = 4 as in export revenue model.

From the $\mathbf{D}$ estimate, we obtain the following relations.

$$\underset{}{\varepsilon_t^E} = \underset{(0.0017)}{0.0319u_t^E}$$

$$\underset{}{\varepsilon_t^M} = \underset{(0.0035)}{0.0032u_t^E} + \underset{(0.0053)}{0.0442u_t^M}$$

$$\underset{}{\varepsilon_t^Y} = \underset{(0.0006)}{0.0002u_t^E} + \underset{(0.0005)}{0.0016u_t^M} + \underset{(0.0008)}{0.0068u_t^Y}$$

Then we estimate D with the diagonal element estimates being normalized to one to obtain the contemporaneous relations of each innovation and one percent structural

shock. Estimated import expenditure response functions are reported in Figure 1.6. The estimated response functions to one percent structural shock and the confidence intervals are obtained by taking 5% and 95% percentiles from 10,000 bootstrap simulations.

Import tourism expenditure decreases contemporaneously when there is a one percent positive exchange rate shock, then increases after four quarters and converging to equilibrium after ten quarters. However the responses are statistically insignificant in both the short-run and the long-run. Import tourism expenditure also exhibits a robust positive response to a positive home income shock and its own shock.

Consolidating the results of the impulse-response functions of the export revenue and import expenditure models, the trade balance in tourism deteriorates initially after dollar devaluation, then improves after one quarter, and converges to the steady state after ten quarters. The short-run deterioration of the trade balance in tourism is statistically insignificant while the long-run improvement of the trade balance is marginally insignificant within the 90% confidence interval. Although a significant J-curve phenomenon is not found, a lagged effect of an exchange rate shock on the export revenue is observed.

For comparison purposes, we further estimate a trade balance model of tourism, that is, $\mathbf{y}_t = [\Delta E_t \Delta B_t \Delta Y_t \Delta Y_t^*]'$ where $B = \frac{X}{M}$. The order of $\mathbf{y}_t$ is chosen by the following. First, we assume that the nominal exchange rate is not contemporaneously affected by the trade balance of tourism, home income or foreign income shocks. Second, we assume that trade balance of tourism is not contemporaneously affected by the home income or foreign income shocks. The rationale of these two assumptions is the same as

above. Third, we assume that the home income is not contemporaneously affected by the foreign income growth (demand) shock. Foreign income growth may lead to a higher demand for the exports of goods and services of the home country and results a home income growth in the long-run. However its effect on the home income in one or two quarters is negligible.

From the **D** estimate, we obtain the following relations.

$$\underset{(0.0008)}{\varepsilon_t^E = 0.0147u_t^E}$$

$$\underset{(0.0041)\quad(0.0026)}{\varepsilon_t^B = 0.0008u_t^E + 0.0418u_t^B}$$

$$\underset{(0.0036)\quad(0.0032)\quad(0.0020)}{\varepsilon_t^Y = 0.0169u_t^E + 0.0012u_t^B + 0.0383u_t^Y}$$

$$\underset{(0.0006)\quad(0.0005)\quad(0.0006)\quad(0.0007)}{\varepsilon_t^{Y^*} = -0.0002u_t^E - 0.0010u_t^B + 0.0000u_t^Y + 0.0066u_t^{Y^*}}$$

Standard errors are reported in brackets and obtained from 10,000 nonparametric bootstrap simulations from empirical distribution. The choice of k = 4 is determined by the Akaike information criterion (AIC).

Then D with the diagonal element being normalized to one is estimated to obtain the contemporaneous relations of each innovation and one percent structural shock. Estimated trade balance response functions are reported in Figure 1.7. The estimated response functions to one percent structural shock and the confidence intervals are obtained by taking 5% and 95% percentiles from 10,000 bootstrap simulations.

Trade balance of tourism increases contemporaneously when there is a one percent positive exchange rate shock. However the short-run positive response is

statistically insignificant. The response becomes statistically significant after four quarters and converges to long-run equilibrium after eight quarters. There is no evidence of a J-curve effect. Trade balance of tourism exhibits a robust positive response to a positive home income shock contemporaneously and the effect becomes statistically insignificant after four quarters. The trade balance of tourism also exhibits a robust positive response to a positive foreign income shock and its own shock over time.

The trade balance model cannot reflect the individual impulse responses of export revenue and import expenditure functions that exhibit a lagged effect to an exchange rate shock. Both export revenue and import expenditure functions show significant long-run income effects to their respective income shocks. However, the trade balance model only exhibits a significant long-run income effect to the foreign income shock and shows an insignificant long-run income effect to the home income shock. Estimating export revenue and import expenditure functions separately provides more detailed dynamics of the responses to the respective shocks.

The estimated long-run price (or exchange rate) elasticities of export tourism revenue and import tourism expenditure are $\theta_2 = 0.875$ and $\phi_2 = 0.122$ respectively. Given the initial trade balance $\left(\frac{X}{M}\right)$ of the first quarter in 1973 is 0.591, the Marshall-Lerner condition (1.28) is satisfied since $|-\theta_2|\left(\frac{X}{M}\right) - |\phi_2| = 0.395 > 0$. The price (or exchange rate) elasticities of export tourism demand and import tourism demand can be derived from equations (1.26) and (1.27), and their values are $\eta_x = -0.875$ and $\eta_m = -0.878$ respectively. Since the effect of the nominal exchange rate on the import tourism

expenditure depends on the price elasticity of import tourism demand (Figure 1.2), the import tourism expenditure will rise when there is an increase in price (or exchange rate) given the import tourism demand (η_m) is price inelastic. However the estimated long-run price elasticity of export tourism revenue is marginally statistically insignificant while the price elasticity of import tourism expenditure is statistically insignificant within the 90% confidence intervals.

The short-run and long-run price (or exchange rate) elasticities and the long-run income elasticities of the three models are summarized in Table 1.3.

Finally, we also estimate a trade balance model of tourism with the trade balance defined as the excess of exports to imports that is, B = (X – M). Studies by Rose (1991) and Bahmani-Oskoosee and Malixi (1992) also adopt this definition of trade balance and take logarithms for (X – M). If there is a trade deficit, the value of the (X – M) is negative. Taking logarithms for a negative value is mathematically impossible. However, the authors have not explicitly explained how they handle this problem in their empirical works. Wilson (2001) recognizes this problem and estimates a lin-log trade balance model. The (X – M) in level is regressed with a set of logarithmic explanatory variables. One disadvantage of estimating a lin-log model is that the estimated coefficients are not the elasticities. To derive the elasticities, the estimated coefficients can be multiplied with $\frac{1}{(X-M)}$. It should be noted that the values of the elasticities vary with the values of (X – M). In practice, the elasticities are computed by using the mean value of (X – M). However if the mean value of (X – M) is close to zero, the derived elasticities are not reliable.

One of the possible solutions for this problem is to add a positive constant to the (X – M) to make the (X – M) series positive. The positive constant can be any values larger than the absolute value of the smallest negative (X – M). We use several different values of positive constant for estimations. The estimated exchange rate elasticities vary with the values of the positive constant. A small positive constant results a relatively larger exchange rate elasticity while a large positive constant results a relatively smaller exchange rate elasticity. It shows that the results are not reliable and this methodology is problematic.

6. Conclusion

A structural vector autoregressive model is used to examine the effect of the nominal exchange rate innovations on the trade balance in tourism of the United States. There is no evidence of a significant J-curve pattern of trade balance in tourism following currency devaluation between the United States and the Rest of the World.

A lagged effect on export revenue is observed, however, it is marginally statistically insignificant within a 90% confidence interval. The initial deterioration of export revenue lasts for one quarter and is followed by an improvement afterward. The finding is consistent with the assumption that tourists usually plan travel abroad at least one quarter ahead. Payments on tour package, air tickets and hotel reservation are made in advance. As a result, the change in the exchange rate may not have significant immediate effect on tourism spending in the short-run. Tourists and tourism providers have recognition lag and quantity-adjustment lag following a change in exchange rate.

These adjustment lags result in a worsening of export revenue in tourism initially and then improve after an adjustment lag.

Although the findings in the present study cannot statistically confirm a J-curve effect in tourism trade between the United States and the Rest of the World, the use of disaggregated trade data in a specific industry does avoid the aggregation bias of data across all industries.

In some recent trade studies, researchers are tempted to investigate sector-specific responses to devaluation. However there is no single study on the balance of trade in tourism. The present study fills this gap by providing an economic model to analyze the effect of the nominal exchange rate on the US trade balance in tourism.

In comparison with the elasticity approach and trade balance approach, the methodology of estimating the export revenue and import expenditure functions separately have at least three appealing features. First, the methodology provides a better picture of the dynamics of the time-path of each individual function to an exchange rate shock rather than only focusing on the net change of the trade balance. Second, it avoids the combined income effect of foreign income and domestic income on the export revenue or the import expenditure. Third, the elasticities of export revenue and import expenditure are estimated first and then the elasticities of export and import demand can be derived afterward.

For future trade studies, the methodology advocated in the present paper can be extended to investigate the bilateral trade in specific industries or commodities. Instead of using aggregate trade data and exchange rate indices, disaggregated trade data on a

particular commodity and bilateral exchange rate can be utilized. Indeed, tourism trade between two countries can be examined if data is available.

Table 1.1: Definitions of Data Variables

Variable	Explanatory Notes
X	the nominal value of the export revenue in tourism in the US dollar
M	the nominal value of the import expenditure in tourism in the US dollar
Y*	the nominal ROW income in the US dollar
Y	the nominal US income in the US dollar
E	the nominal exchange rate (US dollar per ROW currency)
ε	the error term for export revenue equation
ν	the error term for import expenditure equation

Table 1.2: Unit Root Test Results

Variable	Specification	ADF_c	$ADF_{c,t}$
X	Level	-2.16	-1.15
	Differenced	-12.80***	-13.22***
M	Level	-1.98	-0.91
	Differenced	-14.36***	-14.65***
E	Level	-1.06	-1.86
	Differenced	-10.86***	-10.93***
Y	Level	-4.91***	-2.09
	Differenced	-4.88***	-9.28***
Y*	Level	-2.12	-1.69
	Differenced	-5.30***	-5.48***

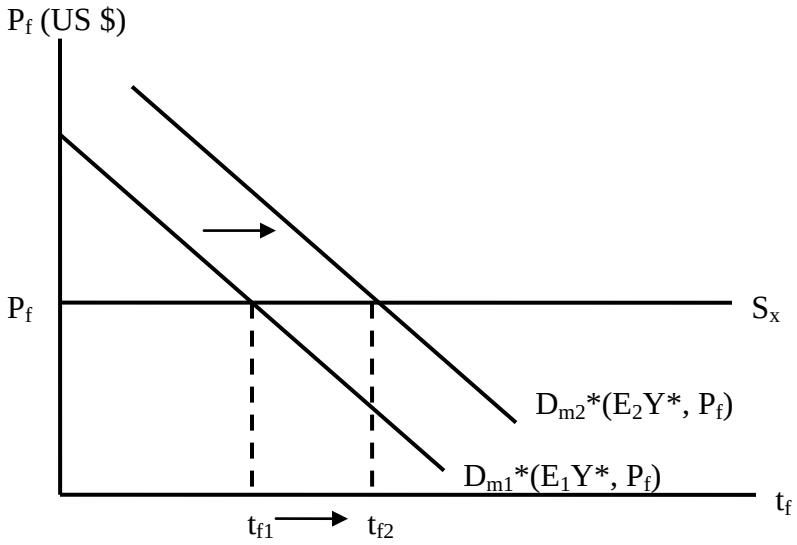
Note: The number of lags is chosen by the Schwarz Information Criterion (BIC). ADF_c and $ADF_{c,t}$ refer to ADF-t statistics when an intercept is included and when an intercept and time trend are included. *, ** and *** indicate the null hypothesis of unit root is rejected at 10%, 5% and 1% level. Asymptotic critical values are from Harris (1992).

Table 1.3: Short-run and Long-run Price (or Exchange rate) and Income Elasticities

Elasticitites	Export Revenue X	Import Expenditure M	Trade Balance B = (X/M)
E (short-run)	-0.204	-0.101	0.051
90% CI	[-0.769, 0.346]	[-0.309, 0.094]	[-0.445, 0.523]
E (long-run)	0.875	0.122	1.007*
90% CI	[-0.038, 1.900]	[-0.319, 0.530]	[0.085, 2.212]
Y (long-run)	---	1.988*	0.710
90% CI		[0.547, 3.725]	[-1.642, 3.128]
Y* (long-run)	0.633*	---	0.746*
90% CI	[0.190, 1.092]		[0.307, 1.293]

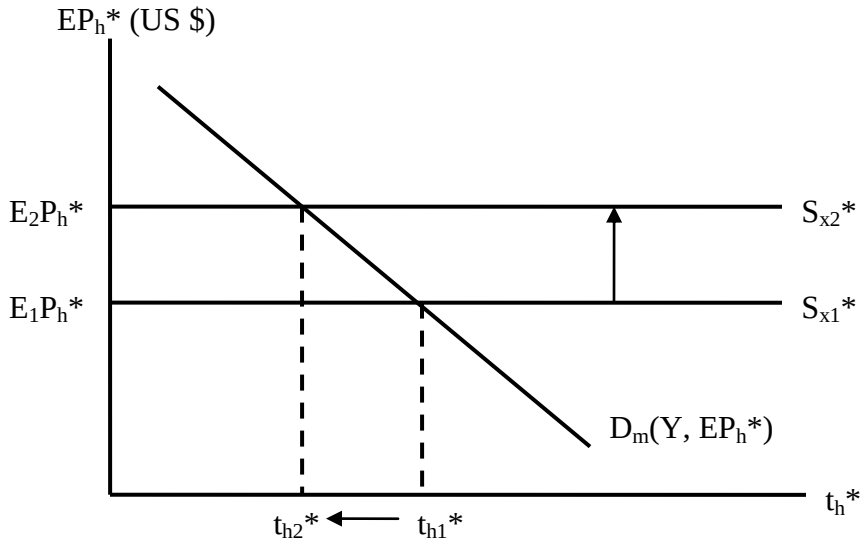
Note: 90% confidence intervals (CI) are obtained by taking 5% and 95% percentiles from 10,000 bootstrap simulations. * represents the coefficients are significant within 90% confidence intervals.

Figure 1.1: Export Revenue of Tourism Model



Note: A rise in the nominal exchange rate (E) raises the foreign income in the home currency and results a higher demand for international travel to the home country. It causes a rise in export revenue from $P_f t_{f1}$ to $P_f t_{f2}$ in home currency given the export supply of tourism is infinitely elastic.

Figure 1.2: Import Expenditure of Tourism Model



Note: A rise in the nominal exchange rate (E) raises the price of international travel abroad in the home currency and results an upward shift of the export supply of tourism of the foreign country. The rise of the price of international travel reduces the quantity demanded for international travel from t_{h1}* to t_{h2}*. The effect of the nominal exchange rate on the import expenditure depends on the price elasticity of import demand.

Figure 1.3: Variable Series

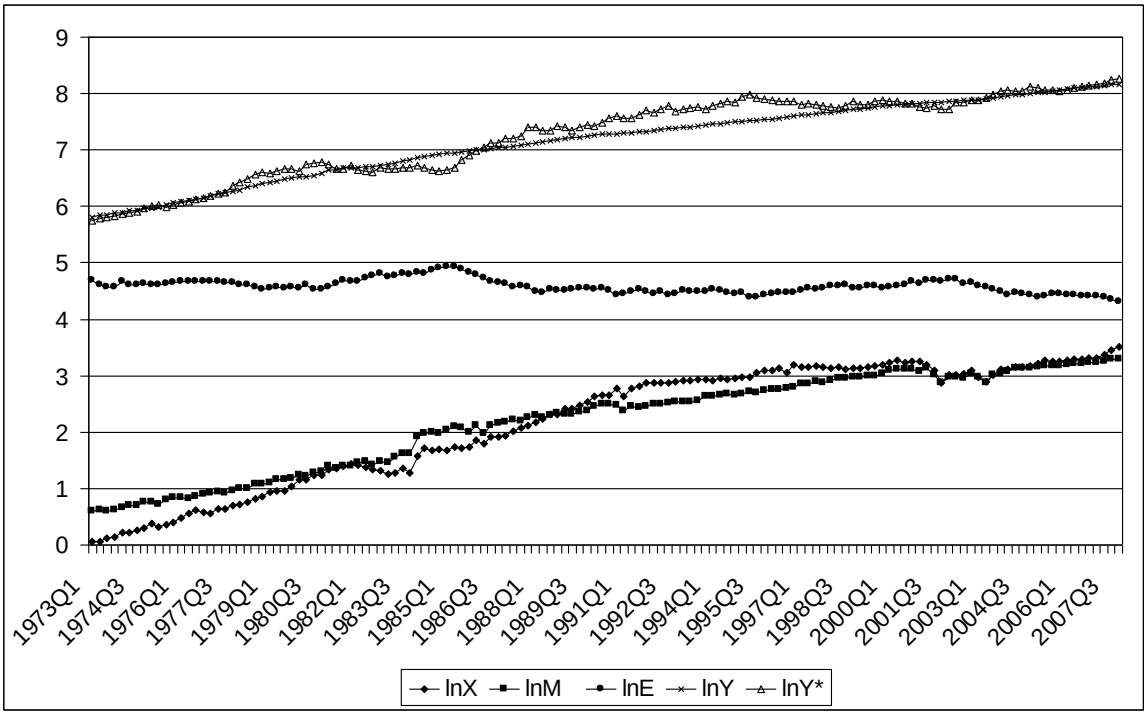


Figure 1.4a: Differences of Variable Series

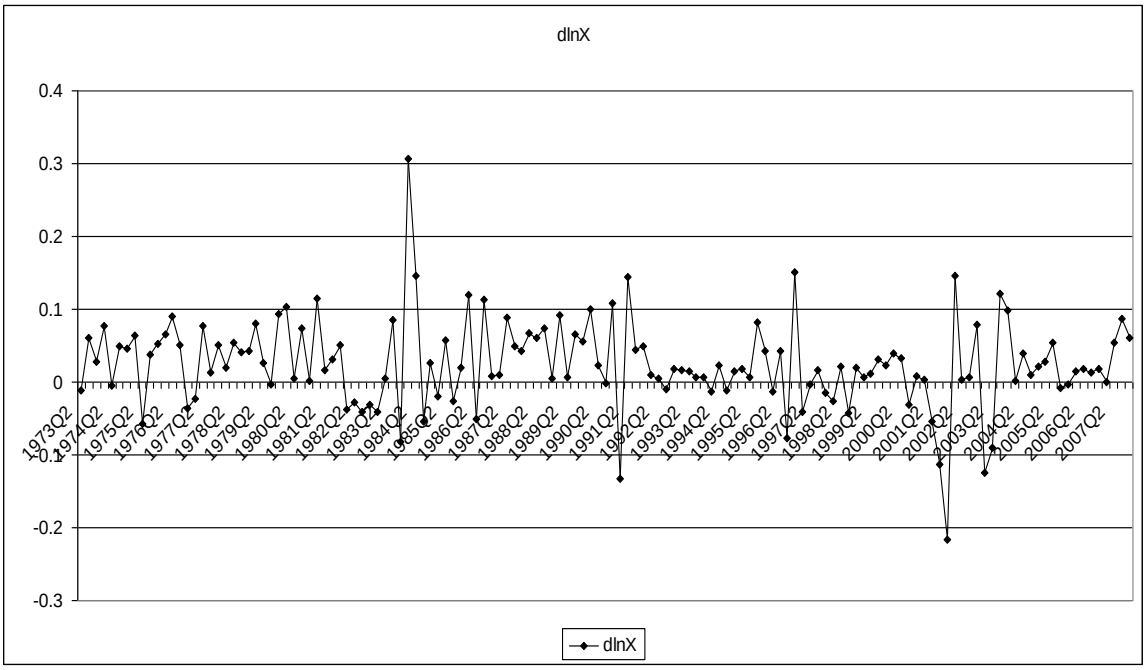


Figure 1.4b: Differences of Variable Series

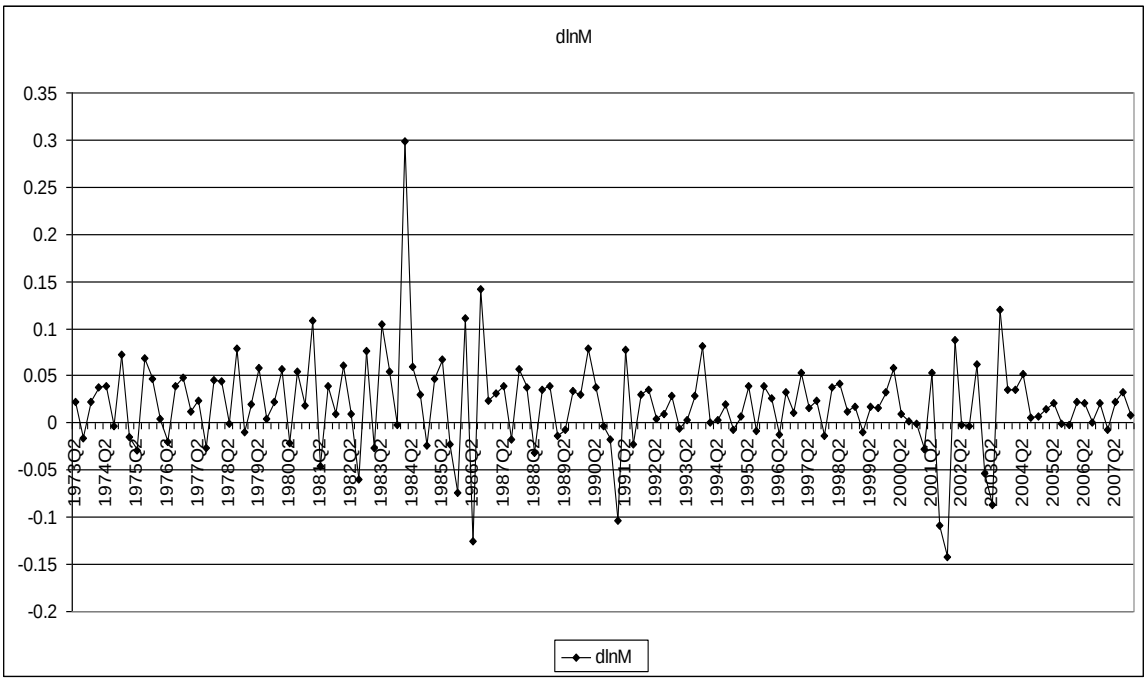


Figure 1.4c: Differences of Variable Series

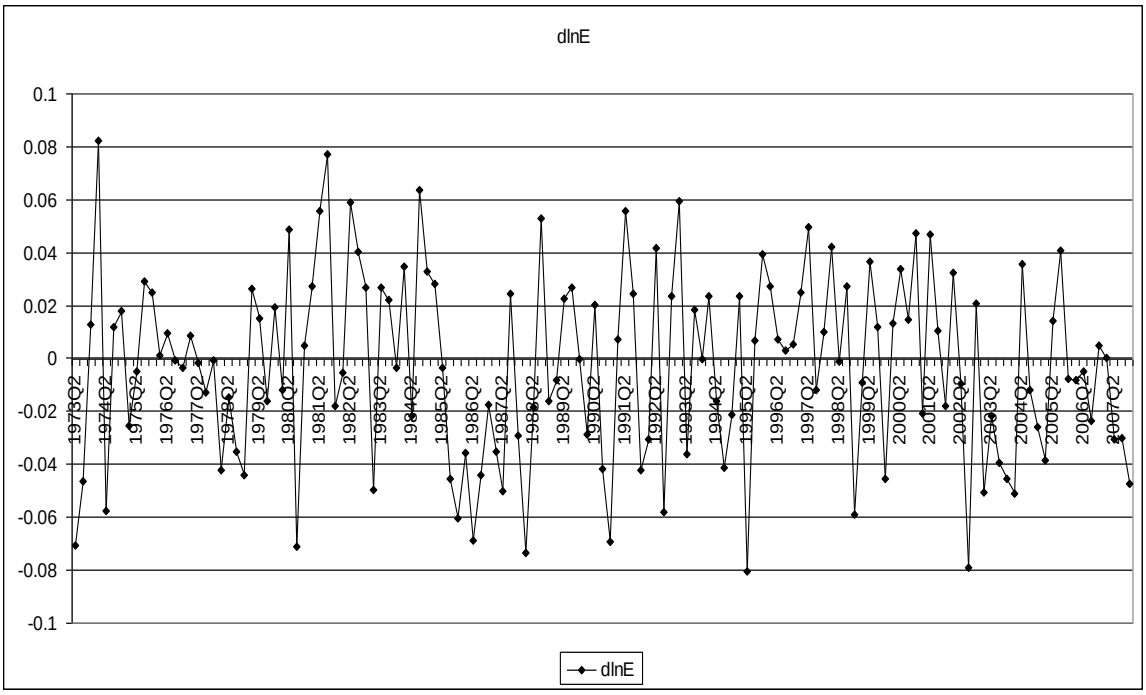


Figure 1.4d: Differences of Variable Series

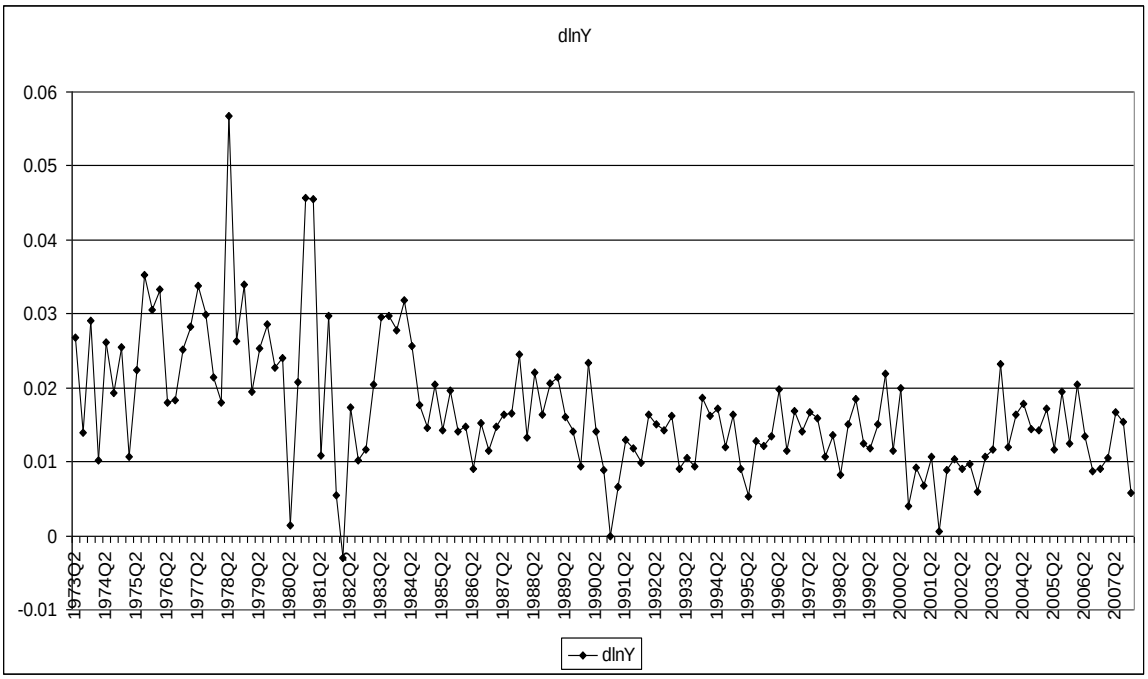


Figure 1.4e: Differences of Variable Series

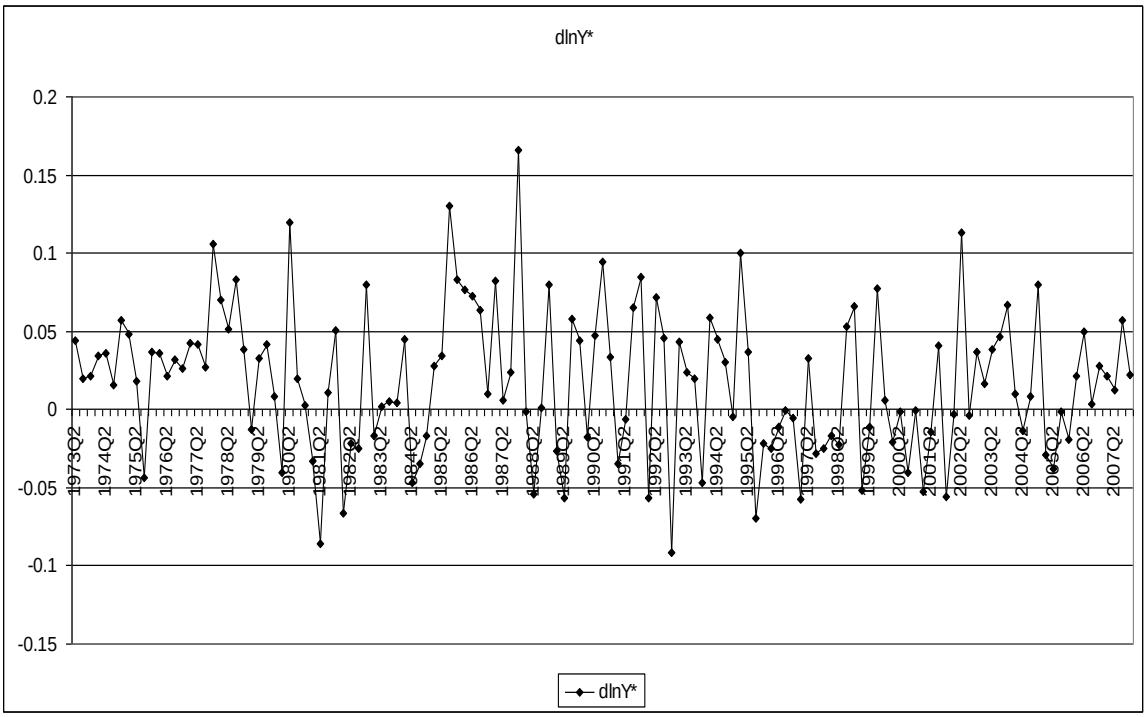
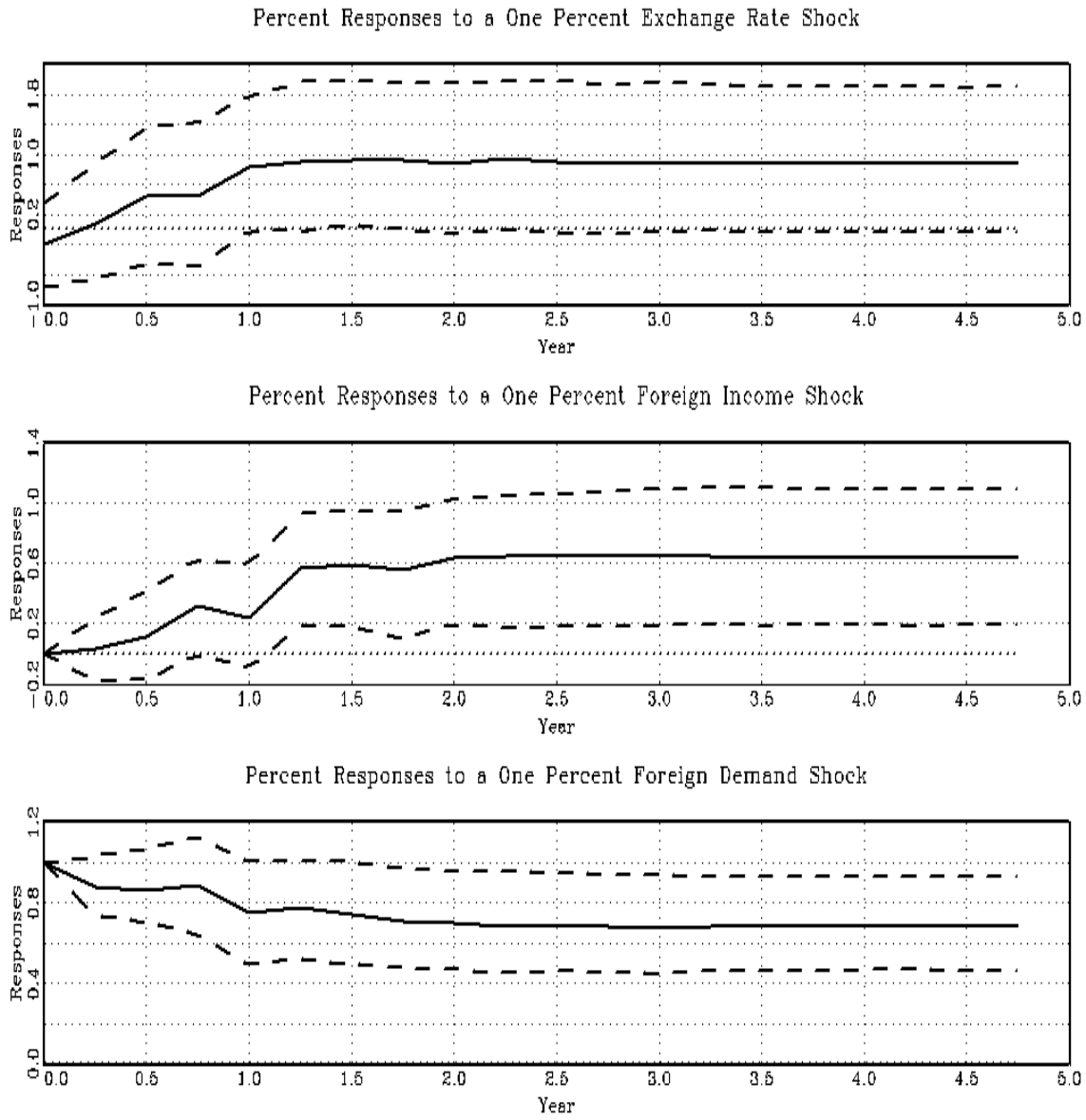
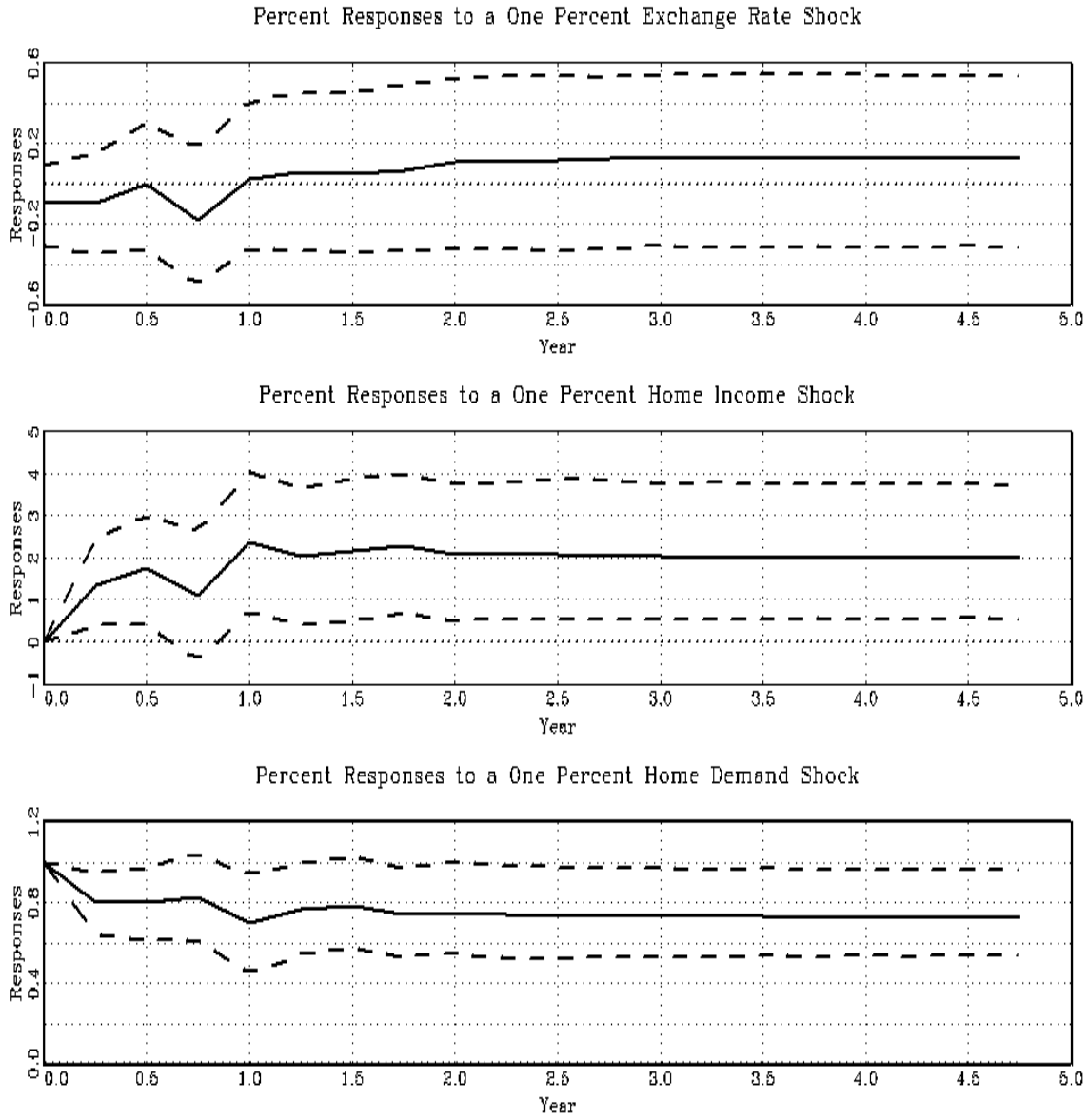


Figure 1.5: Impulse-Response Function Estimates of the Export Revenue of Tourism



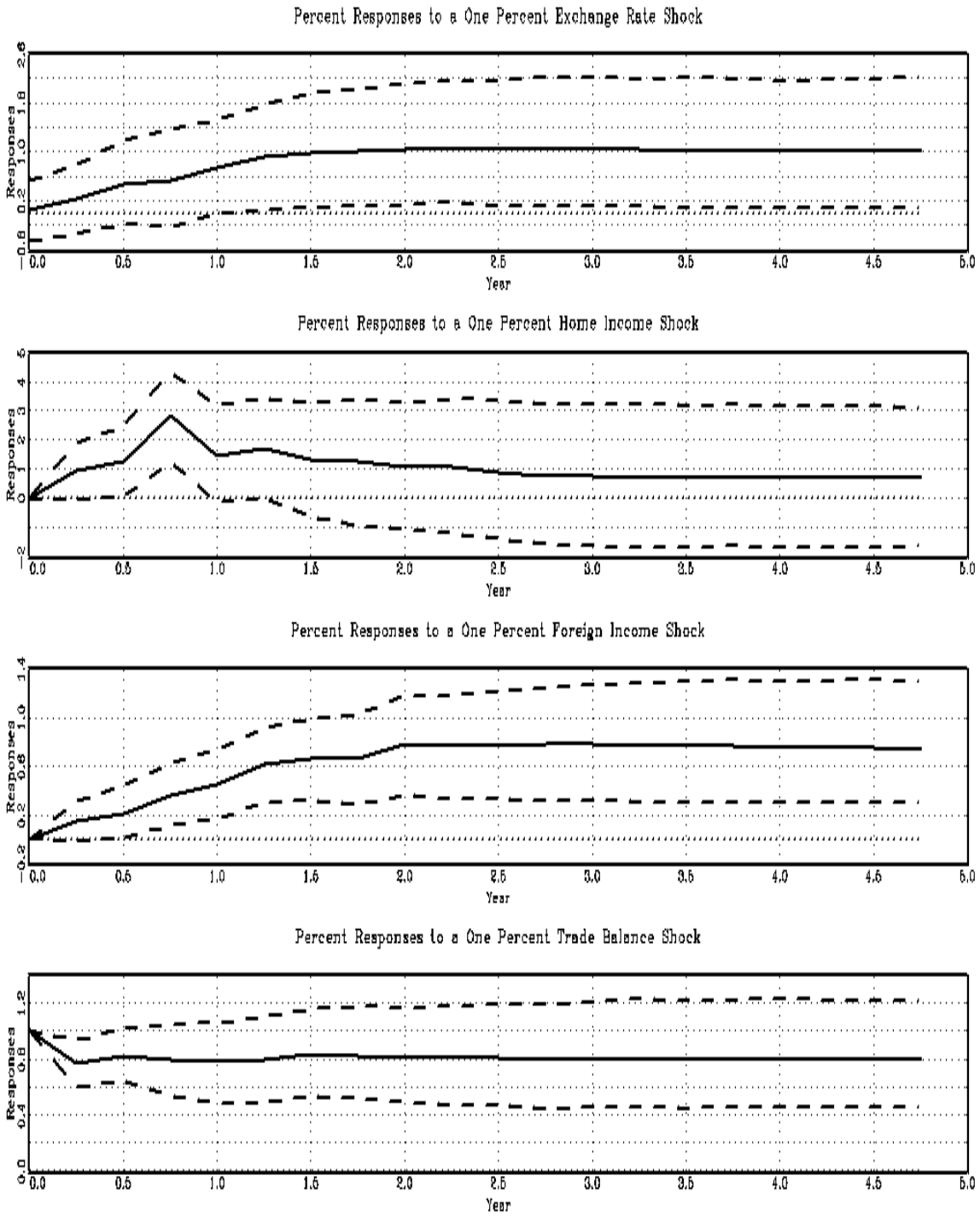
Note: 90% confidence intervals are obtained by taking 5% and 95% percentiles from 10,000 bootstrap simulations.

Figure 1.6: Impulse-Response Function Estimates of the Import Expenditure of Tourism



Note: 90% confidence intervals are obtained by taking 5% and 95% percentiles from 10,000 bootstrap simulations.

Figure 1.7: Impulse-Response Function Estimates of the Trade Balance of Tourism



Note: 90% confidence intervals are obtained by taking 5% and 95% percentiles from 10,000 bootstrap simulations.

CHAPTER 2

TOURISM DEMAND IN HONG KONG: INCOME, PRICES, AND VISA RESTRICTIONS

1. Introduction

Hong Kong is one of the top destination cities for tourists in Asia. International tourism demand for Hong Kong has had significant growth in the last two decades. Tourism is one of the four key industries in Hong Kong. Tourism contributed around 3.2% to Hong Kong's GDP and generated 5.2% of the total employment in 2006.

Japan was the number one tourist arrivals country to Hong Kong in the 1980s with more than 20% of the total Hong Kong market. In 2006, Mainland China and Taiwan became the first (53%) and second (9%) largest source countries for Hong Kong tourism followed by Japan (5%). Mainland China became the first source market because of the relaxation of visa requirement to visit Hong Kong.

Before 1983, Chinese citizens were highly restricted to travel outside Mainland China. Traveling abroad only applied for businessmen and government officials. However there was significant increase in outbound tourism to Hong Kong in the early 1980s. The strong growth of outbound tourism is a result of the Open Door Policy and the introduction of "visit friend and relatives travel". Chinese citizens were issued two-way permits and allowed to join "7-night or 8-day package Hong Kong Tours" organized

by the China National Tourism Administration (CNTA) approved tour operators with the sponsor of their friends and relatives in Hong Kong (Qu and Lam, 1997).

International travel by Chinese citizens became a reality in 1990 under the Approved Destination Status (ADS) system when the bilateral tourism agreements between China and overseas destinations, such as Singapore, Thailand, and Malaysia, were signed. In 1991, the Hong Kong government also allowed Chinese tourists with a valid visa to travel a third country to have free transit for seven days.

In May 2002, a new multiple entry permit was issued to Chinese citizens to replace the quota system of Hong Kong Tours. The permit was good for traveling Hong Kong for the purposes of leisure, business, and visiting relatives. In July 2003, the government of Mainland China announced an Individual Visit Scheme (IVS) for Hong Kong travel. Residents from selected cities or provinces were allowed to visit Hong Kong in their personal expenses. The IVS was first applied to five pilot cities and then gradually extended to residents in many cities and provinces in 2007 (Hong Kong Tourism Board, 2007).

The purpose of the present chapter is to examine the determinants on Hong Kong tourism demand for the top three major tourist arrival countries, namely Mainland China, Taiwan and Japan, with an error correction model (ECM). The use of the ECM provides detailed adjustment dynamics of tourism demand to change in its determinants. Specifically, this chapter will examine the effects of relaxing of the visa requirement, the launch of Individual Visit Scheme, for Mainland Chinese tourists in 2003.

The outline of this chapter is as follows. Section 2 discusses the theoretical framework and the major determinants of tourism demand in the literature. Section 3

discusses the stationarity analysis of the variables and the econometric model. Section 4 reports the empirical results. Section 5 concludes the chapter with a discussion of the effect to the tourism demand for Hong Kong focusing on relaxation of the visa requirement for Mainland Chinese tourists relative to the other two countries.

2. The Theoretical Framework

The present paper adopts the disequilibrium export model of Goldstein and Khan (1978). The model allows the lagged adjustment of the prices and quantities of exports in response to the excess demand and excess supply of the market. The international tourism of the destination country and the domestic tourism of the origin country are assumed to be imperfect substitutes (Goldstein and Khan, 1985) since foreign countries provide tourist attraction sites such as cultural heritage, food, and natural resources that cannot be provided in the home country.

A typical tourist chooses to consume tourism (international or domestic tourism) and other goods according to preferences and constrained by income. The tourist will maximize $U(q^*, q, g)$ subject to $y = p_f q^* + pq + p_g g$ where q^*, q, and g are the quantities of international tourism, domestic tourism, and other goods, and p_f, p, and p_g are their prices in domestic currency, and y is income.

Assume the price of all other goods p_g faced by tourists is constant. Travel decisions are then affected by income and the prices of tourism. If international tourism is a luxury good, then a tourist has a nonhomothetic utility preference for international tourism. A tourist will spend an increasing share of income on international tourism relative to domestic tourism when income increases. Empirical studies show that the

income elasticity for international tourism exceeds unity (Harrop, 1973; Rosensweig, 1988; Crouch, 1994; Song, Witt and Li, 2009). The travel decision among international and domestic destinations is made based on the prices of tourism.

The demand for international tourism in log-linear form follows the export demand equation of Goldstein and Khan (1978) modified for the context of this chapter is specified as

$$q^* = a_0 + a_1 y + a_2\left(\frac{p_f}{p}\right) + \varepsilon \qquad (2.1)$$

where international tourism demand (q*) is a function of real income (y) and the relative price of international and domestic tourism $\left(\frac{p_f}{p}\right)$.

It should be noted that p_f equates to ep* where p* is the price of international tourism in the foreign currency and e is the nominal exchange rate of foreign currency in terms of domestic currency. Assuming the domestic tourism is a substitute for the international tourism, the relative price of international and domestic tourism is defined as $\frac{ep^*}{p}$. To capture the nominal exchange rate effect on tourism demand, $\frac{ep^*}{p}$ is decomposed into *e* and $\frac{p^*}{p}$ where $\frac{p^*}{p}$ is the price ratio of international and domestic tourism. For the same goods, the price difference between two countries will provide the opportunity for arbitrage. However the price differential of international and domestic tourism might not be eliminated through arbitrage since they are imperfect substitutes. Besides the international tourist products require the consumers to travel abroad to consume the goods.

Then (2.1) can be rewritten as

$$q^* = a_0 + a_1 y + a_2 e + a_3 \left(\frac{p^*}{p} \right) + \varepsilon$$

$$q^* = a_0 + a_1 y + a_2 e + a_3 p_i + \varepsilon \qquad (2.2)$$

where $p_i = \left(\frac{p^*}{p} \right)$ which represents the price ratio of international and domestic tourism of country i. Finally the relative price of international and domestic tourism $\left(\frac{p_f}{p} \right)$ in (2.1) can be decomposed into *e* and p_i as in (2.2).

In tourism demand literature, the dependent variable is the number of tourist arrivals (Gunadhi and Boey, 1986; Chadee and Mieczkowski, 1987; Patsoratis, Frangouli and Anastasopoulos, 2005), per capita holiday visits (Martin and Witt, 1987, 1988) or tourist expenditure (Gonzalez and Moral, 1995; Papatheodorou, 1999; Li, Wong, Song and Witt, 2006; Thompson and Thompson, 2009).

The choice of dependent variables in the present study is based on the theoretical equation (2.2). Since q* in (2.2) is the quantity of international tourism, the number of tourist arrivals is adopted as the proxy for q*. The tourist expenditure is not used since it is inconsistent with the theoretical equation (2.2) and there is no reliable data available. The number of tourist arrivals from three origin countries (Mainland China, Taiwan, Japan) is employed since they are the top three tourist arrival countries to Hong Kong.

Li, Song, and Witt (2005) note that the major explanatory variables in tourism demand studies include the income of tourists, the own-price of the tourist products, the substitute-price of the tourist products, the exchange rate, transportation cost, and

investment in tourism. In addition, several dummy variables have been used to take into consideration one-off events such as the oil crises, economic recession, terrorist events, and border closures.

The income of tourists usually measured in terms of origin country income in level form (Patsoratis, Frangouli and Anastasopoulos, 2005) or per capita (Lim and Mcaleer, 2001). The estimated income elasticities typically exceed unity and the normal range is from 1.0 to 2.0 (Harrop, 1973; Rosensweig, 1988). The empirical literature then suggests international tourism is a luxury good. In the present study, the real gross domestic product of the origin countries is employed as the proxy of the tourist income. Residents of those countries with higher real gross domestic product tend to have higher demand for international tourism since they have more income to consume luxury goods.

Demand theory requires the consideration of both own-price and substitute-price effect on consumer demand. However, the own-price (ep*) and substitute-price (p) of tourist product is difficult to measure since tourist product comprises different commodities with a variety of quality. There exists no single price for tourist products.

Many tourism demand studies employ the consumer price index ratio $\left(\frac{p^*}{p}\right)$ adjusted with the bilateral exchange rate (e_i) of the destination country and the origin country i, $P_i = e_i\left(\frac{p^*}{p}\right)$ as the relative price of tourism (Martin and Witt, 1987; Kulendran and King, 1997; Witt, Song and Wanhill, 2004; Li, Wong, Song and Witt, 2006). However it has been argued that P_i should be separated into e_i and $\left(\frac{p^*}{p}\right)$ (Crouch, 1994;

Witt and Witt, 1995; Webber, 2001). The justification for separating the two variables is that tourists usually have better information about nominal exchange rates than foreign prices. It is also noted that tourists are more sensitive to the change of exchange rate than the cost of living (Harrop, 1973; Webber, 2001; Patsoratis, Frangouli and Anastasopoulos, 2005). In practice, the cross-price effects can be captured by using the consumer price index ratio of the destination country and the origin country as the proxy for the price ratio of international and domestic tourism (Crouch, 1994; Witt and Witt, 1995; Dritsakis, 2004; Wang, 2009).

Alternatively, some researchers use the price ratio of the destination and a weighted average of prices in a set of alternative destinations (Song, Witt, and Jensen, 2003) or a weighted average of prices of the alternative destination adjusted with the exchange rate (Wong, Song, Witt, and Wu, 2007; Ouerfelli, 2008) as the proxy for the substitute-price. The disadvantage of using a weighted average price index is that the cross-price effects among alternative destinations may cancel each other out due to the aggregation. Therefore a weighted average price index is inappropriate to serve as a proxy for the substitute-price.

In the present study, the relative price of tourism (P_i) is separated into e_i and $\left(\frac{p^*}{p}\right)$. The nominal exchange rate (e_i) is a measure of the price of tourist products that is used to capture the response of tourists to the change of the nominal exchange rate. The consumer price index ratio $\left(\frac{p^*}{p}\right)$ of the destination country and the origin country is a

proxy for the price ratio of international and domestic tourism. The choice of the explanatory variables, e_i and $\left(\frac{p^*}{p}\right)$, is consistent with the theoretical equation (2.2).

Since some special events occur during the period of the present study, several dummy variables (D) are included to capture the effects of the events. Then the tourism demand function (2.2) can be restated as

$$q^* = a_0 + a_1 y + a_2 e + a_3 p_i + a_4 D + \varepsilon \qquad (2.3)$$

A dummy variable (D_1) captures the effect of 1997 for Japanese tourists. The Japanese believed that Hong Kong might become politically unstable and might have a drastic change of visa requirement for foreign tourists after 1997. Therefore they were interested to visit Hong Kong in 1996 before the British government handed over the country to the Mainland China government on July 1, 1997. As a result, Hong Kong recorded a remarkable increase of Japanese tourist arrivals during 1996.

A dummy variable (D_2) captures a new travel policy for Taiwanese to visit Mainland China for family reunions through a third country after 1987. Since Hong Kong served as the most convenient transit country to enter Mainland China for Taiwanese tourists, there was a significant increase of Taiwanese tourists to Hong Kong in 1988 and the years after.

A dummy variable (D_3) takes into consideration the effect of introducing the Individual Visit Scheme for Mainland Chinese tourists.

Another dummy variable (D_4) is used to capture the effect of the outbreak of a deadly contagious disease, Severe Acute Respiratory Syndrome (SARS) in Asian countries in early 2003. The number of cases and deaths from SARS in Hong Kong were

1755 and 299 respectively in 2003 (SARS Expert Committee, 2003). To avoid the spread of this highly infectious disease, the World Health Organization issued warning to tourists to postpone visiting SARS affected countries such as Hong Kong. It was observed that the international tourist arrivals from the major origin countries such as Taiwan and Japan dropped by 24% and 38% respectively in 2003 (Hong Kong Tourism Board 2003). In June 2003, the Hong Kong Special Administration Region Government announced a HK$ 1 billion stimulus package to boost the local economy and entice back tourists. The package included free airline tickets and special hotel and restaurant discounts. From June, tourist arrivals started to recover and by August they had returned to their original levels (Siu and Wong, 2004). A full recovery of the international tourist arrivals from some major source countries, such as Japan and Taiwan, was achieved only in 2004.

The final specification of the three tourism demand equations is as follows:

Mainland China:

$$q_{ct} = a_0 + a_1 y_{ct} + a_2 p_{ct} + a_3 e_{ct} + a_4 D_3 + \varepsilon_{ct} \tag{2.4}$$

t = 1984 - 2006 for Mainland China

Japan:

$$q_{jt} = b_0 + b_1 y_{jt} + b_2 p_{jt} + b_3 e_{jt} + b_4 D_1 + b_5 D_4 + \varepsilon_{jt} \tag{2.5}$$

Taiwan:

$$q_{tt} = c_0 + c_1 y_{tt} + c_2 p_{tt} + c_3 e_{tt} + c_4 D_2 + c_5 D_4 + \varepsilon_{tt} \tag{2.6}$$

t = 1973 - 2006 for Japan and Taiwan

The definitions of the variables are summarized in Table 2.1.

The relationships among the relevant variables are expressed in logarithmic form and parameters are elasticities of the respective variables. A positive sign for real GDP is expected since a higher level of tourist income will lead to a higher demand for international tourism (a normal good). A negative sign of the price ratio of international and domestic tourism is expected since they are substitutes. A negative sign of bilateral nominal exchange rate is expected since a depreciation of the origin country's currency will increase the price to visit Hong Kong.

A positive sign of the dummy variable (D_1) is expected since Japanese are interested to visit Hong Kong in 1996 before the handover of the country to Mainland China in 1997. A positive sign of the dummy variable (D_2) is expected since Taiwanese tourists use Hong Kong as a transit country to enter Mainland China under the new visa policy. A positive sign of the dummy variable (D_3) is expected since the relaxation of visa requirement allows more freedom for Chinese citizens to visit Hong Kong.

The dummy variable (D_4) is assigned 1 for both 2003 and 2004 since people might believe the SARS disease might recur in 2004. Though there is no single cases recur in Hong Kong, there are several cases reported in Mainland China in 2004. A negative sign of D_4 is expected since tourists are risk averse and prefer to choose safer destinations to travel.

In early tourism demand studies, econometric modeling is restricted to single equation static models which usually suffer from the problem of spurious regression and later studies employ dynamic models such as the autoregressive distributed lag model (ADLM), cointegrated analysis (CI) and error correction model (ECM), and vector autoregressive (VAR) model (Li, Song, and Witt, 2005; Song and Li, 2008).

The ADLM was used in tourism demand analysis and forecasting (Song, Witt, and Jensen, 2003; Song, Wong, and Chon, 2003; Wang, 2009). The ECM was employed to examine the short-run and long-run effects of the determinants on tourism demand (Kulendran and King, 1997; Song, Romilly and Liu, 2000; Kulendran and Witt, 2001; Ouerfelli, 2008). The VAR approach treats all variables as endogenous in a system of equations that can avoid possible bias to predetermine some explanatory variables as exogenous. Many studies utilize the VAR approach, such as the cointegrated VAR and VECM for tourism demand estimation (Lim and Mcaleer, 2001; Webber, 2001; Dritsakis, 2004; Mello and Nell, 2005; Bonham, Edmonds and Mak, 2006). However the major practical challenge of the VAR approach is the choice of the appropriate lag length. If a large number of lags of each variable is included in each equation, there will be a large number of parameters for estimation. If the sample size is small, it will consume a lot of degrees of freedom and results in unreliable regression results (Gujarati, 2003). Since the sample size in the present study is small, the VAR approach becomes inappropriate.

In the present study, the cointegrated analysis (CI) and error correction model (ECM) are adopted. The strength of this methodology is that it can capture both the short-run dynamics and long-run equilibrium relationship of tourism demand to the change of its determinants. Besides, the explanatory variables in the ECM are almost orthogonal and that can avoid the issue of multicollinearity (Engle and Granger, 1987). Indeed, estimating an ADLM involves a large number of explanatory variables that may have the possibility of suffering from the problem of multicollinearity and causes unreliable estimated results (Song, Witt and Li, 2009).

3. Stationarity Analysis and Econometric Models

Data on the number of tourist arrivals in Hong Kong are from Statistics Review of Hong Kong Tourism (various years) from the Hong Kong Tourism Board. Data of the bilateral nominal exchange rate are from Hong Kong Monetary Authority. Data of consumer price index and implicit GDP deflator of Hong Kong, Mainland China, Japan, and Taiwan are extracted from International Financial Statistics, International Monetary Fund. Data of Nominal GDP of Mainland China, Japan and Taiwan are from the corresponding National Statistics. The period of study is 1973 – 2006 (annual data for Taiwan and Japan) and 1984 – 2006 (annual data for Mainland China since Hong Kong Tourism Board only released the number of tourist arrivals from Mainland China starting from 1984). All data are transformed to natural logarithms.

I first test the stationarity of variables by implementing the conventional augmented Dickey-Fuller (ADF) tests. The results are reported in Table 2.2.

The ADF test with an intercept fails to reject the null hypothesis of a unit root for all level log variables. With the intercept and the time trend, the ADF test does not reject the null hypothesis of a unit root for all level log variables. The ADF tests reject the unit root null hypothesis for all differenced log variables. The results indicate that all log variables are I(1) series. By visual inspection of the plots of the level variable series in Figure 2.1(a, b, c) and the differences of variable series in Figure 2.2(a, b, c), the level variable series are non-stationary and the differences of variable series appear stationary.

Since all variables are difference stationary, a two-stage error correction model (Engle and Granger, 1987) can be estimated. The first stage is to estimate the log-linear models for each country. The diagnostics provided for the models are R^2, adj. R^2, F-test,

Durbin-Watson (DW) statistic, and the ARCH (1) test on the residuals. Diagnostic statistics show that the residuals of the regressions have no autocorrelation or heteroskedasticity.

A requirement to estimate an ECM is that the variables of the static long-run equilibrium regression are cointegrated with the same order. To examine the cointegration relationship among the variables, the Engle-Granger test is employed to check whether the residual ε_t of the OLS equation is stationary based on:

$$\Delta\varepsilon_t = \alpha\varepsilon_{t-1} + \sum_{i=1}^{p}\Delta\varepsilon_{t-1} + \mu_t \tag{2.7}$$

For Japan and Taiwan, the t statistics of the coefficients of ε_{t-1} reject the null hypothesis of non-stationary based on the Engle-Granger critical values (MacKinnon, 1991). This result implies that the variables of the respective equations are cointegrated in the first order. For Mainland China, the t statistic does not reject the null hypothesis of non-stationary. It shows that there is no cointegration relationship among the variables. The regression results and the cointegration tests are summarized in Table 2.3.

Although there is no cointegration relationship among the variables of the Mainland China equation (2.4), the estimation of its ECM is still conducted for comparison purposes. The second stage is to incorporate the lag estimated residuals (ε_{t-1}) from the cointegration regressions into the corresponding ECMs as follows:

$$\Delta q_{it} = \gamma_i + \sum_{j=0}^{p}\beta_j\Delta x_{it-j} + \sum_{k=1}^{p}\phi_k\Delta q_{it-k} + \lambda\varepsilon_{it-1} + \upsilon_t \tag{2.8}$$

where Δ is the first difference operator and $x_i = [y_i, p_i, e_i]'$ is a vector of the explanatory variables of the origin countries, i = Mainland China, Japan, and Taiwan. The β_j are the impact coefficients which represent the transitory effects of the vector of the explanatory

variables on the dependent variable. The ε_{it-1} is the estimated residual from the cointegration regression (2.4), (2.5) and (2.6). The coefficient (λ) of the ε_{it-1} is expected to be negative and the value of λ is greater than -1 and less than 0. The dynamics of the system will adjust towards equilibrium by λ from the error of the previous period.

Then a general-to-specific approach is adopted to identify the appropriate ECM for each of the countries. Insignificant variables are dropped and the models are re-estimated until the most appropriate specification of the ECMs is obtained. The lag structure and the model specification are selected based on the Akaike Information Criterion (AIC), the Schwarz Bayesian Criterion (SBC), and the Ramsey RESET test. The appropriate lag structure of each model is obtained based on the smallest value of AIC and SBC. Finally the most appropriate ECM models are obtained as follows:

Mainland China: $$\Delta q_{ct} = \gamma_0 + \beta_1 \Delta q_{ct-1} + \beta_2 \Delta y_{ct} + \lambda \varepsilon_{ct-1} + \upsilon_t \quad (2.9)$$

Japan: $$\Delta q_{jt} = \gamma_0 + \beta_1 \Delta y_{jt} + \lambda \varepsilon_{jt-1} + \upsilon_t \quad (2.10)$$

Taiwan: $$\Delta q_{tt} = \gamma_0 + \beta_1 \Delta y_{tt} + \lambda \varepsilon_{tt-1} + \upsilon_t \quad (2.11)$$

The diagnostics provided for the error correction models are R^2, adj. R^2, F-test, DW statistic, and the ARCH (1) test on the residuals. Residuals of the three models have no autocorrelation and no heteroskedasticity. There are no model misspecifications based on the Ramsey RESET statistic. The regression results and the diagnostic statistics of the ECMs are summarized in Table 2.4.

The transitory and the dynamic effects of the explanatory variables (the Δx_i, x_{it-1} and the dummies) on Hong Kong tourism demand are derived by multiplying the significant error correction coefficients (λ) of ε_{it-1} in Table 2.4 by each of the significant

coefficients (a_s, b_s and c_s) in Table 2.3. The standard errors of the derived coefficients are derived from the rules of error propagation as functions of the standard errors of a_s, b_s, c_s, and λ. The derived coefficients and the t-statistics of Δx_i, x_{it-1} and the dummies on Hong Kong tourism demand are summarized in Table 2.5.

Finally, the difference models of the three countries are estimated for comparison purposes. Although the difference model overcomes the problem of spurious regression as the ECM, the major shortcoming of this methodology is that it can only provide short-run effects and fails to capture the long-run dynamics of the dependent variable to the change of the explanatory variables.

The difference models of the three countries are estimated based on:

$$\Delta q_{it} = \delta_0 + \delta_1 \Delta y_{it} + \delta_2 \Delta p_{it} + \delta_3 \Delta e_{it} + \nu_{it} \qquad (2.12)$$

where Δy_{it}, Δp_{it}, and Δe_{it} are the first differenced of the real GDP, the price ratio of international and domestic tourism, and the bilateral nominal exchange rate respectively. The diagnostics provided for the difference models are R^2, adj. R^2, F-test, DW statistic, and the ARCH (1) test on the residuals. The model specification is checked by the Ramsey RESET test. The regression results and the diagnostic statistics are summarized in Table 2.6.

Regression results show that Mainland China equation has a statistically significant positive short-run income effect. However the low F statistic indicates that the overall significance of the equation is statistically insignificant. Taiwan equation has a statistically significant negative short-run exchange rate effect but there exists the problem of model misspecification by the Ramsey RESET test. As a result, the regression results in both Mainland China and Taiwan equations are unreliable. Indeed,

only the Japan equation passes all diagnostic tests and produces a statistically significant positive short-run income effect.

In comparison with the difference model, the ECM produces more reliable regression results and has no problem of model misspecification. In addition, the ECM can also capture the long-run effects of the tourism demand to the change of its determinants. Therefore only the regression results of the ECMs are discussed below.

4. Empirical Results

4.1. Mainland China

For Mainland China, the statistically significant lag estimated residual (ε_{t-1}) in the ECM equation implies the existence of a cointegration relationship among the variables of the Mainland China equation (2.4) based on Granger Representative Theorem (Engle and Granger, 1987). The tourist arrivals in the present year will adjust towards equilibrium by -0.43 of the error in the previous year.

The transitory income effect on Hong Kong tourism demand is 2.11. The lag-income effect each period is 0.65 and adjusts dynamically towards long-run equilibrium (1.52). Chinese tourists are income elastic for Hong Kong tourism. International tourism is considered as a luxury good for Chinese tourists. This result confirms previous studies with income elasticities usually above unity.

The Individual Visit Scheme (D_3) has a significant positive impact on Chinese tourism demand for Hong Kong. The positive sign (0.41) of D_3 represents a 51% increase in tourism demand. The percentage change is computed by using the formula (exp (0.41) – 1) x 100% = 51%. Since the IVS is launched at the same year of the SARS

outbreak, the 51% is a net rise in tourism demand resulting from outweighing the negative effect of the SARS by the positive effect of the IVS.

The price ratio of international and domestic tourism is statistically insignificant in both short- and long-run. The nominal exchange rate is statistically insignificant in the short-run while it is statistically significant but with a wrong sign in the long-run. The price ratio and exchange rate in the present study do not exhibit significant impacts on the Chinese tourism demand for Hong Kong.

4.2. Japan

For Japan, the statistically significant lag estimated residual in the ECM equation implies the tourist arrivals in the current year will adjust towards the underlying long term equilibrium by -0.64 of the error in the previous year. There is a significant transitory income effect with a short-run income elasticity (4.73) but the long-run elasticity is insignificant and with a wrong sign. Japanese tourists are income elastic for Hong Kong tourism and consider international tourism a luxury good.

The nominal exchange rate is an additional measure of the price of tourism. There is insignificant transitory exchange rate effect on Hong Kong tourism demand. However there is significant lag-exchange rate effect (-0.52) each period that converges towards equilibrium (-0.81) in the long-run that adds to an inelastic tourism demand.

The price ratio of international and domestic tourism is significant but with a wrong sign. Japanese tourists are more sensitive to the change of the nominal exchange rate than the change in the price ratio of tourism.

Japanese has a special interest to visit Hong Kong in 1996 before the return of the country to the Chinese government on July 1, 1997. The dummy (D_1) is statistically significant with the expected sign (0.48). The incidence of the SARS outbreak has a significant negative impact on Japanese tourism demand. The negative coefficient (-0.34) of D_4 represents an approximately 40% drop in tourism demand after the SARS outbreak.

4.3. Taiwan

For Taiwan, the statistically significant lag estimated residual in the ECM equation implies the tourist arrivals in the current year will dynamically adjust towards steady state by -0.50 of the error in the previous year. The transitory income effect on Hong Kong tourism demand is 2.80. The lag-income effect is 1.00 and converges to equilibrium with long-run income elasticity being 2.02. Taiwanese are income elastic and consider international tourism a luxury good.

The price ratio of international and domestic tourism is significant but with a wrong sign. The nominal exchange rate is statistically insignificant.

The new visa policy for Taiwanese to visit Mainland China for the purpose of family reunion through a third country in 1988 has a significant beneficial impact for Hong Kong tourism sector. Since there were no direct flights between Taiwan and Mainland China until 2008, Hong Kong became the most convenient transit country for Taiwanese to enter Mainland China. The dummy (D_2) is statistically significant and with the expected sign (0.75). However the SARS outbreak in 2003 has a significant adverse

effect for Taiwanese tourism demand. The negative coefficient (-0.40) of D_4 represents an approximately 49% drop in tourist arrivals during the SARS period.

5. Conclusion

The purpose of this chapter is to examine the determinants on Hong Kong tourism demand from Mainland China, Taiwan, and Japan, and the effect of the relaxation of visa requirement for Mainland Chinese tourists relative to the other two countries.

The error correction model investigates the short- and long-run dynamics of the change of the tourist arrivals to Hong Kong from the change of the tourist income, the price ratio of tourism, the nominal exchange rate and special events. The empirical results confirm that tourists are income elastic. The short-run and long-run income elasticities exceed unity. The finding is consistent with most of the previous studies that consumers consider international tourism a luxury product.

The empirical results of the price ratio of tourism are either insignificant or significant with a wrong sign in all models. The consumer price index ratios of Hong Kong and the origin country might not be good proxy variables for the price ratio of tourism since they represent the price level of the basket of goods and services of a representative household and that might not be the typical basket of goods and services of a tourist. A better alternate proxy or a more direct measure variable for the price of tourist products might be used for further studies if data becomes available.

The effect of the nominal exchange rate on tourism demand is significant for Japan. The Japanese are more sensitive to the change of the nominal exchange rate while there is no evidence of any exchange rate effects on the Chinese and Taiwanese tourists.

Since the Chinese currency is managed by the Chinese officials under the period of study, its effects on the international tourism demand may not be fully captured in the present estimation. Taiwanese tourists consider Hong Kong is a transit country to enter Mainland China. For those transit tourists, they will stay in Hong Kong for one or two days. As a result, the exchange rate may not exhibit significant impact on their visits to Hong Kong.

The return of Hong Kong to the Chinese government in 1997 attracted a lot of Japanese to visit Hong Kong during 1996. The new visa requirement for Taiwanese to visit Mainland China through a third country in 1988 had a significant beneficial impact on Hong Kong tourism industry. The external shock of the Severe Acute Respiratory Syndrome outbreak has a detrimental effect on tourism demand confirmed by the Japanese and Taiwanese tourists. Although Chinese tourists face the same risk of Severe Acute Respiratory Syndrome, the favorable effect of freedom to visit Hong Kong under the Individual Visit Scheme outweighs the adverse impact of the Severe Acute Respiratory Syndrome.

Since residents from more cities and provinces are allowed to visit Hong Kong under the Individual Visit Scheme in the coming years, the tourism demand for Hong Kong will continue to grow. With the sustainable economic growth of Mainland China in the current years, more and more Chinese citizens can afford to travel abroad for sightseeing and shopping. Hong Kong is one of the favorable holiday destinations for Chinese tourists in Asia. As a result, the tourism receipts from Chinese tourists will continue to be one of the major income sources of Hong Kong in the coming years.

Table 2.1: Definitions of Data Variables

Variable	Explanatory Notes
q_c , q_j , q_t	The number of tourist arrivals to Hong Kong from Mainland China, Japan, and Taiwan
y_c , y_j , y_t	The real Gross Domestic Product in the national currency of Mainland China, Japan, and Taiwan
e_c , e_j , e_t	The bilateral nominal exchange rate is defined as the origin country's currency per Hong Kong dollar (Mainland China, Japan and Taiwan).
p_c, p_j, p_t	The price ratio of international and domestic tourism (the price of tourism in Hong Kong relative to the price of tourism in the origin country), i.e. p_{hk}/p_i where i = Mainland China, Japan, and Taiwan
D_1	The dummy variable represents the 1997 effect for Japanese tourists (1 for year 1996 and 0 for the other years)
D_2	The dummy variable represents a new visa policy for Taiwanese tourists to visit Mainland China for family reunion through a third country (1 for year 1988 to 1994 and 0 for the other years)
D_3	The dummy variable represents the launch of Individual Visit Scheme (IVS) in 2003 (0 for years before the launch of IVS and 1 for year 2003 onward). Since IVS and SARS occur in the same year so that D_3 represents the joint events.
D_4	The dummy variable represents the year of Severe Acute Respiratory Syndrome (SARS) outbreak in 2003. Japan model: 1 for year 2003 and 2004 and 0 for the other years. The SARS effect lasts for two years for Japanese tourists. Taiwan model: 1 for year 2003 to 2006 and 0 for the other years. The SARS has a longer adverse effect for Taiwanese tourists

Table 2.2: Unit Root Test Results

Variable	Specification	ADF_c	$ADF_{c,t}$
q_c	Level	-0.97	-2.08
	Differenced	-4.05**	-3.71**
q_j	Level	-1.21	-1.68
	Differenced	-5.42***	-5.40***
q_t	Level	-1.59	-0.99
	Differenced	-4.79***	-4.96***
y_c	Level	1.66	-2.14
	Differenced	-4.10***	-4.63***
y_j	Level	-1.81	-1.70
	Differenced	-3.37**	-4.43***
y_t	Level	-2.60	0.15
	Differenced	-3.97***	-5.37***
e_c	Level	-3.51**	-1.68
	Differenced	-4.30***	-5.13***
e_j	Level	-1.29	-0.98
	Differenced	-5.40***	-4.65***
e_t	Level	-1.17	-0.82
	Differenced	-5.67***	-5.80***
p_c	Level	-0.95	-3.00
	Differenced	-5.68***	-5.47***
p_j	Level	-1.84	-1.25
	Differenced	-4.30***	-3.65**
p_t	Level	-1.02	-0.93
	Differenced	-6.67***	-6.12***

Note: the number of lags is chosen by the Akaike Information Criterion (AIC). ADF_c and $ADF_{c,t}$ refer to ADF-t statistics when an intercept is included and when an intercept and time trend are included. *, ** and *** indicate the null hypothesis of unit root is rejected at 10%, 5% and 1% level. Asymptotic critical values are from MacKinnon (1996).

Table 2.3: OLS Regression for Tourism Demand

Independent Variable	Mainland China q_c	Japan q_j	Taiwan q_t
constant	-5.71***	12.07***	-11.56***
	(-3.03)	(2.52)	(-6.94)
y_i	1.52***	-0.20	2.02***
	(7.28)	(-0.60)	(14.41)
p_i	-0.07	0.26**	0.59***
	(-0.11)	(2.44)	(3.55)
e_i	0.37*	-0.81***	0.51
	(1.94)	(-5.35)	(1.58)
D_1	---	0.48***	---
		(3.90)	
D_2	---	---	0.75***
			(6.20)
D_3	0.41***	---	---
	(3.06)		
D_4	---	-0.34***	-0.40***
		(-3.78)	(-3.25)
F	418.78	118.68	397.31
R^2	0.99	0.95	0.99
Adjusted R^2	0.99	0.95	0.98
DW statistic	1.30	1.65	1.61
ARCH(1)	-0.75	-0.23	0.74
Engle-Granger test			
$EG_{\tau,0.5}$ (-4.56)	-3.35	-4.74**	-5.02**
DW statistic	2.10	2.05	1.87
ARCH(1)	0.05	-0.09	1.16

Note: *, ** and *** represents the significance of the t-test at the 10%, 5% and 1% level respectively, and t statistic is given underneath in parentheses. Critical value at the 5% level of Engle-Granger test is calculated from MacKinnon (1991). i = Mainland China, Japan and Taiwan

Table 2.4: Error Correction Model

Independent Variable	Mainland China Δq_c	Japan Δq_j	Taiwan Δq_t
constant	-0.07	-0.09*	-0.07
	(-0.69)	(-2.00)	(-0.71)
Δq_{i-1}	0.33	---	---
	(1.37)		
Δy_i	2.11*	4.73***	2.80**
	(1.93)	(3.30)	(2.14)
ε_{it-1}	-0.43*	-0.64**	-0.50*
	(1.76)	(-2.67)	(-2.02)
F	2.55	8.80	4.33
R^2	0.31	0.37	0.22
Adjusted R^2	0.19	0.33	0.17
DW statistic	1.66	2.21	1.98
ARCH(1)	-0.59	1.85	-0.31
AIC	-1.32	-0.87	0.01
SBC	-1.12	-0.73	0.14
Ramsey RESET test			
F statistic	1.26	0.61	0.32

Note: *, ** and *** represents the significance of the t-test at the 10%, 5% and 1% level respectively, and t statistic is given underneath in parentheses. i = Mainland China, Japan and Taiwan

Table 2.5: Derived Results on Hong Kong Tourism Demand

Independent Variable	Mainland China Δq_c	Japan Δq_j	Taiwan Δq_t
constant	-2.45	7.63***	-5.74*
	(-1.52)	(3.31)	(-1.94)
Δy_i	2.11*	4.73***	2.80**
	(1.93)	(3.30)	(2.14)
y_{i-1}	0.65*	---	1.00**
	(1.71)		(1.99)
e_{i-1}	---	-0.52**	---
		(2.39)	
D_1	---	0.48***	---
		(3.90)	
D_2	---	---	0.75***
			(6.20)
D_3	0.41***	---	---
	(3.06)		
D_4	---	-0.34***	-0.40***
		(-3.78)	(-3.25)

Note: *, ** and *** represents the significance of the t-test at the 10%, 5% and 1% level respectively, and t statistic is given underneath in parentheses. i = Mainland China, Japan and Taiwan

Table 2.6: Difference Model

Independent Variable	Mainland China Δq_c	Japan Δq_j	Taiwan Δq_t
constant	-0.03	-0.08	-0.03
	(-0.28)	(-1.64)	(-0.29)
Δy_i	2.28*	3.85**	1.96
	(1.96)	(2.26)	(1.31)
Δp_i	-0.48	0.32	0.11
	(-0.88)	(0.63)	(0.21)
Δe_i	-0.06	-0.24	-0.97*
	(-0.27)	(-0.95)	(-1.77)
F	2.07	3.40	2.51
R^2	0.26	0.26	0.21
Adjusted R^2	0.13	0.18	0.12
DW statistic	1.64	2.35	2.05
ARCH(1)	0.02	1.58	0.13
AIC	-1.21	-0.65	0.09
SBC	-1.01	-0.47	0.27
Ramsey RESET test			
F statistic	0.03	0.39	5.17**

Note: *, ** and *** represents the significance of the t-test at the 10%, 5% and 1% level respectively, and t statistic is given underneath in parentheses. i = Mainland China, Japan and Taiwan

Figure 2.1a: Variable Series (Mainland China)

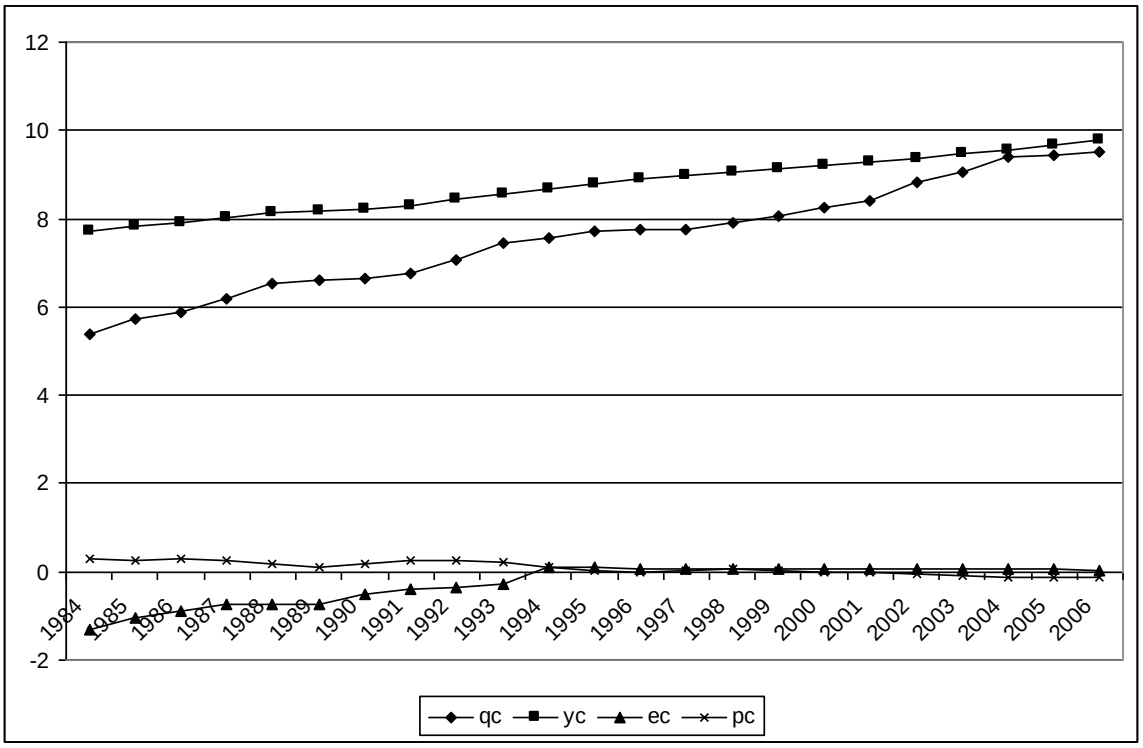


Figure 2.1b: Variable Series (Japan)

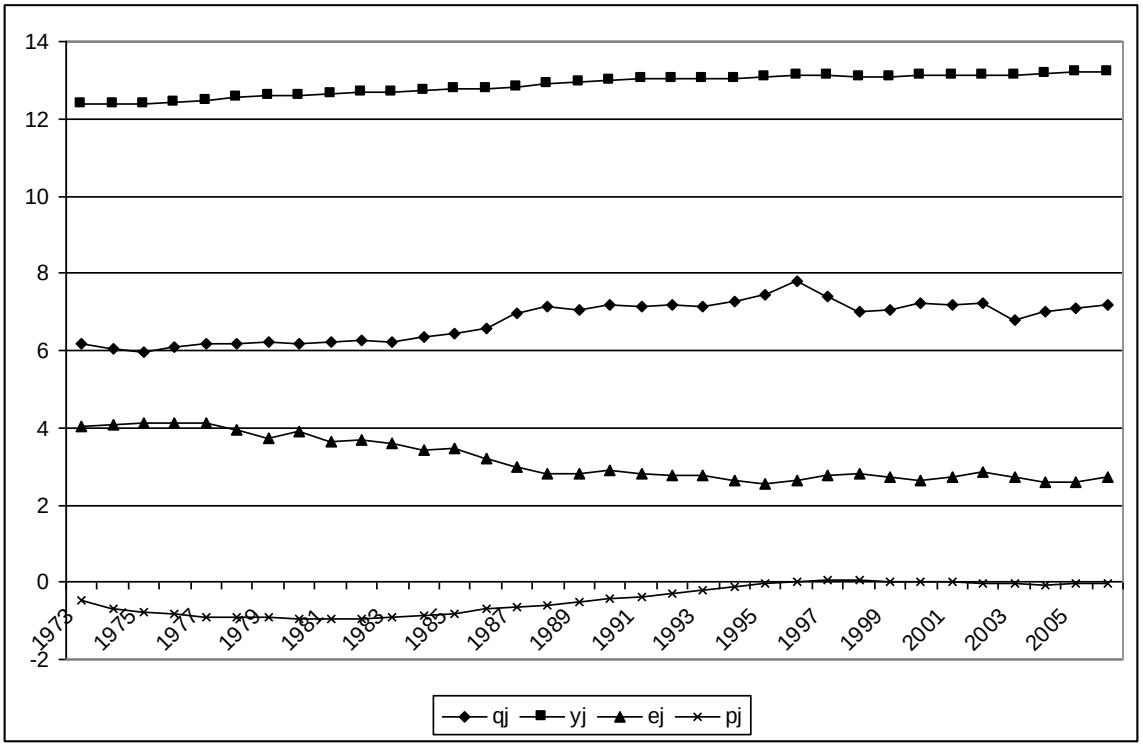


Figure 2.1c: Variable Series (Taiwan)

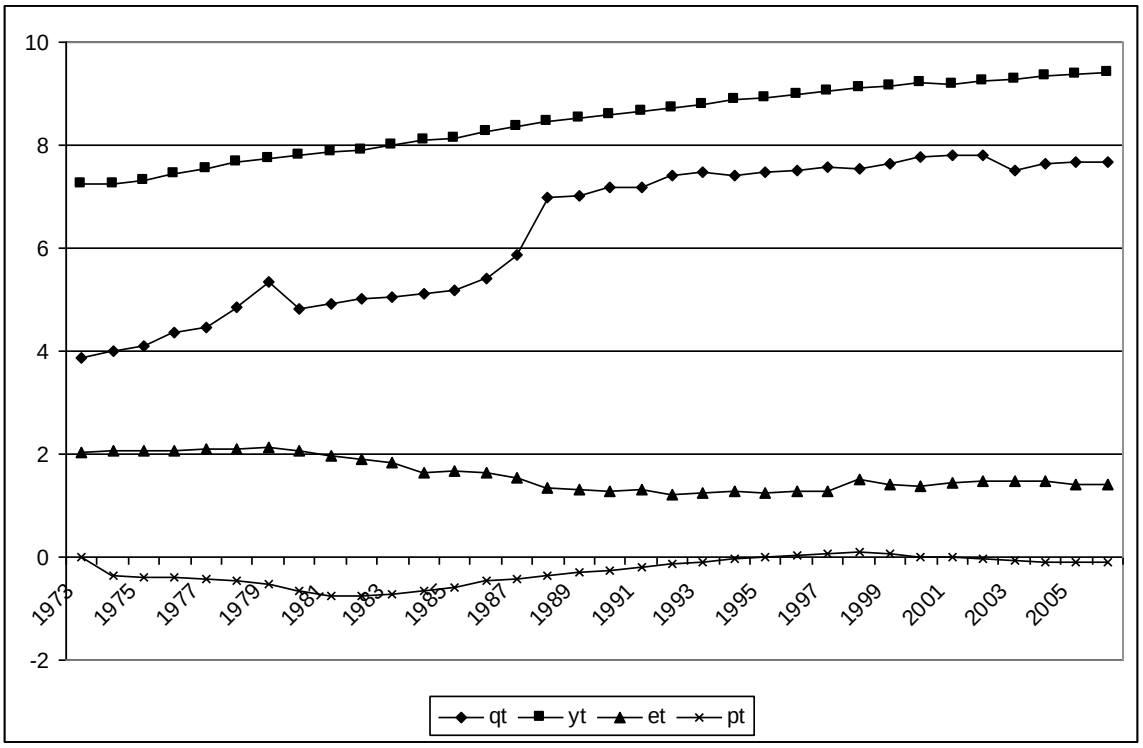


Figure 2.2a: Differences of Variable Series (Mainland China)

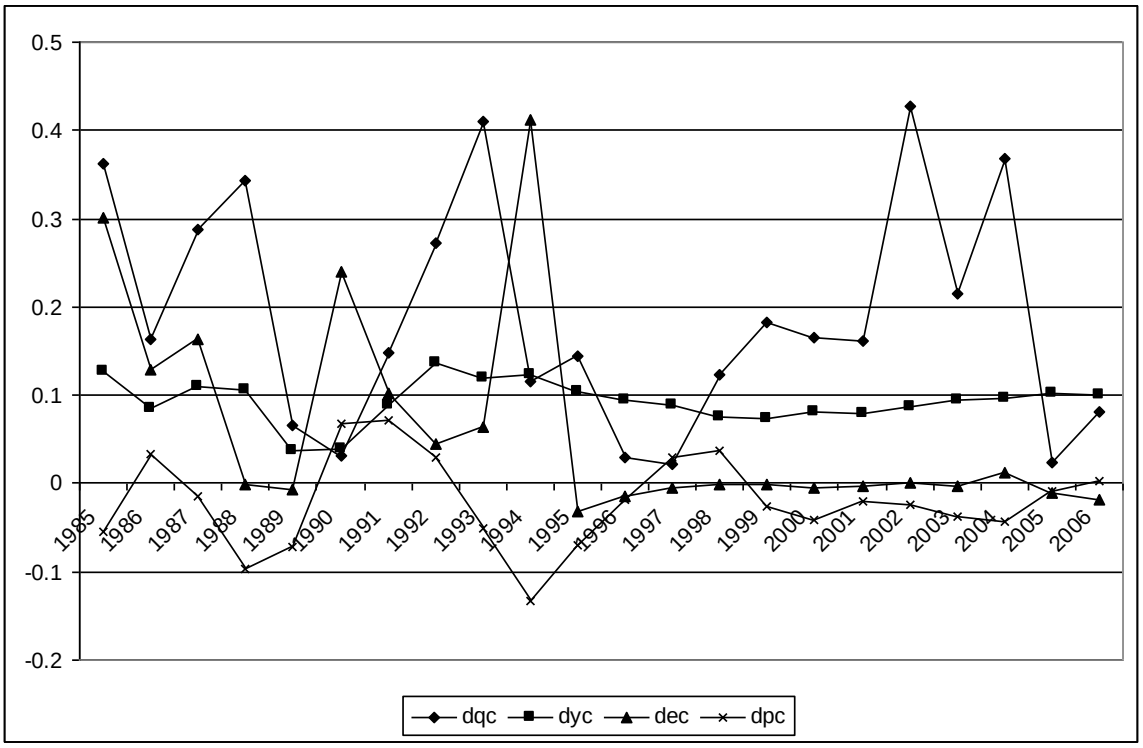


Figure 2.2b: Differences of Variable Series (Japan)

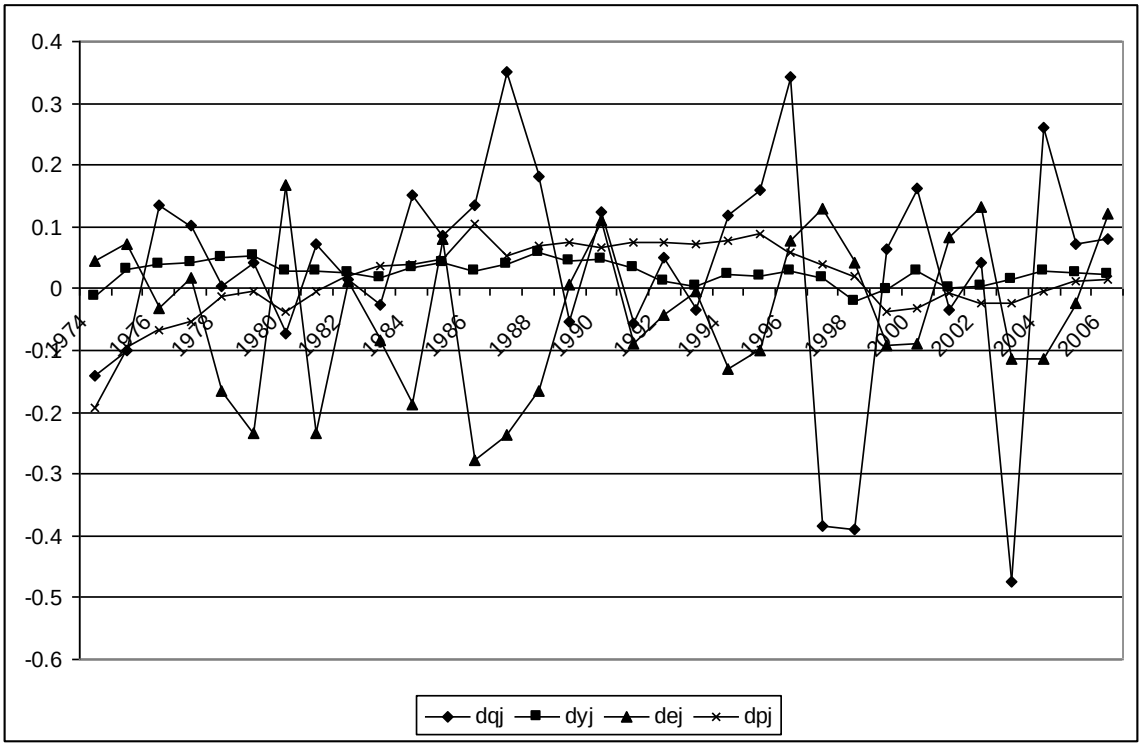
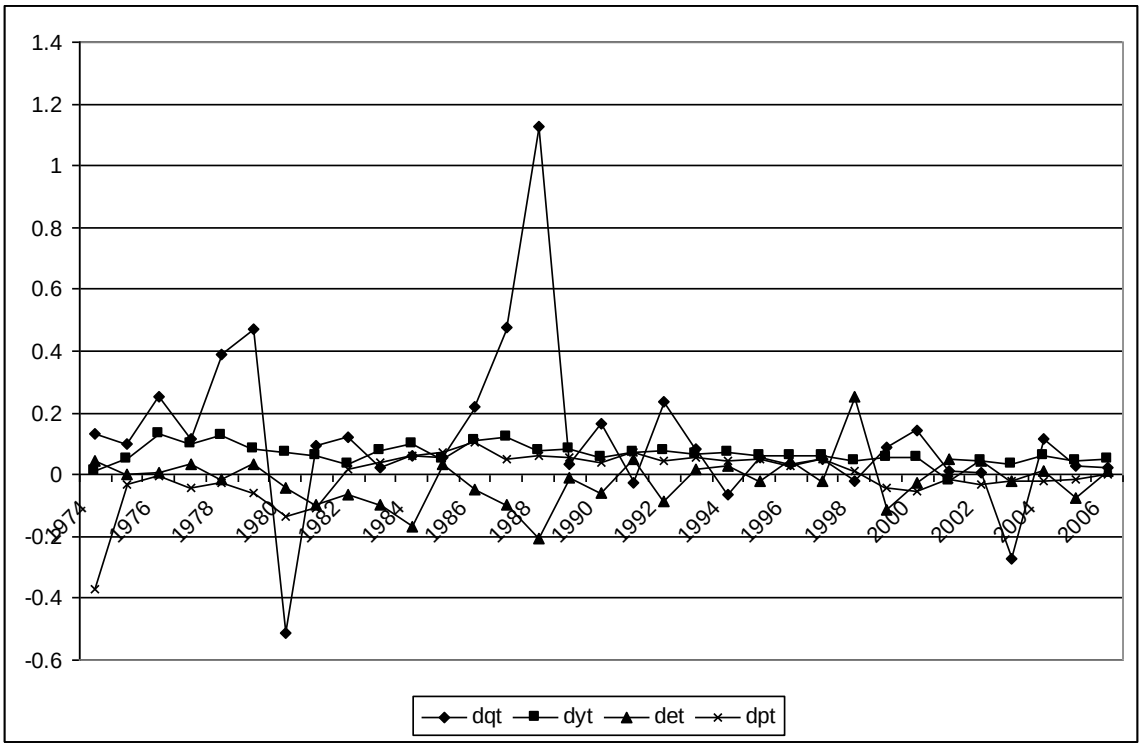


Figure 2.2c: Differences of Variable Series (Taiwan)



CHAPTER 3

TRADE, TOURISM, EDUCATION, AND GROWTH IN MAURITIUS

1. Introduction

Mauritius is an island economy in the Indian Ocean. The country had been an underdeveloped country with low per capita income and high unemployment before its independence in 1968. In late 1970, the economy suffered a sugar bust and faced a large trade deficit. Mauritius then experienced significant economic growth starting from 1984 under a newly restructured Export Processing Zone (EPZ). Income per capita ranks second among Sub-Sahara African countries in 2006 (World Bank Development Indicators, 2008). Its global economic freedom ranks 18 among 157 countries based on the index of economic freedom published by the Heritage Foundation (2008).

This chapter aims to analyze the impacts of trade openness, tourism, investment, and human capital investment on economic growth in Mauritius. Aggregate and disaggregated measures of these determinants examine their effects on economic growth. An error correction model (ECM) indicates positive effects of the EPZ, tourism, investment, and human capital investment. The strategic tourism marketing policy aimed at high spending tourists has led to economic growth. The advantage of the disaggregated measures is that they provide more information about the effects of the specific measures on growth. The use of the ECM methodology can capture the

dynamics of the output growth relative to the specific determinants of growth. The findings may shed light on policy implications for other similar economies.

The outline of this chapter is as follows. Section 2 reviews the economic history of Mauritius with a focus on the Export Processing Zone, the tourism industry, and the human capital accumulation through education. Section 3 discusses the theoretical framework. Section 4 discusses the stationarity analysis of the variables and the choice of econometric models. Section 5 reports the empirical results. Section 6 concludes the chapter with a discussion of policy implications.

2. A Brief History of Economic Development in Mauritius

Mauritius is a small island economy in the Indian Ocean with a land area of 2040 sq km and a population of 1.2 million in 2007. A country is classified as "small" if its population is less than 1.5 million and the major characteristics of small island economies are their deficiencies in natural resources, isolation, and remoteness from the other countries (Prasad, 2003). Given these unfavorable resources endowment, the Nobel laureate James Meade claims that the economic future of Mauritius will be potentially a failure due to its heavy dependence on mono-crop production (sugar) and rapid population growth (Meade, 1961). His pessimistic view about economic development in Mauritius has proven to be a mistake by the rapid and sustained growth of Mauritius in the past three decades. The country is praised as a "Tiger of the Indian Ocean" since the 1980s. It has outperformed the other Sub-Sahara African countries due to its success in turning around its economy by restructuring and strengthening the Export Processing Zone (EPZ) and success in developing its tourism sector.

With a small domestic market, to achieve any economies of scale or any sustainable production level requires trading with foreign countries. It is observed that small island economies rely heavily on trade (exports and imports) to a greater extent than larger countries (Prasad, 2003).

Trade can enhance growth. A developing country can obtain advanced technology through trade with developed countries to enhance productivity. However, the endogenous growth literature has diverse conclusions in which trade restrictions or trade openness can increase or decrease the economic growth rate of the trading countries (Romer, 1990; Grossman and Helpman, 1990; Matsuyama, 1992, Sachs and Warner, 1997). A country could liberalize its export sector and yet employ highly restricted trade policies for imports to encourage development of import substitution industries (Krueger, 1978).

Mauritius was a typical country adopting highly open policy in exports but highly restrictive policy in imports during the 1970s and 1980s. In the 1980s, the average tariff was more than 100% and there are quotas on around 60% of imports (Subramanian, 2001). From the 2000s, the country adopted a more relaxed policy in imports. In 2005, the weighted average tariff rate was about 4.7% though there are still some quantity restrictions on imports.

2.1. Export Processing Zone

The Export Processing Zone (EPZ) in Mauritius is first established in 1970. It was restructured and strengthened in 1984 with the introduction of many effective new policy instruments (Subramanian and Roy, 2001). The government provides a variety of

tax incentives for firms operating in the EPZ. The major incentive is a 10 year tax break on firms' retained earnings and later the tax break was extended to 20 years to retain the interests of the foreign investors in EPZ.

The corporate tax is reduced to 15% in the EPZ providing incentives for foreign direct investment in Mauritius. In addition, in order to increase the EPZ exporter competitiveness, duty-free is applied to all imported inputs.

The Mauritius government separates the labor market of the EPZ from the other sectors in the economy. Employers in the EPZ have greater flexibility in employing and discharging workers, and workers are allowed to work longer hours each day. As a wage policy, the minimum wage for females is relatively lower than males in the EPZ. The lower labor cost provides incentives for firms to absorb unemployed women into EPZ. Eventually the minimum wage law for men was also abolished in the EPZ in 1984. The new labor policy largely increases the employment within the EPZ, especially the employment for men.

The EPZ in Mauritius is mainly textile-based Export Processing Zone with about 90% textile and clothing exports. The country's EPZ textile exports benefited from the Multi-Fiber Agreement (MFA) during the 1980s and 1990s. The majority of textile exports are shipped to European countries such as France and the United Kingdom, and to the United States. The EPZ contributed over 25% to GDP during the period from 1986 to 2001. However, the EPZ textile exports are strongly affected due to the expiration of the quotas under the World Trade Organization Agreement on Textile and Clothing (ATC) at the end of 2004. Despite the declining trend of EPZ exports in recent years, the

restructured EPZ with the effective policies has been regarded as the engine of the rapid economic growth in 1980s and 1990s.

2.2. Tourism

An increasing amount of literature has been analyzing the causal relationship between tourism and economic growth. Some studies focus on tourism impacts on growth in specific countries, such as Mauritius, Greece and South Korea (Durbarry, 2004; Dritaskis, 2004; Oh, 2005) while other studies compare the relative growth performance with a sample of tourism countries (Lea, 1988; Sinclair, 1998; Brau, Lanza and Pigliaru 2003; Leea and Chang, 2008).

Mauritius is a holiday destination beach resort in the coastal area. Tourism has been a growing industry in Mauritius over the last three decades. The contribution of the tourism sector to Gross Domestic Product in Mauritius has made it one of the three pillars of the economy along with sugar production and the Export Processing Zone.

In 2006, tourism has contributed to about 16% of the GDP and 26% of the exports. There is a significant increase in gross tourist receipts from US $69 million in 1980 to US $1065 million in 2006. The major source of tourists is from European countries with majority from France (23 %) and United Kingdom (13%). The second source is from the nearby Reunion Island (11%) and South Africa (9%). The number of tourist arrivals rose from 115,080 to 788,216 between 1980 and 2006.

The national tourism marketing policy is to target high end tourist products, such as luxurious hotels and beach resorts, and to attract high spending tourists from Europe. Most prestige resort hotels are operated and managed by large hotel groups that are

recognized internationally for providing high quality accommodation service. The market positioning at high spending tourist is proven to be successful and evidenced by the rising trend of the average tourist spending in real term over the period from 1980 to 2006.

2.3. Human Capital

The importance of human capital for economic growth is investigated in many empirical studies (Barro, 1991; Mankiw, Romer and Weil, 1992) and the studies find that human capital accumulation through schooling has a significantly positive impact on economic growth. Barro and Sala-i-Martin (2004) further investigate the impact of educational expenditures by governments and conclude that there is a strong positive impact of male education on growth. On the contrary, Caselli, Esquivel and Lefort (1996) and Knowles, Lorgelly and Owen (2002) find that female secondary education rather than male secondary education leads to economic growth.

For more than 30 years, human capital in Mauritius has played a prominent role in the country's development since 1970s. However, Mauritius is facing severe budget constraints to engage in human investment by developing an effective educational system. A major achievement of the educational system so far is that it has provided the manpower requirements for the Export Processing Zone and the tourism industry.

Secondary school enrollment rate in Mauritius rose from 44% to 69% from 1980 to 2006. Specifically, male secondary school enrollment rate increased from 46% to 66% and female enrollment rate increased from 43% to 72%. However, the educational system is lagging behind in manpower requirements for the economic transformation of

the economy (Bunwaree, 2001; Sacerdoti, El-Masry, Khandelwal, and Yao, 2005). The relatively poor quality of scientific and technological education cannot equip enough skilled labor to meet the demand for technical workers for the future economic development in the high technology sector.

3. The Theoretical Framework

The output growth of an economy is due to growth in inputs including labor, physical and human capital, or productivity growth (Feenstra, 2004). The source of productivity growth does not just come from technology; it also includes resource endowments, climate, institution, and some other variables (Mankiw, Romer, and Weil, 1992). Assume the aggregate output function as

$$Y_t = A_t F(K_t, H_t, L_t)$$

where Y_t is the output at period t, K_t is the stock of physical capital, H_t is the stock of human capital, L_t is the labor force, and A_t is a measure of Hicks-neutral technological progress that also represents multifactor productivity.

Suppose the production function is defined as:

$$Y_t = A_t K_t^{\alpha} H_t^{\beta} L_t^{(1-\alpha-\beta)} \qquad (3.1)$$

The production function exhibits constant return to scale. Assume the values of α and β are positive and $(\alpha + \beta)$ is less than 1, which implies that labor, physical and human capital exhibit diminishing returns.

To derive the output per labor or the productivity of a labor, (3.1) is divided by the labor force on both sides to obtain

$$\frac{Y_t}{L_t} = A_t\left(\frac{K_t}{L_t}\right)^{\alpha}\left(\frac{H_t}{L_t}\right)^{\beta}$$

$$y_t = A_t k_t^{\alpha} h_t^{\beta} \quad (3.2)$$

where y_t is the output per labor, k_t is the physical capital per labor and h_t is human capital per labor.

To capture the effect of the trade on the output per labor (y_t), a vector of trade variables, T, are incorporated into (3.2) for estimations (Frankel and Romer, 1999; Yanikkaya, 2003). In general form, the model is as follows,

$$y_t = A_t f(k_t, h_t; T) \quad (3.3)$$

where T includes the trade measures, such as the ratio of exports and imports to GDP (oy), the import penetration ratio (mp) and the exports share in GDP (xy), the exports share of Export-Processing Zone in GDP (ey), and the tourist receipts per tourist (t).

For the dependent variable, per capita real GDP is used as a proxy for the output per labor (Lea, 1988; Mankiw, Romer, and Weil, 1992; Sinclair, 1998; Barro and Sala-i-Martin, 2004; Durbarry, 2004).

The physical capital per labor is the critical determinant in the neo-classical growth model. The derivation of the ratio of physical capital to labor requires an estimation of the capital stock. By using the perpetual-inventory method, the net capital stock in period t, K_t, is the accumulation of the weighted investment series of all surviving vintages. That is $K_t = \Phi_0 I_t + \Phi_1 I_{t-1} + \ldots + \Phi_T I_{t-T}$, where $\Phi_0 = 1$ and (t-T) is the year of the oldest surviving vintages (Hulten, 1990). The value of the efficiency weights, Φ_s, is between zero and one, and the current capital is more productive (or efficient) than the older capital, i.e. $\Phi_0 > \Phi_1 > \ldots > \Phi_T$. Assume the efficiency weights follow a "one-

hoss shay" pattern, that is most of the assets have the same productivity regardless of their age and their productivities will drop to zero when they are retired. Then the efficiency weights, Φ_s, of the assets are equal to one in their life-time, i.e. $\Phi_0 = \Phi_1 = \ldots = \Phi_T = 1$.

As a result, the estimation of the net capital stock is essentially the same as the estimation of the gross capital stock (Hulten, 1990). The gross capital stock in period t, K^G_t, is derived by adding the new gross fixed capital formation (I_t) of each year to the existing capital stock, that is $K^G_t = I_t + I_{t-1} + \ldots + I_{t-T}$.

Barro and Sala-i-Martin (2004) point out a practical problem of estimating the initial capital stock, K_0. They argue that the estimation of the capital stocks of the first few years is unreliable and depends heavily on the accuracy of the guess of the initial capital stock. However, the estimated capital stocks will become more and more accurate after a few years. Therefore, in my present study, the initial capital stock ($K_0 = I_{t-T}$) is the sum of the gross fixed capital formation of the initial year (1980) and the previous four years (1976 - 1979). By using this technique, the guess of the initial capital stock becomes more accurate. Then K^G_t is divided by the labor force (L_t) to obtained the physical capital per labor, i.e. $k_t = (I_t + I_{t-1} + I_{t-2} + \ldots + I_{t-T}) / L_t$.

In growth theory, human capital is a source of economic growth. A vast amount of research investigates how human capital accumulation will sustain economic growth (Lucas, 1988; Jones and Manuelli, 1990; Rebelo, 1991; Stokey, 1991, Barro, 2001). The secondary school enrollment rate is a proxy for human capital accumulation (Barro, 1991; Mankiw, Romer, and Weil, 1992). In addition, many researchers also interested in whether there is a significant difference between male and female education on economic

growth (Caselli, Esquivel, and Lefort, 1996; Knowles, Lorgelly, and Owen, 2002; Barro and Sala-i-Martin, 2004). In the present study, the aggregate secondary school enrollment rate is used in the first model and then two disaggregated variables, male and female school enrollment rates, are used for the second model.

Trade openness as an explanatory variable has been used in many studies (Romer, 1990; Young, 1991; Stokey, 1991; Frankel and Romer, 1999; Rodríguez, F. and D. Rodrik, 2001). Some studies report that trade openness can speed up growth (Romer, 1990) while some other studies argue that trade openness can slow down growth (Young, 1991; Stokey, 1991). Yanikkaya (2003) had explored the effects of a set of trade openness measures on economic growth in a cross-country study and found ambiguous results.

The typical proxy for trade openness is the ratio of the sum of exports and imports to GDP. In addition, disaggregated variables, such as exports share of GDP and imports penetration ratio, are also proxies for trade openness. In the present study, the ratio of the sum of exports and imports to GDP (oy) is used in one model. Next, the import penetration ratio (mp) and the exports share in GDP (xy) are used to explore the specific effects of exports and imports on economic growth.

Rodríguez and Rodrik (2001) argue that the indicators of "openness" in many studies are poor measures of trade barriers. Therefore, in my present study, two additional disaggregated trade variables, the export share of Export-Processing Zone in GDP (ey) and the tourist receipts per tourist (t), are used to investigate their effects on growth.

In a recent study, Durbarry (2004) uses the EPZ exports as an explanatory variable. The problem is that EPZ exports are parts of the total exports and enter directly to GDP leading to the problem of endogeneity in regression estimates. Instead, the exports share of EPZ in GDP (ey) is used to capture the effect of the restructured EPZ on economic growth after 1984.

Tourism as a source of economic growth and development has been recently studied (Sinclair, 1998; Durbarry, 2004; Dritaskis, 2004; Oh, 2005; Kim, Chen, and Jang, 2006; Brida, Carrera, and Risso, 2008) and the empirical results are mixed. Tourism revenue, the number of tourist arrivals, and tourist receipts per tourist are the potential candidates of the explanatory variable. Tourism revenue is a component of exports in national income accounting and will lead to endogeneity problem in regression estimates.

In the present study, the appropriate proxy is the tourist receipts per tourist instead of the number of tourist arrivals. Since Mauritius tourism marketing tactic is aiming at high spending tourists, the tourist receipts per tourist as an explanatory variable tests the hypothesis that high spending tourism contributes to economic growth.

Although rising tourist arrivals may contribute to economic growth, it is not appropriate to test Mauritius tourism marketing policy. More tourist arrivals may lead to economic growth while higher per tourist spending leads to higher economic growth. The number of tourist arrivals has been included as an explanatory variable in the preliminary estimation for comparison purposes.

To determine the responsiveness of income growth to the sources of economic growth such as physical and human capital accumulation, trade openness, the exports of EPZ and the tourist receipts per tourist, a number of log-linear production functions based

on equation (3.3) are derived for estimations. First, per capita real GDP (y) is regressed by a set of explanatory variables including the physical and human capital per labor (k and h) and a trade measure: the ratio of the sum of exports and imports to GDP (oy).

Second, to capture the specific effects of imports and exports on economic growth, two separate disaggregated trade measures, the import penetration ratio (mp) and the exports share in GDP (xy), replace the ratio of the sum of exports and imports to GDP (oy) for estimation.

Third, to capture the specific effects of exports of EPZ and tourism on growth, the EPZ export share in GDP (ey) and tourist receipts per tourist (t) are used for estimation.

Finally, to capture the specific effects of male and female education on economic growth, two separate disaggregated human capital measures, the male and female secondary school enrollment rates (mh and fh) replace the aggregate secondary school enrollment rate (h) for estimation.

Since the relationships among the relevant variables are expressed in logarithmic form, parameters are the elasticities of the respective variables. The expected sign of the physical capital per labor (k) is positive since physical capital is an essential determinant for growth in neoclassical growth theory.

The expected sign of the ratio of the sum of exports and imports to GDP (oy) is ambiguous. It is reported in many previous studies that the sign of the variable can be positive or negative (Romer, 1990; Grossman and Helpman, 1990; Matsuyama, 1992).

The expected sign of the exports share in GDP (xy) is positive while the import penetration ratio (mp) can be positive or negative. If the major imports are consumer goods, it may cause a negative effect on growth. However if the imports are essentially

capital goods or production inputs that help to produce final goods and services, it may have a positive impact on domestic growth.

Positive signs of education, male education and female education (h, fh and mh) are expected since education and training increase the productivities of the labor force.

A positive sign of per tourist spending (t) is expected since tourism is the exports of services which lead to tourism receipts from foreign tourists.

The expected sign of the restructured EPZ (ey) is positive since it provides incentives for investment in EPZ which leads to increasing exports.

Preliminary regression results from estimating the production functions show that the import penetration ratio (mp) is statistically insignificant and the inclusion of the export share in GDP (xy) in the model causes the problem of model misspecification. For comparison purposes, the number of tourist arrivals replaces the tourist receipts per tourist. Regression results show that although the number of tourist arrivals has a positive impact on growth, the inclusion of the variable in the models causes the problem of model misspecification.

As a result, three production functions are chosen for estimation:

Model 1: $y_t = a_0 + a_1k_t + a_2h_t + a_3oy_t + \varepsilon_t$ (3.4)

Model 2: $y_t = a_0 + a_1k_t + a_2h_t + a_3t_t + a_4ey_t + \varepsilon_t$ (3.5)

Model 3: $y_t = a_0 + a_1k_t + a_2fh_t + a_3mh_t + a_4t_t + a_5ey_t + \varepsilon_t$ (3.6)

The definitions of the variables are summarized in Table 3.1.

4. Data and the Choice of Econometric Models

Data on per capita real GDP, gross fixed capital formation, exports and imports of goods and services, secondary school enrollment rate, and tourist receipts are from the Central Statistic Office of Mauritius. GDP implicit price deflator is from the World Bank Development Indicators compiled by the World Bank. All nominal data are deflated by the GDP implicit price deflator at the base year 1990 constant price. The period of study is 1980 to 2006 (annual data).

Stationarity of variables is pretested to check whether the variables are stationary series converging to steady state levels. The results of the unit root test from conventional augmented Dickey-Fuller (ADF) tests of the variables are summarized in Table 3.2. The number of lags is chosen by the Akaike Information Criterion (AIC).

The ADF test with an intercept fails to reject the null hypothesis of a unit root for all level log variables. With the intercept and time trend, the ADF test does not reject the null hypothesis of a unit root for all level log variables. By visual inspection, the plotted variables series in Figure 3.1(a, b) appear non-stationary.

The ADF tests with an intercept reject the unit root null hypothesis for all differenced log variables except the physical capital per labor (k). The ADF tests with an intercept and trend reject the unit root null hypothesis for all differenced log variables except the import penetration ratio (mp). The plots of the differences of the k and my series in Figure 3.2(a, b) appear stationary. The results indicate all log variables are I(1) series.

Since all log variables are difference stationary, a two-stage error correction model (ECM) (Engle and Granger, 1987) may be estimated. The first stage is to estimate

the log-linear models 1, 2 and 3. The diagnostics provided for the models are R^2, adj. R^2, F-test, Durbin-Watson (DW) statistic, and the ARCH (1) test on the residuals. Diagnostic statistics show that the residuals of the regressions have no autocorrelation or heteroskedasticity for models 1 and 3. For model 2, the residuals have the problem of heteroskedasticity by the ARCH (1) test.

A requirement to estimate an ECM is that the variables of the static long-run equilibrium regression are cointegrated with the same order. To examine the cointegration relationship among the variables, the Engle-Granger test is employed to check whether the residual ε_t of the OLS equation is stationary based on:

$$\Delta\varepsilon_t = \alpha\varepsilon_{t-1} + \sum_{i=1}^{p} \Delta\varepsilon_{t-1} + \mu_t \tag{3.7}$$

For models 1 and 3, the t statistics of the coefficients of ε_{t-1} reject the null hypothesis of non-stationary based on the Engle-Granger critical values (MacKinnon, 1991). The test results imply that the variables of the respective equations are cointegrated in the first order. For model 2, the t statistic does not reject the null hypothesis of non-stationary. This result shows that there is no cointegration relationship among the variables. The regression results, the diagnostic statistics and the cointegration tests are summarized in Table 3.3.

Although there is no cointegration relationship among the variables of model 2, the estimation of its ECM is conducted for comparison purposes. The second stage is to incorporate the lag estimated residuals (ε_{t-1}) from the cointegration regressions into the corresponding ECMs as follows:

$$\Delta y_t = b_0 + \sum_{j=0}^{p} b_j \Delta x_{t-j} + \sum_{k=1}^{p} c_k \Delta y_{t-k} + \lambda\varepsilon_{t-1} + \upsilon_t \tag{3.8}$$

where Δ is the first difference operator and x = [k, h; T]' is a vector of the explanatory variables of the log-linear models 1, 2, and 3. The b_j are the impact coefficients which represent the transitory effects of the vector of the explanatory variables on the dependent variable. The ε_{t-1} is the estimated residual from the cointegration regression (3.4), (3.5) and (3.6). The coefficient (λ) of the ε_{t-1} is expected to be negative and the value of λ is greater than -1 and less than 0. The system will adjust dynamically and converge towards equilibrium by λ from the error of the previous period.

A general-to-specific approach is used to find the most appropriate specification of the ECM. In estimating the general equation (3.8), lagged dependent and explanatory variables are included and a "test-down" procedure is used to achieve a specific specification of the ECM. The insignificant variables are eliminated and the model is re-estimated until the most parsimonious specification of the ECM is achieved. The lag structure is selected based on the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC). The appropriate lag structure of each model is obtained based on the smallest values of AIC and SBC. The model specification of the ECM is checked by the Ramsey RESET test. Finally the most appropriate ECM models are obtained as follows:

$$\text{Model 4: } \Delta y_t = b_0 + b_1\Delta k_t + b_2\Delta h_t + b_3\Delta oy_t + \lambda\varepsilon_{t-1} + u_t \quad (3.9)$$

$$\text{Model 5: } \Delta y_t = b_0 + b_1\Delta k_t + b_2\Delta t_t + \lambda\varepsilon_{t-1} + u_t \quad (3.10)$$

$$\text{Model 6: } \Delta y_t = b_0 + b_1\Delta k_t + b_2\Delta t_t + \lambda\varepsilon_{t-1} + u_t \quad (3.11)$$

The diagnostics provided for the error correction models are R^2, adj. R^2, F-test, DW statistic, and the ARCH (1) test on the residuals. Residuals of the three models have no autocorrelation and no heteroskedasticity. There are no model misspecifications for

models 5 and 6 based on the Ramsey RESET statistics. However there is model misspecification for model 4. The regression results and the diagnostic statistics of the ECMs are summarized in Table 3.4.

The transitory and the dynamic effects of the explanatory variables (the Δx and x_{t-1}) on per capita real GDP are derived by multiplying the significant error correction coefficients (λ) of ε_{t-1} in Table 3.4 by each of the significant coefficients (a_s) in Table 3.3. Standard errors of the derived coefficients are derived from the rules of error propagation as functions of the standard errors of a_s, and λ. The derived coefficients and the t-statistics of Δx and x_{t-1} on per capita real GDP are summarized in Table 3.5.

Finally, three difference models (growth rate models) are estimated for comparison purposes. The three difference models are as follows:

$$\text{Model 7: } \Delta y_t = c_0 + c_1 \Delta k_t + c_2 \Delta h_t + c_3 \Delta oy_t + u_t \tag{3.12}$$

$$\text{Model 8: } \Delta y_t = c_0 + c_1 \Delta k_t + c_2 \Delta h_t + c_3 \Delta t_t + c_4 \Delta ey_t + u_t \tag{3.13}$$

$$\text{Model 9: } \Delta y_t = c_0 + c_1 \Delta k_t + c_2 \Delta fh_t + c_3 \Delta mh_t + c_4 \Delta t_t + c_5 \Delta ey_t + u_t \tag{3.14}$$

The diagnostics provided for the difference models are R^2, adj. R^2, F-test, DW statistic, and the ARCH (1) test on the residuals. The model specification is checked by the Ramsey RESET test.

Regression results show that all coefficients of the three equations are statistically insignificant by t-test and the overall significance of the equations are also statistically insignificant by F-test. Therefore the regression results of the three difference models are not reported here.

5. Empirical Results

In models 4, 5 and 6, the significant negative lag estimated residuals (ε_{t-1}) in the ECM equations imply the existence of an error correction relationship among the variables of each of the OLS equations (3.4), (3.5) and (3.6) based on the Granger Representative Theorem (Engle and Granger, 1987).

The regression result of model 4 shows that the growth rate of the per capita real GDP in the current year will adjust towards equilibrium by -0.76 of the error term in the previous year. The transitory effects of physical capital per labor (k) and the human capital per labor (h) on economic growth are 0.51 and 0.49 respectively. The trade openness (oy) has a positive transitory effect (0.16) on economic growth. The lagged effects of physical capital, human capital, and trade openness on economic growth each period are 0.29, 0.33 and 0.19 respectively. The lagged effects will adjust dynamically towards long-run equilibrium.

However, model 4 has the problem of model misspecification based on the Ramsey RESET test. As a result, model 4 may not be an appropriate model for estimation.

In model 5, two disaggregated trade measures, the tourist receipts per tourist (t) and the EPZ export share in GDP (ey), are adopted to replace the aggregate trade measure (oy). The regression result shows that the economic growth rate in the present year will adjust towards long-run equilibrium by -0.92 of the error in the last year. The transitory effect and lagged effect of physical capital per labor (k) on economic growth are 0.39 and 0.29. The lagged effects will add to the transitory effects on economic growth dynamically and converge towards long-run equilibrium. A 10% increase in physical

capital per labor leads to 3.9% economic growth in the current year and contributes to 2.9% growth for the next year. The positive effect of physical capital accumulation on economic growth is consistent with the neo-classical growth theory.

There is no significant transitory effect of human capital (h) on economic growth. However there is a significant lagged effect (0.59) that converges dynamically to steady state with a long-run impact (0.64) on growth. Investment in schooling and training may not have immediate impact on the productivity of labor. It takes time to convert unskilled to skilled labor and raise their productivities. However the lagged effect of human capital implies that education has a long-term impact on growth. The positive impact of human capital investment is also consistent with theory proposed by Mankiw, Romer, and Weil (1992). A 10% increase in secondary school enrollment rate results a 6.4% economic growth.

The transitory effect of the tourist receipts per tourist (t) on economic growth is insignificant. However tourist receipts have a significant long-term effect (0.14) on growth. A 10% increase of per tourist spending raises the economic growth rate by 1.4%. Tourism plays an important role in economic growth in Mauritius. Tourism policy targeting at high-spending tourists serves as a very successful tourism development strategy in Mauritius.

There is no significant transitory effect of the EPZ exports (ey) on economic growth. However there is still a small lagged effect (0.05) on growth.

In model 6, the male and female school enrollment rates replace the aggregate secondary enrollment rate for estimation. The regression result shows that the economic growth rate in the current year will converge towards long-run equilibrium by -0.88 of

the error in the previous year. The transitory effect of physical capital per labor (k) on economic growth is 0.33 while the lagged effect is 0.24.

The male capital investment is statistically insignificant while female capital investment has significant impact on economic growth. Although there is no transitory effect of female education, there exists a significant lagged effect (0.63) on economic growth. The lagged effect adjusts dynamically towards equilibrium and contributes a long-run impact (0.72) on growth. A 10% increase of the female school enrollment rate leads to 7.2% economic growth in the long-run.

Indeed, when women receive more education and training, their opportunity costs of staying home increase. Women are willing to leave home and enter the labor market, increasing the supply of more productive and skilled labor for the EPZ and the tourism sector.

The transitory effects and lagged effects of the tourist receipts per tourist (t) and EPZ exports (ey) on economic growth are essentially the same as model 5. With the rapid development of EPZ and tourism sectors since 1984, EPZ exports and tourism contribute to the economic growth in Mauritius.

Since both model 5 and 6 have no problem of model misspecification based on the Ramsey RESET test, the two models are appropriate.

6. Conclusion

This chapter aims at analyzing the impact of trade openness, tourism, physical capital, and human capital on economic growth in Mauritius. Regression results of the error correction models confirm the positive effects of the Export Processing Zone,

tourism, physical capital investment, and human capital investment on economic growth in Mauritius. The error correction models capture the short-run and long-run dynamics of the determinants on growth.

For policy implications, tourism can be considered as a development strategy for developing small open economies. Higher tourist arrivals lead to economic growth while higher per tourist spending results a higher growth rate. The strategic tourism marketing policy aimed at high spending tourists has proven to be successful and contribute significantly to the economic growth of the country.

The Export Processing Zone in Mauritius has been an impetus of economic growth. The restructured and strengthened Export Process Zone after 1984 with the introduction of many effective new policy instruments provides incentives for foreign direct investment in the country.

The accumulation of physical capital through the development of Export Process Zone and tourism industry has proved to be an important source of growth.

Education investment is essential for supplying skilled labor for both an Export Process Zone and tourism. Higher school enrollment today implies a higher supply of skilled labor a few years later. Education is a sustainable development strategy for all developing countries. For the future development of high technology industry in Mauritius, education reform aimed at improving the quality of education is advised.

Table 3.1: Definitions of Data Variables

Variables	Explanatory Notes
y	Per capita real GDP
k	Physical capital per labor
oy	The ratio of the sum of exports and imports to GDP
xy	The export share in GDP
mp	The import penetration ratio (i.e. the ratio of imports to GDP)
h	Aggregate secondary school enrollment rate
mh	Male secondary school enrollment rate
fh	Female secondary school enrollment rate
ey	The exports share of Export Processing Zone in GDP
t	Real tourist receipts per tourist

Table 3.2: Unit Root Test Results

Variable	Specification	ADF_c	$ADF_{c,t}$
y	Level	-1.67	-0.67
	Differenced	-3.44**	-3.69**
k	Level	-1.60	-1.06
	Differenced	-2.03	-3.65**
h	Level	0.87	-2.38
	Differenced	-2.97*	-3.33*
fh	Level	1.06	-1.28
	Differenced	-3.48**	-3.99**
mh	Level	0.80	-1.96
	Differenced	-2.75*	-3.32*
oy	Level	-2.58	-2.67
	Differenced	-3.76***	-3.70**
xy	Level	-1.70	-1.67
	Differenced	-4.92***	-5.13***
mp	Level	-2.46	-2.80
	Differenced	-3.24**	-3.18
t	Level	-2.08	-0.89
	Differenced	-2.68*	-3.39*
ey	Level	-1.78	-2.25
	Differenced	-5.39***	-5.23***

Note: the number of lags is chosen by the Akaike Information Criterion (AIC). ADF_c and $ADF_{c,t}$ refer to ADF-t statistic when an intercept is included and when an intercept and time trend are included. *, ** and *** indicate the null hypothesis of unit root is rejected at 10%, 5% and 1% level. Asymptotic critical values are from MacKinnon (1996).

Table 3.3: OLS Regressions for Per Capita Real GDP

Independent Variable	Model 1 y	Model 2 y	Model 3 y
constant	11.67***	11.45***	11.33***
	(496.33)	(60.10)	(62.26)
k	0.39***	0.31***	0.27***
	(17.82)	(9.73)	(8.05)
h	0.43***	0.64***	---
	(5.10)	(4.97)	
fh	---	---	0.72***
			(3.81)
mh	---	---	-0.09
			(-0.49)
oy	0.25***	---	---
	(4.88)		
t	---	0.14**	0.13**
		(2.53)	(2.73)
ey	---	0.06**	0.05*
		(2.28)	(1.91)
F	2276.39	1928.48	1829.32
R^2	0.99	0.99	0.99
Adjusted R^2	0.99	0.99	0.99
DW statistic	1.51	1.60	2.24
ARCH (1)	-0.38	1.99*	-0.36
Engle-Granger test			
EG_τ	-4.56**	-4.24	-5.67*
DW statistic	2.07	1.91	2.06
ARCH (1)	0.78	1.50	-0.58

Note: *, ** and *** represents the significance of the t-test at the 10%, 5% and 1% level respectively, and t statistic is given underneath in parentheses. Critical values at the 5% and 10% level of Engle-Granger test are calculated from MacKinnon (1991).

Table 3.4: Error Correction Model

(Regressions for Difference in Per Capita Real GDP)

Independent Variable	Model 4 Δy	Model 5 Δy	Model 6 Δy
constant	-0.01	0.01	0.01
	(-0.69)	(0.57)	(0.80)
Δk	0.51***	0.39***	0.33**
	(3.33)	(2.91)	(2.27)
Δh	0.49*	---	---
	(1.79)		
Δoy	0.16**	---	---
	(2.46)		
Δt	---	0.06	0.09
		(1.31)	(1.69)
ε_{t-1}	-0.76***	-0.92***	-0.88***
	(-3.41)	(-4.48)	(-3.49)
F	5.50	9.57	6.39
R^2	0.51	0.57	0.47
Adjusted R^2	0.42	0.51	0.39
DW statistic	1.83	1.54	1.51
ARCH (1)	-0.32	-0.24	0.12
AIC	-4.80	-4.99	-4.78
SBC	-4.55	-4.80	-4.59
Ramsey RESET test			
F statistic	4.03**	0.09	0.17

Note: *, ** and *** represents the significance of the t-test at the 10%, 5% and 1% level respectively, and t statistic is given underneath in parentheses.

Table 3.5: Derived Results on Per Capita Real GDP

Independent Variable	Model 4 Δy	Model 5 Δy	Model 6 Δy
constant	8.87***	10.53***	9.97***
	(3.41)	(4.47)	(3.48)
Δk	0.51***	0.39***	0.33**
	(3.33)	(2.91)	(2.27)
Δh	0.49*	---	---
	(1.79)		
Δoy	0.16**	---	---
	(2.46)		
k_{t-1}	0.29***	0.29***	0.24***
	(3.35)	(4.07)	(3.20)
h_{t-1}	0.33***	0.59***	---
	(2.83)	(3.32)	
fh_{t-1}	---	---	0.63***
			(2.57)
oy_{t-1}	0.19***	---	---
	(2.80)		
t_{t-1}	---	0.13**	0.11**
		(2.20)	(2.15)
ey_{t-1}	---	0.05**	0.04*
		(2.03)	(1.67)

Note: *, ** and *** represents the significance of the t-test at the 10%, 5% and 1% level respectively, and t statistic is given underneath in parentheses.

Figure 3.1a: Variable Series

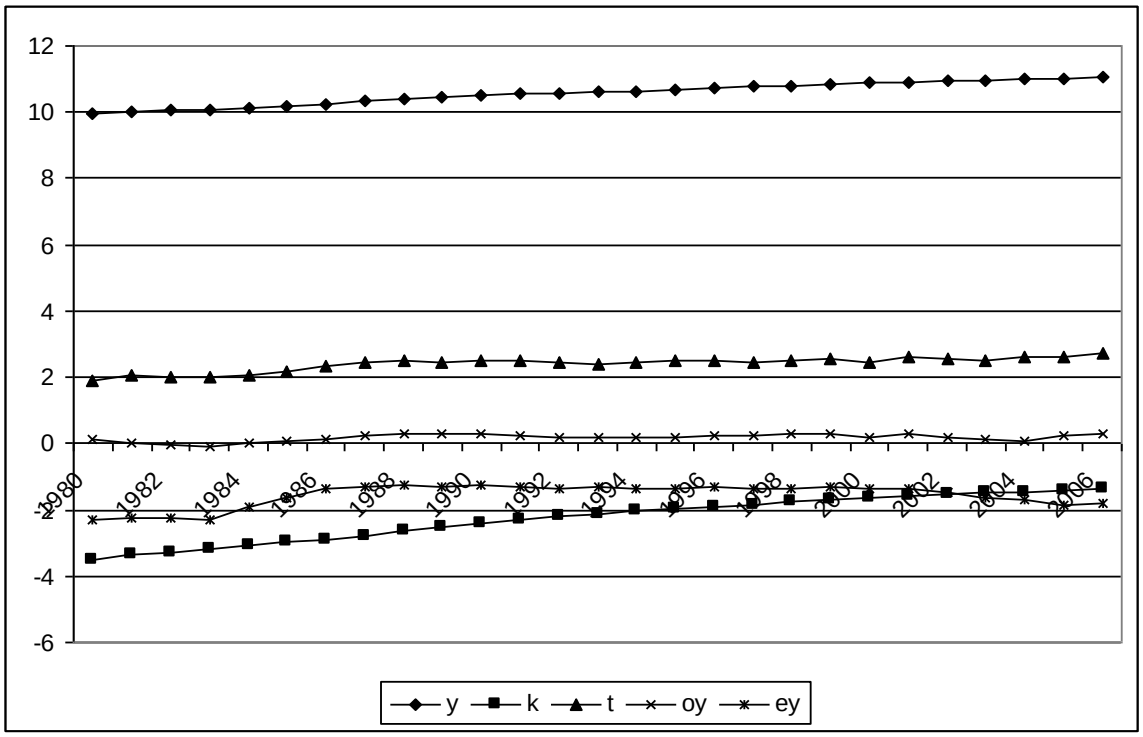


Figure 3.1b: Variable Series

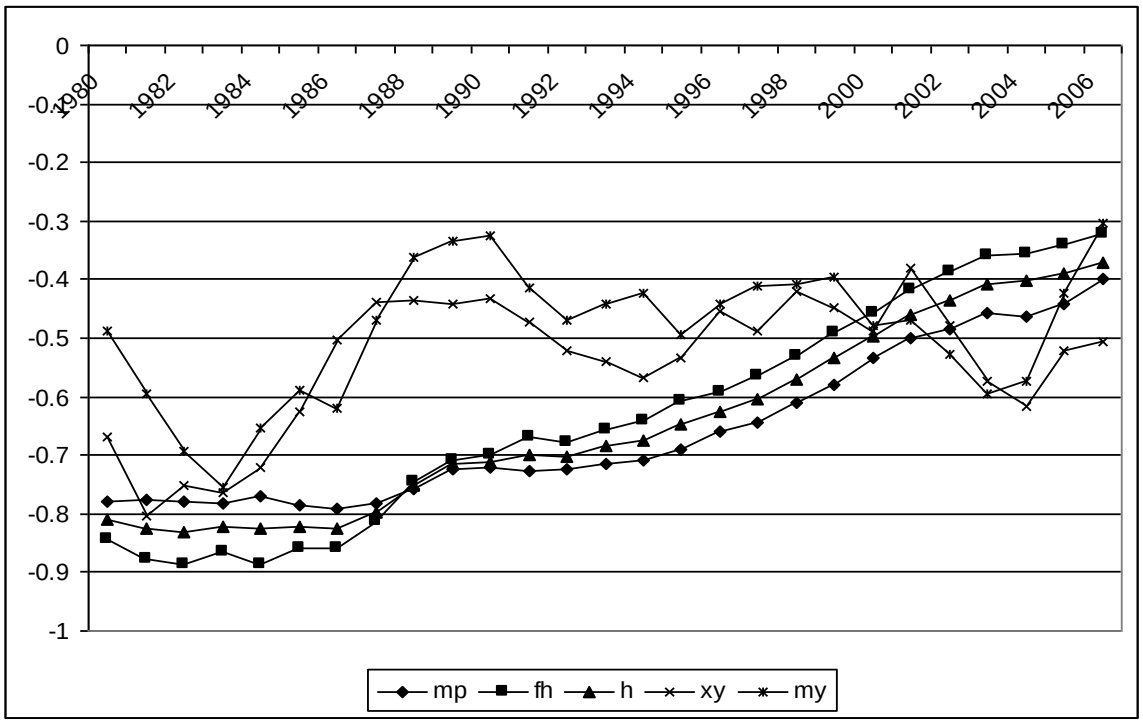


Figure 3.2a: Differences of Variable Series

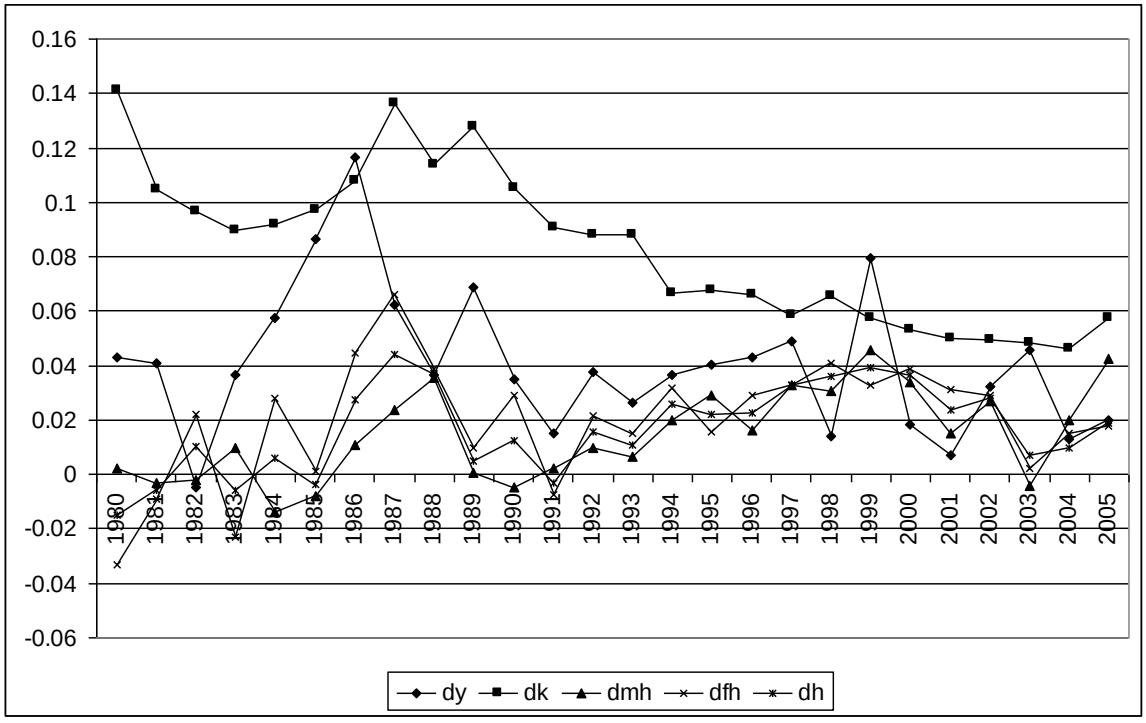
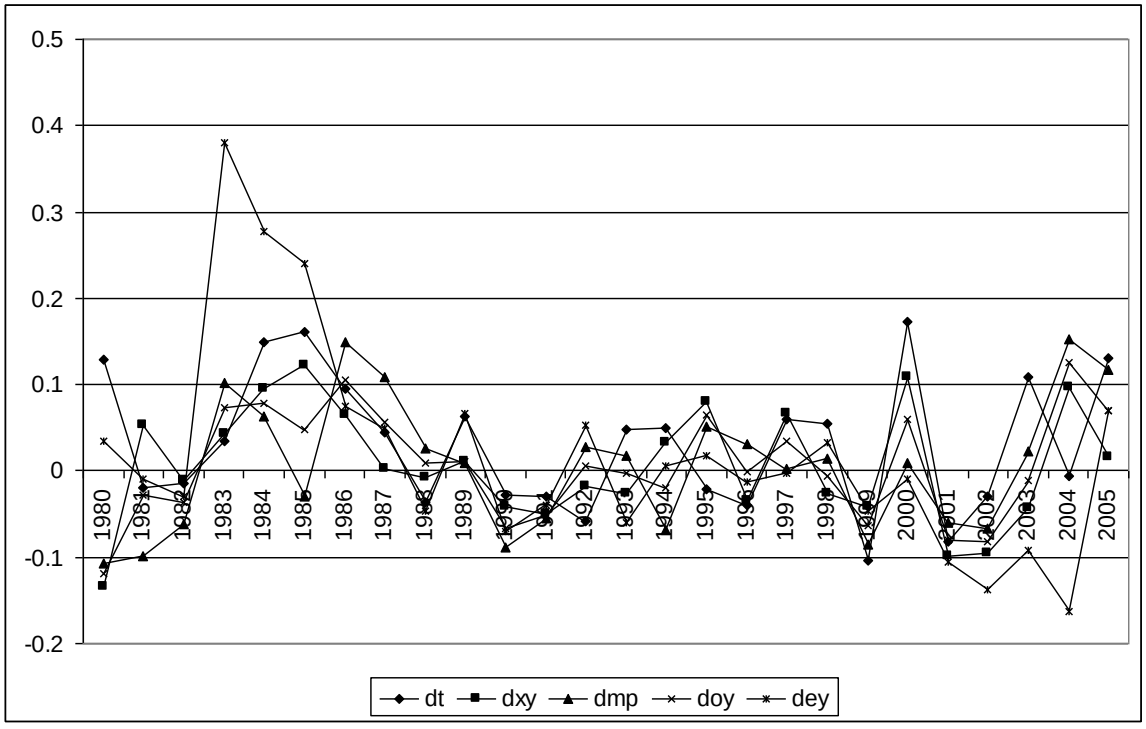


Figure 3.2b: Differences of Variable Series



CONCLUDING CHAPTER

Tourism is the theme of this dissertation. Time series econometrics is the tool to investigate tourism related economic issues such as the trade balance in tourism, demand for international tourism, and tourism-led growth. Aggregate and disaggregated variables have been employed in econometric models to compare their strength in estimations.

Tourism

Tourism as a trading service has not been extensively discussed in the theory of international trade. There is a paucity of empirical studies on the balance of trade in tourism in the literature. Chapter 1 fills this gap by providing an economic model to analyze the effect of the nominal exchange rate on the US tourism in trade balance.

Chapter 2 confirms that international tourism is a luxury good. Instead of examining a combined effect, Chapter 2 decomposes the relative price of tourism (or real exchange rate) into nominal exchange rate and price ratio of tourism to capture their separate effects on international tourism demand. Tourists are found to be more sensitive to the change of nominal exchange rate than the change in the foreign price level.

Chapter 3 confirms that tourism development has led to economic growth in Mauritius. The national tourism strategy aimed at high spending tourists is proven to be a successful development strategy for that country.

The choice of aggregate or disaggregated variables

The choice of aggregate or disaggregated variables is an important issue in empirical studies. Indeed, the choice of appropriate variables depends on the model, estimating equation, and availability of reliable data.

Chapter 1 employs disaggregated trade data in the tourism industry to avoid the aggregation bias of data that combine all traded goods across all industries. Chapter 1 also discusses the shortcoming of using aggregate volume indices or price indices to derive proxy variables for the quantity of exports and imports that will cause the aggregation bias and results in unreliable estimates. One limitation of Chapter 1 is that a trade weighted currencies index has to be used in the two-country partial equilibrium model. Indeed, tourism trade between two countries can be examined in future studies if data becomes available. Then instead of using a trade weighted currencies index, a bilateral exchange rate can be utilized.

Chapter 2 criticizes the use of a weighted average price index that may cause the cross-price effects among alternative destinations to be cancelled due to the aggregation resulting in unreliable estimates.

Chapter 2 also argues that the consumer price index as a proxy for the price of tourist products is inappropriate since it might not be the typical basket of goods and services of a tourist. Since tourist products comprise different commodities with a variety of quality, there exists no single price for tourist products. Unless a better alternate proxy or a more direct measure variable for the price of tourist products becomes available, the empirical results based on the aggregate price index are unreliable.

Chapter 3 employs both aggregate and disaggregated measures to examine their effects on economic growth. The advantage of the disaggregated measures is that they provide more information about the effects of the specific measures on growth.

The choice of time series econometric models

In early empirical studies, econometric modeling was restricted to single equation static models which usually suffer from the problem of spurious regression. More recent studies employ dynamic models such as the autoregressive distributed lag model, cointegrated analysis and error correction model and vector autoregressive model.

Chapters 2 and 3 employ cointegrated analysis and error correction models to overcome the problem of spurious regression. In addition, this methodology can capture both the short-run dynamics and long-run equilibrium relationship of the dependent variable to the change of its explanatory variables.

Chapter 1 chooses the structural vector autoregressive (SVAR) model and the impulse-response functions to study the dynamic behavior of trade tourism in response to an exchange rate shock. A general vector autoregressive (VAR) model assumes all variables are endogenous and is criticized for not having economic content. The SVAR model requires imposing assumptions based on certain prior knowledge or economic theory on short-run relations between the variables of interest. This technique can capture the contemporaneous and long-run response of the dependent variable to a structural shock.

Chapter 1 also advocates the methodology of estimating the export revenue and import expenditure functions separately to provide a better picture of the dynamics of the time-path of each individual function to an exchange rate shock. This methodology

outperforms the trade balance approach since the later approach focuses only on the net change of the trade balance. Besides, it also avoids the combined income effect of foreign income and domestic income on the export revenue or the import expenditure.

For the elasticity approach, if there are no actual quantity data available, the estimation of the price elasticities by using aggregate trade data may lead to unreliable results. Then estimating the export revenue and import expenditure functions separately can provide better estimates for the price elasticities of export and import demand.

Conclusion

The trade theory of tourism is not well-developed and more empirical studies should be done to test their validity. The choice of aggregate or disaggregated variables should be carefully considered in empirical studies. If data is available, disaggregated variables should always be employed to avoid the aggregation bias. The choice of time series econometric models depends on the strength and weakness of the technique and its ability to produce reliable results.

REFERENCES

Akbostanci, E., "Dynamics of the Trade Balance: The Turkish J-Curve," *Emerging Markets Finance and Trade* 40 (2004): 57-73.

Ardalani, Z. and M. Bahmani-Oskoosee, "Is there a J-Curve at the Industry Level?" *Economics Letters* 6 (2007): 1-12.

Backus, D. K., P. J. Kehoe, and F. E. Kydland, "Dynamics of the trade balance and the term of trade: the J-curve?" *The American Economic Review* 84 (1994): 84-103.

Bahmani-Oskooee, M., "Devaluation and the J-curve: some evidence from LDCs," *The Review of Economics and Statistics* 67 (1985): 500-04.

Bahmani-Oskooee, M. and T. J. Brooks, "Bilateral J-curve between US and Her Trading Partners," *Weltwirtschaftliches Archiv* 135 (1999): 156-65.

Bahmani-Oskooee, M. and G. G. Goswami, "A disaggregated approach to test the J-curve phenomenon: Japan vs. her major trading partners," *Journal of Economics and Finance* 27 (2003): 102-13.

Bahmani-Oskooee, M. and M. Malixi, "More evidence on the J-curve from LDCs," *Journal of Policy Modeling* 14 (1992): 641-53.

Bahmani-Oskooee, M. and A. Ratha, "The J-Curve: a literature review," *Applied Economics* 36 (2004a): 1377-98.

___, "The J-curve dynamics of US bilateral trade," *Journal of Economics and Finance* 28 (2004b): 32-38.

___, "The S-curve Dynamics of US Bilateral Trade," *Review of International Economics* 15 (2007): 430-39.

Barro, R. J., "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics* 106 (1991): 407-43.

___, "Human Capital and Growth," *The American Economic Review* 91 (2001): 12-17.

Barro, R. J. and Xavier Sala-i-Martin, *Economic growth*, Cambridge: MIT Press, (2004).

Bonham, C., C. Edmonds, and J. Mak, "The Impact of 9/11 and Other Global Event on Tourism in the U.S. and Hawaii," *Journal of Travel Research* 45 (2006): 99-110.

Boyd, D., G. M. Caporale, and R. Smith, "Real Exchange Rate Effects on the Balance of Trade: Cointegration and the Marshall-Lerner Condition," *International Journal of Finance and Economics* 6 (2001): 187-200.

Brau, R., A. Lanza, and F. Pigliaru, "How fast are the Tourism Countries Growing? The Cross-Country Evidence," *CRENoS Centro Ricerche Economiche Nord Sud, working Paper* No.3 (2003).

Brida, J. G., E. J. S. Carrera, and W. A. Risso, "Tourism's Impact on long-Run Mexican Economic Growth," *Economics Bulletin* 3 (2008): 1-8.

Bunwaree, S., "The Marginal in the Miracle: Human Capital in Mauritius," *International Journal of Educational Development* 21 (2001): 257-71.

Caselli, F., G. Esquivel, and F. Lefort, "Reopening the Convergence Debate: a new look at cross-country growth empirics," *Journal of Economic Growth* 1 (1996): 363-89.

Chadee, D. and Z. Mieczkowski, "An empirical analysis of the effects of the exchange rate on Canadian tourism," *Journal of Travel Research* 26 (1987): 13-17.

Crouch G. L., "The Study of International Tourism Demand: A Review of Findings," *Journal of Travel Research* 33 (1994): 12-23.

Demirden, T. and I. Pastine, "Flexible exchange rates and the J-curve: An alternative approach," *Economics Letters* 48 (1995): 373-77.

Doroodian, K., C. Jung, and R. Boyd, "The J-curve effect and US agricultural and industrial trade," *Applied Economics* 31 (1999): 687-95.

Dritsakis, N., "Tourism as a Long-run Economic Growth Factor: An Empirical Investigation for Greece," *Tourism Economics* 10 (2004): 305-16.

Durbarry, R., "Tourism and Economic Growth: the Case of Mauritius," *Tourism Economics* 10 (2004), 389-401.

Engle, R. and C. W. J. Granger, "Cointegration and error correction: representation, estimation, and testing," *Econometrica* 55 (1987): 251-76.

Flemingham, B. S., "Where is the Australian J-curve?" *Bulletin of Economic Research* 40 (1988): 43-56.

Frankel, J. A. and D. Romer, "Does Trade Cause Growth?" *The American Economic Review* 89 (1999): 379-99.

Freentra, R.C., *Advanced International Trade: Theory and Evidence*, New Jersey: Princeton University Press, (2004).

Goldstein, M. and M. S. Khan, "The supply and Demand for Exports: a Simultaneous Approach," *The Review of Economics and Statistics* 60 (1978): 275-86.

___, "Income and Price Effects in Foreign Trade," in R. Jones and P. Kenen (ed.), *Handbook of International Economics*, Vol. 2 Amsterdam: Elsevier, (1985).

Gomes, F. A. R. and L. S. Paz, "Can real exchange rate devaluation improve the trade balance? The 1990-1998 Brazilian case," *Applied Economics Letters* 12 (2005): 525-28.

Gonzalez, P. and P. Moral, "An analysis of the international tourism in Spain," *International Journal of Forecasting* 12 (1995): 233-51.

Grossman, G. M., and E. Helpman, "Comparative advantage and long-run growth," *The American Economic Review* 80 (1990): 796-815.

Gujarati, D. N., *Basic Econometrics*, New York: MaGraw-Hill Companies, (2003).

Gunadhi, H. and C. K. Boey, "Demand elasticities of tourism in Singapore," *Tourism Management* 7 (1986): 239-53.

Gupta-Kapoor, A. and U. Ramakrishnan, "Is there a J-curve? A new estimation for Japan," *International Economic Journal* 13 (1999): 71-79.

Hacker, R. S. and H.-J. Abdulnasser, "Is the J-curve effect observable for small North European economies?" *Open Economies Review* 14 (2003): 119-34.

Harris, R. I. D., "Testing for unit roots using the augmented Dickey-Fuller test: Some issues relating to the size, power and the lag structure of the test," *Economics letters* 38(1992): 381-86.

Harrop, J., "On the Economics of Tourist Boom," *Bulletin of Economic Research* May (1973): 55-72.

Haynes, S. and J. Stone, "Impact of the Terms of Trade on the U.S. Trade Balance: A Reexamination," *The Review of Economics and Statistics* 64 (1982): 702-06.

Hazari, B. R., "Tourism and growth in a dynamic model of trade," *The Journal of International Trade & Economic Development* 4 (1995): 243-52.

Hazari, B. R. and A-Ng, "An analysis of tourists' consumption of non-traded goods and services on the welfare of the domestic consumers," *International Review of Economics & Finance* 2 (1993): 43-58.

Hazari B. R. and J. J. Nowak, "Tourism, Taxes and Immiserization: A Trade Theoretic Analysis," *Pacific Economic Review* 8 (2003): 279-87.

Hazari, B. R. and P. M. Sgro, *Tourism, Trade and National Welfare,* Elsevier, (2004).

Heritage Foundation, 2008 Index of Economic Freedom, (2008). http://www.heritage.org/Index/Download.aspx

Himarios, D., "The effects of devaluation on the trade balance: a critical view and reexamination of Miles's (New Results)," *Journal of International Money and Finance* 4 (1985): 553-63.

Hong Kong Tourism Board, *A Statistical Review of Hong Kong Tourism 2003,* Hong Kong: Tourism Research Hong Kong Tourism Board.

Hong Kong Tourism Board, *Market Summary June 2007- Mainland China,* Hong Kong: Tourism Research Hong Kong Tourism Board.

Hoque, A., "Terms of trade and current account deficit in the Australian context," *Journal of Quantitative Economics* 27 (1995): 169-79.

Houthakker, H. S. and S. P. Magee, "Income and Price Elasticities in World Trade," *The Review of Economics and Statistics* 51 (1969): 111-25.

Hulten, C. R., "The Measurement of Capital," in E. R. Berntdt and J.E. Triplett (Ed.), *Fifty Years of Economic Measurement,* National Bureau of Economic Research, (1990).

Jones, L. E. and R. Manuelli, "A convex model of equilibrium growth: theory and policy implications," *Journal of Political Economy* 98 (1990): 1008-38.

Junz, H. B. and R. R. Rhomberg, "Price-competitiveness in export trade among industrial countries," *The American Economic Review* 63 (1973): 412-18.

Kim, H. J., M. H. Chen and S. C. Jang, "Tourism expansion and economic development: the case of Taiwan," *Tourism Management* 27 (2006), 925-33.

Knowles, S., P. K. Lorgelly and P. D. Owen, "Are educational gender gaps a brake on economic development? Some cross-country empirical evidence," *Oxford Economic Papers* 54 (2002): 118-49.

Krueger, A.O., *Liberalization Attempts and Consequences*, Cambridge: Ballinger, (1978).

Kulendran, N. and M. L. King, "Forecasting international quarterly tourist flows using error-correction and time-series," *International Journal of Forecasting* 13 (1997): 319-27.

Kulendran, N. and S. F. Witt, "Cointegration versus Least Squares Regression," *Annuals of Tourism Research* 28 (2001): 291-311.

Laffer, A. B., "Exchange rates, the terms of trade, and the trade balance," *Effects of Exchange Rate Adjustments*, Washington, Treasury Department, OASIA Res., (1976).

Lal, A. K. and T. C. Lowinger, "The J-curve: evidence from East Asia," *Journal of Economic Integration* 17 (2002): 397-415.

Lea, J., *Tourism and Development in the Third World*, London: Routledge, (1988).

Leea, C. C. and C. P. Chang, "Tourism development and economic growth: A closer look at panels," *Tourism Management* 29 (2008): 180-92.

Li, G., H. Song, and S. F. Witt, "Recent Developments in Econometric Modeling and Forecasting," *Journal of Travel Research* 44 (2005): 82-99.

Li, G., K. F. Wong, H. Song, and S. F. Witt, "Tourism Demand Forecasting: A Time Varying Parameter Error Correction Model," *Journal of Travel Research* 45 (2006): 175-85.

Lim, C. and M. McAleer, "Cointegration Analysis of Quarterly Tourism Demand by Hong Kong and Singapore for Australia," *Applied Economics* 33 (2001): 1599-619.

Lucas, R.E., "On the mechanics of economic development," *Journal of Monetary Economics* 22 (1988): 3-42.

MacKinnon, J.G., "Critical Values for Cointegration tests," in R.F. Engle and C.W.J. Granger (Ed.), *Long-run economic relationships: readings in cointegration*, New York: Oxford University Press, (1991).

MacKinnon, J.G., "Numerical Distribution Functions for Unit Root and Cointegration Tests," *Journal of Applied Econometrics* 11 (1996): 601-18.

Magee, S. P., "Currency contracts, pass through and devaluation," *Brooking Papers on Economic Activity* 1 (1973): 303-25.

___, "Prices, Income and foreign trade: A survey of recent economic studies," in P. B. Kenen (Ed.), *International trade and finance: Frontiers for research*, Cambridge: Cambridge University Press, (1975).

Mahdavi, S. and A. Sohrabian, "The exchange value of the dollar and the US trade balance: an empirical investigation based on cointegration and Granger causality tests," *Quarterly Review of Economics and Finance* 33 (1993): 343-58.

Mankiw, N. G., D. Romer, and D. N. Weil, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics* 107 (1992): 407-37.

Martin, C. A. and S. F. Witt, "Tourism demand forecasting models: choice of appropriate variable to represent tourists' cost of living," *Tourism Management* 8 (1987): 233-46.

___, "Substitute prices in models of tourism demand," *Annals of Tourism Research* 15 (1988): 255-68.

Marwah, K. and L. R. Klein, "Estimation of J-curve: United States and Canada," *Canadian Journal of Economics* 29 (1996): 523-39.

Matsuyama, K., "Agricultural productivity, comparative advantage, and economic growth," *Journal of Economic Theory* 58 (1992), 317-34.

Meade, E. E., "Exchange rates, adjustment, and the J-curve," *Federal Reserve Bulletin* October (1988): 633-44.

Meade, J. E., "Mauritius: A case study in Malthusian economics," *The Economic Journal* 71 (1961): 521-34.

Mello, M. M. D. and K. S. Neil, "The forecasting ability of a cointegrated VAR system of the UK tourism demand for France, Spain and Portugal," *Empirical Economics* 30 (2005): 277-308.

Miles, M. A., "The effects of devaluation on the trade balance and the balance of payments: some new results," *Journal of Political Economy* 87 (1979): 600-20.

Moffett, M. H., "The J-curve revisited: an empirical examination for the United States," *Journal of International Money and Finance* 8 (1989): 425-44.

Narayan, P. K., "New Zealand's trade balance: evidence of the J-curve and granger causality," *Applied Economics Letters* 11 (2004): 351-54.

Noland, M., "Japanese trade elasticities and the J-curve," *Review of Economics and Statistics* 71 (1989): 175-79.

Oh, C., "The Contribution of Tourism Development to Economic Growth in the Korean Economy," *Tourism Management* 26 (2005): 39-44.

Onafowora, O., "Exchange rate and trade balance in east asia: is there a J-curve?" *Economics Bulletin* 5 (2003): 1-13.

Ouerfelli, C., "Co-integration analysis of quarterly European tourism demand in Tunisia," *Tourism Management* 29 (2008): 127-37.

Papatheodorou, A., "The demand for international tourism in the Mediterranean region," *Applied Economics* 31 (1999): 619-30.

Patsouratis, V., Z. Frangouli, and G. Anastasopoulos, "Competition in Tourism among the Mediterranean Countries," *Applied Economics* 37 (2005): 1865-70.

Prasad, N., "Small Islands' Quest for Economic development," *Asia Pacific Development Journal* 10 (2003), 47-67.

Qu, H. and S. Lam, "A travel demand model for Mainland Chinese tourists to Hong Kong," *Tourism Management* 18 (1997): 593-97.

Rebelo, S., "Long run policy analysis and long run growth," *Journal of Political Economy* 99 (1991): 500-21.

Rhomberg, R. R., "Towards a general trade model," in R. J. Ball (Ed.), The international linkage of national economic models, Amsterdam: North-Holland, (1973).

Rodríguez, F. and D. Rodrik, "Trade Policy and Economic Growth: a Skeptics Guide to the Cross-national Evidence," in B.S. Bernanke and K. Rogoff (Ed.), *NBER Macroeconomics Annual 2000*, Cambridge: MIT Press, (2001).

Romer, P. M., "Endogenous technical change," *Journal of Political Economy* 98 (1990): 71-102.

Rose, A. K., "The role of exchange rates in a popular model of international trade: Does the 'Marshall-Lerner' condition hold?" *Journal of International Economics* 30 (1991): 301-16.

Rose, A. K. and J. L. Yellen, "Is there a J-curve?" *Journal of Monetary Economics* 24 (1989): 53-68.

Rosensweig, J. A., "Elasticities of substitution in Caribbean tourism demand," *Journal of Development Economics* 29 (1988): 89-100.

Rosensweig, J. A. and P. D. Koch, "The US dollar and the 'Delayed J-curve'," *Economic Review*, July/August (1988), Federal Reserve of Atlanta.

Sacerdoti, E., G. El-Masry, P. Khandelwal, and Y. Yao, *Mauritius: Challenges of Sustained Growth*, Washington, D.C.: International Monetary Fund, (2005).

Sachs, J. D. and A.Warner, "Fundamental Sources of Long-Run Growth," *The American Economic Review, Papers and Proceedings* 87 (1997): 184-88.

Salant, M., "Devaluations improve the balance of payments even if not the trade balance," *Effects of Exchange Rate Adjustments*, Washington, Treasury Department, OASIA Res., (1976).

SARS Expert Committee, *SARS in Hong Kong: From Experience to Action.* Report of the SARS Expert Committee, October 2003.
Available at http://www.sars-expertcom.gov.hk

Senhadji, A. S., "Time Series Estimation of Structural Import Demand Equations: A Cross-Country Analysis," *International Monetary Fund Staff Papers* 45 (1998a): 236-68.

___, "Dynamics of the trade balance and the terms of trade in LDCs: the S-curve," *Journal of International Economics* 46(1998b): 105-31.

Senhadji, A. and C. E. Montenegro, "Time Seris Analysis of Export Demand Equations: A Cross-Country Analysis," *International Monetary Fund Staff Papers* 46 (1999): 259-73.

Shirvani, H. and B. Wilbratte, "The relation between the real exchange rate and the trade balance: an empirical reassessment," *International Economic Journal* 11 (1997): 39-49.

Sims, C., "Macroeconomics and Reality," *Econometrica* 48 (1980): 1-48.

Sinclair, M. T., "Tourism and economic development: A survey," *Journal of Development Studies* 34 (1998): 1-51.

Siu, A. and Y. C. R.Wong, "Economic Impact of SARS: The Case of Hong Kong," *Asian Economic Papers* 3 (2004): 62-83.

Socher, K., "Tourism in the theory of international trade and payments," *Tourism Review* 41(1986): 24-26.

Song, H. and G. Li, "Tourism demand modeling and forecasting – A review of recent research," *Tourism Management* 29 (2008): 203-20.

Song, H., P. Romilly, and X. Liu, "An empirical study of outbound tourism demand in the UK," *Applied Economics* 32 (2000): 611-24.

Song, H., S. F. Witt, and T. C. Jensen, "Tourism Forecasting: accuracy of alternative econometric models," *International Journal of Forecasting* 19 (2003): 123-41.

Song, H., S. F. Witt and G. Li, *The Advanced Econometrics of Tourism Demand*, New York: Routledge, (2009).

Song, H. and K. F. Wong, "Tourism Demand Modeling: A Time-Varying Parameter approach," *Journal of Travel Research* 42 (2003): 57-64.

Song, H., K. F. Wong, and K. S. Chon, "Modeling and forecasting the demand for Hong Kong tourism," *Hospitality Management* 22 (2003): 435-51.

Stokey, N.L., "Human capital, product quality, and growth," *Quarterly Journal of Economics* 106 (1991): 587-617.

Subramanian, A., "Mauritius: A Case Study," *Finance and Development* 38 (2001): 22-25

Subramanian, A., and D. Roy, "Who Can Explain the Mauritius Miracle: Meade, Romer, Sachs, or Rodrick?" *IMF Working Paper 01/116*, Washington D.C.: International Monetary Fund, 2001.

Thompson, H. and A. Thompson, "The Exchange Rate, Euro Switch, and Tourism Revenue in Greece," *Tourism Economics* (2009, forth coming).

Wang, Y.S., "The impact of crisis events and macroeconomic activity on Taiwan's international inbound tourism demand,' *Tourism Management* 30 (2009): 75-82.

Wassink, D. and R. Carbaugh, "Dollar-Yen exchange rate effects on trade," *Rivista Int. Sci Econ. Com* 36 (1989): 1075-88.

Webber, A. G., "Exchange Rate Volatility and Cointegration in Tourism Demand," *Journal of Travel research* 39 (2001): 398-405.

Wilson, P., "Exchange rates and the trade balance for dynamic Asian economies: does the J-curve exist for Singapore, Malaysia and Korea?" *Open Economies Review* 12 (2001): 389-413.

Witt, S. F., H. Song, and S. P. Wanhill, "Forecasting Tourism-Generated Employment: The Case of Denmark," *Tourism Economics* 10 (2004): 167-76.

Witt, S. F. and C. A. Witt, "Forecasting tourism demand: A review of empirical research," *International Journal of Forecasting* 11 (1995): 447-75.

World Bank, World Development Indicators Database, CD-ROM, (2008).

World Tourism Organization, *UNWTO World Tourism Barometer* 6, (2008).

Yanikkaya, H., "Trade openness and economic growth: a cross-country empirical investigation," *Journal of Development Economics* 72 (2003): 57- 89.

Yazici, M., "Is the J-curve Effect Observable in Turkish Agricultural Sector?" *Journal of Central European Agriculture* 7 (2006): 319-22.

Young, A., "Learning by doing and the dynamic effects of international trade," *Quarterly Journal of Economics* 106 (1991): 369-406.