Investment and Trade Policy Uncertainty:

An Empirical Research on Developing Countries

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Abstract

This paper investigates whether trade policy uncertainty influences investment. Panel data drawn from 17 countries for the period 1978 – 2000 is employed to analyze this issue. Measures of trade policy uncertainty are constructed on the basis of four trade policy indicators. The estimation results suggest the relationship between investment and trade policy uncertainty is fragile. In the sample studied, trade policy uncertainty does not have a significant effect on investment.

1. Introduction

During the 1980s, many developing countries, such as Argentina, China, and Turkey, initiated trade policy reforms. After the policy reforms, the developing countries' economies prospered. Thus, there appears to be an informal relationship between a country's economic growth and its trade policy reforms. The main objective of this paper is to examine whether a strong statistical link exists between investment and trade policy uncertainty.

China provides a good example of the relationship between investment and trade policy uncertainty. In early 1978, an economic policy called "Reform and Openness" was instituted in China. This policy opened up China's economy to the outside world. As a result, for the past thirty years, China has established trade relations with many countries, including Canada, Japan, Germany, Russia, United Kingdom, and United States. Evidence shows that the open trade policy successfully brought a large amount of capital and investment into the Chinese marketplace. The foreign investment in China increased significantly after China successfully joined the World Trade Organization in 2001. It would, therefore, appear that trade reforms could improve a country's economy and increase its investment.

Likewise, many other developing countries initiated trade reforms and structural adjustments throughout the 1980s. What would spur developing countries to implement trade reforms? Dornbusch (1992) proposes that World Bank pressure and evidence of success are one of the most powerful motivators for trade liberalization. The World Bank and International Monetary Fund have similarly emphasized the importance of trade liberalization in promoting long-term economic development.

In spite of its benefits, trade policy reform has met skepticism from the private sector because of trade policy uncertainty. Interested parties may not believe that these new policies will be sustained. Regarding the Argentine reforms of the late 1970s, Corbo and de Melo (1985) explain, "[E]leven of the twelve interviewed firms waited between three and twenty months before starting to adjust. One firm anticipating a policy change even kept 'idle' workers to minimize the costs associated with layoffs and hiring" (p.9). Due to the uncertainty of trade policy reforms, the private sector may choose not to respond to the reforms that appear to have less than perfect credibility. In this case, if the private sector does not believe that the new trade policy can be sustained over time, interested parties that were previously protected by old policies may consider investing in lobbying efforts to restore the protectionist policy, rather than to adopt the reforms. In this way, the uncertainty of trade policy reforms will reduce the credibility of their implementation (Rodrik, 1995).

Additional skepticism about trade policy reforms may also originate from the expectation of the appropriate sequencing and timing (Krueger, 1986). However, in a world with imperfect information, the time frame in which these reforms will be implemented and sequenced is usually unknown until they are actualized. Firms may make inappropriate adjustments to these new trade policies. The inappropriate adjustments may pressure the government to slow down or even backtrack on these reforms. Such uncertainty would then reduce the credibility of trade policy reforms and may depress investment. Thus, the overall impact of trade policy uncertainty on investment is unclear. The objective of this paper is to investigate the relationship between investment and trade policy uncertainty.

The theoretical research focusing on how trade policy uncertainty affects investment provides ambiguous predictions. For example, Van Wijnbergen (1985) suggests that there is a negative relationship between investment and trade policy uncertainty, while Bhattacharya (1999) asserts that trade policy uncertainty does not necessarily reduce investment. These different theoretical results may be partially attributed to the differences in the models the researchers employed. Due to the lack of a consensus, an empirical evaluation appears necessary. As compared to the large number of theoretical works, the number of empirical studies on this topic is astonishingly small. In addition, most of the empirical studies focused on the relationship between investment and macroeconomic uncertainty, such as Servén and Solimano (1993) and Aizenman and Marion (1993). In contrast, this paper investigates the relationship

between investment and trade policy uncertainty.

As stated previously, the goal of this paper is to investigate whether trade policy uncertainty affects investment from an empirical perspective, using the panel data from 17 developing countries for the period 1978-2002. The paper uses the standard deviation of the residuals in trade policy indicators as a way of measuring the uncertainty of the following trade policy indicators: *Trade Share*, *Average Tariffs*, *Average Duty*, and *Collected Trade Taxes Ratio*. Although there is no consensus on the best way to measure trade policy, these four indicators are strongly recommended by many past studies [Pritchett (1996); Edwards (1998); Rodriguez and Rodrik (1999)]. In addition, the paper employs the Ordinary Least Squares (OLS) regression approach to estimate the investment model. Unexpectedly, the results illustrate that the volatility of each trade policy indicator (trade policy uncertainty) does not have a significant impact on investment.

Although this paper shares many features with the study by Sudsawasd and Moore (2006), such as the model specification, the measures of uncertainty, and the trade policy indicators, there are several differences. It only focuses on developing countries, not on both developing and developed countries. In addition, the research period is from 1978 to 2002, not from 1960 to 2000. Due to these differences, the results of the two studies are not the same. Comparably, this paper provides more details and analysis of the data and regression procedures, which could help readers to

better understand the results.

This paper is organized as follows. Section 2 reviews previous theoretical and empirical studies. Section 3 describes the methodology used in the present paper. Section 4 provides a description and a series of analysis on the data. Section 5 analyzes the estimation results and compares them with Sudsawasd and Moore's (2006) results. Finally, section 6 draws conclusions based on the results.

2. A Brief Review of the Literature

This section provides a brief review of related literature. This review starts with the previous theoretical studies. Although all of these studies focus on how trade policy uncertainty affects investment, their results are not consistent. This may be due, in part, to the differences in transmission mechanisms modeled. Thus, an empirical analysis appears necessary to determine which model is more plausible. When reviewing the empirical studies, this researcher finds that few of them have attempted to examine the interplay between investment and international trade variables. Most center on the relationship between investment and uncertainty of macroeconomic variables. One exception is the paper by Sudsawasd and Moore (2006), as it includes a research on and a sensitivity analysis of the relationship between investment and trade policy uncertainty.

2.1. Review of Previous Theoretical Studies

Two theoretical studies are discussed in this subsection. The first study, conducted by Van Wijnbergen (1985), demonstrates that the uncertainty about future trade policy reversals may lead to a fall in investment after a trade reform. In contrast, the second study, conducted by Bhattacharya (1999), indicates that trade policy uncertainty does not necessarily reduce investment. Thus, the theoretical studies do not form a consensus.

The above-mentioned studies share several similarities. First, both studies address the following question: how does the uncertainty of trade policy reversals impact investment? Second, both employ the dynamic two-period model, in which a government announces a new trade policy in the first period, and this new policy may be reversed in the second period. Third, trade policy uncertainty in both papers is defined as the probability that there will be a trade policy reversal in the second period. Finally, the model in each paper is based on the assumption that the countries investigated have an open economy with two sectors: the import sector and the export sector. This assumption assures that capital can be reallocated when the announced trade policy reverses.

Surprisingly, although these two studies have many similarities, Van Wijnbergen (1985) and Bhattacharya (1999) reach diametrically opposed conclusions. The inconsistent results can be attributed to the modeling differences in their studies.

Van Wijnbergen's model is constructed to compare the rate of return when investing in the import and export sectors, respectively. The higher rate of return attracts more investment, and more investment in imports implies less investment in the domestic economy. On the other hand, Bhattacharya constructs a general equilibrium model. His model consists of two entities. The first is the individual who maximizes his or her utility by varying the consumption in periods one and two. Consumption is constrained by the allocation of his or her income. For example, he or she needs to consider how much income to save and how to allocate savings between investment in the domestic economy and investment in the foreign assets. The second entity is the firm, which maximizes its profits by dividing capital and labor between the import and export sectors. The equilibrium point, the point at which the decisions of the two entities are maximized, determines how trade policy uncertainty affects investment.

Van Wijnbergen (1985) proves that the rate of return for foreign assets is higher. In his model, capital flights out into foreign assets and domestic investment declines. However, based on Bhattacharya's (1999) results, greater trade policy uncertainty does not necessarily decrease investment. The difference in their conclusions can be attributed to the models they use. Van Wijnbergen's model only takes into account the substitution effect, which causes investment to decline, while Bhattacharya's model also considers the income effect (in addition to the substitution effect), which causes an increase in investment. Therefore, the movement of investment is

ambiguous in Bhattacharya's study. Such critical inconsistency in the theoretical studies makes empirical analysis necessary.

2.2. Review of Previous Empirical Studies

Although empirical investigation is important, previous empirical studies have rarely attempted to examine the interplay between investment and international trade variables. Most papers dedicated to investment under uncertainty are more interested in investigating the relationship between investment and macroeconomic variables [Servén and Solimano (1993); Aizenman and Marion (1993)].

The studies conducted by Servén and Solimano (1993) and Aizenman and Marion (1993) both analyze the link between private investment and macroeconomic uncertainty in developing countries. Servén and Solimano use inflation and real exchange rates as the measures of macroeconomic policy. However, the measures of macroeconomic policy are relatively broad in Aizenman and Marion's study. On the fiscal side, they choose the share of government expenditures, the share of public investment, growth in the share of government expenditures, the average tax rate, and the government budget deficit. On the monetary side, they select domestic credit expansion and money growth. Both studies indicate that macroeconomic uncertainty depresses private investment.

Although the above-mentioned papers are not directly related to the present study, they provide a relevant methodology for this research. First, both use panel data. Servén and Solimano's data are from 15 developing countries for the period 1976-1988. Aizenman and Marion employ a sample of about 40 developing countries over the period 1970-1985. Another contribution from Servén and Solimano is that they also apply their estimation process to two subsamples: Latin American countries and East Asian countries. Interestingly, the results differ with the latter subsample, demonstrating that macroeconomic uncertainty increases private investment. Finally, Aizenman and Marion emphasize the inefficiency in the panel data from the potential heteroscedasity. To tackle this problem, they base the standard errors for the coefficients on White's covariance matrix.

2.3. Review of Sudsawasd and Moore (2006)

The last paper reviewed in this section is written by Sudsawasd and Moore (2006). This paper provides methodological foundations for the present paper. The measures of trade policy, the measures of trade policy uncertainty, and the empirical model specification in the present paper are based on their framework.

The study conducted by Sudsawasd and Moore (2006) is an empirical study, exploring the relationship between investment and trade policy uncertainty. Similar to the other two empirical studies, Sudsawasd and Moore's study also employs panel data. However, in their case, the data are drawn from the period 1960-2000 and encompass

about 150 countries. They select two specifications and five trade policy indicators as the measures of trade policy. They also use both fixed effect and random effect models to estimate their empirical model. The results show that all trade policy uncertainty measures are statistically significant.

Another interesting feature is that Sudsawasd and Moore (2006) apply a sensitivity analysis for their sample to test whether the relationship between investment and trade policy uncertainty is robust or fragile. This sensitivity analysis is called the Extreme Bounds Analysis (EBA) approach, which provides bounds for the estimated coefficients of the trade policy uncertainty variables. The EBA approach starts the analysis with a base equation that includes the variable always included in the relevant question and the trade policy uncertainty variable. Next, the base equation is estimated with a different combination of additional variables to determine the extreme lowest and highest bounds of the estimated coefficients that are statistically significant. Finally, the signs and significance of the estimated coefficients on the lowest and the highest bounds are compared to decide whether the relationship between investment and trade policy uncertainty is robust or fragile. If the estimated coefficients are all statistically significant and have the same sign, the relationship is robust. Otherwise, it is fragile. Sudsawasd and Moore's results illustrate that all relationships are robust.

As discussed in more details later, the results of the present study are diametrically opposed to those of Sudsawasd and Moore (2006). It is conjectured that the difference is caused by the difference in the sample studied. Their sample does not exclusively consist of developing countries and is much larger.

3. Methodology

This section provides full details concerning the methodology used in the present study. In particular, it discusses the model specification, the estimation method, the measures of trade policy uncertainty, and the measures of trade policy.

3.1. Theoretical Model

The present study investigates whether trade policy uncertainty affects investment, using a framework similar to that of Sudsawasd and Moore (2006). First of all, it is assumed that there is a functional relationship between investment (Inv) and trade policy uncertainty (Vol):

$$\text{Inv} = f(\text{X}, \text{Vol}) \tag{1}$$

Here, X refers to a set of variables always included in the regression. As in the work of Sudsawasd and Moore (2006), X is the export share in GDP per capita. In this paper, investment (Inv) is measured by investment share in per capita real GDP. The measure of trade policy uncertainty (Vol) is detailed in section 3.4. Equation (1) is the base equation for the EBA approach in the Sudsawasd and Moore's study, verifying whether the relationship between investment and trade policy uncertainty is

robust or fragile.

Second, it is further assumed that the function f is linear. That is, the theoretical model of investment is described by

$$\text{Inv} = \text{C} + \beta_{\text{X}} \times \text{X} + \beta_{\text{Vol}} \times \text{Vol} \tag{2}$$

This paper attempts to determine the significance of β_{Vol} in the context of the empirical model outlined in the next subsection.

3.2. Empirical Model and Estimation Method

The model used in this paper is the fixed effect model for panel data, which takes the form

$$Inv_{i,t} = \alpha + X'_{\text{i,t}}\beta_{\text{x}} + Vol'_{i,t}\,\beta_{Vol} + \gamma_{\text{t}} + \xi_i + \varepsilon_{\text{i,t}} \tag{3}$$

where $Inv_{i,t}$ is investment share of country i in year t and $X_{i,t}$ is export share. As in equation (2), $Vol_{i,t}$ measures trade policy uncertainty, and its coefficient β_{Vol} contains the information related to the impact of trade policy uncertainty on investment. The significance of β_{Vol} is the main interest of the present paper. γ_{t} and ξ_{i} are the specific terms in the fixed effect model. γ_{t} is the time-specific constant term, which does not vary across countries, and ξ_{i} is the country-specific constant term, which does not vary over time. These terms are dummy variables and become the intercept in the fixed effect model. The error term ε_{t} is independently and identically distributed ($\varepsilon_{\text{t}} \sim \text{IID}\ (0, \sigma^2)$).

Several variations of equation (3) are used in the estimation. The first specification is the cross-country fixed effect model. This model removes γ_t from equation (3), leading to the following form:

$$Inv_{i,t} = \alpha + X'_{i,t}\beta_x + Vol'_{i,t}\beta_{Vol} + \xi_i + \varepsilon_{i,t} \quad (3')$$

The second specification is the period fixed effect model. Unlike equation (3'), this specification includes γ_t, not ξ_i, taking the following form:

$$Inv_{i,t} = \alpha + X'_{i,t}\beta_x + Vol'_{i,t}\beta_{Vol} + \gamma_t + \varepsilon_{i,t} \quad (3'')$$

The third specification is the two-way fixed effect model, including both γ_t and ξ_i. Its specification is the same as in equation (3). The last specification adds the lag of investment to equation (3). The purpose of doing so is to eliminate the inefficiency from serial correlation.

$$Inv_{i,t} = \alpha + X'_{i,t}\beta_x + Vol'_{i,t}\beta_{Vol} + Inv_{i,t-1}\beta_{Inv(-1)} + \xi_i + \gamma_t + \varepsilon_{i,t} \quad (3''')$$

These three specifications are used in their corresponding cases in this analysis.

Furthermore, two sets of results comparison are performed in this study. The first is a comparison of the results between 17 developing countries and seven Asian developing countries. The purpose of this comparison is to investigate whether the results vary when the sample consists of more homogeneous countries. For simplicity, only equation (3''') is estimated for both sets of samples. The second comparison is made between my results and those from Sudsawasd and Moore's (2006) study. To match the results with theirs, their model is used for this comparison. The model in their study has subtle differences with equation (3), since it includes additional Z-variables. As suggested by Levine and Renelt (1992) and

Sudsawasd and Moore (2006), this set of variables includes the average rate of government consumption expenditures to real GDP per capita (GOV), the average inflation rate (INFL), the average growth rate of domestic credit to the private sector (GDPC), the standard deviation of inflation (STINFL), and the standard deviation of domestic credit to the private sector (STGDPC). The model is estimated by using the period fixed effect model only. The specification is

$$Inv_{i,t} = \alpha + X'_{i,t}\beta_{\mathrm{x}} + Vol'_{i,t}\,\beta_{Vol} + Z'_{i,t}\beta_{Z} + \gamma_{\mathrm{t}} + \varepsilon_{\mathrm{i,t}} \qquad (4)$$

Equation (3), its derivative equations (equations (3') to (3''')) and equation (4) are estimated by Eviews program, using the Least Squares estimation method. To correct the potential heteroscedasity, White's robust coefficient matrix is used to estimate equation (3) and its derivative equations. To make the model comparable with that of Sudsawasd and Moore (2006), White's robust coefficient matrix is not used to estimate equation (4).

3.3. Measures of Trade Policy Uncertainty

This section explains how to measure trade policy uncertainty, namely, Vol in equation (3). In this paper, trade policy uncertainty is based upon four trade policy indicators.[1] Guided by Edmiston (2004), each trade policy indicator is assumed to take the following form:

$$\tau_{\mathrm{i,t}} = \omega_{\mathrm{i}} + \mu_{\mathrm{i}}\mathrm{t} + \nu_{\mathrm{i,t}} \qquad (5)$$

[1] These measures are detailed in section 3.4.

where $\tau_{i,t}$ is the value of a trade policy indicator in country i in year t, ω_i is the constant term, μ_i is a trend value, and t is the year. The stochastic error, $\nu_{i,t}$, is identically and independently distributed (IID) with zero mean and constant variance ($\nu_{i,t}$ ~IDD $(0, \sigma^2)$). Then the expected value is given by

$$E(\tau_{i,t}) = \omega_i + \mu_i t \tag{6}$$

Volatility (Vol) is defined as the standard deviation of a trade policy indicator away from the expected value:

$$Vol_{i,t} = \sqrt{\hat{\nu}_{i,t}^2} = \sqrt{(\tau_{i,t} - E(\tau_{i,t}))^2} = \sqrt{(\tau_{i,t} - \hat{\omega}_i - \hat{\mu}_{i,t})^2} \tag{7}$$

Equation (5) is estimated by the OLS approach for each trade policy indicator in each country. The regression residuals are constructed as the difference between the value and the predicted value of each trade policy indicator. Trade policy uncertainty, denoted as Vol in equation (3), is measured as the square root of the squared residuals.

3.4. Measures of Trade Policy

Despite the considerable amount of research on trade policy, there is no consensus on which trade policy indicators are best. Previous researchers have proposed different measures of trade policy. Pritchett (1996) examines the link between various indicators measuring the overall trade policy and concludes that

> "the only thing that can be asserted with any confidence is that all of the measures are not successfully measuring some country-specific, time persistent aspect of policy . . . Each outward-orientation measure must stand on its own merits, with the distinct possibility that none of them

deserves even moderate confidence."

(Pritchett, 1996, p326)

Pritchett recommends that, for a pooled cross-country and time-series analysis, one should collect as many measures of overall trade policy as possible. However, this approach encounters a considerable empirical problem in terms of data availability. In this study, four trade policy indicators are used: *Trade Share, Average Tariffs, Average Duty,* and *Collected Trade Taxes Ratio.* These indicators are based on two approaches proposed by Dean, Desai, and Riedel (1994). The first approach assesses the overall effects of trade distortion in trade flows, while the second approach evaluates the effects of trade distortion on relative prices.

(1) *Trade Share (TRSHARE)*

Trade Share is defined as total trade, including imports and exports as the percentage of GDP. *Trade Share* is the most straightforward indicator among the four, since highly protectionist policies tend to reduce the fraction of international trade activities (Pritchett, 1996). The lower is the degree of trade distortions, the higher the value of *Trade Share* and the lower level of investment are.

Although *Trade Share* is a reasonable indicator, it is still imperfect as argued by Dollar and Kraay (2003). This indicator more closely follows the total effects of overall trade policies on actual trade flows. For robustness, the other three indicators, more closely measuring the price distortions of tradable goods, are also included in

this paper.

(2) *Average Tariffs (TARIFF)*

Average Tariffs is computed as the ratio of import duties to the volume of imports. It has a negative effect on openness. If the traffic rate is high, the corresponding import level and the collected tariff revenues tend to be low. However, *Average Tariffs* tends to understate high tariff rates and, hence, have some limit as a proxy for overall trade policy. Rodriguez and Rodrik (1999) find this indicator useful, as it ranks countries according to the restriction of their trade regimes.

(3) *Average Duty (DUTY)*

Average Duty is quite similar to *Average Tariffs*. The only difference is that this measure is computed as the weighted average of both import and export duties. The measuring definition is given in the Data Appendix (p.33). This indicator is also used by Rodriguez and Rodrik (1999). Due to its similarity with *Average Tariffs*, this indicator also has a negative relationship with the degree of a country's openness.

(4) *Collected Trade Taxes Ratio (CRT)*

Collected Trade Taxes Ratio is proposed by Edwards (1998). It is calculated by dividing the total trade taxes by the total trade. This indicator has two advantages. First, it is observable. Second, it captures intermediate situations in which countries are neither totally open nor totally closed. The relationship between *Collected Trade*

Taxes Ratio and openness is negative. That is, a lower value indicates greater degree of openness for one country's trade policy and a higher amount of investment. Pritchett and Sethi (1994) assert that this indicator tends to underestimate the true extent of a country's protectionist policies.

4. Data Description and Analysis

This section provides detailed information about the data sample in the present study. It also compares the trade policy indicators and the trade policy uncertainty measures in several ways.

4.1. Data Description

The sample covers 17 developing countries: Argentina, Brazil, China, Columbia, Hungary, India, Jordan, Malaysia, Mauritius, Mexico, Pakistan, Panama, Philippine, South Africa, Thailand, Turkey, and Uruguay. The dataset is unbalanced, since the data for each country in each period are not always available. The period ranges from the period 1978 to 2002. Therefore, the sample data are categorized as the unbalanced panel data.

The main data sources are Summers and Heston's dataset (the Penn World Table, version 6.2) and the World Development Indicators issued by the World Bank (WDI 2002). The variables real GDP, trade share, government share, and investment share are drawn from the Penn World Table (version 6.2), while the other variables (growth

rate of domestic private credit, inflation of GDP deflator, imports, exports, export duties, and import tariffs) are drawn from the World Development Indicators (WDI 2002). Although some variables do not appear in equation (4), such as imports and exports, they are important in computing some other variables in equation (4), such as *Average Tariffs* and *Average Duty*. More information about the data is given in the Data Appendix (p.33).

The analysis of the present paper is conducted for two sets of countries. The first sample includes all 17 developing countries. As with Servén and Solimano (1993), the researcher is also interested to know whether the estimation results vary for a subsample. This subsample covers the seven Asian developing countries (China, India, Malaysia, Pakistan, Philippine, Thailand, and Turkey).

4.2. Analysis of the Trade Policy Indicators

As already mentioned in Section 3, this paper relies on four indicators, *Trade Share, Average Duty, Average Tariffs,* and *Collected Trade Taxes Ratio*. This subsection compares the trade policy indicators in order to determine whether they explain similar changes in trade policy.

4.2.1. Graphical Comparison of the Trade Policy Indicators

The period of the analysis in this paper covers the years 1978-2002. During this period, many countries in the sample moved toward a higher degree of trade openness. Therefore, the research begins by comparing the evolution of the four trade policy indicators over time. This comparison is performed through graphical analysis.

Graph 1.1 and 1.2 plot the series of the trade policy indicators. To facilitate the comparison of the indicators among different countries, the approach adopted in this subsection is to convert the raw data to a series of indices. Specifically, a base year is set for each country, and the data in other years are divided by their values in the base year. Hence, the base year data for each country is normalized to one, and data in other years are expressed as a fraction of the base year values.

In Graph 1.1, the vertical axis refers to the index of *Trade Share* (from 1 to 6), while the horizontal axis refers to the period (from 1978 to 2002). Since *Trade Share* series are available for all countries, the base year is fixed to 1978. Then, the values of *Trade Share* in the other years are divided by the values in 1978, and expressed as the ratios of the values in 1978. With respect to the overall trends for the 17 developing countries, the countries can be divided into three types. In the first type, the countries experience significant rise in *Trade Share* between 1978 and 2002. These countries include Mexico and Turkey. For example, *Trade Share* in 2002 is almost 5 times higher than in 1978 for Turkey. The second type covers the countries

in which *Trade Share* increases mildly. These countries are China, Malaysia, Philippine, Thailand, and Hungary, most of which are Asian countries. The last category refers to the countries for which *Trade Share* grows only marginally or drops a little. Note that *Trade Share* is positively related to the degree of openness, as discussed in Section 3.4. Based on the graphical analysis, the evolution of *Trade Share* indicates that most countries in the sample adopt more open trade policy. In addition, it is interesting to note that the indicator for Asian countries, especially for China, fluctuates strongly between 1997 and 1998. This phenomenon is likely attributed to the Asian Financial Crisis of 1997.

Graph 1.2 plots the other trade policy indicators (*Average Duty*, *Average Tariffs*, and *Collected Trade Tax Ratio*). These indicators are not always available for each country in 1978. For this reason, the base year cannot be fixed to 1978. To create indices, the researcher chooses the first year when data are available in each country as the base year. Due to the different base years across the 17 developing countries, it is not reasonable to plot the trends of each trade policy indicator for all countries on one graph. Instead, in Graph 1.2, each panel includes three trade policy indicators (*Average Duty*, *Average Tariffs*, and *Collected Trade Tax Ratio*) for each country separately.

Overall, the price-oriented trade policy indicators (*Average Duty*, *Average Tariffs*, and *Collected Trade Tax Ratio*) provide the same pattern of trade policy evolution. Comparatively, *Collected Trade Tax Raito* and *Average Duty* have a closer correlation. The graphical analysis is conducted by two half periods for these three trade policy indicators. The first half period covers 1978 to 1992. During this period, the indicators in most countries steadily increase. After 1992, the case for each country is not as similar as in the first half period. The indicators in Turkey and Columbia tend to continuously increase during the second half period. These three indicators in the other countries, however, decline to different extents. As discussed in Section 3.4, the higher values of these trade policy indicators imply the lower degree of openness. The results may be contrary to what was expected. Since *Trade Share* and the other trade policy indicators have opposite correlations with the degree of openness, they should, at least from the theoretical point of view, be negatively correlated with each other. However, the empirical evidence is not very supportive. For example, all four trade policy indicators increase strongly in Turkey.

4.2.2. Coefficients Analysis

Patterns in the evolution of the trade policy indicators, identified in the graphical analysis, are confirmed through the estimation results of equation (5). For convenience, this equation is reproduced here:

$$\tau_{i,t} = \omega_i + \mu_i t + \nu_{i,t} \qquad (5)$$

Table 3 in the Appendix provides the estimation results for equation (5) for each

country and each trade policy indicator. The first two columns are the country names and the categories of indicators. Other columns provide the coefficients and the standard errors for the constant term and the time trend. The constant term ω_i has no practical relevance to the rest of analysis, as it refers to the starting value of the trade policy indicator. The coefficient μ_i gives the average growth rate of each policy indicator within the sample period. As discussed earlier, most indicators increase in time. The estimation results from Table 3 are used to construct the measures of trade policy uncertainty. The results of μ_i are consistent with the previous graphical analysis. The positive signs of the most values of μ_i demonstrate that the trade policy indicators keep increasing from 1978 to 2002, although these results are contrary to those of the theoretical studies detailed in Section 3.4.

4.3. Analysis of Trade Policy Uncertainty

This subsection provides an analysis of trade policy uncertainty. This analysis is based on the correlation comparison between trade policy uncertainty measures. Table 4 shows the correlation coefficients between different uncertainty measures for each country. The researcher employs three cases for this comparison. The first case analyzes each individual country as a group by itself. The second and the third cases examine all 17 developing countries and the seven Asian developing countries as one group, respectively.

The results of correlation between the uncertainty measures of *Trade Share* and the other three trade policy indicators are ambiguous in the first case. Some countries indicate a positive correlation, such as Argentina, Brazil, Columbia, Hungary, India, Malaysia, Mexico, Panama, Thailand, and Uruguay, while others indicate a negative correlation, such as Mauritius, Philippine, Turkey and South Africa. However, the results of six pair-wise correlations are more consistent in both second and third cases. The correlations between the uncertainty measures of *Trade Share* and any other three trade policy indicators are negative. From this property, one might expect that the uncertainty from *Trade Share* may have an opposite effect on investment than from the other three indicators.

The correlations between the other three measures of trade policy uncertainty (volatility of *Average Duty* and *Average Tariffs*, volatility of *Average Tariffs* and *Collected Trade Taxes Ratio*, and volatility of *Average Duty* and *Collected Trade Taxes Ratio*) are positive in all cases. Furthermore, the coefficients take on very high values. A possible reason for the high values is that these three trade policy indicators are calculated in similar ways.[2] Since they are positively correlated, these three trade policy uncertainty may have the same effect on investment. That is, the signs of β_{Vol} in equation (3) may be identical for volatility of *Average Duty*, *Average Tariffs*, and *Collected Trade Taxes Ratio*.

[2] For details regarding this calculation, please see Section 3.4 in this paper.

5. Results

This section addresses the following question: does trade policy uncertainty affect investment? In addition, it provides a series of analysis of the estimation results for three tables, namely Tables 3, 4 and 5. Table 3 presents the results from estimating equation (3) and its derivative equations (equations (3') to (3'''')) based on the 17 developing countries for the period 1978 to 2002. Table 4 compares the results from estimating equation (3) based on the17 developing countries and those based on the seven Asian developing countries. Both sample periods lie between 1978 and 2002. As suggested by Servén and Solimano (1993), the data with more homogeneity (seven Asian developing countries) are employed to investigate whether results will vary or not. Finally, Table 5 presents the results from estimating equation (4) for the 17 developing countries between the years 1978 and 2002. This table is used to compare the results of the present study with those of Sudsawasd and Moore's (2006) study.

5.1. Does Trade Policy Uncertainty Affect Investment?

The present paper examines whether the volatility of each trade policy indicator affects investment share. The method used is to verify the significance of β_{Vol} in equation (3). If β_{Vol} is statistically significant, this will confirm the strong statistical relationship between investment and trade policy uncertainty.

Table 3 consists of four subtables, each of which corresponds to a particular measure of trade policy volatility (uncertainty). Tables 3.1 to 3.4 report the estimates by equation (3) for the volatility of *Trade Share, Average Tariff, Average Duty,* and *Collected Trade Taxes Ratio,* respectively. Each subtable considers three cases: the cross-country fixed effect model, corresponding to equation (3'); the period fixed effect model, corresponding to equation (3''); and the two-way fixed effect model, corresponding to equation (3). In each subtable, the left presents the OLS estimation results using White's robust covariance matrix. Due to the potential heteroscedasity, White's robust covariance matrix is added to make the sample more efficient. From Durbin-Watson statistic on the left, one observes serious serial correlation exists in the data. To eliminate the inefficiency from serial correlation, the lag of investment share is added to obtain equation (3'''). The results with the lagged dependent variable are presented on the right for each case. Hereinafter, the analysis is only based on the results after the serial correlation correction.

The results in Table 3 show that P-values are very high for all trade policy uncertainty (volatility). P-value provides us the minimum probability that the null hypothesis cannot be rejected. In this case, the null hypothesis is that the coefficient of volatility for each trade policy indicator is zero. Therefore, these extremely high P-values indicate that all trade policy uncertainty measures (volatility) are not statistically significant. In other words, trade policy uncertainty does not affect investment.

Next, the researcher investigates whether the conclusion varies for the Asian subsample, as Servén and Solimano (1993) do in their study. Table 4 shows the comparison results of equation (3''') for the seven Asian developing countries and the 17 developing countries. Similar to Servén and Solimano's results, the conclusion changes when the sample consists of more homogeneous countries. In this case, all signs for the volatility variables are different. In addition, the high P-values in the sample of the seven Asian countries indicate that investment is not affected by trade policy uncertainty.

5.2. Results Comparison with Sudsawasd and Moore (2006)

To facilitate the comparison between the results of the present paper and those of Sudsawasd and Moore (2006), this paper also estimates equation (4) which includes Z-variables. For simplicity, only the period fixed effect model is used. The estimation results for equation (4) are shown in Table 5. Although the Durbin-Watson statistic in Table 5 suggests serial correlation in the data, no correction is applied in order to match the results with those of Sudsawasd and Moore. In comparing the results with Sudsawasd and Moore's, it is worth noting that all signs of trade policy uncertainty variables correspond with their results. The sign of *Trade Share* volatility is positive, and the signs of the other three trade policy indicators volatility are negative. Otherwise, most coefficients in equation (4) are not statistically significant. The results in the study by Sudsawasd and Moore, however, show that most of the coefficients are statistically significant.

From Sudsawasd and Moore's EBA tests, all trade policy uncertainty measures are robustly correlated with investment share in the base equation. Their results illustrate that trade policy uncertainty affects investment, which is contrary to the present findings. There are two reasons for this difference. First, the data in the present paper are drawn only from developing countries, while the data collected by Sudsawasd and Moore are drawn from both developing and developed countries. Second, the data in the present paper are drawn from the 17 developing countries, whereas their data are drawn from over 100 countries.

6. Concluding Remarks

The objective of this study is to empirically examine whether trade policy uncertainty is correlated with investment share of GDP per capita. Panel data drawn from 17 developing countries and four trade policy indicators (*Trade Share, Average Tariffs, Average Duty,* and *Collected Trade Taxes Ratio*) are used to estimate the base equation (3) and its derivative models (equations (3') to (3'")). The results suggest that trade policy uncertainty is not significantly related to investment share.

These results are diametrically opposed to those of Sudsawasd and Moore (2006). Although the impact of each trade policy uncertainty measure on investment is the same as in Sudsawasd and Moore's (2006) study, this impact is not statistically significant. One possible reason for this difference is the diversity in the data, specifically, its size and coverage.

This study attempts to provide empirical evidence on the relationship between investment and trade policy uncertainty in developing countries. In the future, it would be interesting to compare the results between developed and developing countries. Finally, differences in the impact of trade policy volatility on public, private, and domestic investment could be investigated as well.

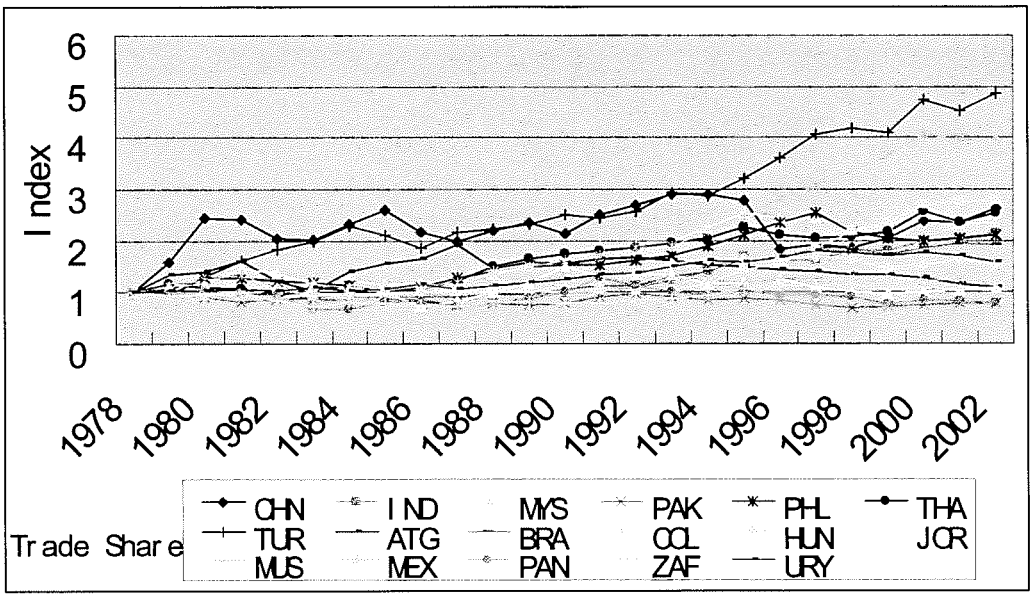
Data Appendix

Variable	Definition and Sources
RGDPL	Real GDP per capita (Laspeyres), in constant 2000 local currency. (Source: Penn World Table 6.2)
TRSHARE	Trade share, total trade as percentage of GDP at the constant price. (Source: Penn World Table 6.2)
GOV	Government share of real GDP per capita at the constant price. (Source: Penn World Table 6.2)
INV	Investment Share of Real GDP per capita at the constant price. (Source: Penn World Table 6.2)
GDPC	Growth rate of domestic private credit. (Source: World Development Indicators (WDI) CD-ROM,2006)
INFL	Inflation of GDP deflator. (Source: World Development Indicators (WDI) CD-ROM,2006)
IMPORT	Total imports, in constant 2000 local currency. (Source: World Development Indicators (WDI) CD-ROM,2002)
EXPORT	Total exports, in constant 2000 local currency. (Source: World Development Indicators (WDI) CD-ROM,2002)
EXPDUTY	Export duties as percentage of exports. (Source: World Development Indicators (WDI) CD-ROM,2006)

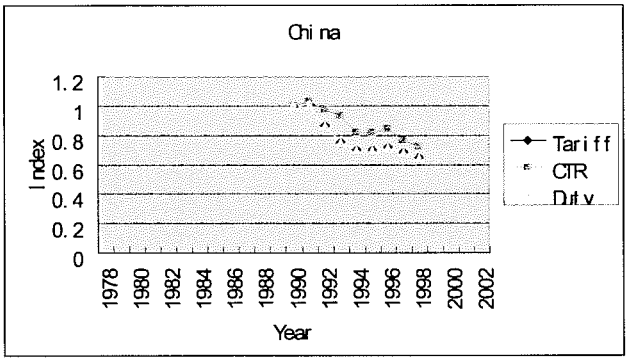
TARIFF	Average Tariffs, import duties as percentage of imports. (Source: World Development Indicators (WDI) CD-ROM,2006)
DUTY	Average Duty. Calculated by [(1+EXPDUTY/100)*(1+TARIFF/100)-1]*100
CTR	Collected Trade Taxes Ratio. Calculated by (EXPDUTY+TARIFF)/(EXPORTC+IMPORTC)
STGDPC	Standard deviation of GDPC. (Source: World Development Indicators (WDI) CD-ROM,2006)
STINFL	Standard deviation of INFL. (Source: World Development Indicators (WDI) CD-ROM,2006)
STGOV	Standard deviation of GOV. (Source: World Development Indicators (WDI) CD-ROM,2006)
Vol	Volatility of trade policy indicators. Measured of square root of the squared residual of and OLS estimation of the trade policy variable regressed on a constant term and time over the entire sample periods in each country.
X	Exports share of real GDP per capita at the constant price. Calculated by EXPORT/RGDPL

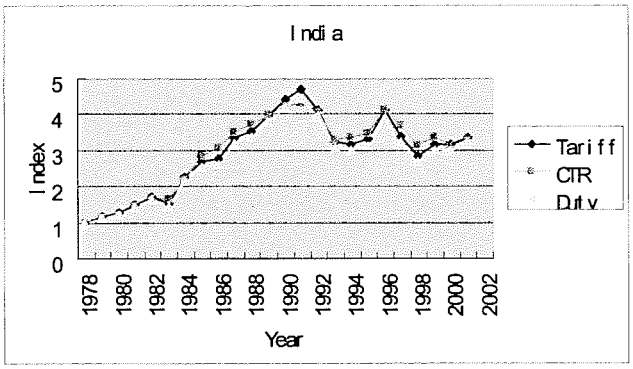
Graph 1. Measures of Four Trade Policy Indicators

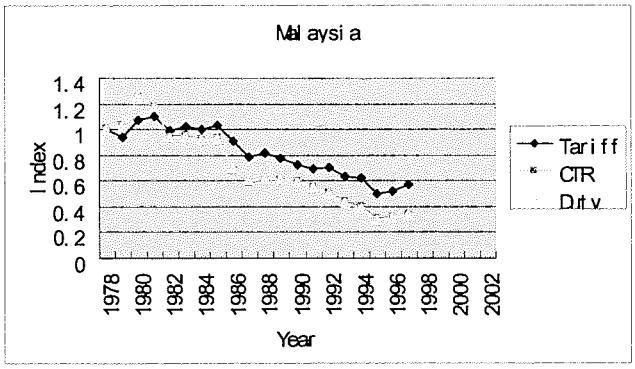
1.1 Trade Share for 17 Countries

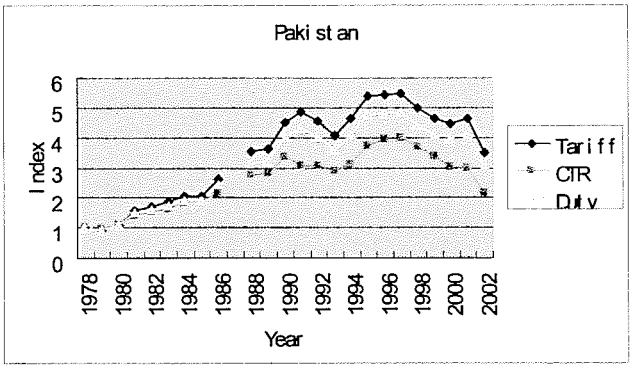


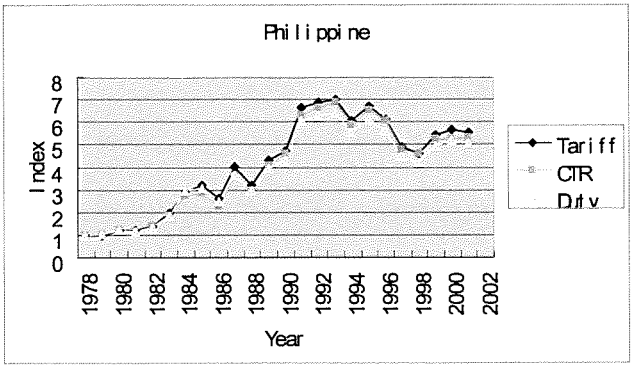
1.2 Average Tariffs, Average Duty, and CTR for 17 Countries







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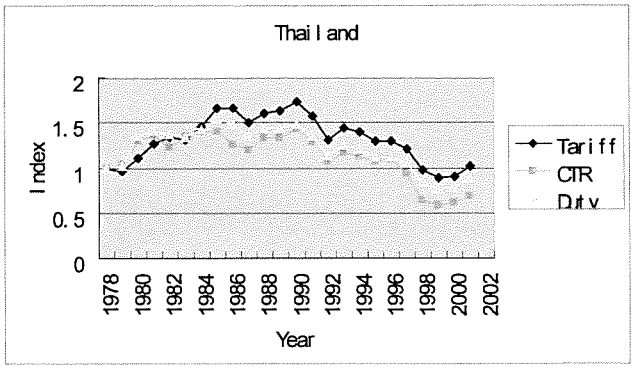
Index
Year
Tariff
CTR
Dutv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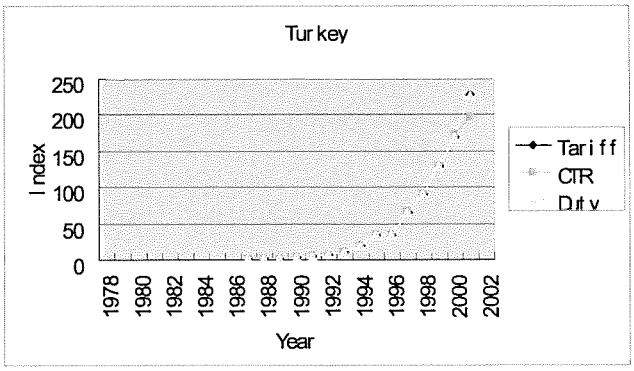
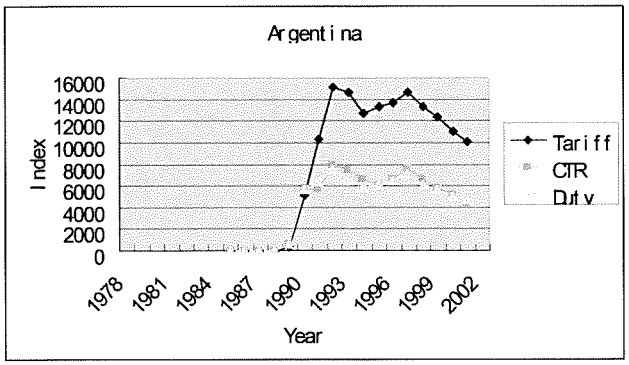
Year
Tariff
CTR
Dutv


Turkey
Index
Year
Tariff
CTR
Dutv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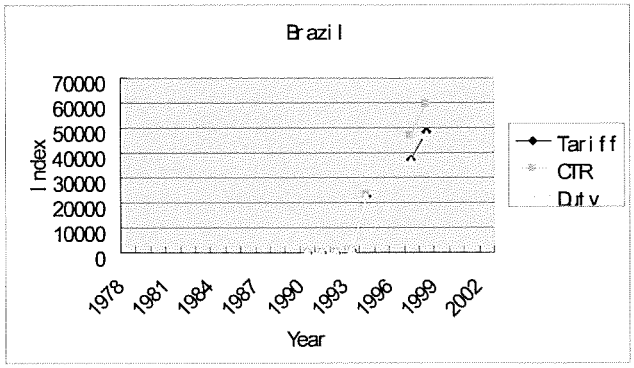
Year
Tariff
CTR
Dutv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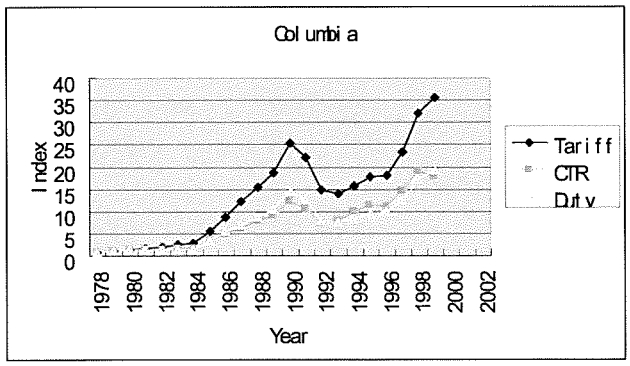
Year
Tariff
CTR
Dutv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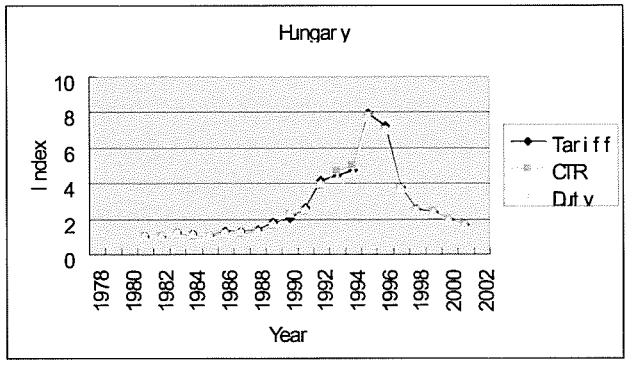
Year
Tariff
CTR
Dutv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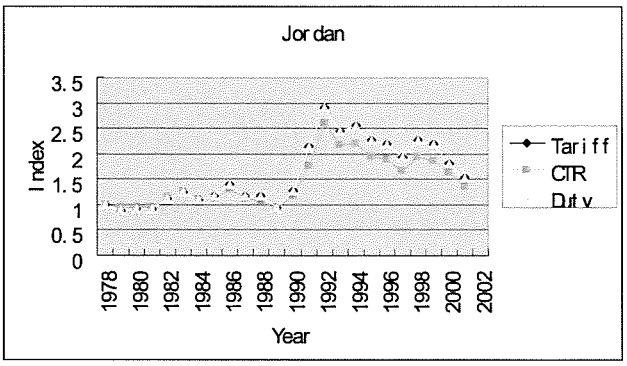
Year
Tariff
CTR
Dutv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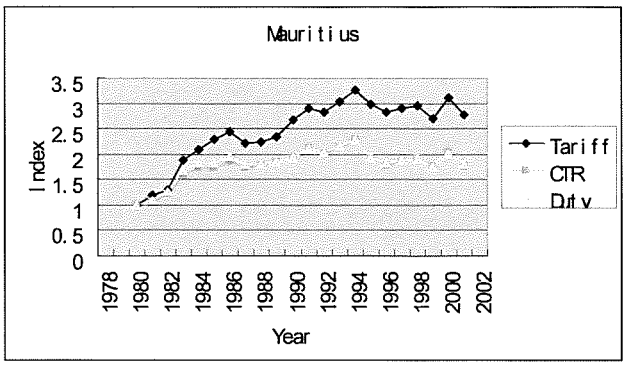
Year
Tariff
CTR
Duty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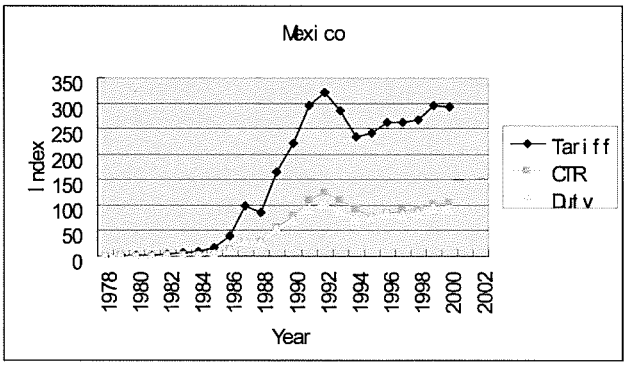
Year
Tariff
CTR
Duty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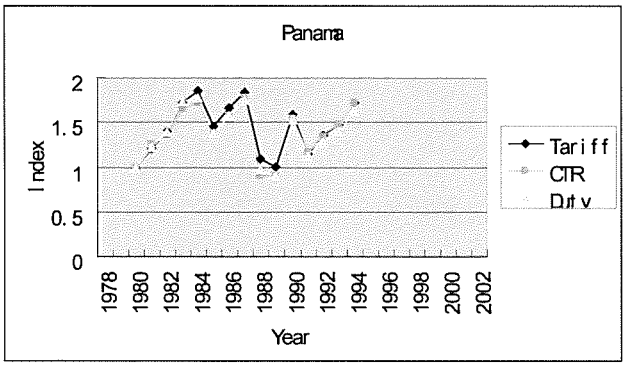
Year
Tariff
CTR
Duty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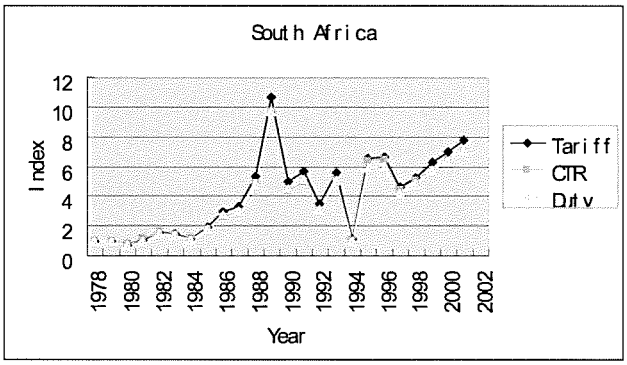
Year
Tariff
CTR
Duty


South Africa
Index
Year
Tariff
CTR
Duty

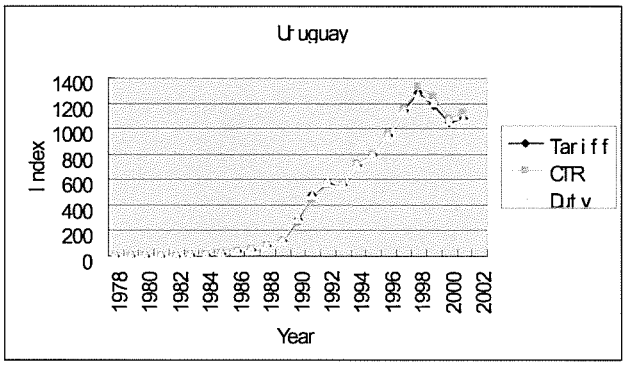

Uruguay
Index
Year
Tariff
CTR
Duty

Table1. Coefficient Estimates for Equation (5)

Country	Trade Policy Measure	ω_i	Standard Error of ω_i	μ_i	Standard Error of μ_i
Argentina	TRSHARE	407.497	1408.696	-0.123	0.708
	TARIFF	-7.741	1.026	0.004	0.001
	DUTY	-8.080	1.186	0.004	0.001
	CTR	-4.299	0.649	0.002	0.000
Brazil	TRSHARE	-1151.762	123.506	0.587	0.062
	TARIFF	-7.035	1.751	0.004	0.001
	DUTY	-7.038	1.752	0.004	0.001
	CTR	-3.916	0.993	0.002	0.001
China	TRSHARE	-714.408	417.769	0.380	0.210
	TARIFF	5.088	0.865	0.003	0.000
	DUTY	5.088	0.865	-0.003	0.000
	CTR	1.923	0.226	-0.001	0.000
Columbia	TRSHARE	-1794.997	219.473	0.919	0.110
	TARIFF	-9.256	0.995	0.005	0.001
	DUTY	-8.983	1.061	0.005	0.001
	CTR	-4.777	0.402	0.002	0.000
Hungary	TRSHARE	-7975.130	1129.137	4.047	0.567
	TARIFF	-2.178	0.881	0.001	0.000
	DUTY	-2.164	0.879	0.001	0.000
	CTR	-1.149	0.451	0.001	0.000
India	TRSHARE	-1434.472	161.857	0.730	0.081
	TARIFF	-16.244	3.637	0.008	0.002
	DUTY	-16.084	3.605	0.008	0.002
	CTR	-8.316	1.692	0.004	0.000
Jordan	TRSHARE	665.839	1122.537	-0.272	0.564
	TARIFF	-5.223	1.057	0.003	0.001
	DUTY	-5.230	1.057	0.003	0.001
	CTR	-2.631	0.607	0.001	0.000
Malaysia	TRSHARE	-12768.910	932.568	6.494	0.469
	TARIFF	3.839	0.325	-0.002	0.000
	DUTY	11.976	0.867	-0.006	0.000
	CTR	5.920	0.443	-0.003	0.000
Mauritius	TRSHARE	-3403.127	645.928	1.767	0.325
	TARIFF	-5.438	0.764	0.003	0.000
	DUTY	-2.924	0.883	0.002	0.000
	CTR	-1.643	0.438	0.001	0.000

Table1. Coefficient Estimates for Equation (5) (Continued)

Mexico	TRSHARE	-4107.900	364.052	2.080	0.183
	TARIFF	-6.300	0.596	0.003	0.000
	DUTY	-6.629	0.601	0.003	0.000
	CTR	-3.228	0.370	0.002	0.000
Panama	TRSHARE	434.408	1345.030	-0.142	0.676
	TARIFF	-0.177	0.553	0.001	0.000
	DUTY	0.008	0.618	0.000	0.000
	CTR	-0.119	0.284	0.000	0.000
Pakistan	TRSHARE	537.821	137.163	-0.254	0.069
	TARIFF	-8.705	1.063	0.004	0.001
	DUTY	-8.392	1.037	0.004	0.001
	CTR	-3.890	0.597	0.002	0.000
Philippine	TRSHARE	-5675.917	597.503	2.893	0.300
	TARIFF	-16.641	2.219	0.008	0.001
	DUTY	-16.192	2.205	0.008	0.001
	CTR	-9.179	1.220	0.005	0.001
Thailand	TRSHARE	-6811.305	448.768	3.464	0.226
	TARIFF	1.117	0.973	-0.001	0.000
	DUTY	2.982	0.857	-0.001	0.000
	CTR	2.057	0.475	-0.001	0.000
Turkey	TRSHARE	-3400/358	188.863	1.724	0.095
	TARIFF	-1594.080	252.784	0.801	0.127
	DUTY	-1594.080	252.784	0.801	0.127
	CTR	-808.0754	118.269	0.406	0.059
South Africa	TRSHARE	-962.800	312.726	0.506	0.157
	TARIFF	-2.333	0.475	0.001	0.000
	DUTY	02.295	0.473	0.001	0.000
	CTR	-1.119	0.223	-0.001	0.000
Uruguay	TRSHARE	-1643.148	134.378	0.841	0.068
	TARIFF	-1558.210	129.498	0.786	0.065
	DUTY	-1601.211	130.434	0.808	0.656
	CTR	-900.085	77.040	0.454	0.039

Table2. Correlation between Trade Policy Uncertainty Measures

Country	Cor (TRSHARE, TARIFF)	Cor (TRSHARE, DUTY)	Cor (TRSHARE, CTR)	Cor (TARIFF, DUTY)	Cor (TARIFF, CTR)	Cor (DUTY, CTR)
Argentina	0.1824	0.2251	0.1999	0.8597	0.8888	0.9663
Brazil	0.4372	0.4374	0.4555	1.0000	0.9895	0.9895
China	0.3267	0.3267	-0.0489	1.0000	0.3174	0.3174
Columbia	0.3876	0.3537	0.0936	0.9901	0.7484	0.7253
Hungary	0.4239	0.4084	0.4506	0.9976	0.9927	0.9940
India	0.6562	0.6512	0.7070	0.9996	0.9263	0.9254
Jordan	-0.0121	-0.0121	0.0032	1.0000	0.9856	0.9856
Malaysia	0.1929	0.0916	0.1204	0.4477	0.4141	0.9893
Mauritius	-0.2781	-0.2673	-0.2699	0.9070	0.9004	0.9566
Mexico	0.1826	0.1816	0.1332	0.9997	0.9521	0.9482
Pakistan	0.0520	0.0490	-0.0084	0.9985	0.8952	0.8981
Panama	0.3042	0.2223	0.1628	0.9784	0.9355	0.9747
Philippine	-0.1265	-0.1239	-0.0859	0.9948	0.9783	0.9703
Thailand	0.3399	0.3501	0.1030	0.9112	0.7704	0.8781
Turkey	-0.2593	-0.2593	-0.1568	1.0000	0.9300	0.9300
South Africa	-0.2011	-0.2021	-0.2148	0.9999	0.9919	0.9918
Uruguay	0.6450	0.6144	0.5752	0.9962	0.9839	0.9877
World	-0.1890	-0.1878	-0.1903	0.9986	0.9942	0.9955
Asia	-0.2429	-0.1536	-0.1549	0.4529	0.4358	0.9776

Table3. Coefficients Estimation Results of the Fixed Effects Model and Its Derivative Series for 17 Countries during 1978 to 2002

3.1 Results Based on Volatility of Trade Share as the Uncertainty

One-way fixed effects in cross-country series					
	Coefficient	**P-value**		**Coefficient**	**P-value**
X	1.06E-09	0.0001	**X**	1.21E-10	0.6260
Vol of Trshare	-0.015084	0.6791	**Vol of Trshare**	0.007118	0.7725
R^2	0.703841		**Inv(-1)**	0.771304	0.0000
Durbin-Watson Statistic	0.466324		**R^2**	0.880687	
			Durbin-Watson Statistic	1.694367	
No. of Obs	412		**No. of Obs**	398	
One-way fixed effects in period series					
X	-7.65E-11	0.4653	**X**	1.48E-11	0.9261
Vol of Trshare	0.07884	0.0747	**Vol of Trshare**	0.008687	0.6718
R^2	0.062438		**Inv(-1)**	0.930131	0.0000
Durbin-Watson Statistic	0.129104		**R^2**	0.885512	
			Durbin-Watson Statistic	1.846537	
No. of Obs	412		**No. of Obs**	398	
Two-way fixed effects					
X	1.20E-09	0.0000	**X**	1.58E-10	0.4636
Vol of Trshare	0.000138	0.9973	**Vol of Trshare**	0.001455	0.9534
R^2	0.755935		**Inv(-1)**	0.756009	0.0000
Durbin-Watson Statistic	0.488653		**R^2**	0.896806	
			Durbin-Watson Statistic	1.730258	
No. of Obs	412		**No. of Obs**	398	

3.2 Results Based on Volatility of Tariff as Uncertainty

One-way fixed effects in cross-country series					
	Coefficient	**P-value**		**Coefficient**	**P-value**
X	3.03E-10	0.4921	**X**	-6.66E-10	0.1553
Vol of Tariff	-0.223657	0.6122	**Vol of Tariff**	0.00714	0.9805
R^2	0.709725		**Inv(-1)**	0.78338	0.0000
Durbin-Watson Statistic	0.466195		**R^2**	0.881059	
			Durbin-Watson Statistic	1.622607	
No. of Obs	356		**No. of Obs**	345	
One-way fixed effects in period series					
X	1.16E-10	0.5009	**X**	-7.63E-11	0.5915
Vol of Tariff	-0.648294	0.0210	**Vol of Tariff**	-0.087098	0.6147
R^2	0.076048		**Inv(-1)**	0.940022	0.0000
Durbin-Watson Statistic	0.128583		**R^2**	0.886154	
			Durbin-Watson Statistic	1.777875	
No. of Obs	356		**No. of Obs**	345	
Two-way fixed effects					
X	5.01E-01	1.82E-10	**X**	-5.60E-10	0.1790
Vol of Tariff	0.021	0.055556	**Vol of Tariff**	0.022011	0.9303
R^2	0.765981		**Inv(-1)**	0.766981	0.0000
Durbin-Watson Statistic	0.495635		**R^2**	0.898005	
			Durbin-Watson Statistic	1.661243	
No. of Obs	356		**No. of Obs**	345	

3.3 Results Based on Volatility of Duty as Uncertainty

One-way fixed effects in cross-country series					
	Coefficient	**P-value**		**Coefficient**	**P-value**
X	2.99E-10	0.5017	**X**	-6.65E-10	0.1561
Vol of Duty	-0.207402	0.6378	**Vol of Duty**	0.002063	0.9943
R^2	0.709708		**Inv(-1)**	0.78335	0.0000
Durbin-Watson Statistic	0.466211		**R^2**	0.881059	
			Durbin-Watson Statistic	1.622532	
No of Obs	356		**No. of Obs**	345	
One-way fixed effects in period series					
X	1.11E-10	0.5198	**X**	-7.56E-11	0.5952
Vol of Duty	-0.629881	0.0256	**Vol of Duty**	-0.089298	0.6011
R^2	0.075913		**Inv(-1)**	0.940017	0.0000
Durbin-Watson Statistic	0.128615		**R^2**	0.886157	
			Durbin-Watson Statistic	1.777853	
No of Obs	356		**No. of Obs**	345	
Two-way fixed effects					
X	1.74E-10	0.6214	**X**	-5.59E-10	0.1792
Vol of Duty	0.083338	0.8158	**Vol of Duty**	0.018721	0.9393
R^2	0.765992		**Inv(-1)**	0.766965	0.0000
Durbin-Watson Statistic	0.495753		**R^2**	0.898004	
			Durbin-Watson Statistic	1.661212	
No of Obs	356		**No. of Obs**	345	

3.4 Results Based on Volatility of CTR as Uncertainty

One-way fixed effects in cross-country series					
	Coefficient	**P-value**		**Coefficient**	**P-value**
X	2.52E-10	0.6073	**X**	-7.07E-10	0.1462
Vol of CTR	-0.05896	0.9399	**Vol of CTR**	4.08E-01	0.4031
R^2	0.709582		**Inv(-1)**	0.78475	0.0000
Durbin-Watson Statistic	0.46678		**R^2**	0.881197	
			Durbin-Watson Statistic	1.624927	
No. of Obs	356		**No. of Obs**	345	
One-way fixed effects in period series					
X	7.84E-11	0.6268	**X**	-9.63E-11	0.5378
Vol of CTR	-1.121328	0.0294	**Vol of CTR**	-3.57E-02	0.8857
R^2	0.076004		**Inv(-1)**	0.940383	0.0000
Durbin-Watson Statistic	0.129549		**R^2**	0.886106	
			Durbin-Watson Statistic	1.778076	
No. of Obs	356		**No. of Obs**	345	
Two-way fixed effects					
X	1.46E-10	0.6919	**X**	-5.96E-10	0.1695
Vol of CTR	0.448873	0.4737	**Vol of CTR**	3.76E-01	0.3617
R^2	0.766141		**Inv(-1)**	0.767484	0.0000
Durbin-Watson Statistic	0.49534		**R^2**	0.898115	
			Durbin-Watson Statistic	1.661632	
No. of Obs	356		**No. of Obs**	345	

Notes: Sample 1978-2002. X is trade share. Inv (-1) is the lagged investment share. Estimation method: ordinary least squares. White's robust coefficient matrix is used to eliminate the potential heteroscedasity. The lagged investment share is added in order to eliminate serial correlation as shown on the right. In each subtable, "one-way fixed effects in cross-country series" refers to the results for equation (3'); "one-way fixed effects in period series" to the results for equation (3''); and "two-way fixed effects" refers to the results for equation (3).

Table4. Coefficients Estimation Results Comparison of the Fixed Effects Model between 17 Countries and 7 Asian Countries during 1978 to 2002

Vol		***17 Countries***	***7 Asian Countries***
Trade Share	**Coefficients**	0.001455	-0.037944
	P-Value	*(0.9534)*	*(0.3999)*
Tariff	**Coefficients**	0.022011	-0.800425
	P-Value	*(0.9303)*	*(0.3608)*
Duty	**Coefficients**	0.018721	-0.809371
	P-Value	*(0.9393)*	*(0.3545)*
CTR	**Coefficients**	3.76E-01	-0.919388
	P-Value	*(0.3617)*	*(0.6698)*

Notes: Samples consist of 17 countries and 7 Asian countries respectively for the period 1978-2002. Estimation method: ordinary least squares. White's robust coefficient matrix is used to eliminate the potential heteroscedasity for both set of samples. The lagged investment share is added in order to eliminate serial correlation for both set of samples. Only equation (3''') is estimated.

Table 5. Coefficients Estimation Results for Period Effect Model with Z-variables for 17 Countries during 1978 to 2002

5.1 Results Based on Volatility of Trade Share as Uncertainty

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	-3.19E-10	6.79E-10	-0.469882	0.6387
VOL_TRSHARE	0.081114	0.039796	2.038262	0.0423
GOV	-0.024514	0.033268	-0.736857	0.4617
INFL	-0.001010	0.001436	-0.703072	0.4825
GDPC	4.590601	1.731633	2.651025	0.0084
STINFL	0.000363	0.001982	0.182952	0.8549
STGDPC	0.517188	1.086431	0.476043	0.6343
R-squared	0.084404	**Durbin-Watson stat**		0.154325
Countries	17			
No. of observations	388			

5.2 Results Based on Volatility of Tariff as Uncertainty

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	1.95E-11	7.81E-10	0.024952	0.9801
VOL_TARIFF	-1.558919	0.442457	-3.523325	0.0005
GOV	-0.005596	0.033713	-0.165976	0.8683
INFL	-0.001145	0.001443	-0.793668	0.4280
GDPC	4.410655	1.730692	2.548493	0.0113
STINFL	0.000273	0.002206	0.123581	0.9017
STGDPC	0.780756	1.154011	0.676559	0.4992
R-squared	0.133075	**Durbin-Watson stat**		0.168806
Countries	17			
No. of observations	338			

5.3 Results Based on Volatility of Duty as Uncertainty

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	-3.03E-10	7.90E-10	-0.384176	0.7011
VOL_DUTY	-1.121113	0.684548	-1.637742	0.1025
GOV	-0.023204	0.034069	-0.681091	0.4963
INFL	-0.001139	0.001468	-0.775859	0.4384
GDPC	4.377669	1.761442	2.485276	0.0135
STINFL	0.000993	0.002233	0.444564	0.6569
STGDPC	1.044366	1.213700	0.860481	0.3902
R-squared	0.104841	**Durbin-Watson stat**		0.156740
Countries	17			
No. of observations	337			

5.4 Results Based on Volatility of CTR as Uncertainty

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	-3.65E-10	7.90E-10	-0.462024	0.6444
VOL_CTR	-2.002833	1.200141	-1.668832	0.0962
GOV	-0.023419	0.034067	-0.687450	0.4923
INFL	-0.001140	0.001467	-0.777029	0.4377
GDPC	4.402971	1.761589	2.499431	0.0130
STINFL	0.000969	0.002234	0.433623	0.6649
STGDPC	1.049958	1.212865	0.865684	0.3873
R-squared	0.105139	**Durbin-Watson stat**		0.158011
Countries	17			
No. of observations	337			

Notes: Sample 1978-2002. Estimation method: ordinary least squares. X is trade share.

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