

# RELATIONSHIP BETWEEN TRADE LIBERALIZATION, GROWTH, AND BALANCE OF PAYMENTS IN DEVELOPING COUNTRIES: An Econometric Study

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*The objectives of this article are to study the impact of liberalization on growth, the trade deficits, and the current accounts of developing countries. It is expected that trade liberalization would promote economic growth from the supply side by leading to a more efficient use of resources, by encouraging competition, and by increasing the flow of ideas and knowledge across national boundaries. Trade liberalization could lead to faster import growth than export growth, and, hence, the supply side benefits may be offset by the unsustainable balance of payments position. This study uses panel data for 42 countries (both time-series and cross-sectional) to estimate the effect of trade liberalization on growth and growth on trade balance while controlling for other factors such as the*

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*income terms of trade. The major finding of the study is that trade liberalization promotes growth in most countries, but the growth itself has a negative impact on trade balance. Countries following trade liberalization could have high real exchange rates, a worsening savings-investment balance and consequently a worsening current account and trade balance and that this would be consistent with the rational forward looking agents in which inter-temporal budget constraints are satisfied.*

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## I. INTRODUCTION

The objectives of this study are to examine the impact of liberalization on economic growth and then the extent to which economic growth influences trade balances and current accounts of a group of developing countries in different regions of the world. Has liberalization changed the relationship between economic growth and trade balance due to its differing effects on economic growth in various developing regions over different time periods?

Previous research in this field tends to give conflicting results. Some studies show that the countries which went for liberalization programs have improved their export performance (Thomas et al., 1991; Joshi and Little, 1996; Helleiner, 1994; Bleaney, 1999; and Ahmed, 2000). On the other hand, other studies have found little evidence of a relationship between trade liberalization and economic growth (UNCTAD, 1989; Clarke and Kirkpatrick, 1992; Greenaway and Sapsford, 1994; Shafaedin, 1994; and Jenkins, 1996). On the import side, there is a strong positive impact of trade liberalization on the growth of imports and this impact is effected through the sensitivity of price and income changes (Melo and Vogt, 1984; Bertola and Faini, 1991).

Thirlwall and Santos-Paulino (2004) found that the impact of liberalization differs as between highly protected countries and less protected countries and the response to liberalization on economic growth was very high when liberalization was adopted in a highly protected environment. The positive effect of trade liberalization on import growth was far greater in the more highly protected industries in the period before liberalization and showed that the impact of a more liberalized trade regime, independent of duty reductions, raised import growth by more than exports. Thirlwall and Santos-Paulino found that import growth increased by about 6% per annum while export growth rose by less than 2% per annum. This precipitated a worsening of the trade balance by over 2% of GDP; however, the impact on current account was only about 0.8 percent of GDP on average. Their overall conclusion was that free trade and flexible exchange rates do not always ensure that unemployed domestic resources are easily converted into scarce foreign exchange.

Dollar and Kray (2004) have shown that the growth pattern of countries who have liberalized have shown an acceleration in their real income. In the 1990s, globalizing developing countries grew by an 5% per capita, rich countries by 2.2%, and non-globalizing developing countries by only 1.4%. Their view is that the countries which have followed a globalization path are catching up with rich countries while non-globalizers are lagging behind.

Irwin and Trevio (2002), following the study of Frankel and Romer (1999), conclude that the countries that trade more as a proportion of their GDP have higher incomes even after controlling for the endogeneity of trade. On the one hand, trade contributes to an improvement in real income and per capita growth while on the other hand, if trade is not combined with adequate policies to balance imports against exports, it could generate balance of trade and balance of payments deficits. Greenaway et al. (2002) found that trade liberalization did not have growth

enhancing effects and their evidence was mixed. When a dynamic panel framework was used, they found that liberalization had an impact on economic growth with a lag.

Rodriguez and Rodrik (2000) raised some concerns about the robustness of the positive relationship between liberalization and economic growth. Their liberalization variable was based on the Sachs-Warner (1995) classification. Wacziarg (2001) used a different classification of liberalization, and also made use of updated data on income levels (Summers et al. 2001). This study uses updated data on income levels, and studies the relationship between liberalization and economic growth. Moreover, the study is extended to examine the impact of liberalization and economic growth on the trade balance and current accounts of a group of developing countries at a regional level. Wacziarg (2001) did not study the impact on the balance of payments while Thirlwall and Sanots-Paulino did not provide any theoretical model to conduct an empirical study and did not use the latest panel data techniques in a dynamic model.

Measurement of liberalization and openness indicators is imperfect in most studies. Liberalization is measured as a dichotomous variable which fails to distinguish between the intensity of liberalization and the time period elapsed from the date of liberalization. Before obtaining a liberalization variable a sub-sample of developing countries with detailed information on broader economic and political context of trade reform was collected and our large sample results are interpreted in the context of country case studies. Details on country case studies can be obtained from the author.

In Section II, static panel data models are used to examine the relationship between liberalization and domestic economic growth and the impact of liberalization and domestic growth on the trade balance. In Section III, a model linking the trade balance or current account to domestic growth is provided. The model is based on the consumption smoothing principle

for the economy and follows a dynamic optimisation model under a current account constraint. In Section IV, the dynamic model is estimated using the dynamic panel data technique. Economic growth is an endogenous variable and our estimation procedure takes this into account. In Section V, a regional analysis for two regions, namely Africa and Latin America (including Asian countries), is undertaken and some of the contrasting features of the results are shown. A separate analysis for a group of Asian countries was not possible since the number of Asian countries in our sample was too small. In Section VI, some policy conclusions are drawn.

## II. LIBERALIZATION AND GROWTH RELATIONSHIP

Data for this study are derived from various sources, the main ones being the *International Financial Statistics*, the *Penn World Tables* and Wacziarg's study on liberalization and growth and the Sachs-Warner measure of liberalization. Trade balance and current account figures are obtained from the IMF issues while an openness indicator and liberalization dummy for the period 1990–99 was taken from Summers Heston, and Aten (2001) and Wacziarg (2001), respectively. Means and standard deviations of growth, TBGDP1 (trade balance to GDP in %) and CAGDP1 (current account to GDP in %) for each country can be obtained from the author. For the cross-sectional study the data on various variables were taken from Barro and Lee (1994), Banks (2001), and Summers, Heston, and Aten (2001).

At the outset 75 developing countries dispersed over different regions of the world, namely Africa, Asia, and Latin America, were considered. Almost all Eastern European and developed market oriented economies were excluded. Growth, investment, and openness can be stimulated under liberalization if the right conditions

prevail in the economies under consideration.<sup>1</sup> The year of liberalization and the time period elapsed from liberalization are used as two separate variables affecting investment, growth and openness. The openness indicator is the ratio of imports plus exports to GDP, the investment rate is expressed as a percentage of GDP, and the growth rate of per capita GDP is expressed in real terms in cross-section regressions. Growth rates in the panel study refer to the growth rate in total real GDP at PPP rates in dollar terms for the countries under consideration. Variables used in the cross-sections and panel study are fully summarized in Appendix 1 and 2. Means and standard deviations of various variables for the countries of the sample by time periods can be obtained from the author.

### **Panel Study: Liberalization, Growth, and Trade balance relationships**

Both fixed effects and random effects models (Table IA) were estimated on a binary liberalization indicator, defined by the dates of liberalization. The growth in real GDP was regressed on a liberalization dummy for the entire period, and for three separate

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<sup>1</sup>Edwards (1993) considers the openness-growth relationship using existing indicators. Overall, nine indicators were used

- (i) The Sachs-Warner index
- (ii) The World Bank Integration index
- (iii) the Edward Leamer Openness Index
- (iv) the average black market premium
- (v) the average tariff rate as developed by Barro and Lee (1994),
- (vi) the average coverage of non-tariff barriers (Barro and Lee)
- (vii) the Heritage Foundation index of distortions
- (viii) the ratio of total revenues on trade taxes to total trade and
- (ix) the regression index of Holger Wolf on import distortions.

His conclusion on various measures was that “in spite of significant efforts and ingenuity, there has not been too much progress in this area.” There existed positive relationship between trade intensity and growth performance on the basis of cross-country plot of average annual growth rate against the average annual growth rate in trade.

Table IA  
Bivariate relationship between trade balance, GDP growth, and liberalisation year using panel data

1970–1999: Developing Countries: Regression Coefficients and t-statistic						1970–79: Developing Countries: Regression Coefficients and t-statistic					
Dependant	Model	Constant	Liber	Growth	Hausmann test chi <sup>2</sup>	Model	Constant	Liber	Growth	Hausmann test chi <sup>2</sup>	Dependant
GROWTH	FE	3.46*** (17.73)	0.28 (0.88)		17.65 <sup>A</sup>	FE	3.38*** (5.60)	8.23** (2.14)		2.18	GROWTH
TBGDP1	RE	−3.02*** (−4.34)	−0.82*** (−3.46)		0.06	FE	−3.15*** (−8.93)	−0.17 (−0.08)		0.63	TBGDP1
CAGDP1	RE	−2.40*** (−8.24)	0.91*** (5.62)		0.27	RE	−2.42*** (−5.67)	0.85 (0.85)		0.07	CAGDP1
OPENK	RE	61.84*** (13.06)	4.05*** (3.20)		2.00	RE	63.74*** (9.49)	7.31 (0.74)		0.05	OPENK
KI	FE	13.17*** (83.37)	−0.56** (−2.10)		76.58 <sup>A</sup>	RE	13.67*** (12.92)	0.4426 (0.23)		2.69	KI
TBGDP1	RE	−4.04*** (−5.18)		−0.04** (−2.37)	1.52	FE	−3.34*** (−18.21)		0.001 (0.04)	52.10 <sup>A</sup>	TBGDP1
CAGDP1	FE	−2.11** (−27.67)		0.02 (1.65)	6.38 <sup>A</sup>	RE	−2.13** (−5.79)		−0.0051 (−0.24)	0.29	CAGDP1

(Continued)

Table IA  
(Continued)

1980–1989: Developing Countries: Regression					1990–1999: Developing Countries: Regression				
Coefficients and t-statistic					Coefficients and t-statistic				
GROWTH	FE	2.52*** (6.91)	1.11 (1.10)	1.49 <sup>A</sup>	FE	1.87*** (3.00)	1.93*** (2.72)	0.91	GROWTH
TBGDP1	RE	−3.25*** (−3.98)	0.40 (0.64)	0.36	RE	−2.94*** (−4.06)	−0.83** (−2.00)	0.24	TBGDP1
CAGDP1	FE	−2.29** (−14.71)	0.40 (0.92)	1.21	FE	−2.32*** (−8.12)	1.13*** (3.45)	0.72 <sup>A</sup>	CAGDP1
OPENK	FE	59.77*** (79.88)	−5.11*** (−2.46)	3.86	FE	61.90*** (38.35)	5.98*** (3.24)	4.02 <sup>A</sup>	OPENK
KI	FE	12.35*** (63.17)	0.311 (0.57)	9.92 <sup>A</sup>	FE	10.87*** (27.75)	2.14*** (4.79)	8.49 <sup>A</sup>	KI
TBGDP1	FE	−3.90*** (−23.50)	−0.03 (−1.33)	5.41 <sup>A</sup>	RE	−4.22*** (−5.01)	−0.03* (−1.81)	0.04	TBGDP1
CAGDP1	FE	−2.42*** (−21.00)	0.002 (0.13)	21.28 <sup>A</sup>	RE	−1.86*** (−6.43)	0.031** (2.25)	0.22	CAGDP1

Note: \*\*\*significant at 1%, \*\* significant at 5%, \* significant at 10%.

A – random effect is rejected, t-statistic in parentheses.



periods, namely 1970–79, 1980–89, and 1990–99. For period by period analysis a change in the pattern of relationship between trade balance to GDP ratios and current account to GDP ratios is examined. For the whole period, there exists a significant negative relationship between trade balance and economic growth. The behavior of current account with respect to GDP growth is the reverse of the trade balance relationship. For a decade by decade relationship, we find that growth reduces current account deficits in the period 1980–89 while it has no significant relationship in earlier or later periods.

Liberalization has a deleterious effect upon the trade balance while growth, current account, and investment rate are all encouraged by liberalization. The timing effect of liberalization (Table IB) is negative and significant in the period 1970–79 and 1980–89 on a openness indicator, while the impact of the timing effect on trade balance to GDP revealed a deterioration in the first period, an improvement in the second period and insignificant in the last period. A similar analysis was conducted at a regional level and some of the summary results are provided here. Detailed results can be obtained from the author.

Liberalization clearly promotes growth, openness, and investment in Asian countries. The trade balance tends to deteriorate with economic growth in Asian economies while there is no such evidence for either Latin American or African economies. For Latin American economies, the direct impact of liberalization is to reduce the trade balance while for African economies liberalization has improved the trade balance. We have a mixed bag of results at a regional level as the data and number of observations differed.<sup>2</sup>

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<sup>2</sup>The relationship between trade balance and GDP growth rates differs between Latin American and East Asian regions because of the lack of establishment of new trading regions in Latin America and slow growth in those countries as compared to East Asia.

Table IB  
Multivariate relationship between trade balance, GDP growth, timing of liberalisation  
and liberalisation year using panel data

	Region	Time period	Model	Constant	Liber	Libertm
GROWTH	Developing countries	1970_1979	FE	2.34 (1.60)	8.68*** (2.23)	-0.08 (-0.83)
	Developing countries	1980_1989	FE	2.54*** (4.30)	0.96 (0.82)	0.02 (0.27)
	Developing countries	1990_1999	FE	1.71** (2.46)	2.69*** (3.00)	-0.06 (-0.77)
OPENK	Developing countries	1970_1979	FE	51.13*** (12.45)	11.38 (0.98)	-0.89*** (-3.42)
	Developing countries	1980_1989	FE	57.19*** (48.20)	-0.68 (-0.29)	-0.74*** (-3.80)
	Developing countries	1990_1999	FE	58.97*** (35.06)	-3.76* (-1.74)	1.50*** (7.59)
KI	Developing countries	1970_1979	FE	14.77*** (15.69)	-2.55 (-0.96)	0.33 (0.55)
	Developing countries	1980_1989	FE	10.63*** (35.54)	2.74*** (4.60)	-0.40*** (-8.28)
	Developing countries	1990_1999	FE	11.22*** (26.10)	2.47*** (4.47)	-0.06 (-1.17)
TBGDP1	Developing countries	1970_1979	FE	-5.82*** (-7.30)	1.01 (0.49)	-0.19*** (-3.74)
	Developing countries	1980_1989	FE	-1.33*** (-3.80)	-1.99*** (-2.77)	0.43*** (7.39)
	Developing countries	1990_1999	FE	-2.71*** (-6.53)	-0.61 (-1.24)	-0.05 (-1.15)
CAGDP1	Developing countries	1970_1979	FE	-3.44*** (-3.55)	0.71 (0.31)	-0.12 (-1.45)
	Developing countries	1980_1989	FE	-0.74*** (-3.33)	1.65*** (3.61)	-0.35*** (-9.49)
	Developing countries	1990_1999	FE	-2.40*** (-7.24)	1.23*** (2.95)	-0.01 (-0.25)

Note: \*\*\*significant at 1%, \*\* significant at 5%, \* significant at 10% t-statistic in parentheses.

Table II  
Cross section regressions using two periods: Regression Coefficients, t-statistic and R<sup>2</sup> using various models

	1970-89						1990-1999					
Explanatory Variables <sup>A</sup>	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
LRGDPCH70/LR GDPCH89	0.1694 (0.44)	0.0401 (0.05)	-1.2976*** (-2.82)	-1.3161*** (-3.01)	-1.4763*** (-3.24)	-1.3681*** (-3.12)	1.2078*** (3.22)	2.2549*** (6.15)	1.7564* (1.72)	-0.4094 (-0.60)	-0.3832 (-0.52)	-0.3533 (-0.48)
LIBERAL70-89/ LIBERAL90-99				1.1909*** (2.81)	1.1833** (2.56)	1.02259** (2.27)				-1.1253* (-1.81)	-1.2435* (-1.90)	-0.8937 (-1.23)
POL					-0.5981 (-1.12)	-0.7461 (-1.44)					0.3658 (0.50)	0.2968 (0.41)
SEC70/SEC85			0.8014 (0.41)	0.4480 (0.23)	1.9431 (1.03)	-0.3708 (-0.19)			6.1405** (2.11)	6.0446** (2.54)	6.3279** (2.50)	5.7521** (2.23)
PRI70/PRI85			0.8922 (0.72)	0.5009 (0.42)	0.2077 (0.17)	0.5949 (0.50)			-4.5141** (-2.14)	-0.6065 (-0.33)	-0.6625 (-0.35)	-0.5047 (-0.26)
GVDXE7084/ CG8998			-0.1166*** (-3.53)	-0.1142*** (-3.63)	-0.1098*** (-3.34)	-0.1158*** (-3.61)			-0.0145 (-0.24)	-0.0587 (-1.11)	-0.0633 (-1.17)	-0.0633 (-1.17)
REVCoup7085/ REV8998			-0.9109 (-1.15)	-1.1062 (-1.47)	-0.7022 (-0.77)	-0.4516 (-0.52)			-0.8107 (-0.90)	-0.9353 (-0.97)	-0.9953 (-1.00)	-1.1495 (-1.15)
ASSASS7085/ASS ASS8998			-0.1024 (-0.34)	-0.1993 (-0.69)	-0.1910 (-0.63)	-0.1313 (-0.45)			0.0339 (0.13)	0.6849** (2.00)	0.7338** (2.09)	0.7185** (2.04)
PPI70DEV/PPI89 DEV			0.3020 (0.71)	0.2081 (0.51)	0.0188 (0.04)	0.1606 (0.39)			0.8334 (0.80)	-0.8953 (-1.20)	-0.8759 (-1.12)	-0.7300 (-0.92)
INV7089/INV8998			0.1443*** (3.49)	0.1307*** (3.31)	0.1133*** (2.73)	0.1298*** (3.24)			0.0313 (0.52)	0.0330 (0.57)	0.0310 (0.52)	0.0316 (0.53)
DENSI60/DENSI80			0.0061*** (2.74)	0.0055** (2.54)		0.0060*** (2.76)						0.0031 (1.08)
Intercept7089/Inter cept9099	-0.3575 (-0.12)	1.4941 (0.26)	9.6684*** (2.88)	9.9575*** (3.11)	11.7713*** (3.51)	10.66*** (3.30)	-8.2728*** (-2.80)	-16.91*** (-5.77)	-11.2308 (-1.51)	3.8959 (0.82)		2.704 (0.49)
Adj R-sq	-0.0113	-0.0383	0.4344	0.5804	0.5450	0.5989	0.1306	0.6120	0.6076	0.2394	0.2280	0.2304
Number of observations 70-89/90-99	73	28	63	62	63	61	71	26	24	64	62	62

Note: \*\*\*significant at 1% \*\* significant at 5% \* significant at 10% t-statistics in parenthesis

<sup>A</sup> Explanatory variables for the 90-99 are shown in the same column with the same symbol with 89 or 90 base year..

Table II reports the results of cross country regressions. These allow the possibility of using some political<sup>3</sup> and other variables in the regression models. The liberalization dummy enters highly significantly with a magnitude of about 1.18–1.20 percentage point of annual growth during 1970–89 years. This is much smaller than that in Wacziarg's paper and it could be due to the non-inclusion of developed countries in the sample. The Sachs-Warner study suggests that open economies tend to converge unconditionally while closed economies do not. Openness, base-year real GDP, investment rate, density of population, and government consumption to GDP are all highly significant in the remaining results provided in Table II. The openness variable is not significant for the period 1990–99 and liberalizing economies do not show any convergence. Our conclusion is that the openness measure could be quite weak for the period under study.<sup>4</sup>

### **Effect of Trade Liberalization and Growth on Trade Balance and Current Account**

The impact of trade liberalization on the trade balance and current account of the balance of payments is ambiguous

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<sup>3</sup>Socio-political and environmental variables have played a crucial role in economic development, growth and international trade. Countries that maintain permanent peace, and domestic and political stability, and are endowed with abundant resources, including a skilled labor force, have a high potential for growth and development. Socio-political variables cannot be easily quantified. Political scientists have constructed indices measuring key socio-political conditions in each economy. Many such variables were employed in the literature to capture the presence or absence of political stability, economic freedom, corruption, democracy, economic efficiency, and other conditions affecting economic performance of countries.

<sup>4</sup>The date based indicator of liberalization was used in a three period analysis using a panel of three cross-sections. A panel was constructed with 3 periods, 1970–79, 1980–89, and 1990–98 in order to estimate the effects of the openness indicator on growth over a longer span of time. The estimated coefficient on liberalization variable lies between insignificant and 1.19. For the 1989–98 period, the liberalization coefficient is not significantly different from zero. In Table III, when estimates are constrained, it was found that liberalization has an effect on growth and the impact for 1 unit change is 1.62 per cent point change on growth. The conditional convergence hypothesis holds. Extreme political repression tends to reduce economic growth while an increase in density of population increases economic growth.

irrespective of the framework used for the analysis of balance of payments. In the elasticities approach to balance of payments, the effect of liberalization will depend upon the price elasticities of exports and imports. If the impact is measured in foreign currency, export earnings will increase if the price elasticity is greater than one and import payments will increase if the price elasticity is less than one in absolute terms. In the absorption approach to balance of payments, the effect of liberalisation will be realised through real income changes. Even if real income increases, the balance of payments may not improve if the absorption propensity is greater than unity. If trade liberalisation reduces prices, this will increase real absorption through a real balance effect and money illusion, but it could increase absorption if there is a redistribution of income to the traded goods sector where the propensity to save is higher than that in the non-traded sector. In the monetary approach to balance of payments, the liberalization could affect both the demand and supply of real money balances. Rose and Ostry (1989) conducted an analysis of the impact of tariff changes on real trade balance and have found no statistically significant effect.

The impact of liberalization on trade performance is measured using monetary units because it is the nominal gap which measures a country's shortage of foreign exchange and by how much a country requires to borrow to sustain growth in case liberalization worsens the payments on current account. Relative prices are introduced by making use of the terms of trade variable. Data on nominal (barter) terms of trade are not available for a large number of sample countries and hence we have to use the available information on the income terms of trade meaning thereby the index of purchasing power of exports. An income variable is introduced as the growth in real income and is expressed in Purchasing Power Parity terms. Liberalisation improves growth performance as our results demonstrate in the previous section. It is probable that liberalization in a country could interact with economic growth and hence an interaction between domestic economic

growth and dummy variable for liberalization is constructed. If the sign of this variable is negative in the trade balance relationship then it has raised the growth rate which in turn has raised import growth and worsened the trade balance/balance of payments. The coefficient on the shift dummy variable (*liber*) should be regarded as the pure liberalization effect on trade balance, independent of liberalisation working through its impact on growth performance. The nations differ in size and this is resolved by using trade balance to GDP ratios in percentage terms (*TBGDP1*).

### III. THEORETICAL BASE OF CURRENT ACCOUNT AND GDP GROWTH RELATIONSHIP

In this section a dynamic model is proposed to study the relationship between GDP growth and trade balance to GDP ratios. Thirlwall and Santos-Paulino (2004) examined the relationship between trade balance and GDP growth but did not provide any theory for the relationship. This theoretical model is largely designed for developed countries but it provides a framework for studying the relationship between trade balance and GDP growth rates when the debt-GDP ratio is constant. Moreover, a theory consistent empirical relationship between trade balance and GDP growth rates is formulated and estimated in the latter section.

We consider a small open economy inhabited by a representative agent with an infinite time horizon. The economy starts in period  $t$  and continues forever. We normalize population size to unity. The utility function for infinite period is

$$(1) \quad U(t) = \sum_{s=t}^{\infty} \beta^{s-t} U(C_s)$$

where  $C_s$  is consumption in period  $s$  and  $\beta$  is the discount rate. Deriving the  $t$  period-budget constraint, the current account with constant interest rate is

$$(2) \quad CA_t = B_{t+1} - B_1 = Y_t + rB_t - C_t - G_t - I_t$$

where CA is current account, B is net foreign assets accumulated on prior dates, I is investment and is equivalent to changes in the capital stock, C is consumption, G is government expenditure, and t refers to the time period.

There is an accounting equivalence between the net export surplus in current account and the negative value of the capital account. The current account balance as defined in equation (2) is the change in the net foreign assets position between two periods.

If output is determined by  $Y = AF(K)$  i.e. output is a function of capital K (accumulated over previous periods) with A as the given technology, the utility function after substitution for consumption in period s will be

$$(3) \quad U_t = \sum_{s=t}^{\infty} \beta^{s-t} U[(1+r)B_s - B_{s+1} + A_s F(K_s) - (K_{s+1} - K_s) - G_s]$$

One finds two necessary conditions for maximizing  $U_t$  with respect to  $B_{s+1}$  and  $K_{s+1}$  for every period  $s \geq t$ :

$$(4) \quad U'(C_s) = (1+r)\beta U'(C_{s+1})$$

$$(5) \quad A_{s+1}F'(K_{s+1}) = r$$

These are called the consumption (Euler) equation (4) and the equality between marginal product of capital and the world interest rate (5).  $U'(C_s)$  and  $F'(K_{s+1})$  are the marginal utility of consumption and marginal product of capital (associated with technology of the period) respectively. The relevant infinite-horizon

budget constraint<sup>5</sup> is

$$(6) \quad \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} (C_s + I_s) = ((1+r)B_t + \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} (Y_s - G_s))$$

Generally, there are inherent uncertainties that will affect consumption and investment decisions. In a stochastic environment, we make the assumption of rational expectations and can replace the utility maximization over time under certainty with the expected utility maximization over an infinite time period corresponding to eq. 1. Rearranging the budget constraint and writing  $TB_s = Y_s - C_s - I_s - G_s$  as the economy's trade balance in eq. (6) we obtain

$$(7) \quad - (1+r)B_t = \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} TB_s$$

The trade balance is the net output transferred to foreigners in each period. Suppose that  $Y_{s+1} = (1+g) Y_s$  where  $g > 0$  is the growth rate in output and that the economy maintains a steady debt-output ratio ( $B_s/Y_s$ ) so that  $B_{s+1} = (1+g) B_s$ . The current account identity would imply a steady imbalance of  $B_{s+1} - B_s = g B_s = TB_s$ , which yields

$$(8) \quad \frac{TB_s}{Y_s} = \frac{-(r-g)B_s}{Y_s} = \frac{-B_s}{Y_s/r - g}$$

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<sup>5</sup>This is based on the assumption that lenders will not permit an individual to die with unpaid debts and it would not be optimal for the individual to disappear leaving unused resources. Given the infinite time horizon, the countries are assumed to have the same behavior as individuals.



To maintain a constant debt-GDP ratio the country needs to pay out the excess of interest over its growth rate. Alternatively, the necessary trade surplus as a proportion of GDP is equivalent to the ratio of the debt to the world market value of a claim on the economy's entire future. The relationship between the trade balance as a proportion to GDP and the country's growth rate is positive.<sup>6</sup> There are, however, possibilities of a negative relationship between economic growth and trade balances. This can happen if the behavior of output is non-stationary.

If output follows a stochastic process

$$(9) \quad Y_{t+1} - Y_t = \phi(Y_t - Y_{t-1})$$

with  $0 < \phi < 1$ , then output will be a non-stationary random variable where

$$(10) \quad Y_t = Y_{t-1} + \sum_{s=-tz}^t \phi^{t-s} \varepsilon_s$$

In the above equation permanent output fluctuates more than the current output level. Consumption smoothing implies that an *unexpected* increase in output causes an even greater *increase* in consumption. Hence, a positive output innovation in this case implies a current account deficit.

The other possibility is the one where there is a trend productivity growth and a small developing economy is growing faster than the world economy. In this case, the debt-GDP ratio increases forever which is unstable. This is because a country is promoting higher growth now at the cost of future

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<sup>6</sup>The slow growing economies are likely to suffer a debt burden in the short-run. In 1991, the slow growing Argentina and Nigeria had external debt as 3.9 percent and 4.8 percent of GDP, respectively while for fast growing Thailand the proportion was only 0.2 percent (Obstfeld and Rogoff 1997).

economic growth. In this case, higher economic growth could lead to trade balance deficits and/or current account deficits. Under our dynamic framework, the debt-GDP ratio could increase if there is a positive output shock or the domestic growth rate<sup>7</sup> is higher than that of the world economy. Productivity shocks<sup>8</sup> can occur through terms of trade shocks and also through the liberalization policy in a developing economy. A temporary deterioration in terms of trade can cause a current account deficit, whereas a permanent deterioration would cause an immediate shift to the new lower consumption level consistent with the external balance.<sup>9</sup>

The model does not use explicitly real exchange rate changes which could come through liberalization and the adopted policies of the countries experiencing liberalization. Consumption and investment plans will be sensitive to changes in real exchange rates and trade liberalization may contribute to improvements in the expected future growth path. If the expected future growth path is raised by adequate reforms along with liberalization, it is rational for forward looking agents to increase present and future consumption

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<sup>7</sup>It is now a well-known proposition that with integrated global capital markets there can be no intercountry differences in returns to capital (risk-adjusted) and as capital flows to the country where the rate of return is higher the cross-country differences in marginal products of capital would disappear leading to a convergence in output per worker. This proposition has been empirically tested and a plausible conclusion to draw from the debate is that there is convergence in output per worker but it has been very slow (See Table II, Coefficient of LRGPCH70 and LRGPCH89).

<sup>8</sup>In the representative agent model, higher productivity growth will tend to weaken the current account as people borrow today against higher future income. In the overlapping generations model, productivity growth could raise the labor income of young workers but does not affect the wage incomes of older workers. As young savers will count more heavily in aggregate saving than old dissavers, saving will tend to rise and the current account to improve (Obstfeld 1995).

<sup>9</sup>We do not distinguish between permanent and temporary deterioration in terms of trade in the empirical study because many developing countries over a long period export primary commodities and terms of trade have either moved against primary products or have not changed drastically during the last 30 years.

and invest more. This will indeed worsen the savings-investment balance and would worsen the trade and current account balances. Countries in this case would have higher real exchange rates and build-up of debt but this will be consistent with the presented model with rational forward-looking agents in which inter-temporal budget constraints are satisfied. Some of the regression results of the static model in Section II are consistent with this conclusion where higher economic growth leads to deterioration in the trade and current account balances.

If we assume that the world real rate of interest<sup>10</sup> is not constant but is equal to the growth rate in developed economies then we have a model equation for the trade balance to GDP ratio where  $CA = B_{s+1} - B_s = rB_s + TB_s$  and the ratio of current account to GDP is equivalent to  $TB/GDP + rB/GDP = F(\text{GDP growth, Productivity shocks})$ . As productivity shocks are caused by terms of trade changes, growth in the developed world and liberalization regimes, these are considered to be determinants of productivity shocks in the trade balance to GDP ratios.

$$(11) \quad TB/GDP = F(\text{GDP growth, Terms of Trade, Growth in Industrial Countries, Liberalization})$$

Eq. 3.11 provided a reduced form relationship which can be estimated from the available sample information. Moreover, under a stochastic framework when output follows a non-stationary path

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<sup>10</sup>World rate of interest on loans provided by the World Bank and other multilateral bodies charge the interest rate prevailing in developed countries. In the long-run growth rates and real interest rates are not likely to diverge from each other.

the relationship between trade balance and output growth becomes negative.<sup>11</sup>

For current account to GDP percentages, the world interest rate that is determined by the growth rate in developed countries is used. So, our estimating equation for CA/GDP is the following:

$$(12) \quad \text{CA/GDP} = F(\text{World Interest Rate, GDP growth, Terms of Trade, Liberalization})$$

where the world interest rate is determined by the growth rate in developed economies.

In the above relationships, interactions between liberalization and GDP growth and liberalization and terms of trade are expected. The marginal effect of GDP growth on TB/GDP will be negative (or positive according to stationary output behavior) as developing countries are likely to grow faster than developed countries and their import propensity will be higher than export propensity in the short-run. Moreover, the marginal impact of the terms of trade will be positive as a favorable change in the terms of trade of developing economies will lead to an improvement in the TB/GDP ratio. The higher growth in developed economies will improve the trade balance to GDP ratio as the developing countries are likely to export more to the developed world (since growth in the industrialized world creates demand for commodities and raw-materials including intermediate products).

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<sup>11</sup>Liberalization could introduce non-stationarity in output behavior which we unfortunately could not investigate with merely 30 observations for each country and in some cases it is even less. Moreover, liberalization could bring structural change and even when the unit root hypothesis was not rejected it could be due to liberalization leading to economy wide changes and repercussions. Hence we have not used unit root tests to discover non-stationarity in output behavior.

#### IV. TRADE BALANCE AND GROWTH RELATIONSHIPS, STRUCTURAL CHANGE AND DYNAMIC PANEL MODELS

The estimation of the following two static models was conducted first. Both fixed effects and random effects models<sup>12</sup> were estimated without any lags.

$$(13) \quad \left( \frac{TB}{GDP} \right)_{it} = \delta_1 + \delta_2(ADVGR)_{it} + \delta_3(GROWTH)_{it} \\ + \delta_4(PPI)_{it} + \delta_5(LIBER)_{it} \\ + \delta_6(LIBGROWTH)_{it} + \delta_7(LIBPPI)_{it} \\ + \delta_8(LIBADVGR)_{it} + \varepsilon_{it} \\ i=1,2,\dots,42 \text{ and } t=1,2,\dots,31$$

and

$$(14) \quad \left( \frac{CA}{GDP} \right)_{it} = \varphi_1 + \varphi_2(ADVGR)_{it} + \varphi_3(GROWTH)_{it} \\ + \varphi_4(PPI)_{it} + \varphi_5(LIBER)_{it} \\ + \varphi_6(LIBGROWTH)_{it} + \varphi_7(LIBPPI)_{it} \\ + \varphi_8(LIBADVGR)_{it} + \varphi_9(DEBT)_{it} + \varphi_{10} \\ \times \left( \frac{DEBY}{GDP} \right)_{it} + \varphi_{11}(CINTEREST)_{it} + \zeta_{it} \\ i=1,2,\dots,42 \text{ and } t=1,2,\dots,31$$

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<sup>12</sup> Results of these can be obtained from the author. These models using panel data analysis differ according to whether they treat intercept parameters as random or fixed across the sample. The estimators in the random effects model are the generalized least squares estimators, and they combine the within and between country estimators using the corresponding residual variances as weights. For elementary panel data techniques see Johnston (1996). For special treatment of panel data models, see Baltagi (1995) and Wooldridge (2002).

The equation for a dynamic model is in the following general form:

$$(15) \quad y_{it} = \delta_1 y_{it-1} + \delta_2 y_{it-2} + \mathbf{X}_{it} \mathbf{B} + \alpha_i + \eta_t + \varepsilon_{it} \\ i = 1, 2, \dots, 42, \quad t = 1, 2, \dots, 31$$

$y_{it}$  is the trade balance or current account to GDP in percentages,  $\mathbf{X}_{it}$  is a set of explanatory variables namely liberalization, growth in real GDP, purchasing power of exports (terms of trade), and interactions of liberalization with purchasing power of exports and of liberalization with the growth rate in real GDP in developing and developed economies.  $\eta_t$  is the effect of time or year dummies and may be represented as the cyclical impact on trade balance to GDP percentages. When the dependent variable is current account to GDP percentages, the debt related variables are used, namely debt service to payments ratios, the annual growth in accumulated long-term debt and the percentage change in world interest rates.<sup>13</sup>

The sign of the coefficients is expected to be positive with respect to the purchasing power of exports and growth in developed economies while it is expected to be negative with respect to growth in real GDP and oil prices. Two-year lags are used on the assumption that lags are not likely to be longer.

Even if  $y_{it-1}$  and  $\varepsilon_{it}$  are not correlated, and  $t$  does not approach infinity ( $t = 31$  in our case) then estimation by fixed or random effects is not consistent even if  $n$  (number of countries) approaches infinity. Arellano and Bond (1991) suggest an alternative procedure that corrects not only for the bias introduced by the lagged endogenous variable, but also permits a degree of endogeneity in the

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<sup>13</sup>We expect the current account to deteriorate with an increase in debt, increase in service payments, and an increase in world interest rates. Expected signs are negative with respect to each one of them.

other regressors (such as Growth variable on the right hand side variable as a subset of the  $\mathbf{X}$  matrix). The Generalized Method of Moments Estimator first differences each variable and then uses the lagged values of each of the variables as instruments. Specifically,

$$(16) \quad \Delta y_{it} = \delta_1 \Delta y_{it-1} + \delta_2 \Delta y_{it-2} + \Delta \mathbf{X}_{it} \mathbf{B} + \Delta \varepsilon_{it}$$

The first three observations are lost due to lags and differencing. We assume that  $\varepsilon_{it}$  are not autocorrelated for each  $i$  at  $t = 4$ ,  $y_{i1}$  and  $y_{i2}$  are valid instruments for lagged variables. Similarly, at  $t = 5$ ,  $y_{i1}$ ,  $y_{i2}$  and  $y_{i3}$  are valid instruments. We thus estimate the dynamic model using the above procedure.<sup>14</sup>

### Results of Arellano-Bond Estimation on the Whole Sample for the entire period and sub-Periods

In Table III, the results of dynamic models are presented for the period 1980–1999 using sample data for 42 countries. The panel is unbalanced as we do not have data for all the years for all countries. Data for the earlier periods were not consistently available and hence we have excluded period 1970 to 1979. Our study is over the period 1980–1999. First differences remove the fixed effects and given the dynamics, lagged effects on changes in TBGDP1 and CAGDP1 are introduced in the respective trade balance and current account equations. It is found that both growth and lagged growth effects are negative on trade balance. This also confirms the hypothesis that faster domestic growth affects the trade balance adversely.

Liberalization increases current account deficits as in Table III. Overall liberalization impacts adversely upon trade balances but its effects come through the terms of trade interaction with liberalization. In Table III, liberalization is used as a dummy and

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<sup>14</sup>Monte Carlo simulation has shown that for panels with  $t = 5$  or  $6$ , the bias of the coefficients of lagged dependent variable can be significant, although the bias for the coefficients on other right hand side variables tends to be minor.

Table III  
Regression Coefficients, Z-statistic: Arellano-Bond Dynamic Panel Estimation 1980–99  
(42 countries Unbalanced Panel)

Name of the Variable	TBGDP1 <sup>A</sup>		CAGDP1 <sup>A</sup>		TBGDP1 <sup>B</sup>		CAGDP1 <sup>B</sup>	
	Coefficient	Z-statistic <sup>D</sup>	Coefficient	Z-statistic <sup>D</sup>	Coefficient	Z-statistic <sup>D</sup>	Coefficient	Z-statistic <sup>D</sup>
TBGDP1 <sup>E</sup> (−1)	0.7335***	29.44			<b>0.7028***</b>	<b>6.16</b>		
CAGDP1 <sup>E</sup> (−1)			<b>0.5198***</b>	<b>8.00</b>			0.4436***	7.92
GROWTH <sup>E</sup>	−0.0346*	−1.93	<b>0.0020</b>	<b>0.12</b>	− <b>0.0360</b>	− <b>1.32</b>	−0.0123	−0.64
GROWTH <sup>E</sup> (−1)					− <b>0.0335**</b>	− <b>2.23</b>	0.0039	0.45
PPI	0.0142***	3.35	<b>0.0021</b>	<b>1.69</b>	<b>0.0141**</b>	<b>2.79</b>	0.0072**	2.38
LIBER	0.3167	0.54	− <b>0.3442*</b>	− <b>1.90</b>	<b>0.7189</b>	<b>1.10</b>	0.4942	1.08
LIBPPI <sup>E</sup>	−0.0104**	−2.35			− <b>0.0053*</b>	− <b>1.79</b>		
ADVGR	0.0018	0.14	<b>0.0234***</b>	<b>3.02</b>	<b>0.0569**</b>	<b>2.17</b>	0.0266	1.31
ADVGR(−1)					− <b>0.1083</b>	− <b>3.61</b>	−0.0733***	−3.08
LIBGROWTH <sup>E</sup>	0.0129	0.43						
DEBTSR			<b>1.3365</b>	<b>0.78</b>			1.2015	0.79
GLTDOL			− <b>0.0058**</b>	− <b>2.12</b>			0.0062	0.95
CINTEREST			<b>0.0025</b>	<b>1.91</b>			0.0025	0.84
CONSTANT	0.0489**	2.76	<b>0.0373**</b>	<b>2.78</b>	<b>0.0351</b>	<b>0.53</b>	0.1315**	2.22



First Order AC	-12.94 (0.000)	<b>-3.04 (0.0024)</b>	<b>-3.10 (0.0019)</b>	-3.82 (0.0001)
Second Order AC	1.88 (0.0604)	<b>1.22 (0.2208)</b>	<b>1.07 (0.2845)</b>	0.71 (0.48)
Wald <sup>C</sup> $\chi^2$		<b>247.98 (8 DF)</b>	<b>359.03 (23 DF)</b>	3025.52 (25 DF)
Number of Obs	888	<b>849</b>	<b>537</b>	692
Sargan <sup>F</sup> Test $\chi^2$	655.35 (0.00)	<b>35.82(1.00)</b>	<b>15.10 (1.00)</b>	15.72(1.00)

\*\*\*Significant at 1% level, \*\*Significant at 5% level, \*Significant at 10% level.

<sup>A</sup>Time Dummies are not used.

<sup>B</sup>Time dummies used.

<sup>C</sup>Wald test is the test of the null hypothesis that all coefficients excepting the constant and time dummies, are zero.

<sup>D</sup>Z-statistic follows a normal distribution and 5% critical value is -1.96 or +1.96.

<sup>E</sup>For the growth and lagged TBGDP1 OR CAGDP1 variable two period lags are used as instruments. This includes the interactions of liberalisation with the right hand side variables.

<sup>F</sup>Sargan test of overidentifying restrictions is from the two-step estimation.

also a slope dummy where it is interacting with income terms of trade. This means that liberalization affects terms of trade and the terms of trade with liberalization has a negative impact on trade balance. In Table III, TBGDP1 and CAGDP1 equations are also estimated with time dummies in the last four columns while the first four columns do not use time dummies. Time dummies indicate that there are autonomous effects and such effects could be correlated with country-invariant advanced countries' growth rates. The terms of trade have significant positive effects on trade balance but the interaction with liberalization variable has negative effect (Table III).

## V. REGIONAL ANALYSIS AND SUB-PERIOD MODELS

It might be worthwhile to look at the results by regions and by sub-periods. Is there any evidence of a change in the relationship between trade balance and economic growth over different sub-periods? Our UNCTAD (1999) study demonstrated that the relationship between trade balance and GDP growth could have changed from one decade to the next. In order to study this aspect the estimates of the periods 1980–89 and 1990–99 are examined using the data of as many countries as possible. The estimation is based on panel data using the Blundell-Bond (1998) dynamic panel estimator. We now do not estimate the current balance to GDP equation. All results refer to TBGDP1 and they are obtained using System GMM and equation GMM<sup>15</sup> as they are explained in Bond (2000). These results are presented in Table IV.

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<sup>15</sup>First differenced GMM estimator (equation GMM) and the extended GMM estimator (system GMM) were studied through Monte Carlo experiments by Blundell and Bond and they showed that the extended estimator has a much smaller finite sample bias and much greater precision when estimating autoregressive parameters using persistent series. Both level and first differenced instruments are used in the system GMM while the equation GMM uses only the instruments in level form.

Table IV  
Blundell-Bond Dynamic Panel Estimators with System GMM and Difference GMM for  
TBGDP1 of 42 Countries

Name of the Variable	1980-89				1990-99			
	System GMM		DIFF-GMM		System GMM		DIFF-GMM	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
TBGDP1(-1)	0.9127***	20.49	0.7017***	3.41	0.9439***	13.98	0.5016***	5.38
GROWTH	-0.0400	-1.52	-0.0263	-1.24	-0.0862*	-1.72	-0.1214***	-2.66
GROWTH(-1)					-0.0423	-0.82	-0.1011***	-3.70
PPI	0.0109***	2.12	0.0093	1.37	0.0053***	3.17	0.0068**	2.36
ADVGR	0.0777	1.61	0.1101	3.28	0.0054	0.17	-0.0287	-1.28
LIBER	-1.2012	-1.20	-0.8278	-0.89	-1.2442	-1.13	-1.1325	-1.55
Year81/91	-0.3207	-0.41	0.1045	1.12	-0.3207	-0.41	-0.1405	1.39
Year82/92	1.3381	1.66	1.6162***	3.20	1.3381	1.66	-0.2950	-0.74
Year84/93	0.1346	0.36	0.3341	0.84	0.1346	0.36	-0.3708	-1.28
Year85/94	0.4103	0.92	0.8166**	2.03	0.4103	0.92	0.5598*	1.75
Year86/95	0.5796	0.90	1.2355***	3.33	0.5796	0.90		
Year87/96							0.3268	0.95
Year88/97	-0.6310	-1.75*	-0.4255	-1.28	-0.6310	-1.75*		
Year89/98	0.2055	0.49	0.1876	0.47	0.2055	0.49	0.0695	0.22
Year 99					-0.1174	-0.20	0.0965	0.21
Constant	-1.0411	-1.58	—		-1.0411	-1.58	—	
AR(1)	-2.76(0.006)***		-2.31(0.021)***		-2.76(0.006)***		2.59(0.01)***	
AR(2)	1.05(0.294)		1.09(0.274)		1.05(0.294)		-1.05(0.293)	
Hansen Test	$\chi^2(101) = 26.87(1.00)$		$\chi^2(96) = 23.68(1.00)$		$\chi^2(101) = 26.87(1.00)$		$\chi^2(112) = 19.54(1.00)$	
No. of Obs.	301		259		301		226	

\*\*\* Significant at 1% level; \*\*Significant at 5% level, \*Significant at 10% level.

Notes: 1. Year dummies are included.

2. Asymptotic standard errors, asymptotically robust to heteroscedasticity are used to report t-statistics.

3. First order AC and second order AC are tests of first-order and second-order serial correlation in the first differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation.

4. Hansen is a test of over-identifying restrictions, asymptotically distributed as  $\chi^2$  under the null of instrument validity, with degrees of freedom reported in parentheses.

5. The instruments used in each equation are: GMM (DIF)- TBGDP<sub>t-2</sub>...TBGDP<sub>t1</sub>, GROWTH<sub>t-1</sub>...GROWTH<sub>t1</sub>, PPI<sub>t-1</sub>...PPI<sub>t1</sub> and ADVGR<sub>t-1</sub>...ADVGR<sub>t1</sub>.

Terms of trade have significant effects on trade balance during the 1980–89 period with the two step system GMM. The growth variable does not have a significant relationship with TBGDP1 and this means that although the relationship is negative, it does not have harmful effects on trade balance. Liberalization on its own does not have significant impact on TBGDP1 during the 1980–89 period. There seems to be significant evidence that the relationship between trade balance and GDP growth is negative in the 1990–2000 decade while although the relationship is negative, it is not significant for the previous decade. Liberalization tends to have a negative impact on TBGDP1 over the period 1990–2000. Pursuit of trade liberalization by South East Asian countries contributed to high growth during the last two decades. This is the case for South Korea, Taiwan, Hong Kong, and Singapore. The two most populous countries in the world, China<sup>16</sup> and India, also achieved phenomenal increases in their rates of growth by pursuing for the first time, trade liberalization policies, particularly with the Association of South East Asian economies. (IMF, World Economic Outlook).

Table V reports results for African countries for two sub-periods 1980–89 and 1990–99 and also a comparative study of 1980–99 for Africa and Latin American including Asian regions. For the first period, all time dummies were insignificant. In an unbalanced panel when observations are differenced out very few observations are left for each of the periods, namely, 1980–89 and 1990–1999. The lagged dependent variable has a small coefficient although significant. The sign of the growth variable for 1990–1999 decade is negative and significant but not for the 1980–89 period. Liberalization has a negative and

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<sup>16</sup>China is excluded from our sample of countries because it has not adopted the market system and it is hard to state that it was a liberalized economy in any of the time periods.

Table V  
Regression Coefficients, t-statistic of Bond-Blundell Dynamic Panel Estimation, for AFRICA 1980–89, 1990–99,  
and 1980–1999 and Latin America, 1980–1999: With or Without Time Dummies

[illegible]

Table V  
(Continued)

Year -/93 <sup>A</sup>					-1.4840**	-1.97		
CONSTANT	—	—	—	—			0.0088	0.15
First Order AC	-2.92 (0.004)		-1.40 (0.162)		-4.36 (0.000)		-2.79 (0.005)	
Second Order AC	-1.12 (0.26)		-0.16 (0.871)		1.14 (0.255)		0.85 (0.394)	
Number of Obs	77		35		139		398	
Hansen Test $\chi^2$	76.68 (0.115)		46.89 (0.210)		131.23 (0.064)		2.91 (1.00)	

<sup>A</sup> Only significant year effects are reported \*\*\*Significant at 1% level, \*\*Significant at 5% level, \*Significant at 10% level.  
Notes:1. Year dummies are included in the second period and as they were insignificant in the first period, they were excluded.  
2. Asymptotic standard errors, asymptotically robust to heteroscedasticity are used to report t-statistics.  
3. First order AC and second order AC are tests of first-order and second-order serial correlation in the first differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation.  
4. Hansen is a test of over-identifying restrictions, asymptotically distributed as  $\chi^2$  under the null of instrument validity, with probability values reported in parentheses.  
5. The instruments used in each equation are: GMM (DIF)- TBGDP<sub>it-2</sub>...TBGDP<sub>i1</sub>, GROWTH<sub>it-2</sub>...GROWTH<sub>i1</sub>, PPI<sub>it-1</sub>...PPI<sub>i1</sub> and ADVGR<sub>it-1</sub>...ADVGR<sub>i1</sub>.

significant coefficient for the 1990–2000 time period and an increase in liberalization may lead to a 1.95 percentage point decline in trade balance, *ceteris paribus*. For the first period, advanced countries' growth has a significant role to play in improving trade balance. Overall, it is found that the relationship is different between the two periods and our hypothesis about liberalization<sup>17</sup> and domestic growth both having deteriorating impacts on trade balance in the 1990–1999 decade is confirmed. Africa is the continent that has suffered from droughts, civil war, AIDS, and limited international trade, and has been the recipient of insignificant Foreign Direct Investment. Economic growth was lowest in the African continent.

The results of the entire sample for African and Latin American economies including Asian countries are also presented in the same table. For the African economies, growth in OECD or advanced countries plays a positive and significant role in improving trade balance. This may imply that the behaviour overall is very different between two periods for African economies. For Latin American (including Asian) economies, growth has a negative impact on the trade balance; an increase in income terms of trade improves trade balance, liberalization is not significant and the dynamic model is plausible. Many time dummies for Latin America and Asian countries are significant so there is a great deal of autonomous effect on trade balance and as anticipated, the effect is positive up to 1988 and as we mentioned before

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<sup>17</sup>We used other variations of the equations for current account and trade balance variables. Growth was never significantly related to trade balance or current account in the first period. Liberalization has reduced both trade account and current account balances in Africa in the period 1990–2000. The dominant negative effect on trade balance comes from its interactions with terms of trade. Liberalization may deteriorate terms of trade as imports expand at a faster rate and import prices might rise faster than export prices leading to deterioration in terms of trade and this in turn could lead to trade balance deterioration. For African economies, liberalization interacting with growth has a positive impact on trade balance.

this was the period when both trade balance and economic growth improved.

In Table VI, the results of Latin American countries combined with Asian countries are presented for trade balance equations for the two different periods. It is found that the growth coefficients are not significant for the first period while for the second period they are highly significant and negative suggesting that growth

Table VI  
Regression Coefficients, t-statistic Bond-Blundell Dynamic Panel  
Estimation 1980–99: Latin America and Asia

TBGDP1: 1980–1989: DIF GMM			TBGDP1:1990–2000:DIF GMM	
Name of the Variable	Coefficient	t-statistic	Coefficient	t-statistic
TBGDP1(–1)	0.7473***	4.90	0.5066***	8.49
GROWTH	–0.0547	–1.41	–0.1679***	–3.65
GROWTH(–1)	–0.0377	–1.28	–0.0905**	–2.62
PPI	0.0103**	2.04	0.00985***	4.87
LIBER	–0.7098	–1.10	0.8669	1.22
ADVGR	0.1278***	3.44	–0.0408	1.65
CONSTANT	0.1078	1.34	–0.2158**	–2.21
First Order AC	–2.22 (0.027)		–2.46 (0.014)	
Second Order AC	1.46 (0.145)		–0.43 (0.668)	
Number of Obs	182		177	
Sargan Test $\chi^2$	10.63 (1.00)		10.35 (1.00)	

.\*\*\*Significant at 1% level, \*\*Significant at 5% level, \*Significant at 10% level.

Notes:1. Year dummies are included.

2. Asymptotic standard errors, asymptotically robust to heteroscedasticity are reported in parentheses.

3. First order AC and second order AC are tests of first-order and second-order serial correlation in the first differenced residuals, asymptotically distributed as  $N(0,1)$  under the null of no serial correlation.

4. Sargan is a test of over-identifying restrictions, asymptotically distributed as  $\chi^2$  under the null of instrument validity, with degrees of freedom reported in parentheses.

5. The instruments used in each equation are: GMM (DIF)-  $TBGDP_{it-2}, \dots, TBGDP_{i1}$ ,  $GROWTH_{it-2}, \dots, GROWTH_{i1}$ ,  $PPI_{it-1}, \dots, PPI_{i1}$  and  $ADVGR_{it-1}, \dots, ADVGR_{i1}$ .



deteriorates trade balance. The decade of 1990 for Latin America<sup>18</sup> shows a worsening of trade balance and this is captured to some extent in time dummies. Latin America has not shown very high growth like ASEAN economies during the last decade because no new trade block has emerged to pursue trade liberalization. MERCOSUR was established in 1991 and consisted of only four countries. The growth in advanced countries improves trade balance in Latin American and Asian economies. Terms of trade have a positive impact on trade balance in both periods while liberalization on its own is not significant in either period. Again, when two periods are studied separately and with the first differencing procedure the number of observations is small. The method of System-GMM did not provide significant results on a large number of variables.

## VI. SUMMARY AND CONCLUSION

Our study has many limitations as data inadequacies dominate the model estimation. The measures of trade liberalization such as Sachs-Warner (1995) or Wacziarg (2001) do not take into account different intensities of liberalization in different time periods. Our study has not considered liberalization attempted by any developed economy. Tariff and non-tariff barriers on a significant scale exist in developed countries for agricultural products largely exported by developing economies.

Nevertheless, we argue that liberalization would lead to higher economic growth if trade reforms are carried out and political stability prevailed. A diverse set of countries have experienced

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<sup>18</sup>We only considered trade balance to GDP and two models, one with time dummies and another without time dummies are estimated. Growth is significantly negatively related to trade balance in both models. What we can infer here is that faster economic growth in Asian and Latin American countries would lead to a decline in trade balance as import growth far exceeds export growth. Surprisingly, growth in advanced countries does not remove pressure on trade balance or current account balance.

different effects of liberalization and this is reflected in our regional study. One of the major issues emerging from this study is the adverse impact of liberalization and economic growth on trade balances of developing countries which implies that the capital financing requirements would increase in the presence of trade deficits in the short and medium run for developing economies. Globalization has made both developing and developed countries highly interdependent. If developing countries were to catch up with developed countries in their per capita income, enormous flows of multilateral and private capital may be needed from developed countries by way of capital financing.

Our study seems to indicate that there are differing patterns on trade deficits across various geographical regions and also during the decade of 1990–1999. Trade liberalization has increased the imports of many developing countries and although after the initial phase of import growth exports picked up in some developing countries, on the whole, it remained insufficient to narrow the trade deficits. Rapid liberalization was sometimes followed by large inflows of capital, currency appreciation, and mounting trade deficits, but it often ended up with a crisis involving reversal of capital inflows, collapse and overshooting of exchange rates, sharp cuts in imports and a deep economic contraction.

We find that trade liberalization does have a significant relationship with economic growth and/or trade deficits in the short to medium run. Our significant relationship between liberalization and trade deficits and economic growth and trade deficits is for Latin American and Asian economies for the latter decade. This seems to indicate that their capital financing requirements are much higher than the world community has been able to provide and rapid liberalization has often caused financial crisis and debt problems in Latin American and some Asian economies.

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## APPENDIX 1

## Variables

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ADVGR	Growth rate in developed countries (%)
CA	Current account
CAGDP	Current account balance to GDP
CAGDP1	Current account balance to GDP (%)
CG	Government share of CGDP
CGDP	Real Gross Domestic Product per Capita (current prices)
CI	Investment share of CGDP
CINTEREST	Annual percentage change in world interest rate (%)
DEBRSIMP	Debt service as a percentage of total imports (%)
DEBT	Long term outstanding debt (US\$ mil.)
GDEBTSIMP	Percentage change in debt service in total imports of goods and services (%)
GROIL	Annual percentage change in oil price (%)
GROWTH	Annual percentage change in real GDP using Summer, Heston, and Aten's Purchasing Power Parity Real GDP
INTEREST	World interest rate
KI	Constant price Investment as a share of Real GDP (based on Laspeyer's index)
LIBADVGR	Liberalization dummy interacting with developed countries growth rates (%)
LIBER	Liberalization dummy taking the value 1 when the country was liberalized
LIBERTM	Time period elapsed from date of liberalization
LIBGROWTH	Liberalization dummy interacting with growth in country under consideration
LIBPPI	Liberalization dummy interacting with income terms of trade (index)
OIL	Crude oil price
OPENK	Exports plus imports at constant prices as a percentage to constant price GDP (%)
OPENNESS	Exports plus imports as a share of GDP (%)
PPI	Income terms of trade = (value of exports / unit value of imports) * 100
RERI	Real Exchange rate
TB	Trade balance
TBGDP	Trade balance to GDP
TBGDP1	Trade balance to GDP (%)

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## APPENDIX 2

### Names and Sources of Variables: Sources and Descriptions of the Variables Used in the Regression

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GROWTH	Real per capita growth rate of GDP per year for example $G7089 = (\log(\text{GDP}89) - \log(\text{GDP}70))/19$ ; Periods 1970–89, 1980–89, 1989–98. Summers, Heston, and Aten (2002)
LRGDPCH	Real GDP per capita in (1996 international prices) Source: Summers, Heston, and Aten (2002)
LIBER_SW_1970–89	Openness indicator for 1970–89.
LIBER_SW_xx	Cross-sectional openness indicator constructed from Sachs and Warner’s liberalization dates from xx = 1970, 1980, 1989
LIBER_WW_1990–99	Openness Indicator for 1990–99, constructed by Wacziarg and Welch (2003)
POL	Composite dummy variables indicating extreme political repression and unrest: Sachs and Warner (1995)
SEC	Secondary School enrolment rate, 1970, 1980, 1985. Source: Barro and Lee (1994)
PRI	Primary School Enrolment rate, 1970, 1980, 1985. Source: Barro and Lee (1994)
GVXDxE	Ratio of government consumption spending net of spending on the military and education to real GDP, averaged 1970–84, Source: Barro and Lee (1994)
CG	Ratio of Real Government Consumption expenditure to real GDP for periods 1970–80, 1980–89, and 1989–98. Source: Summers, Heston, and Aten (2002)
REVCoup	Number of revolutions and coups per year, averaged over period 1970–85, Source: Barro and Lee (1994)
REVOL	Number of revolutions per year, averaged over periods 1970–80, 1980–89, and 1990–98. Source: Banks (2001)
ASSASS	Number of assassinations per million population per year, averaged over the relevant period, 1970–85, 1970–80, 1980–1989, and 1989–1998. Source: Banks (2001)
PPIDEV	The deviation of the log of the price level of investment (PPP investment divided by exchange rate relative to the United States) from the cross-country sample mean in 1970. Source: Summers, Heston, and Aten (2002)
INV	Ratio of real gross domestic investment (public and private) to real GDP, averaged over the period 1970–89. Source: Barro and Lee (1994)
DENSI	Population (in thousands) divided by land area (in square meters), 1960, 1970, 1980. Source: Summers, Heston, and Aten (2002) (population data) and <i>CIA World Factbook</i> (land area)
GROWTH	FIXED and Random Effects Models
INVESTMENT	Real per capita growth rate of GDP per year (annual data). Source: Summers, Heston, and Aten (2002)
OPENNESS	Investment rate. Source: Summers, Heston, and Aten (2002)
	Ratio of imports plus exports to GDP. Source: Summers, Heston, and Aten (2002)

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