

*Muhammad Zakaria<sup>\*</sup>, Eatzaz Ahmed<sup>\*\*</sup>*

## **OPENNESS–GROWTH NEXUS IN PAKISTAN: A MACRO–ECONOMETRIC ANALYSIS**

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The paper empirically examines the effects of trade openness policy on economic growth in Pakistan using various channel variables. Quarterly data is used for the period 1981/82 to 2007/08. The results of GMM estimates indicate that there are ten broad pathways through which trade openness policy has an indirect effect on growth. Trade openness policy positively affects growth through its impact on physical capital, human capital, foreign investment, inflation, real exchange rate, foreign debt, corruption and foreign exchange market distortions, while it negatively affects growth through government consumption and democracy. The results also indicate that the positive effects outweigh the negative ones, thereby delivering the overall positive effect of trade openness policy on output growth. This effect is economically reasonable and statistically significant. This result is robust to alternative estimation techniques, equation specifications and the inclusion of some other channel variables.

**Keywords:** trade openness, output growth, Pakistan

**JEL Classification:** C13, C22, F13

### **1. INTRODUCTION**

Over the past sixty years, particularly in the last three decades, one of the pronounced characteristics of the world economy has been that developing countries have experienced extensive and rapid trade liberalization. The simplification of import procedures, the reduction or elimination of quantitative restrictions and the rationalization of the tariff structures are the most widespread reforms. The feedback effect of trade openness on output growth is the most significant argument of the classical and neoclassical economists. The improved economic growth of developing countries, which have undergone extensive trade policy reforms during the last three decades, validates Adam Smith's view who, over two hundred years ago, argued that opening up to the international market might enhance economic growth by stimulating specialization. The benefits of trade openness include, among others:<sup>1</sup> gains from improved allocative efficiency in line with social

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<sup>\*</sup> COMSATS Institute of Information Technology, Islamabad, Pakistan

<sup>\*\*</sup> Quaid-i-Azam University, Islamabad, Pakistan

<sup>1</sup>For details, see, among others, Edwards (1998), Wacziarg (2001) and Barro and Sala-i-Martin (2004).

marginal costs and benefits, and resource relocation according to their comparative advantage; gains through increased access to a greater variety of goods, which increases productivity through providing less expensive and higher quality intermediate inputs; gains via technological spillovers and the international transmission of knowledge from advanced nations whether licensed or embodied in imported (intermediate) capital goods or through increased foreign direct investment; gains from scale economies and economies of scope that arise in wider markets and a more economically rational market structure; gains in efficiency via greater domestic and international market competition; and gains through shakeup of industry that may create a Schumpeterian environment especially conducive to growth. More importantly, import competition stimulates domestic producers to improve their X-efficiency and to catch up with technology.

On the cost side, some studies have criticized the positive link between trade openness and growth. The most prominent trade openness skeptics include Krugman (1994) and Rodrik (1995), who argue that the effect of free trade on growth is, at best, very tenuous, and, at worst, doubtful. Some studies point out the prevalence of trade-oriented policies pessimism as far as developing countries are concerned (Bhagwati, 1988; Riedel, 1988). Young (1991) puts forward that when comparative advantage patterns allow a country to specialize in goods where technological innovations or learning by doing are largely exhausted, trade openness may actually condense long-term growth. Mosley (2000) goes on to argue that growth responds positively to higher levels of effective protection, particularly if protection promotes investment in the research-intensive sectors of the relevant country. Vamvakidis (2002) shows that the positive correlation between free trade and growth is only a recent phenomenon and that trade openness improves output growth in the medium-term (several decades) but not in the very long run. Grossman and Helpman (1991) argue that, theoretically, the relationship between trade openness and long-term growth is ambiguous.

Taking a pragmatic stance, some studies have shown that free trade and growth remained positively correlated during the last three decades (Edwards, 1992, 1998; Dollar, 1992; Levine and Renelt, 1992; Sachs and Warner, 1995; Greenaway *et al.*, 2002; Wacziarg, 2001; Wacziarg and Welch, 2003; Barro and Sala-i-Martin, 2004).<sup>2</sup> In turn, some studies such as Greenaway and Sapsford (1994), Shafaedin (1994) and Jenkins (1996), find little evidence about positive linkages between trade openness and growth.

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<sup>2</sup> For earlier literature review see USITC (1997).

Vamvakidis (2002) even finds a negative correlation in the early period of the twentieth century (also see Harrison and Hanson, 1999). Rodriguez and Rodrik (2000) have questioned the empirical results on trade openness and growth, pointing to the methodological problems associated with the measurement of openness and the specification of the estimated equations.

In fact, a number of issues have been at the core of these controversies. Firstly, there are flaws in the econometric studies aimed at establishing the causality between trade openness and growth. Secondly, sample sizes and composition vary as do methodological approaches. Thirdly, most of the studies cover only the early phase of trade openness experiences in developing countries (early and mid-1980s), while free trade and growth relationship is only a recent phenomenon. Fourthly, hitherto theoretical models remained blurred in providing channels through which trade policy openness affects economic growth. Fifthly, the empirical literature on the subject has been affected by data quality problems, particularly for developing countries. Sixthly, the absence of profound trade openness measures further complicated the situation. Seventhly, almost all of the previous empirical studies focused on cross-country analysis and overlooked the time-series framework, thereby casting doubt about their outcomes regarding free trade-growth relationship. Finally, most of the studies have not tackled the endemic problem of simultaneity accurately in econometric settings and, hence, delivered often unconvincing and contradictory results. Because of these limitations, further research on this important topic is certainly called for.

Pakistan implemented trade reforms in the early 1980s and trade liberalization was institutionalized. This process of trade liberalization continued in the 1990s and into the early years of the next century as well. However, any authentic work on the openness–growth relationship in Pakistan is limited. The only studies are Khan and Saqib (1993) and Yasmin *et al.* (2006). The first study finds positive effects of trade openness on growth in Pakistan, while the second study finds the negative effects. The models used by these studies are theoretically weak and the results obtained are not reliable as they are prone to the endogeneity problem. The present study is expected to make a significant contribution to the literature in Pakistan. The objective of this study is to examine in detail whether the changing trade reforms in Pakistan have affected its long-term output growth rate. More importantly, the present study will explore in depth the channel variables through which trade openness is expected to affect the overall

economic performance of Pakistan, applying macroeconometric analysis. Quarterly data will be used for the period 1981/82 to 2007/08.

The rest of the paper is organized as follows: Section 2 discusses the theoretical framework, Section 3 provides the estimation results, Section 4 provides a sensitivity analysis and Section 5 presents the forecasting analysis. The final section concludes the paper.

## **2. FRAMEWORK OF ANALYSIS**

### **2.1. Theoretical Underpinnings**

In literature, different theories/approaches have evolved to analyze the impact of trade openness on economic growth. These include Rank Correlation Statistics, Static Allocative-Efficiency Gains Theory, New Classical Approach, and New (Endogenous) Growth Theory. The earlier approach evolved to analyze the impact of trade openness on economic growth is rank correlation statistics.<sup>3</sup> A positive significant Spearman rank coefficient indicates that trade openness is beneficial for growth. This concept is criticized on several grounds. First, by looking at the correlation coefficient between trade openness and growth, the (possible) role of other factors on growth is ignored. Second, it overlooks the issue of causality between openness and growth. Third, this approach is not based on firm theoretical ground. The static allocative-efficiency gains theory postulates that greater trade openness favourably affects the level of output. According to this theory, the removal of trade barriers expands the feasible set of consumption possibilities by providing a more efficient technology to transform domestic resources into goods and services. Thus, efficiency gains from a better allocation of resources increases the level of output. Moreover, the reduction of trade barriers reduces other costs of a less open trade regime, for instance, deadweight losses arising from domestic monopolies, costs arising from scale inefficiency, technical inefficiency or X-inefficiency and costs of rent-seeking and directly unproductive activities. Thus, in static allocative-efficiency gains theory, a liberalized economy, by reducing all these costs, will increase output growth.

According to the neoclassical approach (based on the neoclassical production function) trade openness (proxied by increased level of exports)

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<sup>3</sup> See Michaely (1977) and Balassa (1978) for an earlier application of this approach.

affects output; by generating positive externalities on the non-export sectors; and by creating productivity differential in favour of the export sector. Therefore, it is considered that enhanced exports (i.e. increased trade openness) will have a beneficial effect on output.<sup>4</sup> However, a critical problem with this model is that the channel variables through which trade openness is supposed to affect output growth are not well specified. Further, in the neoclassical growth model, trade and other ancillary variables affect the level of output, not the growth rate of output.

The new endogenous growth theory provides a sound theoretical framework for trade openness – output growth relationship. This theory stipulates that trade openness in the long run can favourably affect output growth rate via technological transfers and increased market size facing domestic exporters, which increases returns to innovation, thereby enhancing the country's specialization in research-intensive activities. A more convincing feature of new growth theory is that it identifies a number of channel variables through which trade openness is expected to affect long-term economic growth (see Krueger, 1990; Dornbusch, 1992; and Wacziarg, 2001). Through some channel variables, trade openness affects output growth positively while through others it affects growth negatively. Thus, under this theory the impact of trade openness on growth is theoretically ambiguous, thereby leaving an open question for empirical investigation.

## 2.2. Theoretical Framework

The proposed theoretical framework is summarized in Figure 1. Basically, the theoretical framework is based on two parts. In the first part, we will model trade equations to examine the effect of trade liberalization policies on exports, imports and trade balance. From these trade equations a trade policy openness index will be formulated. In the second part, by using this trade policy openness index, we will model the effect of trade openness policy on output growth through various channel variables. The first part has already been done by Zakaria (2012) and a trade openness policy index has already been formulated. This paper focuses on the second part. For this purpose it evaluates the theoretical basis of the ten channel variables through which openness is likely to affect output growth in Pakistan. These channel variables are presumed to capture most of the influence of trade openness on economic growth and they are explained below one by one.

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<sup>4</sup> Feder (1983) provides the first formal empirical analysis using this approach.

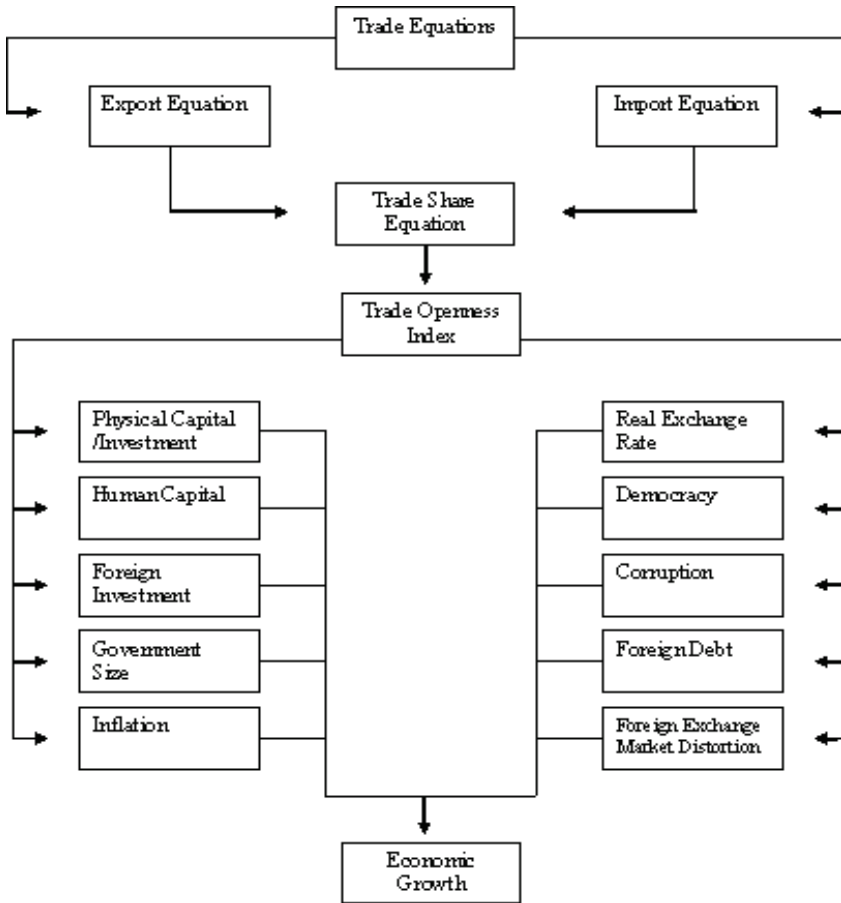


Figure 1. Schematic Representation of Analytical Framework

Source: author's own formulation

1. **Physical Capital.** Baldwin and Seghezza (1996) have documented a number of ways through which trade openness affects physical investment. Firstly, trade openness influences investment through the size of market (market effect). As argued by Adam Smith, small market size restrains the division of labour, therefore, open countries exploit increasing returns to scale. Trade openness thus provides the type of big-push effect on capital accumulation. Therefore, new firms in export markets bring about fixed investment with trade openness. Secondly, trade openness removes

restrictions on the imports of intermediate capital goods, while lowered tariffs reduce the cost of these capital goods and hence increase the rate of return on investment. With inter-temporal optimizations, this will increase the steady-state capital stock and will boost growth in the transition. Thirdly, the traded sector is relatively more capital intensive than the non-traded sector and the competition in the international market of machinery and capital equipment lowers the price of capital, thereby promoting the process of capital accumulation in the domestic country. Fourthly, when relative labour abundant countries open up their economies, they are likely to experience an increase in the wage-rental ratio as factor price equalization will increase the wage rate and will reduce the price of capital goods. This will result in a greater level of investment. Finally, trade openness increases investment and capital stock via efficiency gains (or elimination of X-inefficiency), which in turn increases output growth. In the endogenous growth models of Barro (1990, 1991), investment positively affects growth rate as investment has positive spillovers on output growth.

2. **Human Capital.** There has been little empirical research on the effects of trade on either the incentives to accumulate human capital (e.g. through schooling or on-the-job experience) or on the labour force participation rate. The example of the East Asian Tigers (Hong Kong, Korea, Singapore, and Taiwan), which experienced rapid increase in labour force participation and schooling, and unusually high rates of economic growth, were relatively open compared to other developing countries, is suggestive of possible linkages between openness, human capital formation, and labour force participation. Trade openness might permit more efficient education technologies either by importing better techniques and equipment or by permitting higher education abroad. Moreover, a liberal trade regime is likely to raise the quality of human capital through the learning-by-doing process. All this will lead to an increase in the level of human capital in the country. Theoretically, the effect of human capital on output growth is positive.

3. **Foreign Investment.** Trade openness and foreign direct investment (FDI) are linked in a number of ways. For instance, FDI brings the latest technology to the recipient country in terms of capital goods which are later copied, and in terms of transfer of knowledge and know-how. FDI may work as a substitute for trade openness (in the case of tariff-hopping investment) or as a complement for trade openness (in the case of intra-firm trade). Theoretical literature demonstrates that FDI is encouraged in open countries more than in closed countries (Singh and Jun, 1995). The new growth theory postulates that FDI positively affects the output growth of the host country.

4. **Government Consumption.** The pioneering work on the association between government size and trade openness is Cameron (1978). Cameron argues that public spending should be higher in more liberalized countries since it reduces external demand and supply shocks (also see Alesina and Wacziarg, 1998).<sup>5</sup> However, some researchers argue that countries that open up their economies to international trade are likely to have a predilection in favour of free markets and prefer smaller government. Therefore, open economies go for the laissez-faire argument and limited taxation to maintain price competitiveness and their attractiveness for foreign investors.

Barro (1990, 1991) states that government has to play its role for the provision of a certain level of public goods and services to its citizens. In this respect, big government is beneficial for economic growth. However, non-productive government expenditure and inefficient investment selections may reduce output growth rate. Further, distortionary taxation reduces private savings and profits, which discourages investment and hence growth. Thus, the net effect of government size on growth is ambiguous.

5. **Inflation Rate.** Both theoretical and empirical literature reveals an inverse relationship between inflation and trade openness (Romer, 1993).<sup>6</sup> There are different theories that explain this inverse impact of trade openness on inflation. As countries specialize according to their comparative advantage, more open economies are projected to have lower price levels than closed economies given that the effects of non-tradable goods on the deviation from purchasing power parity are diminished due to trade openness (Dollar, 1992; Rodrik, 1998b). Moreover, in liberalized countries, the prices of traded goods converge across countries because of free trade, therefore, there is a lower degree of price distortion in outward-looking countries. Romer (1993) asserts that rates of inflation are lower in smaller more open countries, arguing that real depreciation, say due to non-anticipatory monetary expansion, produces harmful effects, like increased cost of production, that are greater in more open countries, so the authorities will spend less and hence the inflation rate will be lower. Similarly, Cukierman *et al.* (1992) document that in small open countries most of the revenues are generated through (given levels of) tariffs and less through other sources like

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<sup>5</sup> Trade openness may also increase government spending by enhancing the country's ability to borrow from external sources. To control for this possibility, the debt to GDP ratio will be included as an independent variable in the government size equation (also see Rodrik, 1998b).

<sup>6</sup> However, it is possible for an open economy to import inflation from the rest of the world via the prices of manufactured or raw material imports.



seignorage, which results in lower rates of inflation. A general consensus exists among economists that moderate inflation helps in promoting output growth, while inflation at high levels distorts output growth.

6. **Real Exchange Rate.** When a country opens its economy for international trade, the demand for traded goods will increase and the demand for non-traded goods will decrease due to relative price changes. If the Marshall-Lerner Condition is satisfied, the real exchange rate will be depreciated to attain internal as well as external balances. Similarly, many studies show that permanent tariff reductions lead to real depreciation through the strengthening of import demand, assuming that all goods are normal and that substitution occurs across all goods and that the substitution effect dominates the income effect (Edwards and Wijnbergen, 1987; Connolly and Devereux, 1995). In turn, Calvo and Drazen (1998) put forward that trade liberalization of an uncertain duration can increase the consumption of non-traded goods, and hence can appreciate the real exchange rate. Empirical literature suggests that trade liberalization leads to the devaluation of local currency (Hau, 2002; Li, 2004).

In classical models, if the Marshall-Lerner Condition holds, real exchange rate devaluation will improve output growth by increasing exports – demand-side shocks. Devaluation increases the prices of imported intermediate goods; it adversely affects economic growth – supply-side shocks. To be brief, the prospective impact of a sustained real depreciation on output growth is uncertain and hence becomes an empirical issue. Generally, it is found that devaluation improves output growth.

7. **Democracy.** According to Rodrik (1998a), countries that have gained most from international trade are those who have strong institutions at home to handle the conflicts that trade openness poses. Democratic government is one such kind of institution. In literature, a favourable effect of trade openness on democracy has been documented since open countries have consistently been found more strongly democratic than closed countries. The implication is that globalization promotes growth, which in turn fosters democracy because development is accompanied by the emergence of a middle class demanding expanded political rights that eventually promote democracy (Lipset, 1959). However, some studies also point to the opposite relationship between trade openness and democracy (Li and Reuveny, 2003).

Some studies claim a positive association between democracy and economic growth and argue that a growth pattern appears to be more stable under a democracy (Persson and Tabellini, 2006). In turn, some studies prove the negative effects of democracy on output growth by arguing that

democracies lead to inefficient investments, protect the interest of rent-seekers and do not utilize resources efficiently (Tavares and Wacziarg, 2001).

8. **Corruption.** Theoretical literature specifies basically four identified channels through which trade openness reduces corruption: fewer and less stringent trade restrictions; increased foreign competition; more international investment; and fewer opportunities for local bureaucrats to demand bribes. It is argued that corruption adversely affects output growth as corruption reduces investment opportunities and leads to more income inequality (Mauro, 1995).

9. **Foreign Debt.** Many developing countries are less open as they make their fiscal revenues from high level of tariffs and other trade taxes. After liberalizing their trade, if these countries face severe fiscal balance problems they will increase their dependence on foreign resources to accomplish their development programs. In this sense trade openness is supposed to increase the level of foreign debt in initially closed countries. Alternatively, if trade openness increases the revenues and foreign exchange earnings of these countries by increasing their net exports and foreign direct investment, then the dependence on foreign debt will be decreased in initially highly restricted countries. Trade openness also reduces external debt by attracting FDI – a cheaper source of foreign capital than foreign borrowing – and increasing credibility in the international capital market, which leads to a high level of capital inflows.

Foreign debt can increase output growth if it is used for productive purposes. In turn, external debt may thwart output growth if it decreases domestic savings. Further debt servicing payments reduce the funds available for development programs which also reduces output growth. Pattillo *et al.* (2002) have shown that external debt has positive effects on output growth at low levels while it negatively affects output growth beyond a threshold level (the debt Laffer curve).

10. **Foreign Exchange Market Distortions.** The black (or the parallel) market premium (BMP) above the official exchange rate is widely used to serve as a proxy for governmental distortions of foreign exchange markets. BMP reflects the excessive demand for tradables and hence for foreign assets which is not satisfied by the official foreign exchange market. The greater the control on the use of official foreign exchange, the larger the premium on the black market exchange rate. Thus, theoretically under certain conditions, BMP is directly related to trade restrictions or lack of openness (Matin, 1992). High BMP means that a country is following protectionist policies, since a high BMP plays exactly the same role as an import tariff, while a low value of BMP is indicative that the country is following an

outward-oriented policy. Thus, trade openness is expected to reduce foreign exchange market distortions while trade restrictions increase it. Foreign exchange market distortions increase the prices of imported inputs, which lead to lower rates of capital accumulation and hence a lower output growth rate.

11. **Recapitulation.** We estimate a structural growth model comprising of twelve equations, which include one output growth equation, one trade openness policy index equation and ten channel variables equations. The output growth equation includes both endogenous and exogenous variables. The endogenous variables included are basically the channel variables. The exogenous variables included in the growth equation are government stability, defense expenditure and the law and order situation. Similarly, apart from the openness index, channel equations also include both endogenous and exogenous variables. Mathematically, the twelve equations of our structural growth model are listed as below:

$$Y_t = \rho_0 + \rho_1 y_{tint} + \rho_2 inv_t + \rho_3 h_t + \rho_4 \hat{f}_t + \rho_5 g_t \\ + \rho_6 INF_t + \rho_7 rer_t + \rho_8 DEMOC_t + \rho_9 COR_t + \rho_{10} fdt_t \\ + \rho_{11} FEMD_t + \rho_{12} GS_t + \rho_{13} de_t + \rho_{14} LO_t + \rho_{15} y_{t-1} + \eta_{1t}$$

$$OPENNESS_t = \chi_0 + \chi_1 y_{tint} + \chi_2 Y_t + \chi_3 rer_t + \chi_4 FEMD_t \\ + \chi_5 tot_t + \chi_6 pop_t + \chi_7 OPENNESS_{t-1} + \eta_{2t}$$

$$inv_t = \alpha_0 + \alpha_1 OPENNESS_t + \alpha_2 y_{tint} + \alpha_3 h_t + \alpha_4 \hat{f}_t + \alpha_5 rer_t + \alpha_6 DEMOC_t \\ + \alpha_7 COR_t + \alpha_8 fdt_t + \alpha_9 GS_t + \alpha_{10} LO_t + \alpha_{11} \hat{f}_t + \alpha_{12} dc_t + \eta_{3t}$$

$$h_t = \beta_0 + \beta_1 OPENNESS_t + \beta_2 y_{tint} + \beta_3 inv_t + \beta_4 DEMOC_t \\ + \beta_5 COR_t + \beta_6 edu_t + \beta_7 urb_t + \beta_8 IMR_t + \beta_9 dr_t + \beta_{10} h_{t-1} + \eta_{4t}$$

$$\hat{f}_t = \lambda_0 + \lambda_1 OPENNESS_t + \lambda_2 y_{tint} + \lambda_3 inv_t + \lambda_4 h_t \\ + \lambda_5 g_t + \lambda_6 rer_t + \lambda_7 fdt_t + \lambda_8 GS_t + \lambda_9 LO_t + \lambda_{10} w_t + \lambda_{11} infr_t + \eta_{5t}$$

$$g_t = \delta_0 + \delta_1 OPENNESS_t + \delta_2 y_{tint} + \delta_3 inv_t + \delta_4 h_t + \delta_5 INF_t + \delta_6 DEMOC_t \\ + \delta_7 COR_t + \delta_8 fdt_t + \delta_9 GS_t + \delta_{10} urb_t + \delta_{11} dr_t + \delta_{12} pd_t + \delta_{13} I_t + \eta_{6t}$$

$$INF_t = \gamma_0 + \gamma_1 OPENNESS_t + \gamma_2 y_{tint} + \gamma_3 DEMOC_t + \gamma_4 GS_t + \gamma_5 fdt_t \\ + \gamma_6 dc_t + \gamma_7 w_t + \gamma_8 I_t + \gamma_9 INF_t^* + \gamma_{10} NERD_t + \gamma_{11} INF_{t-1} + \eta_{7t}$$

$$rer_t = \theta_0 + \theta_1 OPENNESS_t + \theta_2 y_{tint} + \theta_3 inv_t + \theta_4 g_t + \theta_5 INF_t + \theta_6 fdt_t \\ + \theta_7 tot_t + \theta_8 dc_t + \theta_9 INF_t^* + \theta_{10} NERD_t + \theta_{11} CINF_t + \theta_{12} fer_t + \theta_{13} rer_{t-1} + \eta_{8t}$$

$$DEMOC_t = \sigma_0 + \sigma_1 OPENNESS_t + \sigma_2 y_{tint} + \sigma_3 inv_t + \sigma_4 g_t \\ + \sigma_5 LO_t + \sigma_6 IMR_t + \sigma_7 POLCON_t + \sigma_8 LEX_t + \eta_{9t}$$

$$COR_t = \vartheta_0 + \vartheta_1 OPENNESS_t + \vartheta_2 y_{tint} + \vartheta_3 inv_t + \vartheta_4 h_t \\ + \vartheta_5 g_t + \vartheta_6 DEMOC_t + \vartheta_7 de_t + \vartheta_8 urb_t + \vartheta_{13} COR_{t-1} + \eta_{10t}$$

$$fdt_t = \omega_0 + \omega_0 OPENNESS_t + \omega_2 y_{tint} + \omega_3 \hat{f}_t + \omega_4 g_t + \omega_5 INF_t + \omega_6 rer_t \\ + \omega_7 DEMOC_t + \omega_8 COR_t + \omega_9 GS_t + \omega_{10} dc_t + \omega_{11} I_t + \omega_{12} CINF_t + \omega_{13} fer_t + \eta_{1t}$$

$$FEMD_t = \psi_0 + \psi_1 OPENNESS_t + \psi_2 y_{tint} + \psi_3 g_t \\ + \psi_4 tot_t + \psi_5 dc_t + \psi_6 NERD_t + \psi_7 fer_t + \psi_8 TD_t + \eta_{12t}$$

where the lower case letters denote that the underlying variables are in natural log form. Various variables are defined as follows:

$Y_t$  = growth rate of real GDP per capita

$y_{tint}$  = initial income

$inv_t$  = physical capital accumulation/investment

$h_t$  = human capital

$\hat{f}_t$  = foreign investment

$g_t$  = government consumption

$INF_t$  = inflation rate

$rer_t$  = real exchange rate

$DEMOC_t$  = democracy

$COR_t$  = corruption

$fdt_t$  = foreign debt

$FEMD_t$  = foreign exchange market distortions

$GS_t$  = government stability

$de_t$  = defense expenditure

$LO_t$  = law and order

$OPENNESS_t$  = trade openness policy index

$tot_t$  = terms of trade

$pop_t$  = population

$fd_t$  = fiscal deficits

$dc_t$  = domestic credit creation/money supply

$edu_t$  = education expenditure

$urb_t$  = urbanization rate

$IMR_t$  = infant mortality rate

$dr_t$  = dependency ratio

$w_t$  = wage rate

$infr_t$  = infrastructure

$pd_t$  = population density

$I_t$  = interest rate

$INF_t^*$  = foreign inflation rate

$NERD_t$  = nominal exchange rate devaluations

$CINF_t$  = capital inflows

$fer_t$  = foreign exchange reserves

$POLCON_t$  = political constraints

$LEX_t$  = life expectancy at birth

$TD_t$  = trade deficit

Table 1 summarizes the theoretically expected effects of trade openness on channel variables and the effect of channel variables on output growth.

Table 1  
Theoretically Expected Effect of Trade Openness on Output Growth

Channel Variables	Effect of Trade Openness on the Channel	Effect of the Channel on Output Growth	Effect of Trade Openness on Output Growth
Physical Capital	(+)	(+)	(+)
Human Capital	(+)	(+)	(+)
Foreign Investment	(+/-)	(+)	(+/-)
Govt. Consumption	(+/-)	(+/-)	(+/-)
Inflation Rate	(-)	(-)	(+)
Real Exchange Rate	(+)	(+)	(+)
Democracy	(+/-)	(+/-)	(+/-)
Corruption	(-)	(-)	(+)
Foreign Debt	(+/-)	(+/-)	(+/-)
Foreign Exchange Market Distortion	(-)	(-)	(+)
<b>Total Effect</b>			(+/-)
<b>Total Net Effect</b>			(+/-)

Source: author's own calculation

### 3. DATA OVERVIEW AND ESTIMATION OF THE MODEL

#### 3.1. Data Overview

The quarterly data were collected for Pakistan for the period 1981/82 to 2007/08. The Appendix summarizes the construction of important variables. Most of the data were collected from International Financial Statistics, Government Finance Statistics, World Development Indicators, International Country Risk Guide and Pakistan Economic Surveys. Some data were also collected from different local and international institutions from their websites and via email communications. We have taken the year 2000 as the base year for all computations. Table 2 presents the correlation matrix of output growth, openness and the channel variables. The most interesting columns are the first and the second. The first column shows the unconditional relationship between growth and channel variables, including also the trade openness policy index. The signs of these correlations are consistent with our prior findings. The second column contains the correlations of trade policy openness with the channels, which are all relatively high. The signs of the correlations are as expected. We interpret these high simple correlations between trade policy openness and the channel variables as validating both our choice of channels and our simultaneous equations approach.

Table 2. Correlation Matrix for the Main Variables (1981/82Q1 – 2007/08Q4)

	Output Growth	Trade Policy Openness	Physical Capital	Human Capital	Foreign Investment	Govt. Consumption	Inflation	Real Exchange Rate	Democracy	Corruption	Foreign Debt	Exchange Market Distortions
Output Growth	1											
Trade Policy Openness	0.102	1										
Physical Capital	0.360	0.677	1									
Human Capital	0.103	0.495	0.595	1								
Foreign Investment	0.010	0.520	0.548	0.812	1							
Govt. Consumption	-0.211	0.132	0.295	0.557	0.514	1						
Inflation	-0.025	-0.199	0.068	0.212	0.031	0.184	1					
Real Exchange Rate	0.010	0.704	0.539	0.754	0.671	0.580	0.122	1				
Democracy	0.014	-0.505	0.134	0.241	0.151	0.503	0.465	-0.130	1			
Corruption	-0.019	-0.389	-0.172	-0.301	-0.258	-0.534	0.084	0.214	0.569	1		
Foreign Debt	-0.386	-0.392	0.011	-0.074	-0.065	0.542	0.220	0.008	0.586	0.455	1	
Foreign Exchange Market Distortions	-0.185	-0.170	-0.010	-0.054	-0.073	-0.136	0.117	-0.188	-0.010	-0.058	-0.109	1

### 3.2. Estimation of the Macro Model<sup>7</sup>

After extensive effort, the parameters of the structural growth model are estimated jointly using the Generalized Method of Moments (GMM) estimation technique.<sup>8</sup> Table 3 presents the estimates of our macro model. With the exception of inflation and distortion equations, the explanatory power of each equation of our structural model is above 75 percent. The autoregressive (AR) process has been applied to remove autocorrelation. The values of Durbin-Watson (DW) statistics are reasonably close to the desired value of 2 in almost all equations, which indicates the absence of an autocorrelation problem in the model. Similarly, the values of Durbin  $h$  statistics also indicate the absence of autocorrelation problem in the model. The results of each equation are explained below one by one.

1. **Output Growth.** The results for the growth equation closely resemble the existing findings in the empirical growth literature (see e.g. Barro, 1991; Barro and Sala-i-Martin, 2004; Levine and Renelt, 1992). The constant term, which basically shows the average level of productivity on growth, is positive and statistically significant. The rate of conditional convergence in our sample (equal to the estimated coefficient of the log of initial income), -0.887%, is in line with the common analyses of convergence in a time-series framework. The convergence is conditional in that it predicts higher growth in response to lower starting GDP per person only if the other explanatory variables are held constant.

Among channel variables physical capital, human capital, foreign investment, real exchange rate and democracy significantly positively affect output growth, while government consumption, inflation, corruption, foreign

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<sup>7</sup> Before estimation, stationarity properties of the variables are checked using the ADF unit root test. The results indicate that all growth variables are stationary at levels and all non-growth variables (with the exception of a few variables) are stationary at first differences. Therefore, there is no chance of full cointegration among the variables. Since the endogeneity problem is also likely to occur in the model, we cannot rely on ARDL. Instead, we have to apply GMM to estimate our model.

<sup>8</sup> In every equation, the number of exclusions is sufficient for the order condition for identification to be satisfied. The rank condition can safely be assumed to hold in a model of this size. Our individual equations and hence the whole system is supposed to be over-identified. Therefore, to estimate this over-identified system and to tackle the simultaneity problem, we have applied GMM to estimate our model. This method achieves consistency by appropriate instrumenting and efficiency through optimal weighting. Separate instruments are used for each equation, which are basically the lagged values of the variables of that particular equation.



debt and foreign exchange market distortions negatively affect output growth. Both government stability and defense expenditure do not seem to significantly affect the growth rate. The estimated coefficient of the rule of law is positive and significant. Further, growth is positively and significantly related to its lagged value. This implies that an increase in the previous year's growth rate would increase that year's growth rate.

2. **Trade Policy Openness.** The trade openness policy equation (column II) is included in the model to tackle the endogeneity problem and to check the possibility of reverse causation between trade openness and growth. This may not affect the parameter estimates in the other equations; however, it may provide efficiency gains. The estimates of this equation are in line with the theoretical predictions. In particular, the estimates underline the positive effects of initial income levels and the real exchange rate on trade openness policy, while, as expected, foreign exchange market distortions and terms of trade negatively affect trade openness. The estimate on economic growth is statistically significant and positive, but small economically. Thus, we do find statistically significant evidence of reverse causation between trade openness policy and output growth even though the effect of the latter on the former is small. Consistent with the previous empirical literature, the significant negative coefficient on country size (proxied by population) indicates that large countries tend to follow inward-oriented trade policies. This result indicates that gravity variables do bear some relation to trade openness policy.

Table 3: System Estimates for the Structural Growth Model (1981/82Q1 – 2007/08Q4)

	Output Growth	Trade Policy Openness	Physical Capital	Human Capital	Foreign Investment	Govt. Consumption	Inflation	Real Exchange Rate	Democracy	Corruption	Foreign Debt	Foreign Exchange Market Distortion
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Constant	0.016 (22.707)*	-0.288 (-14.896)*	-1.035 (-6.923)*	3.801 (15.698)*	-4.190 (-5.604)*	-0.821 (-0.628)	0.272 (16.217)*	0.419 (21.066)*	15.077 (53.035)*	-3.439 (-21.542)*	-0.744 (-1.804)**	0.027 (2.434)*
<b>Trade Policy Openness</b>	-	-	<b>0.430</b> (17.704)*	<b>0.584</b> (27.592)*	<b>1.565</b> (16.177)*	<b>0.112</b> (5.945)*	<b>-0.030</b> (-18.872)*	<b>0.026</b> (7.747)*	<b>-4.325</b> (-14.533)*	<b>-0.482</b> (-28.028)*	<b>-0.572</b> (-8.462)*	<b>-0.037</b> (-19.733)*
Initial Per Capita Income	-0.887 (-32.945)*	0.003 (1.933)**	-0.063 (-4.555)*	0.246 (15.734)*	1.633 (21.741)*	-0.203 (-12.662)*	-0.023 (-24.259)*	-0.018 (-6.948)*	-1.910 (-18.657)*	0.265 (20.877)*	-0.126 (-3.679)*	0.000 (0.338)
Output Growth	-	0.013 (13.283)*	-	-	-	-	-	-	-	-	-	-
Physical Capital	0.049 (3.749)*	-	-	0.183 (24.142)*	-0.032 (-0.545)	0.240 (8.724)*	-	0.031 (14.697)*	-2.521 (-14.819)*	-0.012 (-1.871)**	-	-
Human Capital	0.222 (9.857)*	-	0.251 (8.097)*	-	1.984 (18.464)*	0.852 (26.568)*	-	-	-	-0.105 (-10.036)*	-	-
Foreign Investment	0.029 (7.643)*	-	0.040 (11.279)*	-	-	-	-	-	-	-	-0.028 (-4.683)*	-
Govt. Consumption	-0.080 (-9.034)*	-	-	-	0.280 (8.276)*	-	-	0.006 (8.643)*	2.098 (11.691)*	-0.006 (-1.809)**	0.141 (7.612)*	0.004 (6.650)*
Inflation Rate	-4.208 (-28.287)*	-	-	-	-	-0.738 (-12.086)*	-	0.013 (3.955)*	-	-	-0.109 (-0.994)	-
Real Exchange Rate	0.199 (7.109)*	0.060 (46.218)*	-0.078 (-2.290)*	-	-2.677 (-20.588)*	-	-	-	-	-	0.900 (14.399)*	0.007 (0.013)
Democracy	0.008 (21.505)*	-	0.003 (5.404)*	0.005 (28.789)*	-	-0.021 (-17.368)*	0.001 (29.960)*	-	-	0.007 (22.858)*	0.013 (9.023)*	-

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Output Growth	Trade Policy Openness	Physical Capital	Human Capital	Foreign Investment	Govt. Consumption	Inflation	Real Exchange Rate	Democracy	Corruption	Foreign Debt	Foreign Exchange Market Distortion
Corruption	-0.040 (-7.461)*	-	-0.107 (-9.660)*	-0.051 (-24.124)*	-	-0.101 (-12.760)	-	-	-	-	-0.011 (-0.759)	-
Foreign Debt	-0.366 (-15.289)*	-	0.459 (16.034)*	-	1.061 (13.500)*	0.623 (22.789)*	-	-0.066 (-27.005)*	-	-	-	-
Foreign Exchange Market Distortions	-3.767 (-19.190)*	-0.611 (-27.125)*	-	-	-	-	-	-	-	-	-	-
Govt. Stability	-0.001 (-0.473)	-	0.003 (1.230)	-	0.072 (13.704)*	0.006 (3.621)*	-0.002 (-33.007)*	-	-	-	-0.045 (-10.301)*	-
Defence Expenditure	-0.008 (-0.296)	-	-	-	-	-	-	-	-	-0.257 (-24.660)*	-	-
Law & Order	0.006 (1.783)**	-	0.129 (13.351)*	-	0.025 (1.769)**	-	-	-	-1.021 (-12.217)*	-	-	-
Terms of Trade	-	-0.036 (-31.229)*	-	-	-	-	-	0.014 (9.681)*	-	-	-	0.009 (8.726)*
Population	-	-0.024 (-11.920)*	-	-	-	-	-	-	-	-	-	-
Fiscal Deficit	-	-	0.070 (13.527)*	-	-	-	0.007 (12.693)*	-	-	-	-	-
Money Supply	-	-	0.481 (16.232)*	-	-	-	0.039 (45.177)*	-0.015 (-4.832)*	-	-	0.877 (23.139)*	0.018 (16.204)*
Education Expenditure	-	-	-	0.322 (17.573)*	-	-	-	-	-	-	-	-
Urbanization	-	-	-	3.065 (20.788)*	-	-1.746 (-7.771)*	-	-	-	-0.418 (-9.167)*	-	-

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Output Growth	Trade Policy Openness	Physical Capital	Human Capital	Foreign Investment	Govt. Consumption	Inflation	Real Exchange Rate	Democracy	Corruption	Foreign Debt	Foreign Exchange Market Distortion
Infant Mortality Rate	-	-	-	-0.007 (-17.355)*	-	-	-	-	-0.157 (-22.474)*	-	-	-
Dependency Ratio	-	-	-	-0.034 (-1.091)	-	0.705 (3.488)*	-	-	-	-	-	-
Wage Rate	-	-	-	-	0.093 (1.001)	-	0.015 (6.472)*	-	-	-	-	-
Infrastructure	-	-	-	-	3.191 (13.079)*	-	-	-	-	-	-	-
Population Density	-	-	-	-	-	-1.090 (-4.621)*	-	-	-	-	-	-
Interest Rate	-	-	-	-	-	0.003 (7.269)*	0.001 (14.610)*	-	-	-	-0.009 (-8.079)*	-
Foreign Inflation	-	-	-	-	-	-	0.031 (4.941)*	0.035 (4.005)*	-	-	-	-
Nominal Devaluations	-	-	-	-	-	-	0.016 (4.535)*	1.048 (123.283)*	-	-	-	0.135 (19.358)*
Capital Inflows	-	-	-	-	-	-	-	-0.201 (-37.439)*	-	-	-0.960 (-8.532)*	-
Foreign Exchange Reserves	-	-	-	-	-	-	-	-0.004 (-13.449)*	-	-	-0.085 (-13.919)*	0.003 (12.821)*
Political Constraint	-	-	-	-	-	-	-	-	13.075 (55.550)*	-	-	-

	Output Growth	Trade Policy Openness	Physical Capital	Human Capital	Foreign Investment	Govt. Consumption	Inflation	Real Exchange Rate	Democracy	Corruption	Foreign Debt	Foreign Exchange Market Distortion
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Life Expectancy	-	-	-	-	-	-	-	-	-1.815	-	-	-
Trade Deficit	-	-	-	-	-	-	-	-	(-48.605)*	-	-	0.002
Lag Dependent Variable	1.142	0.888	-	0.909	-	-	0.133	0.994	-	0.844	-	-
AR(1)	(70.772)*	(410.210)*		(77.118)*			(12.728)*	(546.772)*		(233.899)*		
	-	-	0.939	-	0.086	0.945	-	-	0.794	-	0.956	-0.071
			(168.027)*		(6.438)*	(258.792)*			(152.750)*		(159.792)*	(-5.714)*
R <sup>2</sup>	0.758	0.956	0.894	0.965	0.762	0.877	0.397	0.997	0.953	0.885	0.818	0.194
Adjusted R <sup>2</sup>	0.714	0.952	0.877	0.961	0.728	0.856	0.318	0.997	0.948	0.873	0.785	0.105
DW			2.136		1.962	1.753			1.899		2.368	2.064
Durbin h Test	-1.161	0.0245		-1.341			0.084	1.112		0.387		
No. of Obs.	95	96	95	96	95	95	95	96	96	96	93	92

Notes: Dependent variables are given in the first row, while independent variables appear in the first column of the table. Values in parentheses denote *t* statistics. The *t* statistics significant at 5% and 10% levels of significance are indicated by \* and \*\* respectively.

3. **Physical Capital.** Trade openness policy has a strong positive relationship with physical capital accumulation. The coefficient of initial income shows that the conditional convergence holds, which implies that the rate of physical capital accumulation is lower for a country when it has a high level of initial per capita GDP, *ceteris paribus*. This suggests that the traditional assumption of diminishing marginal product of capital, a force that lies behind conditional convergence, holds in our estimates. Moreover, as expected, a high level of human capital, democracy, foreign debt, government stability, law and order, fiscal deficit and a high quality domestic financial system appear conducive to physical capital accumulation. A positive coefficient on foreign investment shows that it complements domestic investment rather than substitutes. Negative factors include real exchange rate and corruption. Thus, depreciation of the real exchange rate renders imported intermediate capital goods expensive, thereby adversely affecting domestic investment. Similarly, a high level of corruption leads to high administration barriers, again hindering domestic investment.

4. **Human Capital.** Estimates also indicate that, like physical capital, trade openness policy is also positively related to human capital, *ceteris paribus*. Further, high initial income has an encouraging effect on human capital. An increase in the level of domestic investment increases the level of human capital. Human capital also increases with an increase in democracy, education expenditure and urbanization. In turn, it decreases with an increase in the level of corruption, infant mortality rate and dependency ratio.

5. **Foreign Investment.** Foreign (direct) investment appears to be a complement, rather than substitute, to trade openness. Our findings support Singh and Jun (1995), that liberalized economies attract more FDI and promote its more efficient utilization than closed economies. High initial per capita GDP has a positive effect on foreign investment. The effect of domestic investment on foreign investment is not statistically of significance. The high level of human capital, government expenditure, foreign debt, government stability, law and order, and infrastructure, all appear conducive to attracting foreign investment. Foreign investment decreases with a high wage rate and real exchange rate depreciation.

6. **Government Consumption.** Trade policy has a positive impact on government consumption. This result substantiates the notion of Cameron (1978) and Rodrik (1998b) that public spending is higher in more trade liberalized countries because they are vulnerable to external shocks and government functions as a risk-reducing instrument by taking control of a

larger share of the country's resources. Initial per capita income is negatively related to government consumption. Both physical and human capitals are positively related with government consumption. Foreign debt also enables government to increase its consumption as does government stability. The dependency rate is positively related to government consumption, which indicates that government consumption will increase with the increase in food and retirement needs. Further, as expected, high interest rates increase government expenditure in Pakistan, as Pakistan is a highly indebted country in terms of both domestic and foreign debt. Factors that limit the size of government include inflation, democracy, corruption, urbanization, and population density. Inflation erodes the real value of government revenues, thereby limiting government size. More interestingly, democracy in Pakistan has controlled unnecessary government expenditure. In Pakistan most revenue leakages occur through corruption, which limits government consumption expenditure. Both urbanization and population density reduce government consumption. This can be viewed as the result of increasing returns in the provision of public goods.

7. **Inflation Rate.** The inflation equation displays a negative and significant effect of trade openness policy on domestic inflation. Thus, our findings corroborate the findings of Dollar (1992) and Rodrik (1998b), that as countries specialize according to their comparative advantage, more open economies are projected to have lower price levels than closed economies. As expected, higher levels of initial income and government stability are associated with reduced inflation. In turn, democracy, fiscal deficit, money supply, wage rate, interest rate, foreign inflation, and nominal exchange rate devaluation positively and significantly affect domestic inflation. Furthermore, inflation abroad transfers its impact into the domestic economy by increasing its inflation as well. This effect cannot be avoided in the present globalized world.

8. **Real Exchange Rate.** Trade openness policy has a significant positive effect on the Pak-rupee real exchange rate. This result endorses the conventional wisdom that openness leads to real depreciation through the strengthening of import demand, assuming that all goods are normal and substitution occurs across all goods and that the substitution effect dominates the income effect. Consistently with the findings of previous empirical studies, the Pakistani rupee real exchange rate depreciates with the increase in domestic investment, government consumption, domestic and foreign inflation rates, terms of trade and nominal exchange rate devaluation. Real exchange rate appreciates with an increase in initial per capita income,

foreign debt, capital inflows and foreign exchange reserves. An excess of domestic currency also appreciates the Pakistani rupee real exchange rate.

9. **Democracy.** The estimates of the democracy equation indicate that the marginal contribution of trade openness policy to democracy is negative. This result is not surprising for Pakistan, since Western countries have always supported dictatorship in Pakistan for their own vested interest. Therefore, it is expected that opening foreign trade will derail the democratic process in Pakistan. High initial per capita income is negatively correlated with democracy in Pakistan. Physical capital accumulation, law and order, infant mortality rate and life expectancy distort democracy, while government size and political constraints strengthen democracy. Although the model appears to perform well from a statistical point of view, it does not perform well from a theoretical point of view as the signs of some coefficients are against theoretical expectations. Examples include the negative signs of law and order and life expectancy variables.

10. **Corruption.** Trade openness policy has a significant negative effect on corruption. This result is compatible with theoretical literature that greater openness to world trade reduces corruption via increased internal market competition and reduced opportunities for local bureaucrats to demand bribes. Other determinants of corruption also have the expected effects on corruption. A higher level of initial income is associated with increased corruption. A high level of democracy also breeds corruption. Physical capital, human capital, government expenditure, defense expenditure and urbanization, all distort corruption.

11. **Foreign Debt.** Trade openness policy has a significant negative effect on foreign debt. This result indicates that in Pakistan, trade openness will increase fiscal revenues and foreign exchange earnings which in turn will decrease the level of dependence on foreign debt. An important implication of this result is that Pakistan should encourage trade, rather than aid. However, in practice foreign debt accumulation is increasing in Pakistan, which indicates that Pakistan has remained unable to use foreign debt for productive purposes and hence has remained unable to increase its net exports to pay back the debt.

High initial income has a negative effect on the accumulation of foreign debt. The accumulation of foreign debt is also adversely affected by high levels of foreign investment, government stability, interest rates, capital inflows and foreign exchange reserves. Foreign debt increases with the level of government size, real exchange rate devaluations, democracy and money



supply. Inflation and corruption do not have any significant effect on foreign debt.

**12. Foreign Exchange Market Distortions.** The regression results indicate a significant negative relationship between trade openness policy and foreign exchange market distortions. This negative effect means that Pakistan is following outward oriented policies, thereby lowering the government's role in the foreign exchange market. Initial per capita income does not have any significant effect on distortions while all other variables, which include government size, terms of trade, money supply, nominal devaluations, foreign exchange reserves and trade deficit, have a significant positive impact on distortions.

**13. Summary of the Channel Effects.** The summary of the channel effects of trade openness policy on grow this presented in Table 4, which reports the effects of trade openness on each channel variable and the effect of each channel variable on output growth. The last column displays the product of the two coefficients along with their *t*-statistics. The table shows that trade openness policy significantly affects output growth through all (ten) channel variables. The effect of trade openness policy on output growth through various channel variables is also shown graphically in Figure 2.

According to Table 4, trade openness policy works positively for growth through eight out of ten channels, i.e., through physical and human capital accumulations, foreign investment, inflation, real exchange rate, foreign debt, corruption and foreign exchange market distortions. Trade openness entails costs to growth through increasing government size and by lowering the level of democracy. Some channels are weak in magnitude, for instance, physical capital accumulation, foreign investment, government consumption, real exchange rate, democracy and corruption. The most important channels by far seem to be human capital, inflation, foreign debt and foreign exchange market distortions. These four channels combined, account for 93 percent of the total net effect of trade openness on growth.

Table 4  
The Contribution of Effects of Trade Openness on GDP Growth – Basic Specification  
(1981/82Q1 – 2007/08Q4)

Channel Variables	Effect of Trade Openness on the Channel	Effect of the Channel on Output Growth	Effect of Trade Openness on Output Growth
	(1)	(2)	(3)
Physical Capital	0.430 (17.704)*	0.049 (3.749)*	0.021 (3.723)*
Human Capital	0.584 (27.592)*	0.222 (9.857)*	0.130 (9.815)*
Foreign Investment	1.565 (16.177)*	0.029 (7.643)*	0.045 (6.982)*
Govt. Consumption	0.112 (5.945)*	-0.080 (-9.034)*	-0.009 (-4.921)*
Inflation	-0.030 (-18.872)*	-4.208 (-28.287)*	0.126 (16.413)*
Real Exchange Rate	0.026 (7.747)*	0.199 (7.109)*	0.005 (5.784)*
Foreign Debt	-0.572 (-8.462)*	-0.366 (-15.289)*	0.209 (7.573)*
Democracy	-4.325 (-14.533)*	0.008 (21.505)*	-0.035 (-12.020)*
Corruption	-0.482 (-28.028)*	-0.040 (-7.461)*	0.019 (7.007)*
Foreign Exchange Market Distortions	-0.037 (-19.733)*	-3.767 (-19.190)*	0.140 (13.611)*
<i>Total Positive Effect</i>			0.696
<i>Total Negative Effect</i>			-0.044
<i>Total Net Effect</i>			0.651
Wald Test			(17.626)* 310.664
(p-value)			0.000

Notes: Values in parentheses denote underlying student-*t* values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by \* and \*\* respectively.

Source: author's own calculation

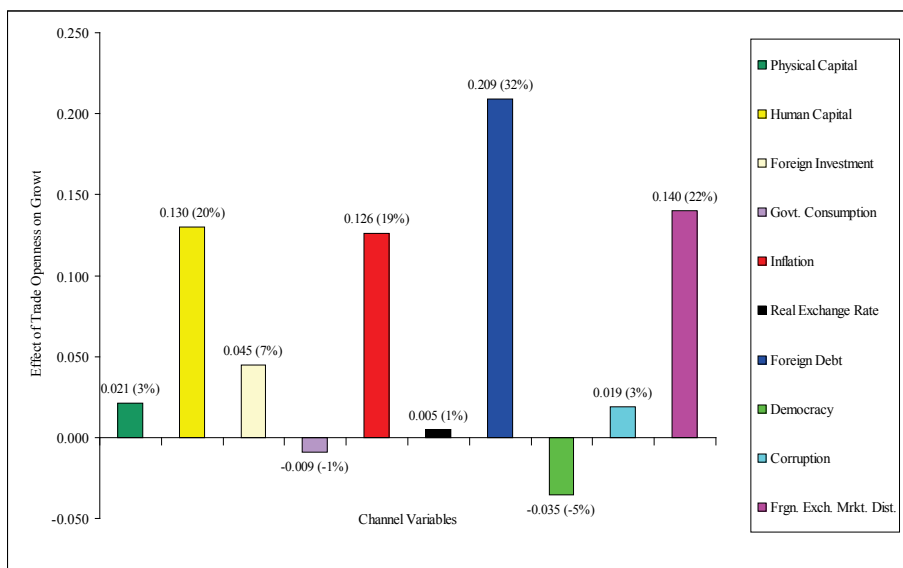


Figure 2. Graphical View of the Channel Effects

Source: author's own calculation

According to the parameter estimates, a one percentage point increase in trade openness policy would bring about a 0.651 percentage point increase in annual growth of per capita income once all of the channels of influence are brought into the picture. This estimate is significantly different from zero at almost 100 percent confidence level. Thus, in accordance with past studies, the overall effect of trade openness policy on output growth is positive.

## 4. SENSITIVITY ANALYSIS

### 4.1. SUR Estimates

The Seemingly Unrelated Regression (SUR) estimator, while inconsistent (no instruments are used), is characterized by greater efficiency and may prove some indication of the model's robustness. Column (2) of Table 5 provides the SUR estimates.<sup>9</sup> The results show that the effects of all channel

<sup>9</sup> For easier comparison, the tables that follow always report the benchmark results from column (3) of Table 4.

variables are much reduced in SUR estimates with the possible exception of government consumption, which has increased to some extent. The signs of government size, foreign debt, democracy and corruption have also changed. This may be due to the reverse causation, which is likely to be prevalent in the trade policy-channels and channels-growth relationship, as argued previously. Furthermore, the effects of channels on growth turned out to be statistically insignificant in SUR estimates. The only exception is foreign exchange market distortions. However, its significance level has also decreased. The magnitude of the overall effect of trade openness policy on growth and its significance level has decreased to a great extent in SUR estimates as compared to GMM estimates. To be brief, we may conclude that our results of channels are somewhat sensitive to the estimation choice and this is not surprising.

#### **4.2. Exclusion of Per Capita Income**

Our model includes initial income as an explanatory variable in every equation. Since we have come to know that trade openness policy and income levels are interlinked, it is important to check the effect of openness on growth, regardless of income levels. For this purpose we exclude initial income from all the equations of the model (except from the growth equation) and re-estimate the model. It is expected that this will increase the overall effect of trade openness on growth. Column (3) of Table 5 provides the estimated results. It is evident from the table that for some of the channel variables the effect of trade openness on growth has increased. These channel variables include foreign investment, government consumption, inflation, foreign debt and democracy. For some other channel variables the effects of openness on growth has decreased (human capital and foreign exchange market distortions), while for physical capital, real exchange rate, and corruption, the effects of trade openness on growth are maintained. The total net effect of trade openness on growth has increased to some extent. This is mainly due to an increase in the magnitude of inflation and foreign debt coefficients. All the signs and significance of the channel effects are preserved. Even the significance level of the total net effect has increased to a great extent. This reinforces our confidence in the benchmark estimates.<sup>10</sup>

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<sup>10</sup> To check the possibility of omission of any other important channel variable through which trade openness may affect output growth, we have extended our model by including some additional channel variables like government stability, labour force, manufacturing imports, etc. But their effects on growth via trade openness turned out to be statistically insignificant. Therefore, they were excluded from the model and their results are not reported here to save space.

Table 5  
Sensitivity to SUR Estimates and Exclusion of Per Capita Income Variable  
(1981/82Q1 – 2007/08Q4)

Channel Variables	Base Specification	SUR Estimates	Excluding Per Capita Income
	(1)	(2)	(3)
Physical Capital	0.021 (3.723)*	0.018 (1.123)	0.021 (4.690)*
Human Capital	0.130 (9.815)*	0.014 (0.931)	0.068 (9.676)*
Foreign Investment	0.045 (6.982)*	0.034 (1.232)	0.050 (9.741)*
Govt. Consumption	-0.009 (-4.921)*	0.036 (0.939)	-0.013 (-7.243)*
Inflation	0.126 (16.413)*	0.056 (1.551)	0.143 (18.523)*
Real Exchange Rate	0.005 (5.784)*	0.000 (0.270)	0.005 (6.259)*
Foreign Debt	0.209 (7.573)*	-0.016 (-0.844)	0.302 (16.263)*
Democracy	-0.035 (-12.020)*	0.010 (0.299)	-0.039 (-12.090)*
Corruption	0.019 (7.007)*	-0.023 (-1.234)	0.018 (10.071)*
Foreign Exchange Market Distortion	0.140 (13.611)*	0.050 (1.771)**	0.125 (17.168)*
<i>Total Net Effect</i>	<i>0.651</i> (17.626)*	<i>0.179</i> (2.364)*	<i>0.679</i> (26.393)*
Wald Test	310.664	5.590	696.572
( <i>p</i> -value)	0.000	0.000	0.000

Notes: Values in parentheses denote underlying Student *t* values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by \* and \*\* respectively.

Source: author's own calculation

### 4.3. Tests Based on the Residuals from the Growth Equation

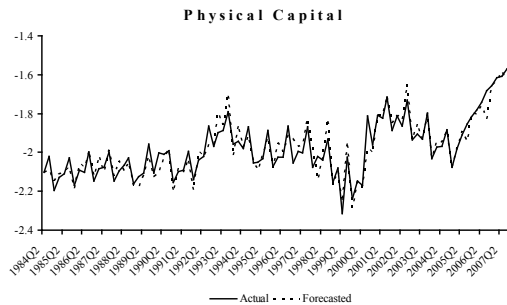
To formally test the possibility of omission of any important channel variable from the model we regress residual vector from the growth regression on the trade openness policy index. If any important channel variable is omitted from the growth regression, this will show a statistically significant effect of trade openness policy on output growth. The results presented in Table 6, based on both GMM and SUR regression estimators, indicate that this is not the case. In both regressions, the residual effect of trade openness policy is negative, but statistically insignificant. This, again, strengthens our confidence in the robustness of the model.

Table 6  
Regression of the Residuals from the Growth Equation  
on the Trade Policy Openness Index

Variables	GMM Estimation	SUR Estimation
	(1)	(2)
Constant	0.003 (0.480)	0.001 (0.181)
<b>Trade Policy Openness</b>	<b>-0.027</b> <b>(-0.737)</b>	<b>-0.016</b> <b>(-0.320)</b>
R <sup>2</sup>	0.002	0.001
No. of Obs.	94	98

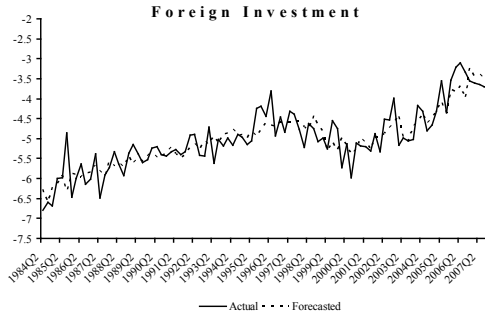
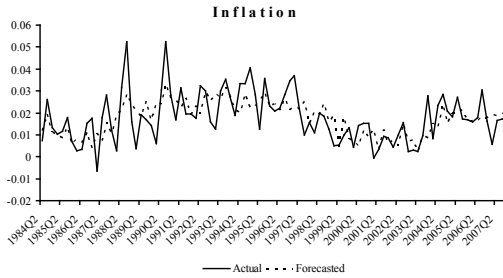
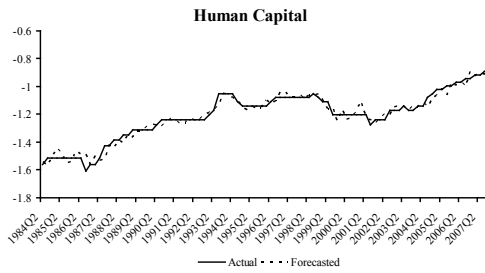
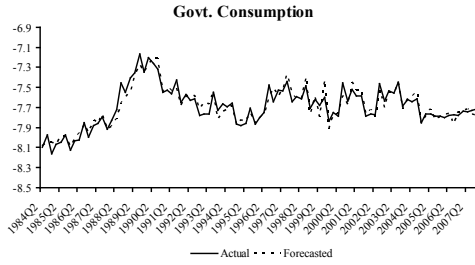
## 5. FORECASTING ANALYSIS

The forecasting performance of the structural model is examined using within-sample forecasts. This forecast compares historical data with the data predicted by the model. For this purpose we have used the deterministic forecast method. Figure 3 shows the graphs of actual and forecasted values of the endogenous variables. We observe that the forecasted series do seem to reproduce the general long-term behaviour of the actual series, although in some of the cases short-term fluctuations in the actual series are not reproduced well as there is minor over/under-prediction in some of the variables. Overall, the forecasted values of the endogenous variables track their historical values well and for the vast majority of variables the tracking is very satisfactory.<sup>11,12</sup>

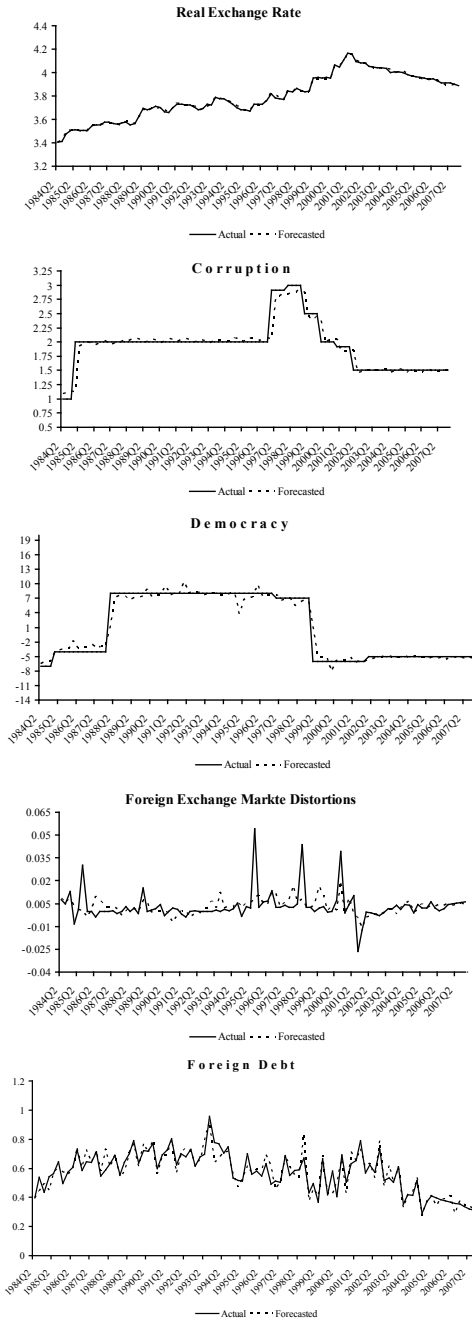


<sup>11</sup> We have also checked the forecasting performance of the model by applying several statistics. For this purpose, Mean Error (ME), Mean Percentage Error (MPE), Root Mean Square Error (RMSE), Root Mean Square Percentage Error (RMSPE), and Theil's Inequality Coefficient (TIC) are calculated. The calculated values of ME, MPE, RMSE, RMSPE, and TIC are close to zero, which indicates higher tracking ability of the model. The results are not reported here to save space.

<sup>12</sup> We have also checked the model's performance through out-of-sample forecasts. For this purpose we re-estimated our model by truncating the sample period by the last 2 years (eight quarters). The values of endogenous variables are then estimated (forecasted) over the final eight quarters for which data were available, finding the values of the endogenous variables by using actual historical values for the exogenous variables. The out-of-sample forecast also makes clear that predictions from the model are reasonably reliable. These forecasts are not reported here again to save space.







## 6. CONCLUSION

The paper empirically evaluates the effects of trade openness on economic growth in Pakistan using various channel variables for the period 1981/82 to 2007/08. For this purpose a macro-econometric model is estimated applying the GMM estimation technique. The results indicate that the net effect of trade openness policy on growth is positive and moderate. The findings uncover evidence of robust effects of trade openness on growth working through human capital (more trade openness → more human capital → higher growth), inflation (more trade openness → less inflation → more growth), foreign debt (more trade openness → less foreign debt → more growth) and foreign exchange market distortions (more trade openness → less distortions → more growth). These four variables explain 93 percent of the total impact of trade openness policy on economic growth. Estimates also uncover the moderate effects of trade openness on growth working through foreign investment and democracy. These two channels explain only the 12 percent effect of trade openness on growth. Finally, our model also uncovers the low effect of trade openness on growth working through physical capital, government consumption, real exchange rate and corruption. They explain only the 8 percent effect of trade openness policy on growth. These results are resistant to changes in estimation technique, equation specifications and considering some additional variables. Thus, the results of this study do not endorse the findings of Michaely (1977), Tyler (1981), and Edwards (1989) that positive trade openness – economic performance relationship is not relevant to low income countries. The study also examines the performance of the macroeconometric model through within-sample forecasts. The model tracks data well and has small mean prediction errors. Thus, the model can be used as a tool for carrying out structural analysis, forecasting and policy evaluation.

The estimated model has some policy relevance for policy makers in Pakistan. The favourable effects of trade openness policy on output growth indicate that Pakistan needs to encourage trade rather than aid, as trade is an important mechanism with other supporting tools that can enable Pakistan to grow and become economically independent. For this purpose, considerable progress needs to be made to improve the trade related infrastructure, labour skills, market know-how, adoption of new technology, quality control management, etc. and to remove the remaining trade distortions.

## APPENDIX: DESCRIPTION OF VARIABLES

- Trade openness policy index is taken from Zakaria (2012). Zakaria constructs a trade openness policy index for Pakistan using quarterly data for the period 1981/82 to 2007/08. For this purpose a trade equation (exports plus imports to GDP ratio) is estimated. Real exchange rate (RER); domestic and foreign income levels; export and import duty rates; Sachs-Warner (1995) liberalization dummy, interaction terms of dummy with RER, domestic and foreign income levels; terms of trade; foreign exchange market distortions, and lagged values of exports and imports expressed as ratio of GDP are taken as independent variables. By picking up the parameter estimates of trade policy variables, i.e., export duties, import duties and trade liberalization dummy and multiplying them by their time-series values, a trade openness policy index is calculated, which is a weighted average of these three variables.

- Initial income is real per capita GDP lagged by eight quarters.
- Corruption is an index ranging from zero to six with zero indicating the maximum corruption. Government stability is an index ranging from zero to twelve with zero the most unstable government. Law and Order is an index ranging from zero to six with zero the worst law and order situation. Data on these variables is taken from ICRG.

- Political constraint is proxied by POLCONV score, which is an index ranging from 0 (no constraints on executive's powers) to 1 (full constraints on executive's powers) and is taken from Henisz (2000) data set.

- Democracy is proxied by Polity 2 score, which is an index ranging from -10 (full autocracy) to +10 (complete democracy). It is taken from Polity IV data set of Marshall and Jaggers (2009).

- Domestic investment (physical capital accumulation), foreign debt, foreign investment, defense expenditure, fiscal deficit, money supply (domestic credit creation), education expenditure, government consumption (net of defense and education expenditure), capital inflow (capital account surplus) and trade deficit are taken as a ratio of GDP.

- Human capital is secondary school enrollment rate of children with age 10 to 14 years.

- Inflation is growth rate of CPI.

- Real exchange rate is nominal exchange rate adjusted for domestic and foreign price levels; where nominal exchange rate is domestic currency per unit of foreign currency.

- BMP (foreign exchange market distortions) is the difference of the market exchange rate to the official rate expressed as a percentage of the latter.
- Infrastructure is the ratio of paved roads to total roads in the country.

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